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ENVIRONMENT
& HEALTH

Via Express Courier

Paulette Gaynor, PhD
GRAS Notification Program
Office of Food Additive Safety (HFS-200)
Center for Food Safety and Applied Nutrition
Food and Drug Administration
5001 Campus Drive
College Park, MD 20740

GRAS NOTIFICATION FOR SILK PROTEIN DERIVED FROM *BOMBYX MORI* COCOONS.

April 10, 2020

Dear Dr. Gaynor,

On behalf of Cambridge Crops, Inc., I hereby submit a notification of the generally recognized as safe (GRAS) determination for silk protein as derived from Bombyx mori cocoons.

If you have any questions or require any additional information, please do not hesitate to contact me.

Sincerely,

Ramboll
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CC: Adam M. Behrens, Ph.D., adam@cambridgecrops.com, Cambridge Crops, Inc.
Laith M. Abu-Taleb, Esq., laith@cambridgecrops.com, Cambridge Crops, Inc.

Enclosures: One (1) paper copy of all submission documents.
One (1) CD-ROM with all submission files.

GENERALLY RECOGNIZED AS SAFE (GRAS) ASSESSMENT FOR THE USE OF CAMBRIDGE CROPS MORI SILK AS A COATING FOR FOODS

Date
April 10, 2020

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Cambridge Crops

CONTENTS

TABLES

FIGURES

APPENDICES

PART 1. SIGNED STATEMENTS AND CERTIFICATION

1.1 Name and Address of the Notifier

Adam Behrens, Ph.D. CEO adam@cambridgecrops.com	Laith Abu-Taleb, Esq. General Counsel & Vice President of Corporate Affairs laith@cambridgecrops.com

Cambridge Crops, Inc.
444 Somerville Avenue
Somerville, MA 02143

1.2 Name of Notified Substance

The subject of this generally-recognized-as-safe (GRAS) notice (GRN) is silk protein, primarily consisting of silk fibroin, as extracted from *Bombyx mori* cocoons. It is isolated from additional proteins within the *Bombyx mori* cocoons through a relatively simple process. It is manufactured as per current Good Manufacturing Processes (cGMP) and is made soluble via the addition (and later, the removal) of commonly found salts. The silk protein shall be marketed under the trade name Mori Silk.

1.3 Background

Silk has been approved by regulatory bodies and used in various industries including healthcare and cosmetics. Silk fibroin was first utilized as a suture in the 1800s, and nonabsorbable silk surgical sutures designed to be used *in vivo* are included as a "General and Plastic Surgery Device" in 21 CFR §878.5030 since 1993. Further, silk fibroin was approved by United States Food and Drug Administration (FDA) as a surgical scaffold to be used *in vivo* in a 510(k) premarket submission by SERI Surgical (Allergan) in 2013 (K123128).

Other countries have also approved the use of silk fibroin *in vivo* by their regulating authorities. In South Korea, for example, Tympasil® has been approved as a silk fibroin patch for ear drum perforations. In China, the silk fibroin has been approved for use as a clinical wound dressing (Sidaiyi®).

Further, in 2015 a Cosmetic Ingredient Review (CIR) panel was commissioned. The CIR panel published a "Safety Assessment of Silk Proteins as Used in Cosmetics" that reviewed the use of ten variations of silk ingredients as conditioning and bulking agents in cosmetic products. The CIR noted the use of silk proteins in cosmetics such as powders and hairsprays, as well as non-cosmetics such as surgical sutures.

While there are no GRNs designating the safety of silk fibroin for oral consumption, silk fibroin remains a well-characterized protein approved for uses in ancillary industries by regulating bodies. Furthermore, silkworms and silkworm-derived food products are consumed by people in regions of the world outside of North America.

1.4 Intended Conditions of Use of the Notified Substance

Mori Silk primarily consisting of silk fibroin isolated from *Bombyx mori* cocoons and applied to various foods including fruits, vegetables, meat, cheeses, and candy (processed foods) results in a thin edible coating to preserve food in accordance with allowed mechanisms described in 21 CFR 170.3(o). It will be used at levels consistent with cGMP. Mori Silk is intended to extend the shelf life of foods by forming a protective barrier on the outside of the food. It will provide a thin, edible, and tasteless barrier to protect against degradation, moisture loss, and oxidation. Mori Silk is effective in extending the shelf life of a variety of foods, from whole- and cut-produce to meats, fish, and processed foods such as hard candies. There are three main ways that Mori Silk may be added to a food, further described in **Part 3**: (1) Wetting the food in a container containing Mori Silk solution, (2) mixing a Mori Silk solution in with food, or (3) spraying food with Mori Silk solution. The estimated 95th percentile daily intake of Cambridge Crops Mori Silk on foods consumption is 5.74 milligrams (mg) Mori Silk / kilograms (kg) body weight / day (**Table 1**). The estimated daily intake by age group is reported in **Table 5** in **Part 3.3**.

Table 1: Estimated Daily Intake[1] of Mori Silk as a food coating by the U.S. population

mg Mori Silk / kg body weight / day	
Median	95th Percentile
1.77	5.74

1.5 Statutory Basis for GRAS Determination

The use of Cambridge Crops Mori Silk as an ingredient in food at the levels described herein has been determined to be safe and GRAS, using scientific procedures[2], in accordance with the Federal Food, Drug and Cosmetic Act (FFDCA), Section 201(s) and Section 170.30 of Part 21 of the Code of Federal Regulations (21 CFR §170.30).

Ramboll, on behalf of Cambridge Crops, organized a panel of experts qualified by training and experience to evaluate the safety of food and food ingredients. This panel of experts ("GRAS Panel") evaluated the Mori Silk food ingredient, the intended conditions of use, and the safety of the proposed intake of Mori Silk based on generally available and accepted information.

[1] As calculated over every individual with reported body weight surveyed in the United States Department of Health and Human Services' 2013-2014 and2015-2016 National Health and Nutrition Examination Surveys (NHANES). Overall, the 2013-2014 and 2015-2016 NHANES had a sample size of 16,085 people from all ages, including infants, children, teenagers, and adults with a reported body weight.

[2] 21 CFR §170.3 Definitions. (h) Scientific procedures include the application of scientific data (including, as appropriate, data from human, animal, analytical, or other scientific studies), information, and methods, whether published or unpublished, as well as the application of scientific principles, appropriate to establish the safety of a substance under the conditions of its intended use.

uses of Mori Silk are excluded from the definition of a food additive, are not subject to the premarket approval requirements of Section 201(s) of the FFDCA and may be used in the U.S. without the promulgation of a food additive regulation by the FDA under 21 CFR.

1.7 Availability of Data and Information to FDA

Should FDA ask to see the data and information that are the basis for the conclusion of GRAS status of the food ingredient uses of Cambridge Crops Mori Silk as described herein, Cambridge Crops

i. agrees to make the data and information available to FDA; and

ii. agrees to the following procedures: upon FDA's request, Cambridge Crops will allow FDA to review and copy the data and information as provided at 21 CFR §170.225(c)(7).

1.8 Freedom of Information Act (FOIA)

None of the data and information in this GRN is exempt from disclosure under the Freedom of Information Act, 5 U.S. Code 552.

1.9 Certification

To the best of the knowledge of Cambridge Crops, this GRAS notice is a complete, representative, and balanced submission that includes unfavorable information, as well as favorable information, known to Cambridge Crops and pertinent to the evaluation of the safety and GRAS status of the proposed food ingredient uses of Cambridge Crops Mori Silk described herein.

1.10 Name, Position, and Signature of Certifier

Based on an evaluation of relevant data laid out within this report, the notifier has determined that Cambridge Crops Mori Silk is safe for its intended uses and GRAS under the terms of 21 CFR §170.30. We also have concluded that other "experts qualified by scientific training and experience to evaluate the safety of food and food ingredients" would agree with this determination.

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The GRAS Panel is composed of the following experts:

These experts, independently and collectively, critically evaluated the safety assessment as presented herein including the supporting data. The safety dossier incorporates publicly available information regarding the safety of Mori Silk including published reports of toxicological studies, unpublished supporting data from the Notifier, and estimates of the potential human exposure to Mori Silk resulting from its intended use as an ingredient in coating for foods. Cambridge Crops and the GRAS Panel concluded that the proposed uses of Mori Silk described herein are safe and GRAS based on scientific procedures. The GRAS Expert Panel Consensus Statement is provided in Appendix A. Curricula Vitae of the Panel members and advisor are provided in **Appendix A1**.

1.6 Exemption from Premarket Approval Requirements of the FFDCA

Cambridge Crops has determined that the proposed food ingredient uses of Mori Silk in food, wherein Mori Silk is manufactured as described herein in accordance with Good Manufacturing Practice (GMP) and meets the specifications described herein, are exempt from the premarket approval requirements of the FFDCA because Cambridge Crops determined such uses to be safe and GRAS. This determination was made in compliance with the Substances Generally Recognized as Safe regulation [21 CFR § 170.30, as published in the Federal Register, Vol. 81, No. 159, FR 54960, August 17, 2016] and meets the requirements of the final regulation (21 CFR §170.35).

Cambridge Crops concluded that the uses of Mori Silk described herein are safe and GRAS based on scientific procedures at the proposed levels of inclusion in food, and thus, these

PART 2. IDENTITY, METHOD OF MANUFACTURE, AND SPECIFICATIONS, AND PHYSICAL OR TECHNICAL EFFECT

2.1 Identity

Silk fibroin is a naturally occurring protein derived from the silk fibers of the domesticated silkworm (*Bombyx mori*). Fibroin consists of three components (Kaplan and McGraith 2012, p106; Vapari and Kaplan 2007; Mondal et al. 2007):

1. ~325-390 kilodaltons (kDa) heavy chain.
2. ~25-26[3] kDa light chain.
3. ~25-30 kDa P25 glycoprotein.

The three proteins coexist in fibroin with a molar ratio between fibroin's heavy chain, light chain, and P25 of 6:6:1 (Inoue et al. 2000). Silk fibroin is dominated by the heavy chain, which has an approximate 15 times higher molecular weight than the light chain. Because of that, silk fibroin's identity is dominated by the heavy chain's characteristics. Taken together, the proteins are known as "silk fibroin." Fibroin has a Chemical Abstracts Service Registry Number (CASRN) of 9007-76-5. Silk fibroin's amino acid composition consists primarily of glycine (approximately 42-46%), alanine (approximately 29-31%), and serine (approximately 9-12%) as shown in **Table 2** and Table B1 in **Appendix B**. Independently, fibroin's light chain is comprised of alanine (approximately 17%), aspartic acid/asparagine (approximately 15%), glycine (approximately 10%), glutamic acid/glutamine (approximately 8%), and valine (approximately 7%) (Sashina et al. 2006). P25, a smaller protein of approximately 220 amino acids, is composed of 20 amino acids with leucine at the highest proportion (10%), followed by alanine (7%), aspartic acid, isoleucine, asparagine, arginine, and serine (6% each) with other amino acids in proportions ≤5% (**Appendix E**). Because of the relative molecular weights, the light chain and p25 do not impact the amino acid concentration of silk fibroin to a significant degree. The light chain and p25 compose relatively little of the overall fibroin content.

Generally, fibroin consists of repeating segments of amino acid sequences. The heavy chain comprises twelve crystalline domains interspersed with non-repetitive primary sequences known as "linkers". The heavy chain is primarily made of glycine (G)-X repeats, with X being alanine (A), serine (S), or tyrosine (Y) (Zhou et al. 2001). Each domain consists of sub-domain hexapeptides made up of these glycine-X repeats including: GAGAGS, GAGAGY, GAGAGA or GAGYGA. These sub-domains end with tetrapeptides such as GAAS or GAGS (Zhou et al. 2001; Zhou et al. 2000; Gage and Manning 1980). The less crystalline forming linker regions are between 42-44 amino acid residues with identical 25 amino acid residues composed of charged amino acids (Zhou et al. 2001; Vepari and Kaplan 2007).

Occurrence of fibroin in silkworm cocoon

The silkworm cocoon naturally contains fibroin protein that is intermingled with sericin in the cocoon fibers. Silk fibers are composed of two proteins (**Figure 2**): fibroin fibers (center) are held together by sericin proteins like a glue or coat (Kaplan and McGraith 2012, Barbosa and

[3] Different publications report different weights for each of these components due to different methodological approaches.

Martins 2017). Fibroin and sericin are different in amino acid profile and solubility. Fibroin mostly consists of four amino acids in the following approximate proportions: 42-46% glycine, 29-31% alanine, 9-12% serine, and 4-5% tyrosine (Mondal et al. 2007, Wray et al. 2011, Kaplan and McGraith 2012). This amino acid profile is distinct from sericin, which is composed of approximately 10-20% glycine, 6% alanine, 30% serine, and 15% aspartic acid/asparagine (Wray et al. 2011, Kaplan and McGraith 2012) (**Appendix B**). Due to the distinct amino acid profiles and the solubility profile of fibroin, fibroin and sericin can be separated during a process known as "degumming." The sericin components represents 20-30% of the silk cocoon by mass. The degumming process has been reported to alter the molecular weight of silk fibroin and lead to a smear of protein below 390 kDa (Yamada et al. 2001; Jiang et al. 2006). This aligns with the range reported by other publications, where the smear starts at approximately 375-446 kDa (Kaplan and McGraith 2012, Vepari and Kaplan 2009, Mondal et al. 2007). Due to the distinct amino acid profiles and the hydrophobic nature of fibroin, fibroin and sericin can separated during the degumming process, and the removal of sericin during the degumming process can be verified.

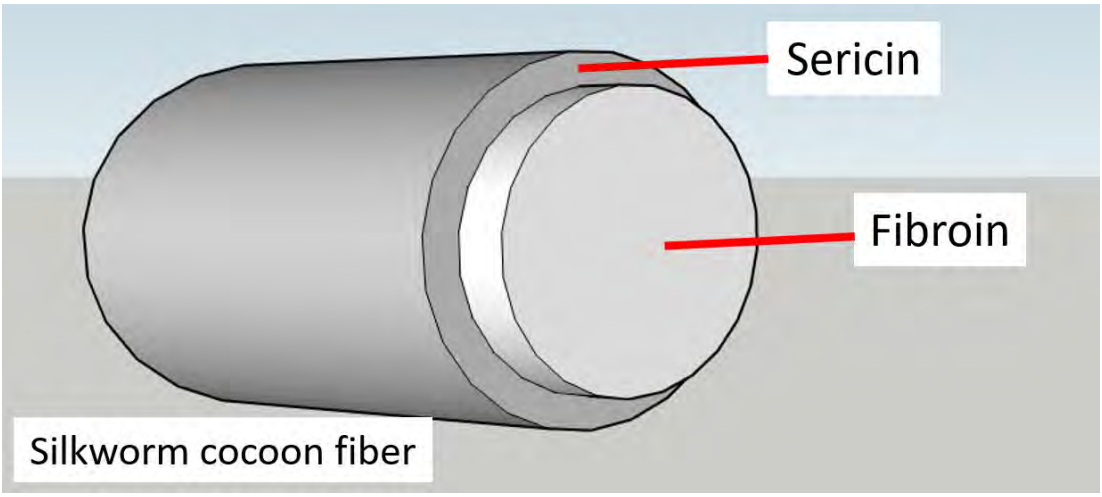

Figure 1: Cross section of a representative silk cocoon fiber. Source: Cambridge Crops

2.2 Physical and Chemical Properties

The physical and chemical properties of fibroin as described in the scientific literature are listed in **Table 2**). The abbreviated amino acid composition as described in the literature is in **Table 2**, with details in **Appendix B**. The molecular weight of silk fibroin ranges between approximately 35 kDa and 446 kDa, as described in **Part 2.1**. As silk fibroin is a large nonuniform molecule with varying structure, different publications report varying values for solubility, pH, and molecular weight due to different methodological approaches. Fibroin is insoluble without further processing, and solubility varies in literature based on methodology. Fibroin is commercially available as a powder or in solution.

2.3 Characterization of Production Organism

Cambridge Crops' Mori Silk is derived from the cocoons of the domesticated silkworm *Bombyx mori*. Silkworms were domesticated in China thousands of years ago primarily for the use of producing silk for textile as well as the edible pupae (Durst et al. 2010).

B. mori silkworms feed solely on the leaves of the mulberry plant and exist only as domesticated – wild *B. mori* silkworms are either rare or nonexistent. *Bombyx mori* silkworms are within the *Bombyx* genus, the *Bombycidae* family, of the order of *Lepidoptera* of the *Insect* class.

The silkworm's silk glands are divided into three functionally different regions. Fibroin is synthesized in the posterior region (Kaplan and McGraith 2012) where it moves by peristalsis to the middle region where it is stored as a viscous aqueous solution until needed for spinning. Sericin is produced in the middle region of the gland. When the silkworms secrete the liquid silk during the spinning, it passes through the anterior gland and expelled out through the spinneret opening (Mondal et al. 2007). As such – the silkworm itself that is eaten in various countries outside of North America contains fibroin at all times.

2.4 Manufacturing Process

Isolation of Mori Silk begins with cocoons from *Bombyx mori* silkworms. Silkworms are first removed from the cocoons. The silkworm-free cocoons then undergo a "degumming" step to separate the fibroin from the sericin "glue", which is glue-like due to hydrogen bonds between serines. As the sericin is more readily soluble in aqueous conditions than fibroin, it is easily removed by boiling in alkaline solutions (Kaplan and McGraith 2012), as highlighted in Step 1 in **Figure 2**. After a period of neutral-to-high pH boiling, the insoluble fibroin is removed and thoroughly rinsed (Step 2a in **Figure 2**). A salt solution is added to the rinsed fibroin and agitated to solubilize the fibroin (Step 2b in **Figure 2**). The salt, oftentimes lithium bromide, calcium chloride or another similar GRAS salt, is then removed from the solution by any traditional method (e.g., dialysis) (Step 3 in **Figure 2**), thus leaving Mori Silk in solution (Product D in **Figure 2**). No antibiotics are used in the production process. Only food or pharmaceutical grade chemicals and processing aids are used in the manufacture of Mori Silk.

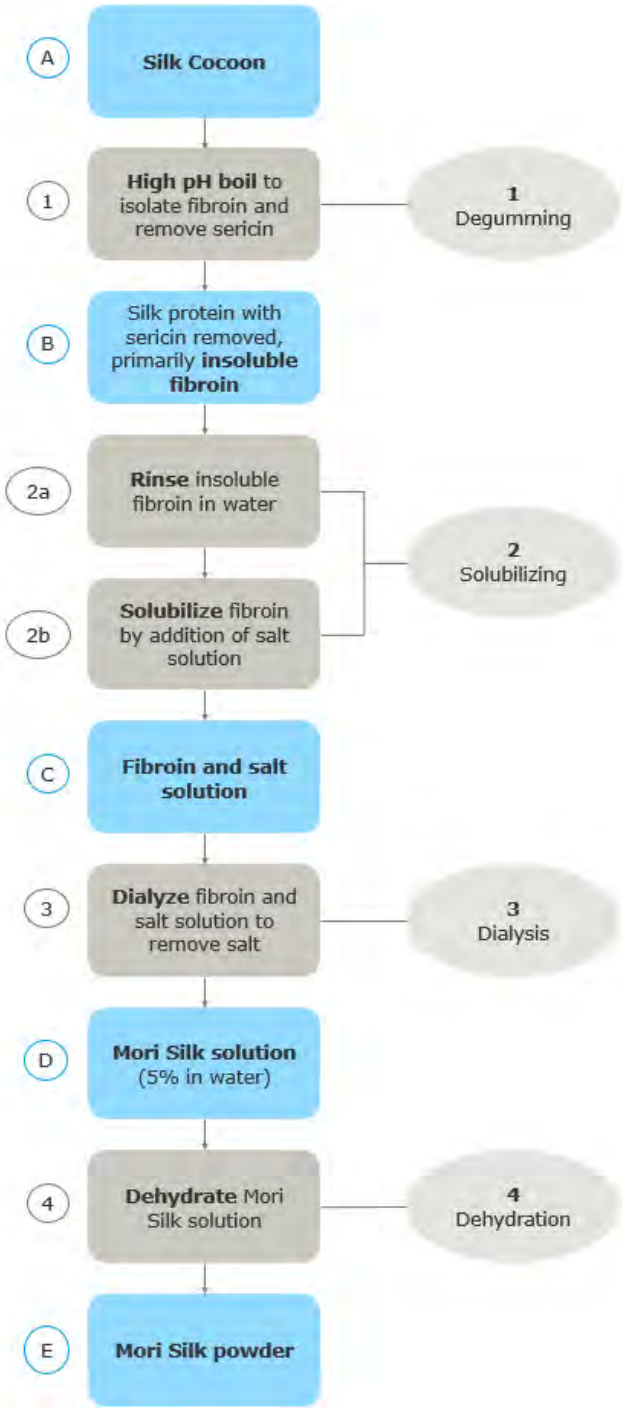

Figure 2: Manufacturing process of Cambridge Crops Mori Silk

Product D (Mori Silk solution) may be applied to foods to extend the underlying food's shelf-life. Further, Product D may be dehydrated until only powder remains (Product E, “Mori Silk powder”). This powder may then be reconstituted in water prior to application on a food.

2.5 Product Characteristics and Specifications

The identity of Mori Silk is confirmed by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) and amino acid analysis (**Appendix B** contains additional details on amino acid analysis) and compared to literature values. The amino acid analysis confirms that Mori Silk is made up of almost entirely the fibroin heavy chain, as the light chain has different proportions of amino acid concentrations (**Appendix B**). The molecular weight range of Mori Silk (smear of fragments of molecular weights below 460 kDa, pictured in **Appendix I**) aligns with the molecular weight range determined from literature (**Table 2**), and the amino acid profile of Mori Silk corresponded with that reported in literature (**Table 2**). Mori Silk is comprised of silk protein, primarily fibroin heavy chain with minimal presence of fibroin light chain and p25.

Table 2: Chemical and Physical Properties of Silk Fibroin

Property	Silk Fibroin Based on Published Values	Mori Silk Manufactured by Cambridge Crops
Chemical		
Molecular weight	Range 375-446 kDa[a] Smear of molecular weights below 390 kDa[b]	Smear of molecular weights at approximately 460 kDa[c]
Amino acid profile[d,e]		
Glycine	42-46%	43-46%
Alanine	29-31%	30-32%
Serine	9-12%	7-10%
Tyrosine	4-5%	4-6%
Valine	1-3%	2-3%
Physical		
Appearance (Form)	Colorless to yellow aqueous solution White or off-white powder	Colorless to yellow aqueous solution White or off-white powder
Solubility	Variable[f]	150-250 mg/mL
pH	$\geq$4.5[g], 6.8[h]	Approximately 7

Abbreviations:
kDa = kilodalton
[a]Kaplan and McGraith 2012, p106; Vepari and Kaplan 2009; Mondal et al. 2007
[b]Yamada et al. 2001
[c]SDS-PAGE yields a smear of molecular weights with an upper bound at or around 460 kDa.
[d]Fibroin heavy chain is presented as it makes of the majority of fibroin; based on eight publications, see Appendix B for details
[e]Cambridge Crops amino acid analysis, see Appendix B for full results.
[f]Fibroin is a large molecule and solubility varies based on method of isolation and processing and resultant structure
[g,h]Advanced BioMatrix, Chen et al. 2008; pH varies depending on structure of fibroin and the part of *Bombyx mori* from which the fibroin was extracted.

Mori Silk will be applied to foods in solution form or as a reconstituted powder—both of which will have identical specifications. Between solution (Part D in **Figure 2**) and powder (Part E in **Figure 2**) is a dehydration process for shipping and storage purposes. Both forms will contain instructions on dilution to particular concentrations. The products will meet specifications for identity and purity including specifications for microbiological contaminants and heavy metals (**Table 3**).

Mori Silk will be added to the foods either by mixing it in with the food, spraying it onto the food, or placing the food in a solution containing Mori Silk.

The salt solution used to solubilize fibroin may contain common salts such as calcium chloride, lithium bromide or other chaotropic salts. If using lithium bromide at maximum lithium residual (specification set at 75 ppm, see **Table 3**) in Mori Silk, the estimated daily intake of lithium due to ingestion of Mori Silk is well below United States Environmental Protection Agency's (EPA) Provisional Peer-Reviewed Toxicity Value (PPRTV) for lithium: a chronic reference dose
for oral exposure of 2 x 10-3 mg/kg-day. This value was derived from a human study resulting in a lowest-observed-adverse-effect-level (LOAEL) of 2.1 mg/kg-day.[4]

Table 3: Specifications of Mori Silk*

Parameter	Product Specification	
	Specification	**Method**
Protein	4.0 - 7.5%wt (40 - 75 mg/g)	AOAC 992.15
Ash	<0.1%wt	AOAC 920.153
Fat	<0.1%wt	AOAC 922.06
Carbohydrates	<0.1%wt	Calculation
Lithium	<75 ppmw	ICP-OES
Arsenic	<5 ppmw	ICP-OES
Lead	<5 ppmw	ICP-OES
Escherichia coli	<10 cfu/g	AOAC 991.14
Listeria monocytogenes	Negative/25g	AOAC 070702
Salmonella typhimurium	Negative/25g	AOAC 2009.03

* Mori Silk solution or Mori Silk powder reconstituted at 5% weight/volume in water (50 mg Mori Silk in 1 mL potable water, mixed or stirred to solution).

Abbreviations: AOAC = Association of Analytical Chemists; cfu = colony-forming units; g = gram(s); ICP-OES = inductively coupled plasma optical emission spectrometry; mg = milligram(s); ppmw = parts per million by weight; wt = weight

[4] EPA notes that the lower bound of the therapeutic serum lithium concentration range was selected as the basis for the derivation of the PPRTV for Lithium.

2.6 Batch Data

Three independently manufactured, nonconsecutive batches of approximately 5% Mori Silk in water were analyzed for protein, carbohydrates, fat, and contaminants including metals and microbes to demonstrate that Mori Silk consistently met specifications set for identity and purity (**Table 4**; **Appendix C1**). All three batches met the established specifications demonstrating that Mori Silk complies with appropriate specifications for food-grade materials and that a consistent product may be produced. Specifications are set and can be seen in **Table 3**. Corresponding certificates of analysis for Mori Silk are in **Appendix C1**. Cambridge Crops demonstrated that protein was the main constituent (98.6%) of Mori Silk in one batch of Mori Silk powder, spray-dried from a 5% in water Mori Silk solution (**Appendix C2**).

Table 4: Analysis of Production Batches of Mori Silk Solution*

Parameter	Specification	Batches			Method
		Batch 215	**Batch 230**	**Batch 244**	
		10/13/2019	11/18/2019	1/16/2020	
Protein	4.0 - 7.5%wt (40 - 75 mg/g)	4.42% (44.2 mg/g)	4.59% (45.8 mg/g)	6.95% (69.5 mg/g)	AOAC 992.15
Fat	<0.1%wt	<0.01%	<0.01%	<0.01%	AOAC 922.06
Carbohydrates	<0.1%wt	0.04%	<0.01%	<0.01%	Calculation
Ash	<0.1%wt	<0.01%	<0.01%	0.05%	AOAC 920.153
Lithium	<75 ppmw	48 ppmw	33 ppmw	59 ppmw	ICP-OES
Arsenic	<5 ppmw	<0.2 ppmw	<1.8 ppmw	<1.7 ppmw	ICP-OES
Lead	<5 ppmw	<0.1 ppmw	<4.1 ppmw	<3.8 ppmw	ICP-OES
Escherichia coli	<10 cfu/g	<10 cfu/g	<10 cfu/g	<10 cfu/g	AOAC 991.14
Listeria monocytogenes	Negative/25g	Negative/25g	Negative/25g	Negative/25g	AOAC 070702
Salmonella typhymurium	Negative/25g	Negative/25g	Negative/25g	Negative/25g	AOAC 2009.03
Calcium	N/A	<0.2 ppmw	3.6 ppmw	<1.7 ppmw	ICP-OES
Magnesium	N/A	<0.3 ppmw	<2.7 ppmw	<2.8 ppmw	ICP-OES
Mercury	N/A	<0.4 ppmw	<4.7 ppmw	<4.4 ppmw	ICP-OES
Bacillus cereus	N/A	<3 mpn/mL	<3 mpn/mL	<3 mpn/mL	AOAC 980.31/ISO 7932
Cronobacter	N/A	Negative/25g	Negative/25g	Negative/25g	PCR
Enterobacteriaceae	N/A	<10 cfu/g	<10 cfu/g	<10 cfu/g	AOAC 2003.01
Staphylococcus aureus	N/A	<10 cfu/g	<10 cfu/g	<10 cfu/g	AOAC 2003.07
Mold	N/A	<10 cfu/g	<10 cfu/g	<10 cfu/g	BAM Ch. 18
Yeast	N/A	<10 cfu/g	<10 cfu/g	<10 cfu/g	BAM Ch. 18

Notes: Protein was provided on a weight basis in mg protein/g sample.
*Mori Silk solution before dehydration

Abbreviations: AOAC = Association of Analytical Chemists; BAM = Bacteriological Analytical Manual; cfu = colony-forming units; g = gram(s); ICP-OES = inductively coupled plasma optical emission spectrometry; mg = milligram(s); mL = milliliter(s); N/A = not applicable (no specification); PCR = polymerase chain reaction; ppmw = parts per million by weight

2.7 Stability

Mori Silk powder was determined to be stable for approximately 317 days (accelerated conditions in a stability study lasting 28 days and extrapolated using Arrhenius equation). Containers carrying Mori Silk powder will be labeled with a stability time of 300 days from time of manufacturing. The stability study was conducted by preparing Mori Silk in three different food-grade packaging materials: (1) Compostable Plant Fiber container (World Centric, SKU CU-SC-U2; (2) Metallized Mylar container (QQStudio, ASIN B071VDZXWX; and (3) Compostable PLA Souffle container (World Centric, SKU CP-CS-2S). Each of the samples were stored at 60°C and 30% relative humidity for the 28 days. At the start of the study and once every seven days, a bicinchoninic acid protein assay (BCA assay) was conducted with part of the sample to quantify the total protein in each sample after resolubilization in water. The standard BCA assay has a margin of error of ±10 mg/ml. The total protein remained substantially similar to baseline throughout the 28-day stability study. Protocol and detailed results are provided in **Appendix D**.

2.8 Allergenic Potential

There are no published instances of allergenic episodes from the consumption of silk fibroin.

Potential allergens within the silkworm itself were researched, as silk fibroin is a substance produced by the silkworm. Details of this bioinformatics investigation are in **Part 6.4**. Furthermore, samples of the *Bombyx mori* pupae and cocoon along with Cambridge Crops in-process fibroin and Mori Silk were analyzed for potential allergenicity by way of mass spectrometry (**Part 6.4**).

2.9 Intended Technical Effect

Cambridge Crops' Mori Silk is intended to be used as a coating on various foods including fruits, vegetables, meat, cheeses, and candy to preserve food in accordance with allowed mechanisms described in 21 CFR 170.3(o) including as a surface finishing agent, a substance used to increase palatability, preserve gloss, and inhibit discoloration of foods, including glazes, polishes, waxes, and protective coatings (21 CFR 170.3(o)(30)).

Cambridge Crops' Mori Silk will be used at levels consistent with current Good Manufacturing Practice. [5]

[5] Good manufacturing practice is defined by FDA (21 CFR §182.1) to include the following restrictions:

(1) The quantity of a substance added to food does not exceed the amount reasonably required to accomplish its intended physical, nutritional, or other technical effect in food; and

(2) The quantity of a substance that becomes a component of food as a result of its use in the manufacturing, processing, or packaging of food, and which is not intended to accomplish any physical or other technical effect in the food itself, shall be reduced to the extent reasonably possible.

(3) The substance is of appropriate food grade and is prepared and handled as a food ingredient.

PART 3. DIETARY EXPOSURE

3.1 Background Intake Level

Foods consisting of or containing silkworm, pupae, or cocoons are available for purchase as a specialty food in the United States. However, the background intake level of silkworm, silkworm pupae or silkworm cocoons in the United States is unknown.

Outside of the U.S., fibroin-containing *Bombyx mori* silkworms and silkworm-derived products, including fibroin powder (Rajakumar et al., 2014), are eaten frequently and by people of all age groups. Most populations that consume silkworm-derived products reside primarily in East and Southeast Asian countries. A review of other countries' health and nutrition examination surveys did not specify silkworms or insect consumption as a food consumption category (Boonchoo et al 2017, Lee et al 2012, Song and Song 2014, University of North Carolina 2015, Japan National Health and Nutrition Survey, 2012).

3.2 Uses in Food

Uses of silkworm, larvae or cocoons either as food itself or within food are common in areas outside of North America; notably China, Japan, and India (see **Part 3.1** Background Intake Level and **Part 5.1** Experience Based on Common Use in Food). Silkworms and silkworm-derived food products exist and are sold in the United States; however, consumption is likely well below rates of consumption in other parts of the world. In fact, *B. mori* silkworms have been consumed as far back as 5,000 years ago in China (Durst et al., 2010), with populations in China, Thailand, India, and other countries treating the silkworms as part of their common diet (Yang 1999 via Yang et al., 2009, Chen et al. 2009, Feng et al 2017). There are no large-scale food uses in the United States.

Cambridge Crops intends to use Mori Silk to extend the shelf life of foods. Specifically, it intends to use Mori Silk with fruits, vegetables, cheese, candy, whole meat, ground meat, processed meat, and fish for ingestion by the general population in accordance with 21 CFR 182.1(b). Those food categories represent approximately 653 grams of food per day at the 95% percentile of intake among adults. The concentration of Mori Silk on foods is dependent on the food item itself. As regulated by 21 CFR 182.1(b), Cambridge Crops intends to only use an amount "reasonably required to accomplish its intended physical, nutritional, or other technical effect in food."

Mori Silk will be applied to foods in three ways, depending on the food product:

1. Wetting the food in a container with Mori Silk solution;
2. Mixing Mori Silk in with the food; or
3. Spraying the food with a Mori Silk solution.

The difference between applications will depend on the underlying food processing lines and methods. Mori Silk is designed to be effective for use with existing processor lines or equipment with minimal changes from farmers, growers, shippers, or packers.

The estimated daily intake is 5.74 mg Mori Silk per kg body weight per day for the 95th percentile consumer (details are presented in **Part 3.3**).

3.3 Estimated Intakes of Mori Silk from the Proposed Uses

Estimates of potential intakes of ingredient resulting from these intended uses were calculated using food consumption data reported in the United States Department of Health and Human Service's 2013-2014 and 2015-2016 National Health and Nutrition Examination Surveys (NHANES).

Mori Silk is intended to be used on a variety of foods, including fruits, vegetables, proteins, and processed foods. In order to estimate potential intake of the Mori Silk, Cambridge Crops analyzed data from the 2013-2014 and 2015-2016 NHANES which had a total sample size of 16,085 people with reported body weights. The 2013-2016 NHANES data are the most recent datasets that have been published. Each food was analyzed to determine consumption of foods belonging to the following food categories: (1) whole meat (2) ground meat; (3) processed meat; (4) fish; (5) fruits; (6) vegetables; (7) cheese; and (8) processed foods, including for example hard candy and candy bars. Further details of NHANES calculations are provided in **Appendix H**. Cambridge Crops anticipates some food items in each of the categories to be coated with Mori Silk.

Each of the foods coated may require a different amount of Mori Silk in order for the coating to be effective. Cambridge Crops will follow good manufacturing practice (21 CFR §182.1(b)) and only use the amount necessary. Further, there is an economic reason to only use what is necessary.

That said, any amount of Mori Silk Protein will extend the underlying food's shelf life. An efficient (i.e. low amount of coating with appropriate coating efficacy) coating concentration would be at or below 110 mg of Mori Silk per kg of food for most foods. The highest coating concentration is expected to be 880 mg of Mori Silk per kg of food. The overwhelming majority of foods will be coated at a concentration at or lower than 110 mg of Mori Silk per kg of food.

Cambridge Crops assumed that 50% of foods are coated with at the concentration of 110 mg Mori Silk per kg food, and that 50% of foods are coated at 880 mg Mori Silk per kg food. Further, Cambridge Crops assumed the very unlikely scenario where *each and every* piece of food in the eight food categories eaten by the individuals surveyed by NHANES is coated with Mori Silk.

In addition, the consumption amounts below do not take into account any sort of rinsing that may occur at any stage in the supply chain; whether on the processing line, in a commercial kitchen, or at home. For some foods, Mori Silk may be readily rinsed or washed off.

These conservative assumptions were used to estimate the daily intake of Mori Silk on foods by age group (**Table 5**). **Part 6** further describes the safety of such amounts as eaten by the consumer.

Table 5. Estimated Daily Intake of Mori Silk as a Food Coating by Age Group					
Population	*n*	g **food** consumed / kg bodyweight / day		mg **Mori Silk** / kg bodyweight / day	
		Median	95th Percentile	**Median**	**95th Percentile**
Infants (0-11 months)	304	5.52	21.84	**2.74**	**10.83**
Toddlers (12-35 months)	800	10.81	26.21	**5.36**	**13.00**
Children (3-11 years)	2,943	6.65	18.37	**3.30**	**9.11**
Teenagers (12-19 years)	2,399	3.22	9.34	**1.60**	**4.63**
Adults (age 18-79 years)	9,874	3.29	8.81	**1.63**	**4.37**
All	16,085	3.57	11.58	**1.77**	**5.74**
Abbreviations: bw = body weight, g = gram(s), kg = kilogram(s), mg = milligram(s)					

Assuming the 95th percentile food consumption rate, an average adult in the United States weighing 83.4 kg would consume 364 mg of Mori Silk each day. An adult consuming the median amount of food per day would consume 136 mg. Adults have the highest overall intake of Mori Silk per day and the next highest overall intake group is teenagers: 312 mg Mori Silk per day (95th percentile), 107 mg per day (median).

PART 4. SELF-LIMITING LEVELS OF USE

The intended uses of Cambridge Crops' Mori Silk are not self-limiting.

PART 5. EXPERIENCE BASED ON COMMON USE IN FOOD

5.1 Naturally Occurring Silk Fibroin: Silkworms are eaten in many parts of the world

The *Bombyx mori* silkworm may be the oldest domesticated insect in the world – domesticated for both the silk textile as well as the edible pupae as far back as 5,000 years ago in China (Durst et al. 2010). The *B. mori* silkworm is reported to be a "well-studied insect and people from many countries have eaten silkworm, larvae, pupae, and adults for centuries." (Mitsuhashi, 1997). The larvae, pupae, and adults (as well as the silkworm cocoon pelade, the innermost layer of silkworm cocoon, commonly eaten as well) all contain fibroin. *B. mori* silkworms are touted for having high protein content and are relatively easy to breed. Yang et al (2009) proposed silkworms as a suitable source of protein for humans on the International Space Station. The silkworm silk fiber contains more than 98% protein (Feng, 2004 via Yang et al., 2009) and fibroin itself contains 18 kinds of amino acids (Yang et al., 2009).

Evidence that silkworms, silkworm pupae and silkworm cocoons have been eaten for centuries in Asian countries including China, Japan and India is plentiful in academic publications (e.g., Yi et al. 2010, Rajakuma et al. 2014, Buhroo et al. 2018). *Bombyx mori* silkworms are consumed during all stages of the silkworm's life cycle: in particular, the silkworms themselves are a popular food among people in Shandong province, China; people in the northeast region of China commonly consume silkworm pupae; and people in Henan province and Southern China commonly consume silkworm moths (Yang et al., 1999 via Yang et al., 2009) – all of which contain fibroin. The cocoon pelade, the inner and unreelable layer of cocoon, is also consumed in Japan where it is hydrolyzed from the waste of silk fibers via enzymatic treatment and further chemically refined to become a final food product intended to be consumed with milk or coffee as a nutritional supplement (Rajakumar et al., 2014). In a United Nations Food and Agricultural Organization Workshop, scholars from around the world touted the positive effects of consuming *Bombyx mori* silkworms (Durst et al., 2010).

Silkworm and pupae are also eaten in other forms. For example, silkworm and silkworm pupae are commonly added to food in powder form as a protein source in Hong Kong, China, Korea and Japan (Savithri and Sujathamma 2016). The Henan Province in China is cited as an area where the larvae and adults of *Bombyx mori* and tussah silkworms (*Antheraea pernyi*) are common foods (Feng et al., 2018). Larvae and adults are also popular cuisines in other regions of China, Japan, and east Asian countries (Yang 1999 *in Chinese* via Yang et al. 2009, Chen et al. 2009, Feng et al 2018). Another species of silkworm is domesticated in India for textiles and serves as a food (Durst et al. 2010). In Thailand, cooked silkworm pupae are a popular snack in rural villages and urban areas like Bangkok (Durst et al. 2010). Silkworms are served boiled in a sweet-sour sauce in Japan as well as in Vietnam, roasted silkworm pupae are sold by street vendors in China, and another boiled and seasoned preparation of silkworm is common in Korea (Savithri and Sujathamma 2016). Fibroin protein from silkworms, silkworm larvae, and silkworm cocoons has been consumed by large populations for many years.

PART 6. NARRATIVE

6.1 Introduction

Silkworms, pupae, and cocoons have been eaten in many countries for centuries, particularly in Asia. Though there is no large-scale consumption noted in the United States, the safety of consuming silkworm and silkworm-derived products is supported by scientific procedures, and a documented history of safe consumption in other parts of the world. In addition, silk fibroin products have been approved by FDA and other regulating bodies around the world for non-food use in humans.

Mori Silk is directly derived from silkworm cocoons which mainly consist of two proteins, sericin and fibroin. Sericin is removed, leaving fibroin for use as a food coating. **Part 2** provides details on the identity and manufacturing process of Cambridge Crops Mori Silk as well as information on analytical testing to demonstrate the absence or acceptable levels of manufacturing residuals including chemical byproducts, processing aids, solvents, bacteria, bacterial proteins, and endotoxins. In this part (**Part 6**), the safety data for Cambridge Crops' Mori Silk and supporting studies are presented and discussed. Cambridge Crops developed a toxicology testing program with a repeated dose 28-day oral toxicity study (**Part 6.3.2.1**) and other supporting studies for the Mori Silk ingredient based on a pre-notification consultation meeting with FDA (September 10, 2019) and subsequent communications. In addition to the results of Cambridge Crops studies, studies of other Bombyx mori-derived substances are also presented and discussed.

6.2 Absorption, distribution, metabolism, and excretion of silk fibroin

Silk fibroin is a protein present within the *Bombyx mori* silkworm cocoon as a double-stranded fiber coated with proteins called sericin (Wray et al. 2011). The silk fiber mass is comprised of 70-80% silk fibroin, 20-30% sericin, 0.4-0.8% wax matter, 1.2-1.6% carbohydrates, 0.7% inorganic matter, and 0.2% as pigment (Mondal et al., 2007). The core of the silk fiber, silk fibroin, is comprised predominately of a crystalline portion that contains repeating amino acids, e.g., glycine, alanine, and serine, that form the antiparallel ß-sheet providing the silk fiber its stability and mechanical properties (Cao and Wang 2009). The amino acid molar composition of fibroin consists of 46.4 mol% of glycine, 31.6 mol% of alanine, 9.48 mol% of serine, and 4.98 mol% of tyrosine, plus residual amounts of other amino acids (Mondal et al. 2007).

In general, digestion of dietary proteins begins in the stomach and continues into the lumen of the duodenum (Lentner et al. 1981). Within the digestive tract of humans, proteins are broken down via hydrolysis primarily into free amino acids. Approximately 10% of the proteins in the gastrointestinal tract do not undergo hydrolysis and are excreted in the feces. (Lentner et al. 1981). Silk fibroin heavy chain, most similar to the composition of Mori Silk, is composed predominately of glycine and alanine and, in smaller proportions, tyrosine and serine and trace amounts of other amino acids (Mondal et al. 2007). Glycine is a non-essential amino acid capable of being endogenously generated from serine with very low acute oral toxicity (European Chemicals Agency (ECHA) 2020a). Following absorption, glycine is transported into the liver and distributed throughout the body where it is involved in the biosynthesis of DNA, phospholipids, heme, and collagen (ECHA 2020a). Glycine undergoes metabolism primarily via the glycine cleavage system leading to the formation of ammonia and carbon dioxide. Glycine can also be converted to serine and then metabolized

to pyruvate or oxidized to oxalate in the liver via hepatic lactate dehydrogenase (ECHA 2020a).

The amino acid alanine, also a primary component of silk fibroin, is a prominent amino acid within the human body that is utilized in the synthesis of proteins (ECHA 2020b). The liver accumulates plasma alanine and metabolizes alanine to pyruvate, which is oxidized or utilized to form glucose by gluconeogenesis (ECHA 2020b). L-alanine is absorbed in the gastrointestinal tract and taken up via active transporters into the mucosal cells, where it may undergo distribution, utilization, or be further broken down by the mucosal cells and excreted. Alanine and its metabolites are water soluble and are filtered and eliminated in the urine by the kidneys. (ECHA 2020b).

L-tyrosine and L-serine, the other major amino acid components of silk fibroin, are highly concentrated in cell membranes and are found in high concentrations in the muscle tissue. Serine undergoes non-oxidative deaminated to pyruvate via L-serine dehydratase. Influenced by the catalytic enzyme, serine hydroxymethyltransferase, serine maintains equilibrium with glycine and has a similar metabolic pathway (Lentner et al. 1981). Finally, L-tyrosine is metabolized in humans by the enzyme tyrosine aminotransferase to yield 4-hydroxyphenylpyruvate, which is further metabolized to acetoacetate and fumarate (Lentner et al. 1981). Serine and tyrosine, like other amino acids, are rapidly metabolized and broken down within the liver and other cells via conversion into urea and other metabolites. Amino acids and their metabolites are filtered by the kidneys, where they are actively reabsorbed, or filtered into the urine for excretion (ECHA 2020c, ECHA 2020d).

6.2.1 Mori Silk Demonstrated Digestible in *in vitro* Digestibility Study in Simulated Human Gastric Fluid

Cambridge Crops conducted an *in vitro* digestibility study in simulated human gastric fluid using Mori Silk. The digestibility of Mori Silk was tested at 10 units pepsin per microgram (ug) Mori Silk. Pepsin was diluted in simulated gastric fluid with a pH of 2.0. The pepsin solution was tested for proteolytic activity by digestion of Mori Silk within 24 hours of each assay day. A limit of detection study was performed prior to digestion to ensure that 10% residual protein was detectable using SDS-PAGE and Coomassie blue staining. 350 ug of Mori Silk with and without pepsin were measured at different time points from 2 minutes to 60 minutes.

The results show that Mori Silk was rapidly digested in pepsin at pH 2.0 at a ratio of 10 units pepsin per ug Mori Silk. The SDS-PAGE Coomassie blue gel staining method demonstrated that over 90% of the protein was digested in less than two minutes. The full study is provided in **Appendix I**.

6.3 Safety of Mori Silk Demonstrated in Toxicological Studies

Studies confirm that Cambridge Crops Mori Silk is safe for its intended uses. A discussion of key studies is presented in this **Part 6.3** and in **Table 6** “Summary of Toxicological Studies Regarding Mori Silk and other *Bombyx mori*-derived Substances”. Studies of *Bombyx mori*-derived substances (i.e. silkworm powder) are included to support the safety of consumption of silk fibroin. Studies of silk fibroin substances that have been significantly altered after isolation from *Bombyx mori* or their cocoons were not included as such substances are different from silk fibroin (Coelho et al. 2020, Naserzadeh et al. 2018).

The test substance used in Cambridge Crops' toxicology studies was Mori Silk solution at approximately 5% in water. The Mori Silk solution was then further diluted or concentrated to create the concentrations necessary for the studies.

6.3.1 Mutagenicity and Genotoxicity Studies

6.3.1.1 Mori Silk is not mutagenic or genotoxic

Mutagenicity

To evaluate the potential mutagenicity of Cambridge Crops Mori Silk, an Ames test was conducted by Product Safety Labs (PSL, 2394 US Highway 130, Dayton NJ, 08810) using *Salmonella typhimurium* strains TA1535, TA1537, TA98, TA100 and *E. coli* strain WP2 uvrA (**Appendix G1**) following OECD Guideline 471 and complying with Good Laboratory Practice (GLP). Based on this Ames test, Mori Silk did not show evidence of bacterial mutagenicity.

Mori Silk was tested at levels of 31.6, 100, 316, 1000, 3160, 10,000, 31,600, and 100,000 ug/plate using the plate incorporation method in both the absence and presence of metabolic activation (chemically-induced rat liver S9 mix), with a confirmatory assay using the same dose levels in a pre-incubation assay (30 minutes at 37°C), with and without metabolic activation. The mean revertant colony counts for each strain treated with the vehicle were close to or within the expected range. The vehicle control was sterile water, the same substance with which the Mori Silk test substance was diluted. The positive control substances yielded the expected substantial increases in revertant colony counts in both the absence and presence of S9 in each phase of the test, confirming the sensitivity of the test and the activity of the S9 mix. The positive control substances used in the test were the following: sodium azide (15 ug/mL in sterile water) for *S. typhimurium* TA100, TA1535, ICR 191 acridine (10 ug/mL in sterile water) for *S. typhimurium* TA1537, daunomycin (60 ug/mL in sterile water) with *S. typhimurium* TA98, methyl methanesulfonate (25 uL/mL in sterile water) with *E. coli* WP2 uvrA, and 2-aminoanthracene (100 ug/mL in DMSO) for all strains tested. Precipitation and toxicity were not present in any of the strains; contamination that did not impact evaluation of mutagenicity, was noted in individual plates for three strains tested (*E. coli* WP2 uvrA, *S. typhimurium* TA1535 and TA1537). No concentration-related or substantial test substance related increases in the number of revertant colonies were reported with any of the *Salmonella* or *E. coli* strains tested in both the absence and presence of metabolic activation using either the plate incorporation or the pre-incubation method. The study met the requirements of appropriate Good Laboratory Practice Standards with the exception that positive control substances and verification of concentration of positive control substances in their carriers were not determined analytically; however, the purity of the materials used were certified by a reputable supplier and all preparations were thoroughly documented. Under the conditions of the study, Cambridge Crops Mori Silk was not mutagenic.

Genotoxicity

To evaluate the potential genotoxicity of Cambridge Crops Mori Silk, (i.e., damage to the chromosomes or mitotic spindle apparatus of erythroblasts), an *in vivo* mouse erythrocyte micronucleus test was performed by Product Safety Labs following OECD Guideline 474 and complying with GLP (**Appendix G2**). The test substance was administered by gavage to 5 male and 5 female Institute of Cancer Research (ICR) mice at 1000 mg/kg·bw/day in a volume of 20 mL/kg for two days. The limit dose of 1000 mg/kg·bw/day was selected

because it was the maximum achievable dose level of the test substance formulation in this test system. Distilled water served as the vehicle control and cyclophosphamide was the positive control. There were no mortalities and no clinical findings were reported in any animal over the course of the study. A minimum target of 4,000 polychromatic erythrocytes per animal was scored for incidence of micronucleated immature erythrocytes.

The test substance did not induce a statistically significant increase in frequency of micronucleated reticulocytes in male or female mice. The frequency of reticulocyte and micronucleated normochromatic erythrocytes did not differ significantly after treatment with the test substance. The negative control and positive control results were valid, and the study met the requirements of appropriate Good Laboratory Practice Standards. Under the conditions of the study, Cambridge Crops Mori Silk was not genotoxic with respect to micronucleus induction.

6.3.1.2 Other studies evaluating genotoxicity of *Bombyx mori*-derived substances (not Mori Silk)

No mutagenicity or genotoxicity not*ed* with silkworm extract powder (Heo et al. 2013)

The test substance used by Heo et al. (2013) was silkworm extract powder from *Bombyx mori* larvae frozen in liquid nitrogen and lyophilized. The lyophilized larvae were extracted with ethanol and lyophilized again to produce the silkworm extract powder. The final test substance powder likely contained fibroin along with other components of the silkworm. Heo et al. (2013) performed a bacterial reverse mutation assay, chromosomal aberration assay, and a mouse bone marrow micronucleus assay.

Silkworm extract powder was tested for mutagenicity in a bacterial reverse mutation test (Ames test) with *Salmonella typhimurium* TA100, TA1535, TA98, TA1537, and *E. coli* WP2 *uvr*A. The bacterial strains were treated with 10, 50, 150, 500, 1500, or 5000 mg/plate silkworm extract powder with or without S9 metabolic activation. There were no increases of the means of revertant per plate for all doses of silkworm extract powder in all test strains both in the presence and absence of metabolic activation. Precipitation was seen in the 1500 and 5000 ug/plate. Positive control plates had results validating the test system. Under the conditions of the study, silkworm extract powder showed no evidence for mutagenicity.

In a chromosomal aberration assay, Chinese hamster lung cells were incubated with silkworm extract powder at concentrations of 0, 150, 275, 300, 550, 600, 900, 700, or 1100 ug/mL for 6 hours with an 18-hour recovery period or 0, 150, 300, 600, or 700 ug/mL for 24 hours with no recovery period. One hundred metaphases per culture (200 metaphases per dose) were evaluated for chromosome aberrations. The number of aberrant metaphases in all of the treatment series in the presence and absence of the metabolic activation system were not significantly increased. The positive controls had results verifying the validity of the test system. Silkworm extract powder showed no evidence for generating chromosomal aberrations under the conditions of this study with Chinese hamster lung cells.

In a mouse bone marrow micronucleus assay, silkworm extract powder was orally administered to 6 male ICR mice per group at doses of 0, 1250, 2500, or 5000 mg/kg for two consecutive days. Cyclophosphamide monohydrate was used as a positive control and was administered intraperitoneally once on day two. No mortality or abnormalities were reported. The frequency of micronucleated bone marrow polychromatic erythrocytes was not

increased at any of the silkworm extract powder dose levels tested. No significant differences in polychromatic erythrocyte/red blood cell (PCE:RBC) ratio were reported at any of the doses of silkworm extract powder tested. In the positive control, the PCE:RBC ratio was decreased significantly. Silkworm extract powder did not show evidence for genotoxicity with respect to micronucleated erythrocytes under the conditions of the study.

Based on the results of the bacterial reverse mutation test, the chromosomal aberration assay, and the mouse bone marrow micronucleus assay, silkworm extract powder had little to no mutagenic or genotoxic potential under the conditions of the studies.

6.3.2 Oral Toxicity: Silk Fibroin Does Not Induce Toxic Effects After Repeated Ingestion by Rats

6.3.2.1 Mori Silk was not toxic in a subchronic 28-day oral toxicity test with rats

14-day range-finding study

Cambridge Crops commissioned a 14-day repeated dose range-finding study with Product Safety Labs following OECD Guideline 407. In this GLP study, Sprague-Dawley rats (5 per sex per group) were administered 0, 125, 250, or 500 mg/kg·bw/day Cambridge Crops' Mori Silk in distilled water via oral gavage (PSL 2020a, **Appendix G3**). The highest dose tested was 500 mg/kg·bw/day limited by the solubility of Mori Silk for a single gavage. The test substance had no reported effect on mortality, body weight, body weight gain, food consumption, food efficiency, or clinical observations at any dose tested. No histopathological abnormalities nor macroscopic findings at necropsy were reported at any dose tested.

28-day repeated dose oral toxicity study

Cambridge Crops commissioned a 28-day repeated dose oral toxicity study with Product Safety Labs. The repeated dose oral toxicity of Cambridge Crops Mori Silk was evaluated in a 28-day study conducted with Sprague-Dawley rats consistent with OECD Guidelines for Testing of Chemicals Test No. 407, US EPA Health Effects Test Guidelines: OPPTS 870.3050, and US FDA Redbook[6] (PSL 2020b, **Appendix G4**). Male and female rats (10 per sex per dose group) were administered Mori Silk (Batch 215) gavage doses of 0 (distilled water), 125, 250, or 500 mg/kg·bw/day. Individual doses were calculated based on the most recent body weights and were adjusted each week to maintain the targeted dose level for each rat. The average concentration of the highest dose tested was 44.8 mg/mL, 89.6% of the target 50 mg/mL. The rats were randomly distributed, stratified by body weight among the four dosing groups on the day of study start. Mori Silk doses were administered daily for 28 consecutive days.

Animals were observed twice daily for viability. Cage-side observations were performed daily. Individual body weights and food consumption were measured one day prior to study start and weekly thereafter. Food efficiency was also reported. The animals were weighed prior to sacrifice. Clinical pathology was performed for clinical chemistry, hematology, and coagulation on blood collected at necropsy. All animals in the study were subjected to a gross necropsy, which included examination of the external surface of the body, all orifices,

[6] OECD Guidelines for testing of chemicals, Section 4, Test No. 407: Health Effects, Repeated Dose 28-Day Oral Toxicity Study in Rodents (adopted 1995; updated October 2008).

US EPA Health Effects Test Guidelines: OPPTS 870.3050 Repeated Dose 28-day Oral Toxicity Study in Rodents (2000)

US FDA Toxicological Principles for the Safety Assessment of Food Ingredients, Redbook 2000, Revised 2007 IV.C. 4. A. *Subchronic Toxicity Studies with Rodents* (2003).

musculoskeletal system, and the cranial, thoracic, abdominal, and pelvic cavities with their associated organs and tissues including adrenals, brain, epididymides, kidneys, liver, heart, spleen, thymus, and reproductive organs. All gross lesions were recorded. Histological examination was performed on the preserved organs and tissues of the animals from both the control and high dose groups.

No significant changes were reported in clinical observations, food efficiency, clinical chemistry, hematology, or coagulation at any of the doses tested. All animals survived to the end of study and no test substance-related gross or microscopic findings were reported. No adverse effects were reported. The reported No-Observed-Adverse-Effect-Level (NOAEL) was the highest dose tested, 500 mg/kg·bw/day[7]. The highest dose was limited by solubility of Mori Silk in water for a single gavage per day.

6.3.2.2 Toxicological studies evaluating *Bombyx mori*-derived test substances (not Mori Silk)

No evidence for acute or subchronic toxicity of silkworm extract powder (Heo et al 2013)

In the following acute and subchronic oral toxicity GLP studies consistent with OECD Guidelines, the test substance, silkworm extract powder, came from *Bombyx mori* larvae frozen in liquid nitrogen and lyophilized (Heo et al. 2013). The lyophilized larvae were extracted with ethanol and lyophilized again to produce the silkworm extract powder.

A single oral dose of silkworm extract powder was administered to five male and five female Sprague-Dawley rats at doses of 0, 1250, 2500, or 5000 mg/kg. Clinical signs of toxicity and mortality were recorded continuously for the first hour, and once per hour for the next 5 hours, then once daily for 14 days. No deaths were reported at any of the administered doses. Soft stool was reported in 3 of 5 males at 2500 mg/kg, all 5 males at 5000 mg/kg and 2 of 5 females at 5000 mg/kg on the second day. No treatment-related changes were reported in body weight and no gross findings were recorded at necropsy. The study authors concluded that the approximate lethal dose of the silkworm extract powder was greater than 5000 mg/kg.

Silkworm extract powder was administered by gavage at doses of 0, 500, 1000, or 2000 mg/kg·bw/day to groups of ten male and ten female Sprague-Dawley rats for 90 consecutive days in a subchronic toxicity study. Additional groups of five male and five female rats were orally administered 0 or 2000 mg/kg·bw/day for 90 days followed by a 28-day recovery period. The doses for the subchronic study were determined in a 4-week dose range-finding study in which doses of 0, 250, 500, 1000, and 2000 mg/kg·bw/day were administered. The authors reported the absence of toxic effects at any dose and the highest dose tested, 2000 mg/kg·bw/day, was selected as the highest dose for the subchronic study. No significant changes related to silkworm extract powder exposure were reported in body weights, food and water consumption, ophthalmological findings, hematological values, or histopathological findings. Results of the urinalysis indicated a significant increase in ketone bodies in males dosed with 2000 mg of silkworm extract powder/kg·bw/day. The study authors did not elaborate further on this observation. Specific gravity was significantly elevated among males in all doses of the test substance, and pH was significantly increased among females

[7] While the study called for 500 mg/kg·bw/day, PSL achieved an average of 89.6% of the targeted high dose, leaving the high dose as measured during Concentration Verification Analysis to be 448 mg/kg bw/day. Further details provided in the 28-day study report in **Appendix G4.**

dosed with 500 and 2000 mg/kg·bw/day of the test substance compared to controls. There were significant increases in absolute adrenal and kidney weights in males at 500 and 200 mg/kg·bw/day, and a significant increase in relative liver weights in males at 2000 mg/kg·bw/day. The absolute weight of liver, kidney, lung, brain, and fasting weight were significantly higher in both males and females in the recovery group for the highest dose tested. However, changes in absolute and relative organ weight were not considered treatment related by the study authors. Under the conditions of the study, no significant toxic effects of silkworm extract powder were reported in rats at doses up to 2000 mg/kg·bw/day of silkworm extract powder.

No evidence for toxicity of silkworm powder administered to rats (Rattana et al 2017)

An acute oral toxicity test evaluated the toxicity of silkworm powder. Three varieties of *Bombyx mori* silkworms in Thailand were freeze-dried at the larval stage and ground into a fine powder. The silkworm powder contained fibroin along with other components of the silkworm. The silkworm powder from three varieties of *Bombyx mori* were administered by gavage to three groups of male Albino Wistar rats, 6 rats/group at single doses of 0, 1000, 1500 and 2000 mg/kg body weight for a total of ten groups. Behavioral changes, general toxicity, mortality, body weight, and clinical signs were reported each day for 14 days. No treatment-related mortalities, signs of toxicity or changes in body weights of control or treated rats were reported.

In a sub-acute toxicity test, 60 male albino Wistar rats were divided into 10 groups, 6 rats per group, and treated orally with 2000 mg silkworm powder/kg body weight every two days) from one of the three varieties of *Bombyx mori* for 6 weeks. Body weights and blood glucose levels were measured weekly for six weeks. Hematological values, lipid profiles, and blood chemistry parameters were analyzed at the end of the experiment. The body weights among control and silkworm powder treated rats were not significantly different. Blood glucose levels and blood chemistry parameters of the control and silkworm powder treated rats were not different, suggesting that silkworm powder did not alter organ system function in male rats and did not exhibit any toxicity in rats.

No evidence for toxicity observed in acute and subchronic oral toxicity studies of silk peptide administered to rats (Han et al. 2011)

Silk peptide E5K6, a peptide derived from silk fiber of *Bombyx mori*, was administered by gavage at doses of 0, 2000, or 5000 mg/kg/bw to female and male Sprague-Dawley rats in an acute single dose oral toxicity study indicated no evidence of toxicity following 14 days of observation. Silk peptide E5K6 is different from Mori Silk. E5K6 is a hydrolyzed silk protein with a much lower average molecular weight (1.5 kDa) than Mori Silk (up to approximately 500 kDa). No mortalities and no clinical signs related to the administration of silk peptide were reported during the study. Normal body weights and no abnormal gross findings were reported.

Silk peptide E5K6 was administered by gavage to female and male Sprague-Dawley rats (5/sex/group) at doses of 0, 500, 1000, or 2000 mg/kg·bw/day doses for 90 days in a subchronic oral toxicity study. No mortalities, abnormal clinical signs, changes in body weight or food consumption, ophthalmological findings, hematology and necropsy findings related to the administration of test article were reported. Water consumption in males

treated with 1000 or 2000 mg/kg·bw/day was significantly ($P < 0.05$) lower than consumption in the control group in week 4. This was considered unrelated to the administration of silk peptide because it was not dose-dependent, seen in only one sex and at only one time point. Creatine phosphokinase (CPK) was decreased in males treated with greater than 1000 or 2000 mg/kg·bw/day compared to the vehicle control group ($p<0.01$), however this change in blood biochemistry was not dose-related and within the normal range of the reference data. Clear fluid in the uterus of females was reported in several rats across exposure groups, which is often observed in females due to the estrus cyclicity. There were some differences reported in organ weights: greater absolute weight of the prostate gland in the 500 and 1000 mg/kg·bw/day groups, greater relative weight of the prostate gland in the 500 mg/kg·bw/day group, greater relative weight of the kidney in the 1000 and 2000 mg/kg·bw/day treated groups, and greater relative weight of the liver in males in the 500 and 1000 mg/kg·bw/day groups, all compared to the control group ($p < 0.05$). The relative weight of the heart in females in the 2000 mg/kg·bw/day group was significantly less than that of the control group. No treatment-related histopathological findings were reported in any of the treated animals. The authors reported that "the oral NOAEL of Silk peptide E5K6 is greater than 2000 mg/kg·bw/day" in both male and female rats and target organs were not established.

Acute toxicity tests of powdered moth reported no abnormalities (Gao et al 2018)

As summarized in a review of edible insects by Gao et al. (2018), Duan et al. (2000) conducted a study wherein Chinese Kun Ming mice (sex not reported) were gavaged with 10 g/kg/bw of *Bombyx mori* body fluid, 10 g/kg/bw of pupae body fluid, or 0.68 to 17 g/kg/bw graine *[sic]* powder. No toxicity was reported in the maximum tolerated dose acute toxicity tests, and no evidence of genotoxicity was reported in a bone marrow cell micronucleus test (Duan et al., 2000 via Gao et al., 2018). Gao et al (2018) summarized the results of a seven-day acute toxicity test conducted by Gu (2009). Powdered female *Bombyx mori* moths were administered to Institute of Cancer Research (ICR) mice at 83 g/kg/bw. No deaths or abnormalities in organs were observed. One mouse had malaise and one mouse had flatulence; both symptoms disappeared after a couple hours post-administration. As summarized by Gao et al. (2018), Gu (2009) conducted a seven-day acute toxicity test wherein Sprague-Dawley rats were given 34.4 g/kg/bw of powdered moth reported no deaths and no abnormalities in organs at the conclusion of the study (Gu 2009 via Gao et al., 2018). The test substances used in these two studies were derived from *Bombyx mori* and contained fibroin as well as other components of *Bombyx mori* in various life stages. These acute toxicity tests showed that the test substances did not result in abnormalities in the test animals.

6.3.3 Tabular Summary of Safety Studies

Table 6. Summary of Toxicological Studies Regarding Mori Silk and other *Bombyx mori*-derived Substances

Study Type	Species / Sex / Number per Dose Group	Test Material	Route of Exposure; Dose - Duration	Observed Effects	Reference	Conclusionary Remarks
Genotoxicity and Mutagenicity						
Bacterial reverse mutation test OECD 471	*Salmonella typhimurium* strains TA1535, TA1537, TA98, TA100 and *E. coli* strain WP2 uvrA	Cambridge Crops' Mori Silk	31.6, 100, 316, 1000, 3160, 10,000, 31,600, and 100,000 ug/plate	Precipitation and toxicity were not present in any of the strains at any of the eight doses tested. There was no concentration-related or substantial test substance related increases in the number of revertant colonies observed in all strains in both the absence and presence of S9 metabolic activation.	Appendix G1	Cambridge Crops test substance did not show evidence for mutagenicity with respect to bacterial revertants under the conditions of the study.
Bacterial reverse mutation test OECD 471	*Salmonella typhimurium* TA100, TA1535, TA98, TA1537 and *E. coli* WP2 *uvrA*	Silkworm extract powder	10, 50, 150, 500, 1500, and 5000 mg/plate	No increases of the means of revertant per plate for all doses of test substance for all strains both in the presence and absence of S9 metabolic activation.	Heo et al. 2013	Silkworm extract powder did not show evidence for mutagenicity with respect to bacterial revertants under the conditions of the study.
Mammalian erythrocyte micronucleus test OECD 474	Mouse/MF/10	Cambridge Crops' Mori Silk	Oral gavage; 1000 mg/kg·bw/day for 2 days	Fibroin did not induce a statistically significant increase in frequency of micronucleated reticulocytes in male or female mice. The frequency of reticulocyte and micronucleated normochromatic erythrocytes did not differ significantly after treatment with the test substance.	Appendix G2	Cambridge Crops test substance did not show evidence for genotoxicity with respect to micronucleus induction under the conditions of the study.
Mammalian erythrocyte micronucleus test OECD 474	Mouse/M/6	Silkworm extract powder	Oral gavage; 0, 1250, 2500, 5000 mg/kg·bw for 2 consecutive days	The frequency of micronucleated bone marrow polychromatic erythrocytes was not increased at any of the doses tested. No significant differences in PCE:RBC ratio at any of the doses tested. No mortality or abnormalities were reported.	Heo et al. 2013	Silkworm extract powder did not show evidence for genotoxicity with respect to micronucleated erythrocytes under the conditions of the study.

Table 6. Summary of Toxicological Studies Regarding Mori Silk and other *Bombyx mori*-derived Substances

Study Type	Species / Sex / Number per Dose Group	Test Material	Route of Exposure; Dose - Duration	Observed Effects	Reference	Conclusionary Remarks
Chromosomal aberration test OECD 473	Chinese hamster lung cells	Silkworm extract powder	0, 150, 275, 300, 550, 600, 900, 700, and 1100 ug/mL for 6 hours with 18-hour recovery period 0, 150, 300, 600 and 700 ug/mL for 24 hours with no recovery period	The number of aberrant metaphases in all of the treatment series in the presence and absence of the metabolic activation system were not significantly increased.	Heo et al. 2013	Silkworm extract powder did not show evidence for genotoxicity with respect to chromosome aberrations under the conditions of the study.
Single Dose Toxicity Studies						
Acute toxicity test	Rat/MF/10	Silkworm extract powder	Oral gavage; 0, 1250, 2500, 5000 mg/kg	No deaths or treatment-related changes were reported in body weight; no gross findings were recorded at necropsy.	Heo et al. 2013	Silkworm extract powder did not show evidence for toxicity at doses up to 5000 mg/kg.
Acute toxicity study	Rat/MF/10	Silk peptide E5K6	Oral gavage; 0, 2000, 5000 mg/kg·bw	No mortalities and no clinical signs related to the administration of silk peptide were reported during the study. Normal body weights and no abnormal gross findings were reported.	Han et al. 2011	Silk peptide E5K6 did not show evidence for toxicity under the conditions of the study.
Repeated Dose Oral Toxicity Studies						
14-day range-finding study OECD 407	Rat/MF/10	Cambridge Crops' Mori Silk	Oral gavage; 0, 125, 250, 500 mg/kg·bw/day for 14 days	The test substance had no observed effect on mortality, body weight, body weight gain, food consumption, food efficiency, or clinical observations. No pathological abnormalities nor macroscopic findings at necropsy were reported.	PSL 2020a, Appendix G3	Cambridge Crops test substance did not show evidence for oral toxicity under the conditions of the study.
14-day oral toxicity study	Rat/M/6	Silkworm powder	Oral gavage; 0, 1000, 1500, 2000 mg/kg·bw for 14 days	No treatment-related mortalities, signs of toxicity or changes in body weights of control or treated rats were reported.	Rattana et al. 2017	Silkworm powder did not show evidence for oral toxicity under the conditions of the study.

Table 6. Summary of Toxicological Studies Regarding Mori Silk and other *Bombyx mori*-derived Substances

Study Type	Species / Sex / Number per Dose Group	Test Material	Route of Exposure; Dose - Duration	Observed Effects	Reference	Conclusionary Remarks
28-day oral toxicity study OECD 407	Rat/MF/10	Cambridge Crops' Mori Silk	Oral gavage; 0, 125, 250, 500 mg/kg·bw/day for 28 days	The test substance had no observed effect on mortality, body weight, body weight gain, food consumption, food efficiency, or clinical observations. No pathological abnormalities nor macroscopic findings at necropsy were reported.	PSL 2020b, Appendix G4	Cambridge Crops test substance did not show evidence for oral toxicity under the conditions of the study.
4-week range-finding study OECD 408	Rat/MF/10	Silkworm extract powder	0, 250, 500, 1000, 2000 mg/kg·bw/day	No toxic effects observed at any dose.	Heo et al. 2013	Silkworm extract powder did not show evidence for oral toxicity under the conditions of the study.
Subacute toxicity test	Rat/M/6	Silkworm powder	2000 mg/kg·bw every two days for 6 weeks	The body weights among control and silkworm powder treated rats were not significantly different. Blood glucose levels and blood chemistry parameters of the control and silkworm powder treated rats were not different.	Rattana et al. 2017	Silkworm extract powder did not show evidence for oral toxicity under the conditions of the study.
90-day oral toxicity study OECD 408	Rat/MF/10	Silkworm extract powder	Oral gavage; 0, 500, 1000, 2000 mg/kg·bw/day for 90 consecutive days	No significant changes related to silkworm extract powder exposure were reported in body weights, food and water consumption, ophthalmological findings, hematological values, or histopathological findings. Minor changes in absolute and relative organ weight were not considered treatment-related by the study authors.	Heo et al. 2013	Silkworm extract powder did not show evidence for oral toxicity under the conditions of the study.

Table 6. Summary of Toxicological Studies Regarding Mori Silk and other *Bombyx mori*-derived Substances

Study Type	Species / Sex / Number per Dose Group	Test Material	Route of Exposure; Dose - Duration	Observed Effects	Reference	Conclusionary Remarks
90-day oral toxicity study OECD 408	Rat/MF/10	Silk peptide E5K6	0, 500, 1000, 2000 mg/kg·bw/day for 90 days	No mortalities, abnormal clinical signs, changes in body weight or food consumption, ophthalmological findings, hematology and necropsy findings related to the administration of test article were reported. Water consumption and creatine phosphokinase differed from control but was determined by authors as not dose-related. No treatment-related histopathological findings were reported.	Han et al. 2011	Silk peptide E5K6 did not show evidence for oral toxicity under the conditions of the study. The authors reported that the NOAEL is greater than 2000 mg/kg·bw/day for Silk peptide E5K6 in male and female rats.

6.4 Assessment of Potential Allergenicity

Instances of Silk Allergy

There are no instances in the published literature of a reaction to silk fibroin by the oral ingestion route. No evidence was found to suggest that the silk fibroin components (heavy chain, light chain, P25 or sericin) are allergens or that they bind immunoglobulin E (IgE) from allergic subjects. Pupae of the silkworm have been consumed by humans for thousands of years (see **Part 5**). There are reports of anaphylaxis following consumption of silkworm and silkworm pupae (Feng et al. 2018, Ji et al. 2008). Most consumers do not experience allergy nor toxic responses from consuming Bombyx mori pupae.

Processed silk from the cocoons of *Bombyx mori* have been used to produce surgical implant devices and sutures that remain safely in human recipients for years without allergic reactions or other adverse health effects (**Part 6.5**). Certain silk implants have caused short-lived inflammatory responses, such as subcutaneous silk-gels (4-week inflammatory response) and woven silk meshes (7-day inflammatory response) (Thurber et al., 2015). This inflammatory response is not expected to be relevant to Cambridge Crops application of ingested proteins.

Proteins of Allergenic Interest

Cambridge Crops and Dr. Richard Goodman of the Food Allergy Research and Resource Program (FARRP) at the University of Nebraska-Lincoln investigated the source organism (*Bombyx mori*) and source product (*Bombyx mori* cocoons) for potential allergens in order to conclude little to no allergenicity in Mori Silk with confidence. The AllergenOnline.org (AOL) database and the World Health Organization/International Union of Immunological Societies (WHO/IUIS) allergen nomenclature only identified one allergen in *Bombyx mori* silkworms: arginine kinase. In Liu et al. (2009), in vitro serum tests demonstrated that arginine kinase was linked to patients' allergic responses to silkworm extracts. A search of PubMed by Dr. Goodman suggested that there may be additional allergens within the silkworm itself that are not reported in the AOL or WHO/IUIS databases. Based on the literature suggesting possible allergens other than arginine kinase in the silkworm as well as literature describing possible allergens existing in arthropods similar to *Bombyx mori* silkworms, four potential allergens were identified for further investigation regarding allergenicity within the silkworm pupae, cocoons, degummed fibroin (Cambridge Crops' in-process fibroin prior to solubilization by salt solution), and Cambridge Crops' final product, Mori Silk. Together, these four potential allergens are (1) arginine kinase, (2) tropomyosin, (3) chitinase, and (4) paramyosin. The four proteins will be referred to as "Proteins of Allergenic Interest" for the remainder of the GRN. Thioredoxin has been demonstrated to have IgE binding from other insects – but not from *Bombyx mori* silkworms – and was thus used as a positive control in the analyses. Dr. Goodman discusses his findings in detail in **Appendix E**.

Proteomics Evaluation of *Bombyx mori* components and Mori Silk

To determine whether any of the four Proteins of Allergenic Interest are present in Mori Silk, Cambridge Crops commissioned a mass spectrometry analysis from the Harvard University Center for Mass Spectrometry. Samples of *Bombyx mori* pupae, cocoon, degummed fibroin (Cambridge Crops in-process fibroin prior to solubilization) and Mori Silk powder were

analyzed, with the raw data being sent to Dr. Philip Johnson of the Department of Food Science and Technology at the University of Nebraska-Lincoln.

While arginine kinase was determined to be present in the silkworm itself, none of the four proteins of allergenic interest were found at any detectable limits in Cambridge Crops' degummed fibroin or Mori Silk. Thioredoxin, the positive control, was also not found in the degummed fibroin or Mori Silk. As such, under the standardized identification criteria set by the Human Proteome Organization (HUPO)-Proteomics Standards Initiative (PSI), none of the "Proteins of Allergenic Interest" were found at any detectable limits in the Mori Silk product. Further details on the analysis and conclusions are provided in Dr. Johnson's report (**Appendix F**).

Comparison between proteins that have been identified as being present in fibroin to proteins of known and putative allergens or toxic proteins

The amino acid (AA) sequences of the four fibroin proteins, three of which (fibroin heavy chain, fibroin light chain and fibroin P25) form the majority of Mori Silk, were compared to known and putative allergen sequences. The AA sequence comparisons did not uncover matches that suggest any reasonable level of possible allergenicity. A summary of the bioinformatics analysis by Dr. Goodman is presented below and in full in **Appendix E**.

The four primary components in fibroin: fibroin heavy chain, fibroin light chain, P25 and sericin protein amino acid sequences were used to search for identity matches to allergens and for toxins. The sequence of Ber e 1 from *Bertholletia excelsa* (Brazil nut) was used as an allergen control, and the complete ricin protein from *Ricinus communis* was used as a control for the toxin searches.

In order to compare the fibroin amino acid sequences with the sequences of known allergens, the AllergenOnline database (AOL) was used. The primary amino acid sequences of fibroin were queried in AOL using FASTA3, a computer algorithm that provides similar local alignments and results if the appropriate scoring matrices and criteria are used. None of the full-length searches of the fibroin proteins resulted in >50% identity, and thus no concerns of allergenicity or potential cross-reactivity.

The Codex Alimentarius Commission for Food Safety procedures for evaluating new proteins in foods recommend looking for proteins with more than 35% identity to segments of 80 or more amino acids of allergens or putative allergens. A protein is identified as a putative allergen either if it contains at least eight contiguous exact amino acid matches, or if it has at least 35% sequence similarity within an 80 amino acid (AA) window when compared with known allergens. Based on the recommendation of Codex (2003), an 80 AA search in the AOL database was conducted. This short segment search is utilized as it may identify structural motifs shorter than the intact protein that might contain a conformational IgE binding epitope. It would also identify potentially cross-reactive proteins that are not true homologues of an allergen with significant local identities but may be an immunological target for IgE antibodies in those with allergies to the matched allergen.

Per Codex guidelines, matches >35% over 80 AA may be considered significant. The results yielded a few potentially significant matches for fibroin and sericin (details in **Appendix E**).

However, given the overall short alignments and level of identity matches, the matches were dissimilar and unlikely to share IgE epitopes for productive binding and stimulation of cross-reactive IgE binding. Dr. Goodman concluded no concerns of potential allergic reactions or cross-reactivity.

Lastly, an exact 8 contiguous amino acid search was conducted between fibroin components and any known allergens. None of the fibroin components (heavy chain, light chain, p25, sericin) had a match of 8 AA to any allergen in AOL.

Because the AOL database may not have every possible allergen identified, an additional search of the complete protein database of NCBI ("Entrez Protein") using BLASTP searches looking for high identity matches to "allergens" or "allergenic proteins" was used as a double check. Using the BLASTP algorithm (similar to FASTA3), the fibroin components and control proteins were run against the entire Entrez Protein database. Entire matched sequences were reviewed. No sequences of any of the fibroin or sericin sequences were found that would be of allergenic or toxic concern.

Though there were 16 matches where there was >35% identity over 80 AA, potentially prompting further investigation into allergy using serum IgE tests, there are no clear risks for those allergic to matched allergens. This is due to the overall low identity matches and dissimilarity of proteins. The alignments were from the highly repetitive region of fibroin, with scattered low identities across broad regions demonstrate the coincidental nature of the matches. There are no common findings for allergic cross-reactivity of proteins from ragweed pollen to bovine collagen to soybean seed storage protein, fish parasite (*Anisakis simplex),* fungal protease, corn and wheat proteins including chitinase and glutenins. Results from the sliding 80mer matching program demonstrates that alignments are scattered across segments of the individual allergenic proteins that would require conformational changes in the proteins to have significant matches. Each match was carefully examined and compared to the fibroin protein. Based on protein structures it is extremely unlikely that any antibody would demonstrate cross-reactivity between fibroin and the identified allergen.

In sum, it was determined that the Mori Silk product does not contain allergens or potentially IgE-cross-reactive proteins within the realm of functional sequence alignments.

The GRAS Expert Panel agrees that there is no allergenic concern over the consumption of Mori Silk as described in this GRN.

6.5 Safety Information for Non-Food Uses of Silk Protein

Silk protein is used in biomaterials and approved medical devices

Silk proteins are currently used in other non-oral applications including as a biomaterial in sutures, surgical scaffolds, and wound healing.

Silk was first utilized as a suture in 1869. In the 1960s, Ethicon Inc. patented silk proteins for use in silk sutures (Holland et al., 2019). Since 1980, premarket approvals have been issued for silk sutures in medical applications. Nonabsorbable silk surgical sutures are included as a "General and Plastic Surgery Device" in 21 CFR 878.5030 since 1993.

In 2013, FDA approved a 510(k) premarket submission for SERI® (currently Allergan®) for the use of a silk-fibroin based surgical scaffold. It was launched in the US market for use in humans shortly thereafter.

Other countries have also approved the use of silk fibroin for use in humans. For example, the Ministry of Food and Drug Safety in South Korea approved *Bombyx mori* silk fibroin as a silk patch for ear drum perforations (Tympasil®, Daewoong-Bio) (Lee et al, 2015). Further, the China Food and Drug Administration approved the use of a silk film as a wound dressing for clinical use (Sidaiyi®, Suzhou Soho Biomaterial Science and Technology Co., Ltd) (Song et al. 2018).

Dermal exposure due to cosmetic use: 2015 Cosmetic Ingredient Review Panel Safety Assessment

In 2015, the Cosmetic Ingredient Review (CIR) panel published a "Safety Assessment of Silk Proteins as Used in Cosmetics" that reviewed the use of ten silk proteins as conditioning and bulking agents in cosmetic products: Fibroin, Hydrolyzed Fibroin, Hydrolyzed Sericin, Hydrolyzed Silk, MEA-Hydrolyzed Silk, Sericin, Silk, Silk Extract, Silk Powder, and Silkworm Cocoon Extract. The CIR described composition of silk, fibroin, and sericin, and the available safety information in the literature.

The CIR noted the use of silk proteins in cosmetics such as powders and hairspray, as well as non-cosmetics. Based on the FDA's Voluntary Cosmetic Registration Program (VCRP) and an industry survey, the CIR noted fibroin is not being used in cosmetics. However, hydrolyzed silk and silk powder (each containing fibroin as a component of silk) are used in 675 and 177 formulations, respectively. Silk powder has been used at a max concentration of 1.4% in leave-on products. Hydrolyzed silk and silk extract in hairspray are used at maximum concentrations up to 0.024% and 0.0036%.[8]

The CIR also searched for and reviewed related literature on toxicity, sensitization, and immunological responses. The CIR reported no notable gross lesions or deaths in an acute dermal toxicity study of silk protein film following OECD Test Guideline 402 wherein rats were exposed dermally to one application of the film for 24 hours and observed for a total of 14 days. Two animal studies reported no skin irritation in response to silk protein film exposure to the skin.

The CIR did not find literature on toxicokinetics, repeated dose toxicity, reproductive and developmental toxicity, genotoxicity, and carcinogenicity studies for silk or fibroin protein.[9]

6.6 Summary of Safety Information

The available scientific data supports the conclusion that Cambridge Crops Mori Silk is safe and suitable for use as a food ingredient.

Mori Silk exhibited no evidence of genotoxicity or mutagenicity based on results from an in vitro Ames assay and an in vivo micronucleus assay. Similar *Bombyx mori*-derived substances exhibited no evidence of genotoxicity or mutagenicity in the bacterial reverse

[8] The CIR noted that 95-99% of droplets/particles have aerodynamic equivalent diameters >10 µm, and therefore would be deposited in the nasopharyngeal and bronchial regions and not be respirable to any appreciable amount.

[9] The CIR reviewed sericin studies that covered toxicity (evidence for cytotoxicity in one study, proliferation in a rat insulinoma cell line), skin depigmentation, lack of inflammatory responses, and fibroblast proliferation

mutation Ames assay, chromosomal aberration assay, and micronucleus assay (Heo et al. 2013).

Further, *Bombyx mori*-derived substances including powder moth and silkworm extract powder also were reported to produce no toxicity following oral exposures in rats and mice for 1 to 90 days (Han et al. 2011, Rattana et al. 2017, Heo et al. 2013). The safety of Mori Silk was evaluated in a GLP-compliant repeated dose 28-day oral toxicity study consistent with OECD Test Guideline No. 407 and the US FDA Toxicological Principles (RedBook 2000).[10] The doses tested were determined in a 14-day dose range-finding oral toxicity test. The highest dose tested in both studies, 500 mg/kg·bw/day, was based on the solubility of Mori Silk and using a once-per-day-gavage administration. Mori Silk did not elicit any signs of toxicity at the highest dose tested and the NOAEL was reported to be 500 mg/kg·bw/day for both sexes. The highest dose tested was set at 500 mg/kg·bw/day due to limitations of solubility of the test substance and limiting gavage to once per day.

Because there were no adverse effects observed at the highest dose, the upper limit of tolerable intake is not known. Therefore, margins between exposure in the 28-day repeated dose oral toxicity study (the NOAEL) and EDIs of Mori Silk by humans are compared. These margins provide information on the ratio between the highest intakes identified in the 28-day oral toxicity animal study (which had no observed adverse effects) and the conservative estimates of Mori Silk intakes for various segments of the U.S. population (assuming *every* piece of food consumed within the categories are coated with Mori Silk). In comparing the reported NOAEL of 500 mg/kg·bw/day with the median EDIs of Mori Silk by age group, the margins of safety range from 80 – 280. The range of margins are adequate to ensure safety of consumption of Mori Silk based on the readily digestible nature of the protein, the lack of any indication of adverse health effects in toxicology studies, and the lack of allergenic potential

The intakes of Mori Silk are very likely to be significantly less than the EDIs presented herein because this assessment uses a conservative approach that assumes each food item consumed by an individual from each of the eight food categories is coated with Mori Silk. In addition, a conservative approach was used to estimate the amount of Mori Silk deposited on food items (as described in **Part 3.2**). Furthermore, there were no adverse effects observed at the highest dose tested in an oral toxicity study so the upper limit of tolerable intake in unknown.

The safety of the proposed uses of Mori Silk as a food ingredient was determined based on the results of properly designed and executed toxicological studies and other evidence. There are further sources of supportive safety data for the intended uses of Mori Silk. First, Mori Silk consists primarily of fibroin, a well-characterized silk protein which has a history of safe human exposure from approved *in vivo* medical device use and cosmetic use in the United States. Second, silkworm and silkworm-derived food products including fibroin powder have a history of safe human consumption in East and Southeast Asia for thousands of years. Third, silkworm-derived medical products have been approved by regulatory bodies for *in vivo* use around the world, including silk sutures and surgical scaffolds by FDA with no recalls for any safety reasons. Mori Silk is readily digestible, contains no known allergens, shows no evidence of genotoxicity or mutagenicity, and there were no adverse effects reported at the highest dose achievable in a repeated dose 28-day toxicity study. These data support the

[10] Duration of oral toxicity study was decided during a pre-consultation notification meeting with FDA on September 10, 2019 and subsequent communications.

conclusion that the proposed food ingredient uses of Mori Silk as an edible food coating are safe.

6.7 Conclusion of GRAS Status

On the basis of scientific procedures and the evidence presented herein, Cambridge Crops concluded that the intended uses on fruits, vegetables, cheese, candy, whole meat, ground meat, processed meat, and fish of Mori Silk, manufactured consistent with cGMP and meeting the specifications presented herein, are safe and suitable and GRAS.

PART 7. LIST OF SUPPORTING DATA AND INFORMATION

7.1 Acronyms and Abbreviations

AA	amino acid
AOAC	Association of Analytical Chemists
BAM	Bacteriological Analytical Manual
CASRN	Chemical Abstracts Service Registry Number
CFR	Code of Federal Regulations
cfu	colony-forming units
cGMP	current Good Manufacturing Processes
CIR	Cosmetic Ingredient Review
ECHA	European Chemicals Agency
EDI	estimated daily intake
EPA	Environmental Protection Agency
FARRP	Food Allergy Research and Resource Program
FDA	Food and Drug Administration
FFDCA	Federal Food, Drug and Cosmetic Act
FOIA	Freedom of Information Act
g	gram(s)
GLP	Good Laboratory Practice
GRAS	Generally Recognized As Safe
GRN	Generally Recognized As Safe Notice
HUPO	Human Proteome Organization
ICP-OES	inductively coupled plasma optical emission spectrometry
ICR	Institute of Cancer Research
IgE	immunoglobulin E
kDA	kilodalton(s)
LOAEL	lowest-observed-adverse-effect-level
LOD	limit of detection
mg	milligram(s)
microgram	ug
mL	milliliter(s)
NHANES	National Health and Nutrition Examination Survey
NOAEL	no-observed-adverse-effect-level
OECD	Organisation for Economic Co-operation and Development
PCR	polymerase chain reaction
PCE:RBC	polychromatic erythrocyte/red blood cell
ppmw	parts per million by weight
PPRTV	Provisional Peer-Reviewed Toxicity Value
PSI	Proteomics Standards Initiative

PSL	Product Safety Labs
SDS-PAGE	sodium dodecyl sulfate-polyacrylamide gel electrophoresis

7.2 References

In accordance with 21 CFR §170.255, references listed in this section are generally available:

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7.3 Appendices

Appendix A: GRAS Expert Panel Consensus Statement

Appendix A1: GRAS Expert Panel Curricula Vitae

Appendix B: Amino Acid Profile of Fibroin and Mori Silk

Appendix C: Mori Silk Specifications and Batch Data

Appendix D: Mori Silk Stability Study

Appendix E: Bioinformatics Analysis Regarding Allergenicity of Silkworms

Appendix F: Proteomics Analysis of Silkworm Pupae, Cocoons, and Cambridge Crops Product

Appendix G: Mori Silk Toxicological Studies

Appendix H: Derivation of Consumption Rates from NHANES

Appendix I: Mori Silk *in vitro* Digestibility Study in Human Simulated Gastric Fluid

Expert Panel Consensus Statement on the Generally Recognized as Safe Status of Proposed Uses of Cambridge Crops' Mori Silk

Introduction

Ramboll Environment and Health (Ramboll), on behalf of Cambridge Crops, Inc. (Cambridge Crops) convened a panel of experts (Expert Panel), qualified by their scientific training and experience to evaluate the safety of food ingredients.[1] The Expert Panel included

The Expert Panel was tasked with determining the safety, suitability and the Generally Recognized as Safe (GRAS) status of Mori Silk, a silk protein intended to be used as an edible coating on food items, manufactured using *Bombyx mori* cocoons.

Independently and collectively, the Expert Panel critically evaluated the available information presented in documents prepared and presented by Ramboll and other materials deemed appropriate and necessary for this review. This information included the description of the substance (including the identity and physical and chemical properties), analyses demonstrating and confirming the purity and manufacturing consistency of the product, the characterization of Mori Silk, and product specifications. A critical overview about the history of use, intended conditions of use and levels of use, its regulatory status, and anticipated exposures or intake, product stability and safety assessment of Cambridge Crops' Mori Silk were provided to and reviewed by the Expert Panel.

Following its independent and collective critical evaluation of the available information, the Expert Panel, convened on 31 March 2020. Following the discussion, the Expert Panel unanimously agreed to the conclusions described herein. A summary of the basis for these conclusions follows.

Description of Mori Silk, the Manufacturing Process, and Product Specifications

The substance in this GRAS determination is silk protein, primarily consisting of silk fibroin, as extracted from *Bombyx mori* cocoons through a relatively simple process with commonly found salts. The Chemical Abstracts Service Registry Number for fibroin is 90070-76-5. This silk protein will be marketed by Cambridge Crops under the trade name Mori Silk.

The silkworm cocoon naturally contains fibroin protein that is intermingled with sericin in the cocoon fibers. Silk fibers are composed of two proteins (fibroin fibers held together by sericin proteins like a glue or coat). Cambridge Crops isolates fibroin through the removal of sericin by boiling. Fibroin is then solubilized in a salt solution, and then the salt is removed by traditional means, leaving Mori Silk in solution. No antibiotics are used in the production process of Mori Silk. Only food or pharmaceutical grade chemicals and processing aids are used in the manufacture of Mori Silk.

Fibroin's amino acid composition consists primarily of glycine (approximately 42-46%), alanine (approximately 29-31%), and serine (approximately 9-12%). The identity of Mori Silk is confirmed by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) showing a smear of molecular weights at or around 460 kDa and amino acid analysis showing a distinct amino acid profile to that described in literature.

To ensure that a consistent food-grade ingredient is produced, Cambridge Crops has established specifications for their Mori Silk. The chemical, physical and microbiological specifications are presented in **Table 1**. Three batches were analyzed for chemical and microbiological parameters listed in the specifications including metals. The powder product is made by dehydrating the solution.

[1] Curricula Vitae presented in **Appendix A1.**

Table 1. Specifications of Cambridge Crops' Mori Silk		
Parameter	**Specification**	**Method**
Protein	4-7%wt (40-70 mg/g)	AOAC 992.15
Fat	<0.1%wt	AOAC 922.06
Carbohydrates	<0.1%wt	Calculation
Ash	<0.1%wt	AOAC 920.153
Lithium	<75 ppmw	ICP-OES
Arsenic	<5 ppmw	ICP-OES
Lead	<5 ppmw	ICP-OES
Escherichia coli	<10 cfu/g	AOAC 991.14
Listeria monocytogenes	Negative/25g	AOAC 070702
Salmonella	Negative/25g	AOAC 2009.03
Note: Specifications are for Mori Silk solution or Mori Silk powder reconstituted at 5% weight/volume in water (50 mg Mori Silk in 1 mL potable water, mixed or stirred to solution). Abbreviations: AOAC = Association of Analytical Chemists; cfu = colony-forming units; g = gram(s); ICP-OES = inductively coupled plasma optical emission spectrometry; mg = milligram(s); ppmw = parts per million by weight; wt = weight		

Stability tests confirmed that Mori Silk powder is stable after 317 days when stored under standard conditions of 25ºC and 65% humidity as demonstrated in a four-week long test under accelerated conditions (60ºC and 30% relative humidity).

History of Exposure and Use

Outside of the U.S., fibroin-containing *Bombyx mori* silkworms and silkworm-derived products, including fibroin powder, are eaten frequently and by people of all age groups. Most populations that consume silkworm-derived products reside primarily in East and Southeast Asian countries. Silkworm consumption dates back to 5,000 years ago in China. Silkworms and silkworm-derived food products exist and are sold in the United States. However, consumption is likely well below rates of consumption in other parts of the world.

Silk fibroin is a well-characterized protein approved for uses in various industries including healthcare and cosmetics: Silk fibroin was first utilized as a suture in the 1800s, and nonabsorbable silk surgical sutures designed to be used *in vivo* are included as a "General and Plastic Surgery Device" in 21 CFR §878.5030 since 1993. Silk fibroin was approved by United States Food and Drug Administration (FDA) as a surgical scaffold to be used *in vivo* in a 510(k) premarket submission by SERI Surgical (Allergan) in 2013 (K123128).

Intended Use: Proposed Uses and Estimated Daily Intakes

Cambridge Crops intends to use Mori Silk to extend the shelf life of foods. Specifically, it intends to use Mori Silk with fruits, vegetables, cheese, candy and processed foods, whole meat, ground meat, processed meat, and fish for ingestion by the general population. Those food categories represent approximately 653 grams of food per day at the 95% percentile of intake among adults. The concentration of Mori Silk on foods is dependent on the food item itself. Mori Silk will be applied to foods in three ways, depending on the food product: (1) wetting the food in a container with Mori Silk solution, (2) mixing Mori Silk in with the food, or (3) spraying the food with a Mori Silk solution.

Estimated daily intake of Mori Silk was based on the following conservative assumptions:

- 50% of foods are coated with a concentration of 110 mg Mori Silk per kg food and 50% of foods are coated with the highest applicable concentration of 880 mg Mori Silk per kg food.
- Every piece of food in the eight food categories eaten by individuals surveyed by NHANES is coated with Mori Silk.
- No rinsing or washing of Mori Silk occurred at any stage in the supply chain.

The estimated daily intake of Mori Silk on foods is presented in **Table 2**. Assuming the 95th percentile food consumption rate, an average adult weighing 83.4 kg would consume 364 mg of Mori Silk each day. An adult consuming the median amount of food per day would consume 136 mg.

Table 2. Estimated Daily Intake of Mori Silk as a Food Coating by Age Group

Population	*n*	g **food** consumed / kg bodyweight / day		mg **Mori Silk** / kg bodyweight / day	
		Median	95th Percentile	Median	95th Percentile
Infants 0-11 months	304	5.52	21.84	2.74	10.83
Toddlers 12-35 months	800	10.81	26.21	5.36	13.00
Children 3-11 years	2,943	6.65	18.37	3.30	9.11
Teenagers 12-19 years	2,399	3.22	9.34	1.60	4.63
Adults 18-79 years	9,874	3.29	8.81	1.63	4.37
All	16,085	3.57	11.58	1.77	5.74

Abbreviations: bw = body weight, g = gram(s), kg = kilogram(s), mg = milligram(s)

Intended Effect

Cambridge Crops' Mori Silk is intended to be used as a coating on various foods including fruits, vegetables, meat, cheeses, and candy to preserve food in accordance with allowed mechanisms described in 21 CFR 170.3(o) including as a surface finishing agent, a substance used to increase palatability, preserve gloss, and inhibit discoloration of foods, including glazes, polishes, waxes, and protective coatings (21 CFR 170.3(o)(30)).

Safety Assessment

Silkworms, pupae, and cocoons have been eaten in many countries for centuries, particularly in Asia. Though there is no large-scale consumption noted in the United States, the safety of consuming silkworm and silkworm-derived products is supported not only by scientific procedures, but also by the many consumption uses in other parts of the world. In addition, silk fibroin products have been approved by FDA and other regulating bodies around the world for use in humans.

Analysis of allergenic potential

There are no published instances of allergenic episodes from the consumption of silk fibroin. As a precaution, potential allergens within the silkworms itself were researched. The AllergenOnline.org (AOL) database and the World Health Organization/International Union of Immunological Societies (WHO/IUIS) allergen nomenclature only identified one allergen in *Bombyx mori* silkworms: arginine kinase. A search of PubMed by Dr. Richard Goodman of the Food Allergy Research and Resource Program (FARRP) at the University of Nebraska-Lincoln suggested that there may be additional allergens within the silkworm itself that are not reported in the AOL or WHO/IUIS databases. Between potential allergens identified in literature, and potential allergens existing in similar arthropods to *Bombyx mori* silkworms, it was decided that there may be four potential allergens within the silkworm itself: arginine kinase, tropomyosin, chitinase, and paramyosin.

Mori Silk samples were then run under mass spectrometry. It was determined that using the standardized identification criteria set by the Human Proteome Organization (HUPO)-Proteomics Standards Initiative (PSI), none of the four proteins of allergenic interest were found at any detectable limits in Cambridge Crops degummed fibroin or Mori Silk.

Absorption, distribution, metabolism and excretion of silk fibroin

In general, digestion of dietary proteins like silk fibroin begins in the stomach and continues into the lumen of the duodenum. Within the digestive tract of humans, proteins are broken down via hydrolysis primarily into free amino acids. Approximately 10% of the proteins in the gastrointestinal tract do not undergo hydrolysis and are excreted in the feces. Cambridge Crops demonstrated in an *in vitro* digestibility study in human simulated gastric fluid that Mori Silk was rapidly digested in pepsin at pH 2.0 at a ratio of 10 units pepsin per ug Mori Silk within two minutes.

Toxicological Studies

The toxicological studies performed with Cambridge Crops Mori Silk demonstrate the safety of the substance. A repeated dose 28-day oral toxicity study with Cambridge Crops Mori Silk demonstrate that it is safe for consumption by rats at levels up to 500 mg/kg·bw/day. The authors concluded a No-Observed-Adversed-Effect-Level (NOAEL) of 500 mg/kg·bw/day, the highest dose tested.

Cambridge Crops Mori Silk is neither mutagenic nor genotoxic as demonstrated in an *in vitro* Ames assay and an *in vivo* micronucleus assay. Not only that, but other *Bombyx mori*-derived test substances have been shown to be neither mutagenic nor genotoxic as demonstrated in several publications. Further, acute and subchronic repeated dose oral toxicity tests demonstrated that various *Bombyx mori*-derived test substances are not toxic. *Bombyx mori*-derived silk and silk fibroin also have been safely used as biomaterial in sutures and surgical meshes, and wound dressing, and as an additive in cosmetics. Silkworms and silkworm products containing fibroin have a long history of consumption in East and Southeast Asia for thousands of years. Combined with the evidence that Mori Silk is readily digestible, contains no known allergens, and that there were no adverse effects observed at the highest dose achievable in a 28-day toxicity study, the available data support the conclusion that the proposed food ingredient uses of Mori Silk as an edible food coating is safe.

Conclusions

We, the members of the Expert Panel, have independently and collectively, critically evaluated the available information on the silk protein (Mori Silk) manufactured by Cambridge Crops, Inc. using *Bombyx mori* cocoons (as presented in this dossier prepared by Ramboll on behalf of Cambridge Crops and summarized herein).

We unanimously conclude that the proposed uses of Cambridge Crops' Mori Silk as a coating on foods, manufactured consistent with current Good Manufacturing Practice and meeting the food grade specifications presented herein, are safe and suitable.

We further unanimously conclude that the proposed uses of Cambridge Crops' Mori Silk, manufactured consistent with current Good Manufacturing Practice and meeting the food grade specifications presented herein, are Generally Recognized as Safe (GRAS) based on scientific procedures.

It is our opinion that other experts, qualified by scientific training and experience, and evaluating the same data and information, would concur with these conclusions.

84 Pages of Curriculum Vitae removed in accordance with the Privacy Act of 1974.

APPENDIX B
AMINO ACID PROFILE OF FIBROIN AND MORI SILK

Table B1. Amino Acid Composition: Cambridge Crops Mori Silk Compared With Fibroin and Sericin from Literature

	Fibroin										Mori Silk[d]	Sericin	
Amino Acid[b] (mol %)	Asakura et al. 2002	Qi et al. 2017	Asakura et al. 2015[c]	Sashina et al. 2006 (total)[g]	Sashina et al. 2006 (heavy chain)[g]	Sashina et al. 2006 (light chain)[g]	Zhou et al. 2001[c,e]	Kaplan and McGraith 2012	Mondal et al. 2007[f]	Wray et al. 2011[a]	Cambridge Crops	Wray et al. 2011[a]	Kaplan and McGraith 2012
Glycine	42.9	43	46	42.9	49.4	10	45.9	42.9	44.6	45.7	43.5-46.1	19.0	13.5
Alanine	30.0	30	30	30.0	29.8	16.9	30.3	30.0	29.4	30.6	30.2-31.7	6.4	5.8
Serine	12.2	12	12	12.2	11.3	7.9	12.1	12.2	12.1	8.8	7.3-10.3	24.2	34.0
Tyrosine	4.8	5.3	5.3	4.8	4.6	3.4	5.3	4.8	5.17	NR	4.9-5.5	NR	3.6
Valine	2.5	NR	NR	2.5	2	7.4	1.8	2.5	2.20	NR	2.1-2.4	NR	2.9
Aspartic Acid/Asparagine	NR	NR	NR	1.9	0.65	15.4	NR	1.9	1.30	NR	1.2-1.9	NR	14.6
Glutamic Acid/Glutamine	NR	NR	NR	1.4	0.7	8.4	NR	1.4	1.02	NR	0.9-1.5	NR	6.2

[a]Wray et al. (2011) did not report the full amino acid composition, but rather focused on the amino acids that had the greatest changes in percent composition between fibroin and sericin.

[b]Any amino acids that comprised less than 1% in fibroin are not listed here

[c]Zhou et al. (2001) and Asakura et al. (2015) specifically reported the amino acid composition of fibroin's heavy chain.

[d]Range for all samples tested. Triplicates of degummed fibroin, Mori Silk solution, and Mori Silk powder were analyzed

[e]Qi et al. (2017), Zhou et al. (2001) and Kaplan and McGraith (2012) did not specify the basis for the percentages reported.

[f]Mondal et al. (2007) reported percentages based on residues via Robson 1985.

[g]Sashina et al. (2006) reported total as well as for the heavy chain and light chain separately.

Abbreviations: NR = not reported

Table B2. Average amino acid composition of Cambridge Crops products compared with fibroin solution

	Degummed fibroin		Mori Silk Powder		Mori Silk Solution		Fibroin Solution*
Amino acid proportion (mole %)	150-minute boil	30-minute boil	150-minute boil	30-minute boil	150-minute boil	30-minute boil	
Glycine	44.72	43.69	45.60	45.29	45.94	44.97	44.47
Alanine	30.89	30.28	31.45	31.31	31.56	31.14	30.46
Serine	9.98	4.24	9.52	7.43	9.50	8.65	10.15
Tyrosine	5.05	5.30	5.36	5.30	5.27	5.27	5.28
Valine	2.18	2.25	2.15	2.38	2.10	2.26	2.18
Aspartic Acid/Asparagine	1.53	1.78	1.26	1.90	1.18	1.80	1.65
Glutamic acid	1.14	1.29	0.99	1.43	0.91	1.35	1.23

Notes: Degummed fibroin is in-process fibroin, prior to solubilization step; boil times denote time during degumming step.

*One sample of fibroin obtained from Advanced BioMatrix, California (value reported in table is not an average)

CC-30-powder-1
Mass Hydrolyzed=2.3mg
Final Vol=20mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	1.02	0.12	1.87	2.84	0.18	2.05
Thr	0.37	0.04	0.68	0.91	0.06	0.66
Ser	4.00	0.35	7.32	8.40	0.69	6.05
Glx	0.74	0.10	1.36	2.31	0.13	1.66
Pro	0.34	0.03	0.62	0.80	0.06	0.57
Gly	24.80	1.42	45.43	34.18	4.31	24.63
Ala	17.08	1.21	31.29	29.32	2.97	21.12
Val	1.30	0.13	2.38	3.10	0.23	2.23
Ile	0.38	0.04	0.70	1.04	0.07	0.75
Leu	0.31	0.03	0.57	0.84	0.05	0.61
Tyr	2.87	0.47	5.25	11.30	0.50	8.14
Phe	0.54	0.08	0.99	1.92	0.09	1.38
His	0.06	0.01	0.11	0.19	0.01	0.14
Lys	0.15	0.02	0.27	0.46	0.03	0.33
Arg	0.36	0.06	0.67	1.37	0.06	0.99
Cysteic acid	0.06	0.01	0.10	0.14	0.01	0.10
Met sulfone	0.07	0.01	0.12	0.22	0.01	0.16
Trp	0.15	0.03	0.27	0.65	0.03	0.47
Total	**54.59**	**4.14**				
Total mg		**1.66**				
% Protein		**72.00**				**72.04**

CC-30-powder-2
Mass Hydrolyzed=2.7mg
Final Vol=20mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	1.37	0.16	1.94	2.94	0.20	2.34
Thr	0.51	0.05	0.72	0.96	0.08	0.77
Ser	5.31	0.46	7.49	8.60	0.79	6.85
Glx	1.06	0.14	1.50	2.55	0.16	2.03
Pro	0.34	0.03	0.47	0.61	0.05	0.48
Gly	32.04	1.83	45.21	34.03	4.75	27.10
Ala	22.23	1.58	31.36	29.40	3.29	23.41
Val	1.69	0.17	2.38	3.11	0.25	2.48
Ile	0.54	0.06	0.77	1.14	0.08	0.91
Leu	0.44	0.05	0.62	0.93	0.07	0.74
Tyr	3.76	0.61	5.30	11.40	0.56	9.08
Phe	0.65	0.10	0.92	1.78	0.10	1.42
His	0.08	0.01	0.11	0.20	0.01	0.16
Lys	0.20	0.03	0.28	0.47	0.03	0.37
Arg	0.41	0.06	0.57	1.18	0.06	0.94
Cysteic acid	0.07	0.01	0.10	0.13	0.01	0.10
Met sulfone	0.08	0.01	0.11	0.19	0.01	0.15
Trp	0.11	0.02	0.15	0.37	0.02	0.29
Total	**70.87**	**5.38**				
Total mg		**2.15**				
% Protein		**79.60**				**79.64**

CC-30-powder-3
Mass Hydrolyzed=3.3mg
Final Vol=30mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	1.03	0.12	1.90	2.87	0.19	2.15
Thr	0.38	0.04	0.70	0.93	0.07	0.69
Ser	4.04	0.35	7.48	8.57	0.73	6.40
Glx	0.77	0.10	1.43	2.42	0.14	1.81
Pro	0.21	0.02	0.38	0.49	0.04	0.36
Gly	24.43	1.39	45.23	33.96	4.44	25.36
Ala	16.89	1.20	31.28	29.24	3.07	21.83
Val	1.28	0.13	2.37	3.09	0.23	2.31
Ile	0.44	0.05	0.81	1.20	0.08	0.90
Leu	0.34	0.04	0.64	0.95	0.06	0.71
Tyr	2.89	0.47	5.35	11.48	0.53	8.57
Phe	0.53	0.08	0.99	1.91	0.10	1.43
His	0.06	0.01	0.11	0.19	0.01	0.14
Lys	0.15	0.02	0.27	0.46	0.03	0.35
Arg	0.30	0.05	0.55	1.13	0.05	0.84
Cysteic acid	0.05	0.01	0.10	0.13	0.01	0.10
Met sulfone	0.07	0.01	0.12	0.21	0.01	0.16
Trp	0.17	0.03	0.31	0.75	0.03	0.56
Total	**54.01**	**4.11**				
Total mg		**2.46**				
% Protein		**74.70**				**74.67**

CC-150-powder-1
Mass Hydrolyzed=2.9mg
Final Vol=30mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	0.69	0.08	1.25	1.92	0.14	1.64
Thr	0.37	0.04	0.67	0.91	0.08	0.78
Ser	5.25	0.46	9.50	11.05	1.09	9.46
Glx	0.54	0.07	0.97	1.68	0.11	1.44
Pro	0.14	0.01	0.25	0.32	0.03	0.28
Gly	25.23	1.44	45.68	34.82	5.22	29.81
Ala	17.37	1.24	31.45	29.85	3.59	25.55
Val	1.18	0.12	2.14	2.83	0.24	2.42
Ile	0.31	0.04	0.56	0.85	0.06	0.73
Leu	0.23	0.03	0.41	0.63	0.05	0.54
Tyr	2.91	0.48	5.27	11.48	0.60	9.83
Phe	0.42	0.06	0.77	1.50	0.09	1.29
His	0.09	0.01	0.16	0.29	0.02	0.25
Lys	0.10	0.01	0.18	0.30	0.02	0.26
Arg	0.20	0.03	0.36	0.75	0.04	0.64
Cysteic acid	0.03	0.00	0.06	0.09	0.01	0.07
Met sulfone	0.05	0.01	0.08	0.14	0.01	0.12
Trp	0.13	0.02	0.24	0.59	0.03	0.50
Total	**55.23**	**4.14**				
Total mg		**2.48**				
% Protein		**85.60**				**85.60**

CC-150-powder-2
Mass Hydrolyzed=3.4mg
Final Vol=30mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	0.97	0.11	1.26	1.94	0.17	1.98
Thr	0.53	0.05	0.68	0.92	0.09	0.94
Ser	7.34	0.64	9.53	11.07	1.30	11.28
Glx	0.76	0.10	0.98	1.69	0.13	1.73
Pro	0.25	0.02	0.32	0.41	0.04	0.42
Gly	35.19	2.01	45.67	34.80	6.21	35.46
Ala	24.23	1.72	31.44	29.83	4.28	30.40
Val	1.66	0.16	2.15	2.85	0.29	2.90
Ile	0.37	0.04	0.48	0.73	0.07	0.74
Leu	0.28	0.03	0.37	0.55	0.05	0.56
Tyr	4.14	0.68	5.37	11.70	0.73	11.93
Phe	0.54	0.08	0.71	1.39	0.10	1.41
His	0.13	0.02	0.17	0.31	0.02	0.31
Lys	0.14	0.02	0.18	0.30	0.02	0.31
Arg	0.28	0.04	0.36	0.76	0.05	0.77
Cysteic acid	0.00	0.00	0.00	0.00	0.00	0.00
Met sulfone	0.07	0.01	0.09	0.16	0.01	0.17
Trp	0.18	0.03	0.23	0.58	0.03	0.59
Total	**77.06**	**5.77**				
Total mg		**3.46**				
% Protein		**101.90**				**101.90**

CC-150-powder-3
Mass Hydrolyzed=2.7mg
Final Vol=20mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	0.95	0.11	1.28	1.96	0.14	1.63
Thr	0.51	0.05	0.69	0.93	0.08	0.77
Ser	7.11	0.62	9.52	11.05	1.05	9.17
Glx	0.76	0.10	1.01	1.74	0.11	1.45
Pro	0.31	0.03	0.42	0.54	0.05	0.45
Gly	33.92	1.94	45.46	34.57	5.03	28.70
Ala	23.48	1.67	31.46	29.78	3.48	24.73
Val	1.61	0.16	2.16	2.85	0.24	2.37
Ile	0.36	0.04	0.49	0.73	0.05	0.61
Leu	0.28	0.03	0.37	0.56	0.04	0.46
Tyr	4.07	0.66	5.45	11.84	0.60	9.83
Phe	0.53	0.08	0.70	1.38	0.08	1.15
His	0.11	0.02	0.15	0.28	0.02	0.23
Lys	0.13	0.02	0.17	0.30	0.02	0.25
Arg	0.27	0.04	0.37	0.77	0.04	0.64
Cysteic acid	0.00	0.00	0.00	0.00	0.00	0.00
Met sulfone	0.05	0.01	0.07	0.12	0.01	0.10
Trp	0.18	0.03	0.24	0.58	0.03	0.48
Total	**74.63**	**5.60**				
Total mg		**2.24**				
% Protein		**83.00**				**83.00**

CC-30-sol-1
Initial Vol (µL)=50
Final Vol (µL)=30000

Amino acid	nm/50µL	ugr/50µL	mole %	weight %
Asx	**1.085**	**0.125**	**1.79**	**2.72**
Thr	0.455	0.046	0.75	1.00
Ser	5.242	0.457	8.64	9.93
Glx	0.819	0.106	1.35	2.30
Pro	0.117	0.011	0.19	0.25
Gly	27.288	1.558	44.99	33.88
Ala	18.896	1.344	31.15	29.21
Val	1.374	0.136	2.26	2.96
Ile	0.431	0.049	0.71	1.06
Leu	0.342	0.039	0.56	0.84
Tyr	3.195	0.521	5.27	11.34
Phe	0.608	0.089	1.00	1.95
His	0.071	0.010	0.12	0.21
Lys	0.189	0.024	0.31	0.53
Arg	0.326	0.051	0.54	1.11
Cysteic acid	0.038	0.004	0.06	0.09
MetSO2	0.059	0.008	0.10	0.17
Trp	0.119	0.022	0.20	0.48
Total	**60.66**	**4.60**		
Total µg		**2759.8**		
Conc. (µg/µL)		**55.2**		

CC-30-sol-2
Initial Vol (µL)=50
Final Vol (µL)=30000

Amino acid	nm/50µL	ugr/50µL	mole %	weight %
Asx	**1.126**	**0.13**	**1.76**	**2.67**
Thr	0.482	0.049	0.75	1.00
Ser	5.593	0.487	8.72	10.02
Glx	0.835	0.108	1.30	2.22
Pro	0.157	0.015	0.24	0.31
Gly	28.859	1.648	45.01	33.91
Ala	19.958	1.419	31.13	29.20
Val	1.447	0.143	2.26	2.95
Ile	0.451	0.051	0.70	1.05
Leu	0.353	0.040	0.55	0.82
Tyr	3.439	0.561	5.36	11.55
Phe	0.587	0.086	0.92	1.78
His	0.074	0.010	0.12	0.21
Lys	0.198	0.025	0.31	0.52
Arg	0.328	0.051	0.51	1.05
Cysteic acid	0.038	0.004	0.06	0.08
MetSO2	0.060	0.008	0.09	0.16
Trp	0.129	0.024	0.20	0.50
Total	**64.11**	**4.86**		
Total µg		**2916.0**		
Conc. (µg/µL)		**58.3**		

CC-30-sol-3
Initial Vol (µL)=50
Final Vol (µL)=30000

Amino acid	nm/50µL	ugr/50µL	mole %	weight %
Asx	**1.11**	**0.128**	**1.84**	**2.80**
Thr	0.465	0.047	0.77	1.03
Ser	5.18	0.451	8.60	9.87
Glx	0.851	0.11	1.41	2.40
Pro	0.188	0.018	0.31	0.40
Gly	27.064	1.545	44.91	33.81
Ala	18.759	1.334	31.13	29.18
Val	1.357	0.134	2.25	2.94
Ile	0.432	0.049	0.72	1.07
Leu	0.339	0.038	0.56	0.84
Tyr	3.119	0.509	5.18	11.14
Phe	0.599	0.088	0.99	1.93
His	0.071	0.010	0.12	0.21
Lys	0.189	0.024	0.31	0.53
Arg	0.323	0.050	0.54	1.10
Cysteic acid	0.038	0.004	0.06	0.09
MetSO2	0.058	0.008	0.10	0.17
Trp	0.121	0.023	0.20	0.49
Total	**60.26**	**4.57**		
Total µg		**2742.3**		
Conc. (µg/µL)		**54.8**		

CC-150-sol-1
Initial Vol (µL)=50
Final Vol (µL)=30000

Amino acid	nm/50µL	ugr/50µL	mole %	weight %
Asx	0.646	0.074	1.18	1.82
Thr	0.36	0.036	0.66	0.89
Ser	5.093	0.444	9.30	10.86
Glx	0.507	0.065	0.93	1.60
Pro	0.076	0.007	0.14	0.18
Gly	25.238	1.441	46.08	35.27
Ala	17.336	1.233	31.65	30.17
Val	1.156	0.115	2.11	2.80
Ile	0.301	0.034	0.55	0.83
Leu	0.215	0.024	0.39	0.60
Tyr	2.829	0.462	5.17	11.30
Phe	0.458	0.067	0.84	1.65
His	0.083	0.011	0.15	0.28
Lys	0.123	0.016	0.23	0.39
Arg	0.191	0.030	0.35	0.73
Cysteic acid	0.012	0.001	0.02	0.03
MetSO2	0.041	0.005	0.08	0.13
Trp	0.102	0.019	0.19	0.46
Total	**54.77**	**4.09**		
Total µg		**2451.4**		
Conc. (µg/µL)		**49**		

CC-150-sol-2
Initial Vol (µL)=50
Final Vol (µL)=30000

Amino acid	nm/50µL	ugr/50µL	mole %	weight %
Asx	0.705	0.081	1.16	1.79
Thr	0.397	0.04	0.66	0.89
Ser	5.769	0.502	9.52	11.11
Glx	0.536	0.069	0.88	1.53
Pro	0.132	0.013	0.22	0.28
Gly	27.806	1.588	45.90	35.10
Ala	19.143	1.361	31.60	30.09
Val	1.266	0.125	2.09	2.77
Ile	0.325	0.037	0.54	0.81
Leu	0.242	0.027	0.40	0.61
Tyr	3.214	0.525	5.31	11.60
Phe	0.438	0.065	0.72	1.43
His	0.088	0.012	0.15	0.27
Lys	0.135	0.017	0.22	0.38
Arg	0.218	0.034	0.36	0.75
Cysteic acid	0.015	0.002	0.02	0.03
MetSO2	0.046	0.006	0.08	0.13
Trp	0.101	0.019	0.17	0.41
Total	**60.57**	**4.52**		
Total µg		**2713.7**		
Conc. (µg/µL)		**54.3**		

CC-150-sol-3
Initial Vol (µL)=50
Final Vol (µL)=30000

Amino acid	nm/50µL	ugr/50µL	mole %	weight %
Asx	0.76	0.087	1.21	1.87
Thr	0.43	0.043	0.69	0.93
Ser	6.067	0.528	9.68	11.28
Glx	0.57	0.074	0.91	1.57
Pro	0.096	0.009	0.15	0.20
Gly	28.727	1.640	45.84	35.02
Ala	19.702	1.401	31.44	29.91
Val	1.325	0.131	2.11	2.80
Ile	0.332	0.038	0.53	0.80
Leu	0.243	0.027	0.39	0.59
Tyr	3.340	0.545	5.33	11.64
Phe	0.458	0.067	0.73	1.44
His	0.088	0.012	0.14	0.26
Lys	0.138	0.018	0.22	0.38
Arg	0.224	0.035	0.36	0.75
Cysteic acid	0.015	0.002	0.02	0.03
MetSO2	0.046	0.006	0.07	0.13
Trp	0.104	0.019	0.17	0.41
Total	**62.66**	**4.68**		
Total µg		**2810.4**		
Conc. (µg/µL)		**56.2**		

CC-30-df-1
Mass Hydrolyzed=2.4mg
Final Vol=20mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	1.28	0.15	1.90	2.86	0.21	2.45
Thr	0.58	0.06	0.87	1.14	0.10	0.98
Ser	6.82	0.59	10.17	11.56	1.14	9.90
Glx	0.92	0.12	1.38	2.32	0.15	1.99
Pro	0.35	0.03	0.52	0.66	0.06	0.56
Gly	29.16	1.67	43.48	32.38	4.86	27.75
Ala	20.25	1.44	30.20	28.01	3.38	24.00
Val	1.54	0.15	2.29	2.96	0.26	2.54
Ile	0.53	0.06	0.79	1.17	0.09	1.00
Leu	0.45	0.05	0.66	0.98	0.07	0.84
Tyr	3.48	0.57	5.20	11.06	0.58	9.48
Phe	0.55	0.08	0.83	1.59	0.09	1.36
His	0.26	0.04	0.39	0.69	0.04	0.59
Lys	0.18	0.02	0.27	0.45	0.03	0.39
Arg	0.40	0.06	0.59	1.21	0.07	1.04
Cysteic acid	0.06	0.01	0.08	0.11	0.01	0.10
Met sulfone	0.07	0.01	0.10	0.18	0.01	0.15
Trp	0.19	0.03	0.28	0.67	0.03	0.58
Total	**67.07**	**5.14**				
Total mg		**2.06**				
% Protein		**85.70**				**85.69**

CC-30-df-2
Mass Hydrolyzed=2.4mg
Final Vol=20mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	1.25	0.14	1.81	2.72	0.21	2.40
Thr	0.59	0.06	0.86	1.14	0.10	1.00
Ser	7.10	0.62	10.29	11.71	1.18	10.31
Glx	0.88	0.11	1.27	2.15	0.15	1.89
Pro	0.29	0.03	0.42	0.53	0.05	0.47
Gly	30.26	1.73	43.83	32.71	5.04	28.80
Ala	20.86	1.48	30.22	28.08	3.48	24.72
Val	1.56	0.15	2.26	2.92	0.26	2.57
Ile	0.47	0.05	0.68	1.00	0.08	0.88
Leu	0.39	0.04	0.57	0.84	0.07	0.74
Tyr	3.71	0.60	5.37	11.45	0.62	10.08
Phe	0.60	0.09	0.86	1.66	0.10	1.46
His	0.17	0.02	0.24	0.43	0.03	0.38
Lys	0.18	0.02	0.26	0.43	0.03	0.38
Arg	0.36	0.06	0.52	1.07	0.06	0.94
Cysteic acid	0.06	0.01	0.09	0.12	0.01	0.11
Met sulfone	0.09	0.01	0.13	0.21	0.01	0.19
Trp	0.23	0.04	0.34	0.82	0.04	0.72
Total	**69.04**	**5.28**				
Total mg		**2.11**				
% Protein		**88.00**				**88.04**

CC-30-df-3
Mass Hydrolyzed=5.9mg
Final Vol=50mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	1.05	0.12	1.63	2.46	0.18	2.06
Thr	0.54	0.05	0.83	1.10	0.09	0.92
Ser	6.62	0.58	10.25	11.71	0.12	9.77
Glx	0.79	0.10	1.22	2.07	0.13	1.73
Pro	0.25	0.02	0.39	0.50	0.04	0.42
Gly	28.47	1.63	44.12	33.03	4.83	27.56
Ala	19.62	1.40	30.41	28.34	3.33	23.64
Val	1.41	0.14	2.19	2.85	0.24	2.37
Ile	0.41	0.05	0.64	0.95	0.07	0.79
Leu	0.33	0.04	0.51	0.75	0.06	0.63
Tyr	3.44	0.56	5.33	11.40	0.58	9.51
Phe	0.60	0.09	0.93	1.79	0.10	1.49
His	0.17	0.02	0.26	0.46	0.03	0.39
Lys	0.15	0.02	0.23	0.39	0.03	0.33
Arg	0.33	0.05	0.51	1.04	0.06	0.87
Cysteic acid	0.05	0.01	0.08	0.11	0.01	0.09
Met sulfone	0.07	0.01	0.11	0.19	0.01	0.16
Trp	0.23	0.04	0.35	0.86	0.04	0.72
Total	**64.53**	**4.92**				
Total mg		**4.92**				
% Protein		**83.40**				**83.43**

CC-150-df-1
Mass Hydrolyzed=5.4mg
Final Vol=50mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	0.96	0.11	1.64	2.47	0.18	2.04
Thr	0.47	0.05	0.79	1.05	0.09	0.87
Ser	5.94	0.52	10.14	11.58	1.10	9.57
Glx	0.70	0.09	1.19	2.02	0.13	1.67
Pro	0.19	0.02	0.33	0.41	0.04	0.34
Gly	25.89	1.48	44.21	33.11	4.79	27.38
Ala	17.86	1.27	30.50	28.44	3.31	23.52
Val	1.31	0.13	2.23	2.90	0.24	2.40
Ile	0.40	0.04	0.68	1.01	0.07	0.83
Leu	0.32	0.04	0.55	0.81	0.06	0.67
Tyr	3.05	0.50	5.21	11.14	0.56	9.21
Phe	0.50	0.07	0.85	1.65	0.09	1.36
His	0.14	0.02	0.25	0.44	0.03	0.37
Lys	0.16	0.02	0.27	0.45	0.03	0.37
Arg	0.31	0.05	0.53	1.08	0.06	0.89
Cysteic acid	0.06	0.01	0.10	0.13	0.01	0.11
Met sulfone	0.05	0.01	0.09	0.16	0.01	0.13
Trp	0.27	0.05	0.47	1.15	0.05	0.95
Total	**58.57**	**4.47**				
Total mg		**4.47**				
% Protein		**82.70**				**82.69**

CC-150-df-2
Mass Hydrolyzed=3.5mg
Final Vol=40mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	0.77	0.09	1.51	2.31	0.18	2.03
Thr	0.39	0.04	0.77	1.03	0.09	0.91
Ser	5.06	0.44	9.89	11.44	1.16	10.08
Glx	0.57	0.07	1.12	1.92	0.13	1.69
Pro	0.25	0.02	0.49	0.64	0.06	0.56
Gly	23.02	1.31	44.96	34.11	5.26	30.04
Ala	15.91	1.13	31.07	29.35	3.64	25.85
Val	1.09	0.11	2.14	2.81	0.25	2.48
Ile	0.29	0.03	0.56	0.84	0.07	0.74
Leu	0.24	0.03	0.46	0.69	0.05	0.61
Tyr	2.53	0.41	4.93	10.70	0.58	9.42
Phe	0.41	0.06	0.80	1.56	0.09	1.37
His	0.12	0.02	0.23	0.41	0.03	0.36
Lys	0.11	0.01	0.22	0.38	0.03	0.34
Arg	0.23	0.04	0.45	0.94	0.05	0.83
Cysteic acid	0.03	0.00	0.06	0.08	0.01	0.07
Met sulfone	0.05	0.01	0.09	0.16	0.01	0.14
Trp	0.13	0.02	0.25	0.62	0.03	0.55
Total	**51.20**	**3.85**				
Total mg		**3.08**				
% Protein		**88.10**				**88.07**

CC-150-df-3
Mass Hydrolyzed=2.6mg
Final Vol=20mL

Amino acid	nm/50µL	ugr/50µL	mole %	weight %	µm/mg	%(w/w)
Asx	1.09	0.13	1.45	2.21	0.17	1.93
Thr	0.57	0.06	0.75	1.01	0.09	0.88
Ser	7.49	0.65	9.92	11.48	1.15	10.04
Glx	0.83	0.11	1.11	1.90	0.13	1.66
Pro	0.29	0.03	0.38	0.49	0.04	0.43
Gly	33.99	1.94	44.99	34.12	5.23	29.85
Ala	23.50	1.67	31.11	29.38	3.62	25.71
Val	1.63	0.16	2.16	2.85	0.25	2.49
Ile	0.42	0.05	0.56	0.84	0.07	0.74
Leu	0.34	0.04	0.46	0.69	0.05	0.60
Tyr	3.78	0.62	5.01	10.86	0.58	9.50
Phe	0.57	0.08	0.75	1.46	0.09	1.28
His	0.19	0.03	0.25	0.46	0.03	0.40
Lys	0.17	0.02	0.22	0.38	0.03	0.33
Arg	0.34	0.05	0.45	0.92	0.05	0.81
Cysteic acid	0.04	0.00	0.06	0.08	0.01	0.07
Met sulfone	0.07	0.01	0.09	0.16	0.01	0.14
Trp	0.22	0.04	0.29	0.71	0.03	0.62
Total	**75.54**	**5.69**				
Total mg		**2.27**				
% Protein		**87.50**				**87.49**

Standard 1(AB)
Initial Vol (µL)=50
Final Vol (µL)=30000

Amino acid	nm/50µL	ugr/50µL	mole %	weight %
Asx	0.775	0.089	1.65	2.50
Thr	0.389	0.039	0.83	1.10
Ser	4.768	0.415	10.15	11.64
Glx	0.576	0.074	1.23	2.08
Pro	0.115	0.011	0.25	0.31
Gly	20.884	1.192	44.47	33.42
Ala	14.307	1.017	30.46	28.51
Val	1.022	0.101	2.18	2.84
Ile	0.342	0.039	0.73	1.09
Leu	0.257	0.029	0.55	0.81
Tyr	2.480	0.405	5.28	11.35
Phe	0.435	0.064	0.93	1.80
His	0.092	0.013	0.20	0.35
Lys	0.122	0.016	0.26	0.44
Arg	0.235	0.037	0.50	1.03
Cysteic acid	0.029	0.003	0.06	0.08
MetSO2	0.043	0.006	0.09	0.16
Trp	0.092	0.017	0.20	0.48
Total	**46.96**	**3.57**		
Total µg		**2140.7**		
Conc. (µg/µL)		**42.8**		

45-1 Ramsey Road, Shirley, NY 11967, USA
Tel: 1-631-275-3058 Fax: 1-631-614-7828
www.creative-proteomics.com
info@creative-proteomics.com

Analysis Report

Project Name	Amino Acids Composition Analysis
Sample Description	Silk fibroin
Sample Quantity	20
Order Number	CPMC02132001
Client	
Project Date	*2020-3*
Remark	

Creative Proteomics
45-1 Ramsey Road, Shirley, NY 11967, USA
Tel: 1-631-275-3058 Fax: 1-631-614-7828
www.creative-proteomics.com
info@creative-proteomics.com

Part 1 Sample Preparation

1.1 Samples and Groups

20 silk fibroin samples, for quantitative measurement of amino acids in the collected sample.
Name: Shown in the excel sheet.

1.2 Analytical Procedures

(1) For powder, weigh X mg of sample into hydrolysis tube. For solution, transfer X μL sample into hydrolysis tube; Dry. For DF, crush aliquot of sample with mortar and pestle, weigh X mg of sample into hydrolysis tube.

(2) Soak "PO" samples in 800 μL fresh performic acid overnight; Dry.

(3) Perform parallel base hydrolysis (200 μL 4.2N NaOH 110℃ for 24hrs); Neutralize NaOH with 200 μL 4.2N HCl, add 600 μL Norleu diluent.

(4) Perform liquid phase hydrolysis on "HCl" and "PO" samples (200μL 6N HCl/1% phenol @ 110℃ for 24hrs); Dry.

(5) Add Norleu dilution buffer for a final dilution as indicated.

(6) Vortex; Spin down; Load 50μL

Note: Each 50μL injection = 2.0nmol Norleu.

Part 2 Analytical Results

The chromatograms and results are shown in the PDFs and excel sheet.

APPENDIX C
MORI SILK SPECIFICATIONS AND BATCH DATA

Specifications of Mori Silk*		
Parameter	Product Specification	
	Specification	Method
Protein	4.0 - 7.5%wt (40 - 75 mg/g)	AOAC 992.15
Ash	<0.1%wt	AOAC 920.153
Fat	<0.1%wt	AOAC 922.06
Carbohydrates	<0.1%wt	Calculation
Lithium	<75 ppmw	ICP-OES
Arsenic	<5 ppmw	ICP-OES
Lead	<5 ppmw	ICP-OES
Escherichia coli	<10 cfu/g	AOAC 991.14
Listeria monocytogenes	Negative/25g	AOAC 070702
Salmonella typhimurium	Negative/25g	AOAC 2009.03
* Mori Silk solution or Mori Silk powder reconstituted at 5% weight/volume in water (50 mg Mori Silk in 1 mL potable water, mixed or stirred to solution).		
Abbreviations: AOAC = Association of Analytical Chemists; cfu = colony-forming units; g = gram(s); ICP-OES = inductively coupled plasma optical emission spectrometry; mg = milligram(s); ppmw = parts per million by weight; wt = weight		

APPENDIX C1
MORI SILK SOLUTION: SPECIFICATIONS AND BATCH DATA

Table C1: Analysis of Production Batches of Mori Silk Solution*					
Parameter	Specification	Batches			Method
		Batch 215	Batch 230	Batch 244	
		10/13/2019	11/18/2019	1/16/2020	
Protein	4.0 - 7.5%wt (40 - 75 mg/g)	4.42% (44.2 mg/g)	4.59% (45.8 mg/g)	6.95% (69.5 mg/g)	AOAC 992.15
Fat	<0.1%wt	<0.01%	<0.01%	<0.01%	AOAC 922.06
Carbohydrates	<0.1%wt	0.04%	<0.01%	<0.01%	Calculation
Ash	<0.1%wt	<0.01%	<0.01%	0.05%	AOAC 920.153
Lithium	<75 ppmw	48 ppmw	33 ppmw	59 ppmw	ICP-OES
Arsenic	<5 ppmw	<0.2 ppmw	<1.8 ppmw	<1.7 ppmw	ICP-OES
Lead	<5 ppmw	<0.1 ppmw	<4.1 ppmw	<3.8 ppmw	ICP-OES
Escherichia coli	<10 cfu/g	<10 cfu/g	<10 cfu/g	<10 cfu/g	AOAC 991.14
Listeria monocytogenes	Negative/25g	Negative/25g	Negative/25g	Negative/25g	AOAC 070702
Salmonella typhymurium	Negative/25g	Negative/25g	Negative/25g	Negative/25g	AOAC 2009.03
Calcium	N/A	<0.2 ppmw	3.6 ppmw	<1.7 ppmw	ICP-OES
Magnesium	N/A	<0.3 ppmw	<2.7 ppmw	<2.8 ppmw	ICP-OES
Mercury	N/A	<0.4 ppmw	<4.7 ppmw	<4.4 ppmw	ICP-OES
Bacillus cereus	N/A	<3 mpn/mL	<3 mpn/mL	<3 mpn/mL	AOAC 980.31/ISO 7932
Cronobacter	N/A	Negative/25g	Negative/25g	Negative/25g	PCR
Enterobacteriaceae	N/A	<10 cfu/g	<10 cfu/g	<10 cfu/g	AOAC 2003.01
Staphylococcus aureus	N/A	<10 cfu/g	<10 cfu/g	<10 cfu/g	AOAC 2003.07
Mold	N/A	<10 cfu/g	<10 cfu/g	<10 cfu/g	BAM Ch. 18
Yeast	N/A	<10 cfu/g	<10 cfu/g	<10 cfu/g	BAM Ch. 18
Notes: Protein was provided on a weight basis in mg protein/g sample. *Mori Silk solution before dehydration					
Abbreviations: AOAC = Association of Analytical Chemists; BAM = Bacteriological Analytical Manual; cfu = colony-forming units; g = gram(s); ICP-OES = inductively coupled plasma optical emission spectrometry; mg = milligram(s); mL = milliliter(s); N/A = not applicable (no specification); PCR = polymerase chain reaction; ppmw = parts per million by weight					

Alliance Analytical Laboratories, Inc.

179 West Randall Street
Coopersville, MI 49404
Phone: (616) 837-7670
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TEST RESULTS REPORT

Test methods marked with ^ are accredited under the laboratory's ISO/IEC 17025 accreditation issued by ANSI-ASQ National Accreditation Board. Refer to certificate and scope of accreditation AT-2044

CUSTOMER	Cambridge Crops 444 Somerville Ave Somerville, MA 02143 Email: sezin@cambridgecrops.com;
SAMPLE DESCRIPTION	Batch 215 SD NA
SAMPLE DATE	
DATE RECEIVED	10/18/2019
REFERENCE NUMBER	190361: 1936155 **Customer PO** CC201910153
TEMPERATURE AT RECEIVING	

Test Requested	Test Method	Results	Ref Number	Start Date
Ash	AOAC 920.153 Analyst: 45	<0.01 %	MS01:70	11/6 10:00 AM
Bacillus cereus	AOAC 980.31/ ISO 7932 Analyst: 39	<0.30 mpn/ml		10/21 12:43 PM
Carbohydrates	Calculation Analyst: 42	0.04 %	DF02:07	12/18 12:00 PM
Cronobacter	PCR Analyst: 39	Negative/25g		10/21 10:06 AM Kit Lot Number: GDSCB07291910A
Enterobacteriaceae:^AOAC 2003.01	^AOAC 2003.01 Analyst: 39	<1 cfu/ml		10/21 10:05 AM
Escherichia coli - Generic	^AOAC 991.14 Analyst: 39	<1 cfu/ml		10/21 10:05 AM
Fat:Sox/AH	AOAC 963.15 Analyst: 38	<1.0 %	JW03:49	12/3 10:00 AM
Listeria monocytogenes	^AOAC 070702 Analyst: 39	Negative/25g		10/21 10:06 AM Kit Lot Number: GDSLM07101904A
Milk:Solids	SMEDP 15.114 Analyst: 34	4.06 %	MS201905:31	10/22 10:17 AM
Protein	^AOAC 992.15 Analyst: 37	4.42 %	JV01:81	10/23 12:00 PM

It is the customer's responsibility to evaluate the compliance of these results to any regulatory requirement.
Test results apply to the sample as received.

Reviewed and Approved by: [redacted] Date: 1/10/2020

Date: 1/10/2020

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TEST RESULTS REPORT

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CUSTOMER	Cambridge Crops 444 Somerville Ave Somerville, MA 02143 Email: sezin@cambridgecrops.com;
SAMPLE DESCRIPTION	Batch 215 SD NA
SAMPLE DATE	
DATE RECEIVED	3/17/2020
REFERENCE NUMBER	200104: 2010409 **Customer PO** CC202003001
TEMPERATURE AT RECEIVING	

Test Requested	Test Method		Results	Ref Number	Start Date
Bacillus cereus	AOAC 980.31/ ISO 7932 Analyst: 44		<3 mpn/ml		3/17 11:59 AM
BAM:Mold	^BAM Ch. 18 Analyst: 44	Log: <1.0	<10 cfu/g		3/17 1:49 PM
BAM:Yeast	^BAM Ch. 18 Analyst: 44	Log: <1.0	<10 cfu/g		3/17 1:49 PM
Enterobacteriaceae:^AOAC 2003.01	^AOAC 2003.01 Analyst: 44	Log: <1.0	<10 cfu/g		3/17 11:59 AM
Escherichia coli - Generic	^AOAC 991.14 Analyst: 44	Log: <1.0	<10 cfu/g		3/17 11:59 AM
Fat:Acid Hydrolysis:Cereal	AOAC 922.06 Analyst: 45		<0.01 %	MS03-102	3/20 8:00 AM
Staphylococcus aureus	^AOAC 2003.07 Analyst: 44	Log: <1.0	<10 cfu/g		3/17 11:59 AM

Sample Comment:
Revised Correct Fat Results 3-30-20

Reviewed and Approved by: [redacted] Date: 3/30/2020

Date: 3/30/2020

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TEST RESULTS REPORT

SAMPLE DESCRIPTION	Batch 215 SD NA		
SAMPLE DATE			
DATE RECEIVED	10/18/2019		
REFERENCE NUMBER	190361: 1936155	**Customer PO**	CC201910153
TEMPERATURE AT RECEIVING			

Test Requested	Test Method	Results	Ref Number	Start Date
Rapid Mold	AOAC 2014.05 Analyst: 39	<1 cfu/ml		10/21 10:06 AM
Rapid Yeast	AOAC 2014.05 Analyst: 39	<1 cfu/ml		10/21 10:06 AM
Salmonella	^AOAC 2009.03 Analyst: 39	Negative/25g		10/21 10:06 AM Kit Lot Number: GDSSL06071917A
Staphylococcus aureus	^AOAC 2003.07 Analyst: 39	<1 cfu/ml		10/21 10:05 AM

Reviewed and Approved by: [redacted] Date: 1/10/2020

Date: 1/10/2020

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TEST RESULTS REPORT

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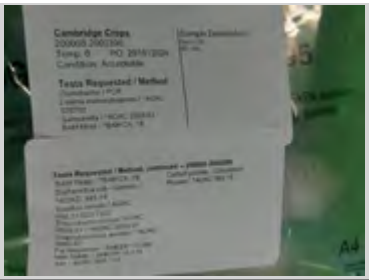
CUSTOMER	Cambridge Crops 444 Somerville Ave Somerville, MA 02143 Email: sezin@cambridgecrops.com;
SAMPLE DESCRIPTION	Batch 230 SD NA
SAMPLE DATE	
DATE RECEIVED	1/3/2020
REFERENCE NUMBER	200003: 2000390 **Customer PO** 201912024
TEMPERATURE AT RECEIVING	



Test Requested	Test Method		Results	Ref Number	Start Date
Ash	AOAC 920.153 Analyst: 45		<0.01 %	MS02-79	1/7 4:00 PM
Bacillus cereus	AOAC 980.31/ ISO 7932 Analyst: 39		<3 mpn/ml		1/7 3:39 PM
BAM:Mold	^BAM Ch. 18 Analyst: 39	Log: <1.0	<10 cfu/g		1/7 4:00 PM
BAM:Yeast	^BAM Ch. 18 Analyst: 39	Log: <1.0	<10 cfu/g		1/7 4:00 PM
Carbohydrates	Calculation Analyst: 45		<0.01 %		1/17 10:00 AM
Cronobacter	PCR Analyst: 39		Negative/25g		1/7 3:39 PM Kit Lot Number: GDSCB07021902B
Enterobacteriaceae:^AOAC 2003.01	^AOAC 2003.01 Analyst: 39	Log: <1.0	<10 cfu/g		1/7 3:39 PM
Escherichia coli - Generic	^AOAC 991.14 Analyst: 39	Log: <1.0	<10 cfu/g		1/7 3:39 PM
Fat:Acid Hydrolysis:Cereal	AOAC 922.06 Analyst: 45		<0.01 %	MS02-80	1/8 7:00 AM
Listeria monocytogenes	^AOAC 070702 Analyst: 39		Negative/25g		1/7 3:39 PM Kit Lot Number: GDSLM07221908A

It is the customer's responsibility to evaluate the compliance of these results to any regulatory requirement.
Test results apply to the sample as received.

Reviewed and Approved by: [redacted] Date: 1/24/2020

Date: 1/24/2020

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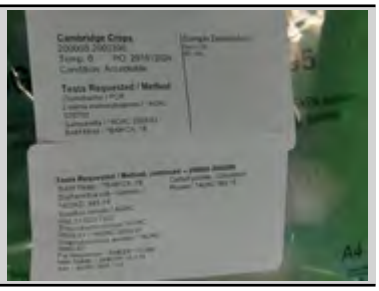
TEST RESULTS REPORT

SAMPLE DESCRIPTION	Batch 230 SD NA		
SAMPLE DATE			
DATE RECEIVED	1/3/2020		
REFERENCE NUMBER	200003: 2000390	**Customer PO**	201912024
TEMPERATURE AT RECEIVING			



Test Requested	Test Method		Results	Ref Number	Start Date
Protein	^AOAC 992.15 Analyst: 37		4.59 %	JV02:28	1/13 9:00 AM
Salmonella	^AOAC 2009.03 Analyst: 39		Negative/25g	Kit Lot Number: GDSSL08301905C	1/7 3:39 PM
Solids	AOAC 927.23 Analyst: 45		3.87 %	MS02-79	1/7 4:00 PM
Staphylococcus aureus	^AOAC 2003.07 Analyst: 39	Log: <1.0	<10 cfu/g		1/7 3:39 PM

Reviewed and Approved by: [redacted] Date: 1/24/2020

Date: 1/24/2020

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TEST RESULTS REPORT

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CUSTOMER	Cambridge Crops 444 Somerville Ave Somerville, MA 02143 Email: sezin@cambridgecrops.com;
SAMPLE DESCRIPTION	Batch 241
SAMPLE DATE	
DATE RECEIVED	1/20/2020
REFERENCE NUMBER	200027: 2002752 **Customer PO** CC202001003
TEMPERATURE AT RECEIVING	

Test Requested	Test Method		Results	Ref Number	Start Date
Ash	AOAC 920.153 Analyst: 45		0.05 %	MS02-99	1/21 2:00 PM
Bacillus cereus	AOAC 980.31/ ISO 7932 Analyst: 39		<3 mpn/ml		1/21 9:14 AM
BAM:Mold	^BAM Ch. 18 Analyst: 44	Log: <1.0	<10 cfu/g		1/21 3:03 PM
BAM:Yeast	^BAM Ch. 18 Analyst: 44	Log: <1.0	<10 cfu/g		1/21 3:03 PM
Carbohydrates	Calculation Analyst: 42		<0.01 %	DF02:50	2/14 9:40 AM
Cronobacter	PCR Analyst: 39		Negative/25g		1/21 9:14 AM Kit Lot Number: GDSCB07291910A
Enterobacteriaceae:^AOAC 2003.01	^AOAC 2003.01 Analyst: 39	Log: <1.0	<10 cfu/g		1/21 9:14 AM
Escherichia coli - Generic	^AOAC 991.14 Analyst: 39	Log: <1.0	<10 cfu/g		1/21 9:14 AM
Fat:Acid Hydrolysis:Cereal	AOAC 922.06 Analyst: 45		<0.01 %	MS02-100	1/21 10:00 AM
Listeria monocytogenes	^AOAC 070702 Analyst: 39		Negative/25g		1/21 9:14 AM Kit Lot Number: GDSLM07221908B

It is the customer's responsibility to evaluate the compliance of these results to any regulatory requirement.
Test results apply to the sample as received.

Reviewed and Approved by: [redacted] Date: 2/19/2020

Date: 2/19/2020

Alliance Analytical Laboratories, Inc.

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TEST RESULTS REPORT

Test methods marked with ^ are accredited under the laboratory's ISO/IEC 17025 accreditation issued by ANSI-ASQ National Accreditation Board. Refer to certificate and scope of accreditation AT-2044

SAMPLE DESCRIPTION	Batch 241		
SAMPLE DATE			
DATE RECEIVED	1/20/2020		
REFERENCE NUMBER	200027: 2002752	**Customer PO**	CC202001003
TEMPERATURE AT RECEIVING			

Test Requested	Test Method		Results	Ref Number	Start Date
Protein	^AOAC 992.15 Analyst: 37		6.95 %	JV03:05	2/12 12:00 PM
Salmonella	^AOAC 2009.03 Analyst: 39		Negative/25g	Kit Lot Number: GDSSL08301905D/11071911A	1/21 9:14 AM
Solids	AOAC 927.23 Analyst: 45		6.15 %	MS02-99	1/21 2:00 PM
Staphylococcus aureus	^AOAC 2003.07 Analyst: 39	Log: <1.0	<10 cfu/g		1/21 9:14 AM

Reviewed and Approved by: [redacted] Date: 2/19/2020

Date: 2/19/2020

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Analytical Report		
Title:	Elemental Analysis of a Protein Solution using Inductively Coupled Plasma Optical Emission Spectroscopy	
Report No.	128365v2	
Company:	Cambridge Crops	
Issue Date:	March 6, 2020	
Notebook Reference:	ASA-015364	
Contributors:	Brady Frill	
Job/Quote No.:	CambridgeCrops101619av1-IC : Qu-01021465-0	
Contact Information:	**Submitter** Name:	**Intertek Allentown Contact** Name: Email: Phone

Approvals:

Reviewed and Released By

7201 Hamilton Blvd. Allentown, PA 18195 Phone: (610) 295-0100 http://www.Intertek.com

Purpose:
Determine the concentrations of arsenic, calcium, cadmium, mercury, lithium, magnesium, sodium and lead in one protein solution using inductively coupled plasma optical emission spectroscopy (ICP-OES).

Summary and Conclusions:
The results of the quantitative elemental analysis routine are presented in Table 1.

Samples:
Batch 215 Liquid

Experimental:
- Sample Preparation
  - Microwave assisted nitric/hydrochloric acid digestion carried out in quartz vessels using a Milestone UltraWave® Single Reaction Chamber digestion system.
- Instrumental Analysis
  - ICP-OES analysis using a Perkin Elmer Optima 5300DV Optical Emission Spectrometer.
  - Linear calibration using four matrix-matched instrument calibration standards (0.25 ppmw to 2 ppmw) prepared from traceable single and multi-element stock standards.
  - At least two analytical wavelengths per element included in the analysis sequence to confirm concentrations and evaluate spectra for potential interferences.
  - Sample analysis bracketed by calibration blank and standard solution measurements.
  - Method blanks used to correct the background signal in sample measurements, where appropriate.
  - Single determination carried out on the sample submitted for analysis.
  - 1 ppm QC recovery sample prepared from traceable single and multi-element stock standards.

Discussion and Observations:
Results from the quantitative elemental analysis routine carried out on the protein solution are presented in Table 1. The linear regressed calibration curve correlation coefficient is $R^2 \geq 0.9999$ for the analytical wavelengths reported for each element. QC recoveries ranged from 94.6% to 102% which is within the acceptable range for the experiment.

Data from multiple measurements of the matrix-matched calibration blank were used to calculate limit of detection (LOD) and limit of quantitation (LOQ) values. The LOD and LOQ for each element were calculated using the average of the linear regressed absolute mean blank values, $\boldsymbol{x}$, and the standard deviation about the mean blank values, σ, from the blank measurements as shown in equations [1] and [2].

$$Limit\ of\ Detection = (3\sigma + x) \times sample\ dilution\ factor \quad [1]$$
$$Limit\ of\ Quantitation = (10\sigma + x) \times sample\ dilution\ factor \quad [2]$$

Measurement uncertainty values specific to this request cannot be determined since the analysis was carried out using only a single determination.

Table 1. Elemental Analysis of a Protein Solution using ICP-OES.

Element	Batch 215 (ppmw)	QC Recovery (%)	Correlation Coefficient (R^2)
Arsenic (As)	< 0.2	100%	0.9999
Calcium (Ca)	< 0.2	94.6%	0.9999
Cadmium (Cd)	< 0.1	98.1%	0.9999
Mercury (Hg)	< 0.4	98.2%	1.0000
Lithium (Li)	48	102%	0.9999
Magnesium (Mg)	< 0.3	98.5%	1.0000
Sodium (Na)	41	102%	0.9999
Lead (Pb)	< 0.1	101%	1.0000

(<) indicates not detected above LOD
(≤) indicates measured concentration is between LOD and LOQ

End of Report

Analytical Report		
Title:	Determination of Lead, Arsenic, Mercury, Cadmium, Calcium, Lithium, Sodium and Magnesium using Inductively Coupled Plasma Optical Emission Spectroscopy	
Report No.	129002v2	
Company:	Cambridge Crops	
Issue Date:	March 6, 2020	
Notebook Reference:	ASA-015889	
Contributors:	Heather May	
Job/Quote No.:	CambridgeCrops012219av2-CL: Qu-01046060-1	
Contact Information:	**Submitter** Name: cc:	**Intertek Allentown Contact** Name: Email: Phone:

Approvals:

Reviewed and Released By

7201 Hamilton Blvd. Allentown, PA 18195 Phone: (610) 295-0100 http://www.Intertek.com

Purpose:
Determine the concentrations of lead, arsenic, mercury, cadmium, calcium, lithium, sodium and magnesium in 5% protein solutions using inductively coupled plasma optical emission spectroscopy (ICP-OES).

Summary and Conclusions:
Lithium was measured at 33 ppmw in sample Batch 230 and 59 ppmw in sample Batch 244[a]. Calcium was measured at 3.6 in sample Batch 230 and <1.7 ppmw in sample Batch 244[a]. The remaining elements requested were below detection limits for the submitted samples. Trace metals results are summarized in Table 1.

Samples:
Batch 230 Protein solution- sterile
Batch 244[a] Protein solution- sterile

Experimental:
Samples were prepared through microwave assisted nitric acid digestion using a Milestone Ultrawave Single Reaction Chamber digestion system. A digestion control and blank were taken through the sample preparation procedure.

ICP-OES analysis was performed using a Perkin Elmer Optima 5300DV Optical Emission Spectrometer. Standards were prepared in the concentration range of 0.1 to 5ppmw from single and multi-element stock solutions. A minimum of two analytical wavelengths were measured to confirm concentrations and evaluate spectra for potential interferences.

Discussion and Observations:
For ICP-OES analysis, the calibration curve correlation coefficient (R^2) was determined to be greater than 0.9994 for the analytical wavelengths reported. The standard recoveries from the digestion control ranged from 90% to 105% which is within the acceptable range for the experiment.

Data from multiple measurements of the matrix-matched calibration blank were used to calculate the limits of detection (LOD) and limits of quantification (LOQ) values. The LOD and LOQ for each element were calculated using the average of the linear regressed absolute mean blank values, $\boldsymbol{x}$, and the standard deviation about the mean blank values, σ, from the blank measurements as shown in equations [1] and [2].

$$Limit\ of\ Detection = (3\sigma + x) \times sample\ dilution\ factor \quad [1]$$
$$Limit\ of\ Quantitation = (10\sigma + x) \times sample\ dilution\ factor \quad [2]$$

Measurement uncertainty values specific to this request cannot be determined since the analysis was carried out using single determinations.

Table 1. Summary of Elemental Results using ICP-OES.

Sample ID	Arsenic (ppmw)	Calcium (ppmw)	Cadmium (ppmw)	Mercury (ppmw)	Lithium (ppmw)	Magnesium (ppmw)	Sodium (ppmw)	Lead (ppmw)
Batch 230	<1.8	3.6	<2.9	<4.7	33	<2.7	<10	<4.1
Batch 244[a]	<1.7	<1.7	<2.7	<4.4	59	≤2.8	<9.6	<3.8

[a] sample name in original report 129002v1 is different than Cambridge Crops internal records. Client made a clerical error when submitting it to Intertek.

End of Report

Cassie Huang

From: [redacted]
Sent: Friday, March 27, 2020 11:57 AM
To: [redacted]
Cc:
Subject: RE: Questions on previous test results

Good afternoon,
I was able to discuss the results with the chemist and we are running this sample again on Monday for confirmation.
We began to re-dry the sample for weight and determined that there is a reduction.
I believe through the process that this sample will require additional dry time in comparison to the method referencing 1 hour.
We will be drying this longer for new results along with a new sample Monday.

Attached below is the % nitrogen for the samples.

Sample #	%Nitrogen
1936155	17.382
2000390	19.133
2000390	19.104
2002752	18.071
2006302	18.594
2006302	18.277

Thank You,

[redacted]

Weight Nitrogen(mg)	=	Sample Weight(g)	*	$\frac{\%\ \text{Nitrogen}}{100}$	*	1000
Weight Nitrogen (mg of N/g of Sample)	=	$\frac{\%\text{Nitrogen}}{100}$	*	1000		
Weight Protein(mg)	=	Sample Weight(g)	*	$\frac{\%\ \text{Protein}}{100}$	*	1000
Weight Protein (mg of N/g of Sample)	=	$\frac{\%\text{Protein}}{100}$	*	1000		

Thank You,

[redacted]

From: [redacted]
Sent: Thursday, March 26, 2020 4:03 PM
To: [redacted]
Cc: [redacted]
Subject: RE: Questions on previous test results

Hi [redacted]

As we just discussed on the phone, please add a note about how you derived the protein weight to the reports for Samples 1936155, 2000390, and 2002752.

Now that I'm looking at your protein weights table in your email below, were samples 2000390 and 2006302 run in duplicate? I didn't realize that, based on the test results report. Can you clarify why there are two results for those samples?

Thank you for accommodating our requests. I really appreciate it.

Kind regards,
Cassie

[redacted]
Senior Consultant

[redacted]

From: [redacted]
Sent: Thursday, March 19, 2020 3:13 PM
To: [redacted]
Cc: [redacted]
Subject: RE: Questions on previous test results

Good afternoon all,
Below is the chart of mg of protein per gram of sample and then the actual weight of sample and protein weight in mg is the 3rd and 4th column.

Sample #	Protein Wt (mg of Protein/g of Sample	Grams of Sample	Protein Wt(mg)
1936155	44.2	0.2525	11.161
2000390	45.9	0.179	8.216
2000390	45.8	0.159	7.282
2002752	69.5	0.1481	10.293
2006302	994.5	0.1444	143.606
2006302	977.6	0.1353	132.269

Thank You,

[redacted]

APPENDIX C2
MORI SILK POWDER

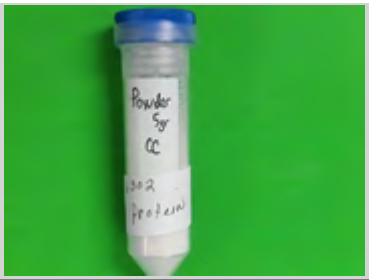
Alliance Analytical Laboratories, Inc.

179 West Randall Street
Coopersville, MI 49404
Phone: (616) 837-7670
Fax: (616) 837-7701

TEST RESULTS REPORT

Test methods marked with ^ are accredited under the laboratory's ISO/IEC 17025 accreditation issued by ANSI-ASQ National Accreditation Board. Refer to certificate and scope of accreditation AT-2044

CUSTOMER	Cambridge Crops 444 Somerville Ave Somerville, MA 02143 Email: sezin@cambridgecrops.com;
SAMPLE DESCRIPTION	Powder 5gr SD NA
SAMPLE DATE	
DATE RECEIVED	2/14/2020
REFERENCE NUMBER	200063: 2006302 **Customer PO**
TEMPERATURE AT RECEIVING	



Test Requested	Test Method	Results	Ref Number	Start Date
Protein	^AOAC 992.15 Analyst: 37	98.60 % Protein determined from 18.44% Nitrogen and collagen conversion factor of 5.55. Adjusted for 3.63% moisture.		

It is the customer's responsibility to evaluate the compliance of these results to any regulatory requirement.
Test results apply to the sample as received.

Reviewed and Approved by: [redacted] Date: 2/24/2020

APPENDIX D
STABILITY STUDY OF MORI SILK POWDER

I. Study Preparation

1. Experimental Design:
    - 1.1 Prepare the required powder amount aliquoted into chosen packaging materials and the environment for the stability study.
        - 1.1.1 All samples are stored at 60°C, 30% RH
        - 1.1.2 Packaging materials to be tested are compostable plant fiber cup, metallized mylar, and PLA container.
            - 1.1.2.1 Compostable Plant Fiber Container purchased from World Centric, SKU CU-SC-U2
            - 1.1.2.2 Metallized Mylar Container purchased from QQStudio, Product Number ASIN B071VDZXWX
            - 1.1.2.3 Compostable PLA Souffle Container purchased from World Centric, SKU CP-CS-2S
    - 1.2 Sampling time and duration
        - 1.2.1 Studies will span 4 weeks (28 days)
        - 1.2.2 Testing will be taken on Day 0, Day 7, Day 14, Day 21, and Day 28
    - 1.3 The amount of silk is calculated for the entirety of the stability study
        - 1.3.1 1 gram of silk powder is aliquoted into each packaging unit
        - 1.3.2 5 packaging units per packaging category (Compostable Plant Fiber Cup; Metallized Mylar; and PLA Container)
            - 1.3.2.1 4 * 5 = 20 samples per packaging category
2. All samples stored in an environmental chamber at 60°C and 30% RH until sampling.
3. Complete Day 0 testing for each sample in each package.
    a. Stability study testing will consist concentration measurement centrifuged and non-centrifuged samples using the BCA protein assay after solubilization of 50mg of the sample in 1ml (5% w/v). Testing should be completed according to Version 1.0 of the "Silk Concentration Measurement Using BCA Protein Assay" protocol, listed in detail under Section V.

II. Samples Tested at Day 7, 14, 21, and 28

1. Solutions prepared
    i. 50mg of each sample weighed (n=5 per group) and placed in an Eppendorf tube.
    ii. 1 mL of Milli-Q (MQ) water added; Eppendorf tube vortexed for 20 seconds for full reconstitution.
2. Concentration tested using BCA Protein assay
    - 3.1 500 µL of each stability study sample transferred from Eppendorf tubes into a new microcentrifuge tube.
        - 3.1.1 Microcentrifuge tubes labeled using the same nomenclature as the original stability study sample tube, adding "C" to indicate centrifugation.
    - 3.2 For each sample, concentration tested using the BCA protein assay for 2 replicates of both centrifuged and non-centrifuged samples (4 samples total) according to the protocol "Silk Concentration Measurement Using BCA Protein Assay" as described in Section V.

III. Data Analysis

1. Each sample concentration recorded and averaged for each sampling point (each week)
    a. Centrifuge and non-centrifuged data treated as separate groups
2. After week 4 (end of study), data (n=5 data points) plotted for respective packaging unit on a separate graph that shows the trend from Week 1-4 and delta between centrifuge and non-centrifuged.

IV. Results

Concentrations were verified at each timepoint for each container type and compared to a standard. Averages between each measurement were taken after centrifuging each sample. The standard BCA assay has a margin of error (MOE) of +/- 10mg/ml. Table 2 shows those results:

Week	Compostable PLA Cups (mg/ml)	Metallized Mylar Bag (mg/ml)	Compostable Plant Fiber Cups (mg/ml)	Standard (Advanced BioMatrix) (mg/ml)	Standard error (mg/ml)
t=0	49.59	49.59	49.59	50	+/- 10
Week 1	52.13	52.78	54.55	50	+/- 10
Week 2	47.27	47.57	54.05	50	+/- 10
Week 3	56.21	53.95	53.95	50	+/- 10
Week 4	45.38	56.73	56.73	50	+/- 10

Table 2. Average BCA Concentrations

The results indicate that the silk powder remained stable in all of the storage containers at high temperature and humidity. The concentration over the course of the four-week study did not exhibit an overall decrease. While there is a week to week movement both up and down for the concentrations, this is due to inherent inconsistencies in the BCA assay and are all within an expected margin of error. The general trend for all samples showed consistent concentration measurements within the expected range for the BCA assay.

Due to the fact that the samples do not exhibit an overall decrease in concentration over time nor an increase in concentration difference between the centrifuged and non-centrifuged samples, it is concluded that the powder remained stable in all of the tested storage containers throughout the four-week study at high temperature and humidity.

V. BCA Protocol

Materials and Equipment

1. Advanced BioMatrix (AB) silk fibroin solution, 50 mg/mL

2. Thermo Scientific BCA Reagent A
3. Thermo Scientific BCA Reagent B
4. Milli-Q (MQ) water
5. Microcentrifuge tubes
6. Microcentrifuge tube racks
7. 96-well microplates
8. 50 mL centrifuge tube
9. Multichannel pipette reservoirs
10. 200 µL multichannel pipette
11. Micropipettes + tips
12. Centrifuge
13. Vortex mixer
14. SPECTRAmax™ 250 microplate spectrophotometer (incubator set to 37°C)

Procedure

1. Microplate Reader Setup
   1.1. Set the plate reader temperature to 37°C.

2. Protein Standard Preparation
   2.1. Thaw one microcentrifuge tube of AB silk fibroin solution over ice.
   2.2. Label 6 sets of 3 microcentrifuge tubes from #1 to #6.
   2.3. In Tube #1, add 50 µL of original AB silk fibroin solution + 450 µL of MQ water. Vortex 5 times in 1-second intervals.
      2.3.1. **Note:** This 1:10 dilution is necessary to create the remaining dilutions in the protein standard. A 1:10 dilution is too concentrated for the BCA assay to yield accurate results and ultimately is not plated.
   2.4. In Tube #2, add 100 µL from Tube #1 + 400 µL of MQ water. Vortex.
   2.5. In Tube #3, add 375 µL from Tube #2 + 225 µL of MQ water. Vortex.
   2.6. In Tube #4, add 400 µL from Tube #3 + 100 µL of MQ water. Vortex.
   2.7. In Tube #5, add 200 µL from Tube #4 + 300 µL of MQ water. Vortex.
   2.8. In Tube #6, add 125 µL from Tube #5 + 375 µL of MQ water. Vortex.
   2.9. Repeat steps 1.3-1.8 for all 3 replicates of tubes 1-6.

Table 1. Final AB silk concentrations prepared from serial dilutions

Tube Number	1	2	3	4	5	6
Silk Concentration (mg/mL)	5.0	1.0	0.625	0.5	0.2	0.05

3. Silk Powder Sample
   3.1. For each sample of interest, label 8 microcentrifuge tubes with its identifier (e.g., container type and replicate number).
      3.1.1. Label 4 of the tubes “1:10” to indicate a 1 to 10 dilution.
         3.1.1.1. Label 2 of these tubes with a “C” to indicate centrifuged samples.
         3.1.1.2. Place these “1:10” tubes in a microcentrifuge tube rack.

3.1.1.3. **Note:** The 1:10 dilutions are necessary to accurately create the following 1:100 dilutions. Note that a 1:10 dilution is too concentrated for the BCA assay to yield accurate results and ultimately is not plated.

3.1.2. Label the other 4 tubes "1:100" to indicate a 1 to 100 dilution.

3.1.2.1. Label 2 of these tubes with a "C" to indicate centrifuged samples.

3.1.2.2. Place these "1:100" tubes in a **separate** microcentrifuge tube rack. See Figure 1.

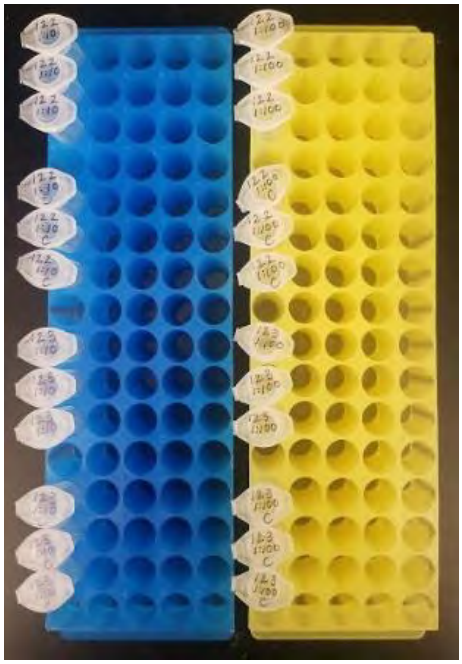


Figure 1. Labeled tubes for unknown sample dilutions with 1:10 and 1:100 tubes places in separate tube racks.

3.2. Add 450 µL of MQ water to all labeled tubes.

3.3. Invert the container holding the sample of interest 5 times, or until it is well-mixed.

3.4. Transfer 50 µL of the sample into each of its 2 pre-labeled "1:10" tubes (**without** the "C"); close the lids.

3.5. For each unknown, transfer 250 µL of the sample of interest into a clean microcentrifuge tube.

3.6. Label the tube(s) with a sample identifier (e.g., batch number) and a "C" to indicate that it will be centrifuged.

3.7. Centrifuge the tube(s) for 3 minutes at 15,000 rpm.

3.8. Transfer 50 µL from the top portion of the centrifuged tube into each of its 2 pre-labeled "1:10, C" tubes; close the lids. Ensure not to transfer any aggregates formed during centrifugation.

3.9. With all the "1:10" tubes (with closed lids) vortex each of the samples for 10 seconds.

3.10. Transfer 50 µL from each "1:10" tube into its corresponding "1:100" tube; close the lids.

3.11. With all the "1:100" tubes (with closed lids) vortex each of the samples for 10 seconds.

4. Working Reagent (WR) Preparation

4.1. Use the following formula to determine the total volume of WR required:

$$\left(\begin{matrix}\#\ of\\ controls\end{matrix}+\begin{matrix}\#\ of\\ standards\end{matrix}+\begin{matrix}\#\ of\\ unknowns\end{matrix}\right)\times\left(\begin{matrix}\#\ of\\ replicates\end{matrix}\right)\times\left(\begin{matrix}volume\ of\ WR\\ per\ sample\end{matrix}\right)+2\ mL=\begin{matrix}total\ volume\ of\\ WR\ required\end{matrix}$$

4.1.1. # of controls = 1 (water)
4.1.2. # of standards = 5 (tubes 2-6 of the serially diluted AB silk)
4.1.3. # of unknowns = variable
4.1.4. # of replicates = 3
4.1.5. Volume of WR per sample = 0.260 mL
4.1.6. +2 mL to ensure there is enough solution

4.2. To prepare the WR, mix 50 parts BCA Reagent A with 1 part BCA Reagent B (50:1, Reagent A:B). Use the following formulas to calculate the volumes of BCA Reagents A and B required:

$$\begin{pmatrix} total\ volume\ of\ WR \\ required \end{pmatrix} \div 51 = \begin{matrix} volume\ of \\ BCA\ Reagent\ B \end{matrix}$$

$$\begin{pmatrix} volume\ of \\ BCA\ Reagent\ B \end{pmatrix} \times 50 = \begin{matrix} volume\ of \\ BCA\ Reagent\ A \end{matrix}$$

4.3. Add *volume of BCA Reagent A* to a centrifuge tube of appropriate size.
4.4. Add *volume of BCA Reagent B* to the same centrifuge tube.
4.5. Gently invert the WR 10 times or until well-mixed.
4.5.1. **Note:** Throughout the assay, be sure not to contaminate the WR. Small amounts of protein will lead to color development.

5. Assay Protocol

5.1. Arrange all replicates of silk standard tubes 2-6 and all replicates of the 1:100 (**not** 1:10) sample dilutions in tube racks in the same order that they will be placed into the 96-well microplate. Order them top to bottom, keeping replicates together, and **take a picture**. Note that each column of the 96-well microplate has 8 wells. See Figure 2.

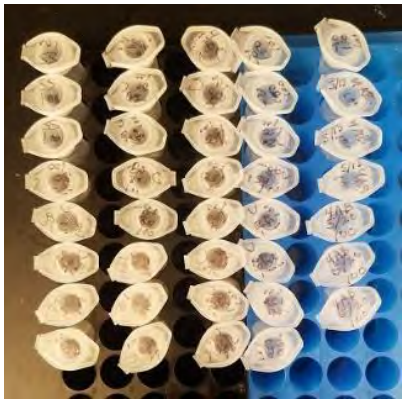


Figure 2. Silk standards and 1:100 unknowns arranged in the same order that they will be placed into the 96-well microplate

5.2. Pipette 9 µL of each replicate of silk standards and 1:100 dilutions to the center of the microplate well.
5.2.1. **Note:** Add samples directly to the center of the well and avoid touching the sides of the well.
5.2.2. **Note:** Precision pipetting is essential. Small errors when pipetting account for large errors when measuring the absorbance.

5.3. Pipette 9 µL of MQ water into 3 more wells.
5.4. Add 260 µL of the WR to each well.
5.4.1. Invert the WR tube 5 times.
5.4.2. Pour some of the WR into a new multichannel pipette reservoir.
5.4.3. Using the multichannel pipette, add 130 µL **two times** to each column of sample wells.
5.4.4. For the final row of samples if not 8, carefully remove unneeded tips by hand and proceed as above.
5.4.5. **Note:** Take care not to touch the pipette tip to the solution in each well. If this occurs, discard the pipette tips. If no contamination occurs, the same tips can be used throughout the addition of WR.
5.4.6. **Note:** Add WR to all wells within 5 minutes. Color development begins as soon as the WR is added.
5.5. Place the microplate into the microplate reader and click the "Mix" button in the software 5 times.
5.6. Incubate the plate at 37°C for exactly 30 minutes in the microplate reader; click the "Mix" button every 15 minutes.
5.7. Cool plate at room temperature (RT) for exactly 5 minutes. Turn off the temperature control on the microplate reader.
5.7.1. **Note:** Because the BCA Assay does not reach a true end point, color development will continue even after cooling to RT. The absorbance increases at a rate of ~0.25% per minute at RT.
5.8. Measure the absorbance of the standards, unknown samples, and water controls at 562nm on the plate reader.
5.9. Export the data as a text file and transfer to another computer for analysis in Microsoft Excel.
5.10. Prepare a linear standard curve by plotting the average water-corrected 562nm value for each silk standard vs. its concentration (mg/mL). Use the standard curve to determine the protein concentration of each unknown sample.
5.10.1. **Note:** The Excel file should automatically subtract the average 562nm absorbance value of the water replicates from the 562nm absorbance value of all silk standards and unknown sample replicates.

References

1. Advanced BioMatrix Silk Fibroin Solution Usage Guide
2. Pierce® Microplate BCA Protein Assay Kit – Reducing Agent Compatible Instructions
3. Pierce® BCA Protein Assay Kit – Reducing Agent Compatible Instructions

APPENDIX E
LITERATURE AND BIOINFORMATICS ANALYSIS OF POTENTIAL ALLERGY OF CAMBRIDGE CROPS SILK PROTEIN

Study Title

Literature and bioinformatics analysis of potential allergy and toxicity risks of processed Fibroin fraction from silkworm (*Bombyx mori*) cocoons

Author

[redacted]

Study Completed On

5 April 2020

Performed by

[redacted]

Laboratory Project ID

Study Number: REG-CC-Fibroin-1

Summary

Cambridge Crops, Inc. has developed a process for extracting the fibroin of silkworm cocoons and processing the primary proteins to allow reformation of a protective fibroin layer over fruits, vegetables, meat and other food products for prolonged shelf-life with reduced opportunities for spoilage. They have commissioned studies to evaluate for possible risks of allergenicity and toxicity. This report presents information on evaluation of possible risks of allergy and toxicity from naturally produced and processed fibroin proteins.

The first steps of evaluation were learning about and understanding what is known about the allergenicity and toxicity of the silkworm cocoons of the *Bombyx mori* silkworm and understanding the processing of the silkworm cocoons for production of the fibroin proteins. Silkworms have been cultured for production of silk as well as the pupae for food for approximately 5,000 years. The silk fibers have been used for production of cloth and other materials used in medical applications and foods. Literature searches were performed using keywords to find published information about potential allergy and toxicity as well as the sequence and structure of the primary proteins in silk. The NCBI PubMed was the primary targets of inquiry. Reference downloads were searched for allergy and allergenicity as well as toxicity. Primary publications were examined from those published in English, and the abstracts were evaluated for all identified publications. There is clear evidence that consumption of the pupae of silkworm has caused allergic reactions in a number of consumers, but few allergens have been identified.

That said, silk cocoons that are cleared of the pupae have not been identified as sources of allergic reactions.

References were identified that reported protein identification of proteins in silk and in cocoons. Additionally, there references describing the use of fibroin from the cocoons to produce surgical materials from the processed cocoon materials. The AllergenOnline.org database at the University of Nebraska-Lincoln and the WHO/IUIS allergen nomenclature database only identified one allergen (arginine kinase) from *Bombyx mori* silkworm. Yet a search of PubMed suggests there may well be 3 other allergens within the silkworm itself, including reports for tropomyosin, paramyosin and chitinase proteins. Published reports were examined to understand the evidence and the protein sequences of implicated materials.

There are gaps in the knowledge of proteins that might be produced from pupae of *Bombyx mori*. The NCBI Protein database shows 82,087 protein genes from "*Bombyx mori*" genome, compared to 352,142 proteins for peanut (*Arachis hypogaea*) and 502,196 for honeybee (*Apis mellifera*), although as indicated in an internet search that identified a hew genome assembly for this species, approximately 46% of the genome is not yet verified (Kawamoto et al., 2019).

Cambridge Crops had protein materials from pupae, cocoons and processed fibroin as well as their intended food coating product, called Mori Silk, tested for residual allergenic and putative allergenic proteins. The identification of potential allergens described in this report was used to focus the analysis of proteins that was performed by the proteomics lab at Harvard and was also

analyzed by [redacted] of the Food Science and Technology Department at the University of Nebraska. The targeted proteins and the results of the tests are described here.

In conclusion from this evaluation, I find there are no added risks form the fibroin proteins from Cambridge Crops for use as a coating material for food preservation using the criteria that the CODEX Alimentarius Commission recommends for food safety (2003 and 2009).

Study Number: REG-CC-Fibroin-1

Literature and bioinformatics analysis of potential allergy and toxicity risks of processed Fibroin fraction from silkworm (*Bombyx mori*) cocoons

Facility: [redacted]

Principle Investigator: [redacted]
Tel: +1 (402) 417-5549

Study Start Date: 1 January 2020

Study Completion Date: 5 April 2020

Records Retention: All study specific raw data and a copy of the final report will be retained by [redacted].

Signature of Final Report Approval:

[redacted]

5 April 2020

Principle Investigator: [redacted] Date

Table of Contents

Tables

Abbreviations and Definitions

aa	Amino acid
AK	Arginine kinase
AOL v20	http://www.AllergenOnline.com/ database version 20
BLASTP	Algorithm used to find local high scoring alignments between a pair of protein sequences (using databases on Entrez)
CT	Chitinase
Entrez NCBI	A public genetic database maintained by the National Center for Biotechnology Information (NCBI) at the National Institutes of Health, Bethesda, MD. Protein entries in the Entrez search and retrieval system are maintained by the NCBI of the National Institutes of Health (U.S.A.)
FARRP	Food Allergy Research and Resource Program, University of Nebraska
FASTA3	Algorithm used to find local high scoring alignments between a pair or protein sequences (using the AllergenOnline database)
GI	A unique identification number assigned by NCBI to each sequence in the database
PM	Paramyosin
PubMed	A public information database of scientific journal articles and abstracts maintained by the National Library of Medicine, National Institutes of Health (U.S.A.)
TM	Tropomyosin
TR	Thioredoxin
8mer	Exact word search for segments of eight amino acid matches between the query protein and proteins in AllergenOnlin.org
80mer	Sliding window of 80 amino acids of query protein are compared to AOL v 20 by FASTA

1.0 Introduction. Silkworm (*Bombyx mori*) is a Lepidopteran moth that has been cultured for nearly 5,000 years to produce cocoons made from the silk fiber secreted by glands in the immature larvae that is used to cover the body as it prepares to metamorphize to adulthood. Pupae of the silkworm have been consumed by humans in China for more than 2,000 years. However, there are at least five reports of anaphylaxis following consumption (Feng et al., 2018). Most consumers do not experience allergy from consuming the pupae as identified using keyword searches in PubMed in March 2020. Additionally, the pupa of silkworm is not known to cause toxic responses for consumers.

Generally, the silk fibers are predominantly made of polymers of fibroin proteins bonded by adhesive sericin proteins (Inoue et al., 2000; Zhang et al., 2015). The cocoon itself is made in layers of silk fiber from specific glands in the pupae and the composition of the layers differ a bit in protein composition (Zurovec et al., 1998; Zhang et al. 2015). As described by Rockwood et al. (2013), silk fibroin is produced from raw silk of the cocoons by a process of physically removing the pupae, then boiling the cocoons to remove most of the sericin and then denaturing the fibroin proteins (heavy chain and light chain proteins) and finally forming gels under controlled conditions to form a variety of surgical constructs or even a soluble coating for perishable foods (Marelli et al., 2016).

Based on literature searches it is clear that processed silk from the cocoons of *Bombyx mori* has been used to produce surgical implant devices and sutures that remain safely in human recipients for years without allergic reactions or other adverse health effects. Certain silk implants have caused short-lived inflammatory responses, such as subcutaneous silk-gels (4-week inflammatory response) and woven silk meshes (7-day inflammatory response) (Thurber et al., 2015). This inflammatory response is not expected to be relevant to Cambridge Crops application of ingested proteins. The process of forming edible coatings for fruits, vegetables and other perishable food items is roughly the process Cambridge Crops uses to isolate the firoin proteins (removing the pupae, boiling the cocoons, denaturing the fibroin proteins to make them soluble). The proteins in this solution includes primarily heavy chain fibroin, light chain fibroin, fibroin P25 and sericin (Dong et al., 2013).

The purpose of this study is to provide the target proteins that are to be used to identify possible allergenic proteins in the final fibroin powder used to coat edible foods. Searches were performed to identify the proteins in the pupae or in silk that have been identified as having any potentially allergenic properties. Furthermore, this study was conducted to compare proteins that have been identified as being present in fibroin to those of known and putative allergens using guidelines of the CODEX Alimentarius Commission for genetically modified plants to identify possible risks (Codex, 2003 as modified and re-published in 2009). Aalberse (2000) provided the basic argument for this cutoff that was accepted by CODEX. Examples of this approach are outlined for a genetically modified mustard (Siruguri et al., 2015) and a GM banana (Jin et al., 2017). In addition, a search was performed for possible toxic proteins in the species *Bombyx mori*. The Codex guidelines recommend looking for proteins with more than 35% identity to segments of 80 or more amino acids of allergens or putative allergens. Since the www.allergenonline.org database may not have every possible allergen identified, an additional search of the

complete protein database of NCBI using BLASTP searches looking for high identity matches to "allergens" or "allergenic proteins" is used as a double check.

2.0 Purpose. The purpose of this study is to perform an evaluation of the potential allergenicity and toxicity of the fibroin protein product developed by Cambridge Crops, Inc.

3.0 Methods. The evaluation for potential food risks typically includes a careful search of scientific literature for relevant peer-reviewed studies to evaluate the safety of the gene donor as well as the safety of the proteins encoded by any transferred genes. In addition, computer searches (bioinformatics) are used to evaluate the potential similarity of the encoded protein to any known allergen or toxin by comparisons to those in appropriate databases.

3.1 Scientific literature search strategies. The PubMed database (http://www.ncbi.nlm.nih.gov/pubmed) maintained by the U.S. National Library of Medicine was used as the primary data source for scientific literature on allergy and toxicity. The primary question is whether the source of the gene is a common cause of allergy or toxicity. The data (authors, publication, date and abstracts) from searches were saved to files for review. All publication abstracts were manually reviewed and any likely relevant publications suggesting adverse health risks were investigated further by reading the journal articles.

3.1.1 Search for allergenicity. A search was performed using the terms "*Bombyx mori*" AND "allergen" as well as "allergy". The searches were repeated with the terms "silkworm" AND "allergy" and replacing "allergy" with "allergen".

3.1.2 Search for toxicity. A search was performed using the terms "*Bombyx mori*" AND "toxin" as well as "toxic". The searches were repeated with the terms "silkworm" AND "toxin" and replacing "toxin" with "toxic".

3.2 Amino acid sequence of query proteins. The four primary proteins in fibroin: fibroin heavy chain, fibroin light chain, P25 and sericin protein amino acid sequences were used to search for identity matches to allergens and for toxins, and the sequence of Ber e 1 from *Bertholletia excelsa* was used as an allergen control, and the complete ricin protein from *Ricinus communis* was used as a control for the toxin searches with the sequences shown in Table 1.

Table 1 Amino acid sequences of the native Fibroin proteins. The Fibroin heavy chain, Fibroin light chain, P25 and sericin were compared to allergens in AllergenOnline.org version 20. Sequences shown in this table were used in the bioinformatics searches for allergens and toxins. A positive control for allergen is Ber e 1. A positive control for toxin is Ricin.

Gene source Common name of *Latin name*	**Protein name** Protein length (aa) [GI:#]	**Protein sequence (**representative proteins based on records in protein databases UniProt, NCBI Protein)
Silkworm *Bombyx mori*	**Fibroin heavy chain** 5263 amino acids NP_001106733.1	>NP_001106733.1 fibroin heavy chain precursor [Bombyx mori] MRVKTFVILCCALQYVAYTNANINDFDEDYFGSDVTVQSSNTTDEIIRDASGAVIEEQITTKKMQRKNKN HGILGKNEKMIKTFVITTDSDGNESIVEEDVLMKTLSDGTVAQSYVAADAGAYSQSGPYVSNSGYSTHQG YTSDFSTSAAVGAGAGAGAAAGSGAGAGAGYGAASGAGAGAGAGAGAGYGTGAGAGAGAGYGAGAGAGAG AGYGAGAGAGAGAGYGAGAGAGAGAGYGAGAGAGAGAGYGAGAGAGAGAGYGAASGAGAGAGYGQGVGSG AASGAGAGAGAGSAAGSGAGAGAGTGAGAGYGAGAGAGAGAGYGAASGTGAGYGAGAGAGYGGASGAGAG AGAGAGAGAGAGYGTGAGYGAGAGAGAGAGAGAGYGAGAGAGYGAGYGVGAGAGYGAGYGAGAGSGAASG AGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGTGAGSGAGAGYGAGAGAG YGAGAGSGAASGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGAGAGYGAGAGAGYGAGAGVG YGAGAGSGAASGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGVG YGAGVGAGYGAGYGAGAGAGYGAGAGSGAASGAGAGAGAGAGTGSSGFGPYVANGGYSRSDGYEYAWSSD FGTGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGVGVGYGAGYGAGAGAGYGAGAGSGAA SGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGVGSGAG AGSGAGAGVGYGAGAGVGYGAGAGSGAASGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAG SGAGAGSGAGAGSGAGVGYGAGVGAGYGAGYGAGAGAGYGAGAGSGAASGAGAGSGAGAGSGAGAGSGAG AGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGAGAGYGAGYGAGAGAG YGAGAGSGAASGAGAGSGAGAGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGVG AGYGAGYGAGAGAGYGAGAGSGAASGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAG VGYGAGYGAGAGAGYGAGAGSGAASGAGAGAGAGAGTGSSGFGPYVAHGGYSGYEYAWSSESDFGTGSGA GAGSGAGAGSGAGAGSGAGAGSGAGYGAGVGAGYGAGYGAGAGAGYGAGAGSGAGSGAGAGSGAGAGSGA GAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGYGAGAGAGYGAGAGSGAGSGAGAGSGA GAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGVGAGYGAGYGAGAGAGYGAGAGSGAGS GAGAGSGAGAGSGAGAGSGAGVGSGAGAGSGAGAGSGAGAGSGAGAGYGAGYGAGAGAGYGAGAGSGAGS GAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGVGYGAGVGAGYGAGYGAGAGAGYGA GAGSGAASGAGAGAGAGAGTGSSGFGPYVANGGYSGYEYAWSSESDFGTGSGAGAGSGAGAGSGAGAGSG AGAGSGAGAGYGAGYGAGAGAGYGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSG AGAGSGAGSGSGAGAGSGAGAGSGAGAGYGAGVGAGYGVGYGAGAGAGYGAGAGSGAASGAGAGAGAGAG TGSSGFGPYVAHGGYSGYEYAWSSESDFGTGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGA GAGYGAGVGAGYGAAYGAGAGAGYGAGAGSGAASGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGS GAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGAGAGYGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGA GSGAGAGSGAGSGSGAGAGSGAGAGSGAGAGYGAGVGAGYGAGYGAGAGAGYGAGAGSGAGSGAGAGSGA

		GAGYGAGAGAGYGAGYGAGAGAGYGAGAGTGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGS GAGSGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGAGAGYGAGYGAGAGAGYGAGAGSGA GSGAGAGSGAGAGSGAGAGSGAGAGYGAGYGAGAGSGAASGAGAGAGAGAGTGSSGFGPYVAHGGYSGYE YAWSSESDFGTGSGAGAGSGAGAGAGAGAGSGAGAGYGAGVGAGYGAGYGAGAGAGYGAGAGSGTGSGAG AGSGAGAGYGAGVGAGYGAGAGSGAAFGAGAGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAG YGAGVGAGYGAGAGSGAASGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGVGAGYGAGYGAG AGAGYGAGAGSGAASGAGAGSGAGAGAGSGAGAGSGAGAGSGAGAGSGAGSGAGAGSGAGAGSGAGAGYG AGAGSGAASGAGAGAGAGAGTGSSGFGPYVANGGYSGYEYAWSSESDFGTGSGAGAGSGAGAGSGAGAGS GAGAGSGAGAGYGAGVGAGYGAGYGAGAGAGYGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGA GSGAGAGSGAGAGYGAGAGSGAASGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGV GAGYGVGYGAGAGAGYGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGSGAGAGSGAGAGSGAGA GSGAGSGAGAGSGAGAGYGVGYGAGAGAGYGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGSGAGAGSGA GAGSGAGAGSGAGAGYGAGVGAGYGVGYGAGAGAGYGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGAGS GAGAGSGAGAGSGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGSGAGAGSGAGAGSGAGAGSGA GAGYGAGVGAGYGVGYGAGVGAGYGAGAGSGAASGAGAGSGAGAGAGSGAGAGSGAGAGSGAGAGSGAGA GSGAGAGSGAGAGYGAGYGAGVGAGYGAGAGVGYGAGAGAGYGAGAGSGAASGAGAGAGSGAGAGTGAGA GSGAGAGYGAGAGSGAASGAGAGAGAGAGTGSSGFGPYVANGGYSGYEYAWSSESDFGTGSGAGAGSGAG AGSGAGAGSGAGAGSGAGAGYGAGVGAGYGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYG AGAGSGTGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGVGAGYGVGYGAGAGAGYGVGYGAG AGAGYGAGAGSGTGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGVGAGYGVGYG AGAGAGYGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGSGAG AGSGAGAGYGVGYGAGAGAGYGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGSGAGAGSGAGAGSGAGAG SGAGAGYGAGVGAGYGVGYGAGAGAGYGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAG AGSGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGVGAGYGVGYGAGAGAGYGAGAGSGAASGAG AGAGAGAGTGSSGFGPYVANGGYSGYEYAWSSESDFGTGSGAGAGSGAGAGSGAGAGYGAGYGAGVGAGY GAGAGVGYGAGAGAGYGAGAGSGAASGAGAGAGAGAGSGAGAGSGAGAGAGSGAGAGYGAGYGIGVGAGY GAGAGVGYGAGAGAGYGAGAGSGAASGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGA GYGAGVGAGYGAGAGVGYGAGAGAGYGAGAGSGAASGAGAGAGAGAGAGSGAGAGSGAGAGSGAGAGSGA GAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGVGAGYGAGYGGAGAGYGAGAGSGAASGAGAGSG AGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGAGSGAASGAGAGAGAGAGTGSSGFGPYVNGGYSGYEYA WSSESDFGTGSGAGAGSGAGAGSGAGAGYGAGVGAGYGAGYGAGAGAGYGAGAGSGAASGAGAGSGAGAG SGAGAGSGAGAGSGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGVGAGYGAGYGAGAG AGYGAGAGSGAASGAGAGSGAGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGSGAGAGSGAG AGYGAGYGAGVGAGYGAGAGVGYGAGAGAGYGAGAGSGAASGAGAGSGSGAGSGAGAGSGAGAGSGAGAG AGSGAGAGSGAGAGSGAGAGYGAGYGAGAGSGAASGAGAGAGAGAGTGSSGFGPYVANGGYSGYEYAWSS ESDFGTGSGAGAGSGAGAGSGAGAGYGAGVGAGYGAGYGAGAGAGYGAGAGSGAGSGAGAGSGAGAGSGA GAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGYGAGAGAGYGAGAGVGYGAGAGAGYGAGAGSGA GSGAGAGSGSGAGAGSGSGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGYGAGYGI GVGAGYGAGAGVGYGAGAGAGYGAGAGSGAASGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGAGSGA GAGSGAGAGSGAGAGSGAGAGYGAGAGVGYGAGAGSGAASGAGAGSGAGAGSGAGAGSGAGAGSGAGAGS

		GAGAGSGAGAGSGAGSGAGAGSGAGAGYGAGYGAGVGAGYGAGAGYGAGYGVGAGAGYGAGAGSGAGSGA GAGSGAGAGSGAGAGSGAGAGSGAGAGSGAGSGAGAGYGAGAGAGYGAGAGAGYGAGAGSGAASGAGAGA GAGSGAGAGSGAGAGSGAGSGAGAGSGAGAGYGAGAGSGAASGAGAGSGAGAGAGAGAGAGSGAGAGSGA GAGYGAGAGSGAASGAGAGAGAGTGSSGFGPYVANGGYSRREGYEYAWSSKSDFETGSGAASGAGAGAGS GAGAGSGAGAGSGAGAGSGAGAGGSVSYGAGRGYGQGAGSAASSVSSASSRSYDYSRRNVRKNCGIPRRQ LVVKFRALPCVNC
Silkworm *Bombyx mori*	**Fibroin light chain** 262 amino acids NP_001037488.1	>NP_001037488.1 fibroin light chain precursor [Bombyx mori] MKPIFLVLLVATSAYAAPSVTINQYSDNEIPRDIDDGKASSVISRRWDYVDDTDKSIAILNVQEILKDMA SQGDYASQASAVAQTAGIIAHLSAGIPGDACAAANVINSYTDGVRSGNFAGFRQSLGPFFGHVGQNLNLI NQLVINPGQLRYSVGPALGCAGGGRIYDFEAAWDAILASSDSSFLNEEYCIVKRLYNSRNSQSNNIAAYI TAHLLPPVAQVFHQSAGSITDLLRGVGNGNDATGLVANAQRYIAQAASQVHV
Silkworm *Bombyx mori*	**Fibroin P25** CAA27804.1	>CAA27804.1 P25 [Bombyx mori] MLARCLAVAAVAVLASAGPPSPIYRPCYLDDYKCISDHLAANSKCIPGRGQIPSQYEIPVFQFEIPYFNA TYVDHNLITRNHDQCRVSEFYDNVRTLKTVLTVDCPWLNFESNRTLAQHMSFKEDVVLSFYINGSYPLIR LTTVFDKGNNFDLCSAFTFADLAGGLPIFHINPNDQRTAQWLSKDLTLLHIYEREHIFGKRNWLARSFIS RTLCDFGCQH
Silkworm *Bombyx mori*	**Sericin** P07856.2	>sp|P07856.2|SERI1_BOMMO RecName: Full=Sericin 1; AltName: Full=Silk gum protein; Flags: Precursor MRFVLCCTLIALAALSVKAFGHHPGNRDTVEVKNRKYNAASSESSYLNKDNDSISAGAHRAKSVEQSQDK SKYTSGPEGVSYSGRSQNYKDSKQAYADYHSDPNGGSASAGQSRDSSLRERNVHYVSDGEAVAASSDARD ENRSAQQNAQANWNADGSYGVSADRSGSASSRRRQANYYSDKDITAASKDDSRADSSRRSNAYYNRDSDG SESAGLSDRSASSSKNDNVFVYRTKDSIGGQAKSSRSSHSQESDAYYNSSPDGSYNAGTRDSSISNKKKA SSTIYADKDQIRAANDRSSSKQLKQSSAQISSGPEGTSVSSKDRQYSNDKRSKSDAYVGRDGTVAYSNKD SEKTSRQSNTNYADQNSVRSDSAASDQTSKSYDRGYSDKNIVAHSSGSRGSQNQKSSSYRADKDGFSSST NTEKSKFSSSNSVVETSDGASASRESSAEDTKSSNSNVQSDEKSASQSSSSRSSQESASYSSSSSSSTLS EDSSEVDIDLGNLGWWWNSDNKVQRAAGGATKSGASSSTQATTVSGADDSADSYTWWWNPRRSSSSSSSA SSSSSGSNVGGSSQSSGSSTSGSNARGHLGTVSSTGSTSNTDSSSKSAGSRTSGGSSTYGYSSSHRGGSV SSTGSSSNTDSSTKNAGSSTSGGSSTYGYSSSHRGGSVSSTGSSSNTDSSTKSAGSSTSGGSSTYGYSSR HRGGRVSSTGSSSTTDASSNSVGSSTSGGSSTYGYSSNSRDGSVSSTGSSSNTDSNSNSAGSSTSGGSST YGYSSNSRDGSVSSTGSSSNTDSNSNSAGSSTSGGSSTYGYSSNSRDGSVSSTGSSSNTDASTDLTGSST SGGSSTYGYSSDSRDGSVSSTGSSSNTDASTDLAGSSTSGGSSTYGYSSDCGDGSVSSTGSSSNTDASTD LAGSSTSGGSSTYGYSSDSRDGSVSSTGSSSNTDASTDLAGSSTSGGSSTYGYSSNSRDGSVSSTGSSSN TDASTDLTGSSTSGGSSTYGYSSSNRDGSVLATGSSSNTDASTTEESTTSAGSSTEGYSSSSHDGSVTST

		DGSSTSGGASSSSASTAKSDAASSEDGFWWWNRRKSGSGHKSATVQSSTTDKTSTDSASSTDSTSSTSGA STTTSGSSSTSGGSSTSDASSTSSSVSRSHHSGVNRLLHKPGQGKICLCFENIFDIPYHLRKNIGV
Bertholletia excelsa Brazil nut 2S albumin	**Ber e 1** 146 amino acids Accession P04403	>Positive allergen control Ber e 1 MAKISVAAAALLVLMALGHATAFRATVTTTVVEEENQEECREQMQRQQMLSHCRMYMRQQMEESPYQTMP RRGMEPHMSECCEQLEGMDESCRCEGLRMMMMRMQQEEMQPRGEQMRRMMRLAENIPSRCNLSPMRCPMG GSIAGF
Ricinus communis Jack bean Chain A and Chain B	**Ricin** 576 amino acids Accession P02879.1	>Positive toxin control Ricin MKPGGNTIVIWMYAVATWLCFGSTSGWSFTLEDNNIFPKQYPIINFTTAGATVQSYTNFIRAVRGRLTTG ADVRHEIPVLPNRVGLPINQRFILVELSNHAELSVTLALDVTNAYVVGYRAGNSAYFFHPDNQEDAEAIT HLFTDVQNRYTFAFGGNYDRLEQLAGNLRENIELGNGPLEEAISALYYYSTGGTQLPTLARSFIICIQMI SEAARFQYIEGEMRTRIRYNRRSAPDPSVITLENSWGRLSTAIQESNQGAFASPIQLQRRNGSKFSVYDV SILIPIIALMVYRCAPPPSSQFSLLIRPVVPNFNADVCMDPEPIVRIVGRNGLCVDVRDGRFHNGNAIQL WPCKSNTDANQLWTLKRDNTIRSNGKCLTTYGYSPGVYVMIYDCNTAATDATRWQIWDNGTIINPRSSLV LAATSGNSGTTLTVQTNIYAVSQGWLPTNNTQPFVTTIVGLYGLCLQANSGQVWIEDCSSEKAEQQWALY ADGSIRPQQNRDNCLTSDSNIRETVVKILSCGPASSGQRWMFKNDGTILNLYSGLVLDVRASDPSLKQII LYPLHGDPNQIWLPLF

3.3 Sequence database search strategies. The AllergenOnline version 20 (http://www.allergenonline.org/) and the NCBI Entrez Protein (http://www.ncbi.nlm.nih.gov/BLAST/) databases were used as the protein amino acid data sources for the sequence comparisons for allergens and toxins respectively. The AllergenOnline database was updated in 10 February 2020 and is maintained by the Food Allergy Research and Resource Program of the University of Nebraska. Protein entries in the Entrez search and retrieval system is compiled and maintained by the NCBI of the National Institutes of Health (U.S.A.). The database is potentially updated or modified daily, and therefore the date of sequence searches by BLASTP is relevant to the dataset used in the BLASTP searches. BLASTP and FASTA3 are unique computer algorithms that provide similar local alignments and results if the appropriate scoring matrices and criteria are used.

3.3.1 FASTA3 overall search of AllergenOnline.org. The primary amino acid sequences of the silk Fibroin four proteins and of Ber e 1 were entered in the Search Entry query box of http://www.allergenonline.org/databasefasta.shtml. The search was performed as Full FASTA version 35.04 with default setting of *E*-value of 1, using a BLOSUM 50 scoring matrix. The overall alignment provides the most likely estimate of potential allergic cross-reactivity and is unlikely if identity matches of less than 50% occur for most of the length of the aligned proteins.

3.3.2 FASTA3 of AllergenOnline.org by 80 aa segments. This short segment search with AllergenOnline.org version 20 is based on the recommendation of Codex (2003). The rationale is that this might help in identifying structural motifs, much shorter than the intact protein, which might contain a conformational IgE binding epitope. It should also help to identify potentially cross-reactive proteins that are not true homologues of an allergen that have significant local identities that might provide an immunological target for IgE antibodies in those with allergies to the matched allergen. Only matches >35% are listed in the output table. The search starts at AA 1-80, then 2-81 to the end of the search sequence. The *E* score is set to 1,000 to eliminate limitations of short searching query sequences.

3.3.3 Exact 8 contiguous amino acid match. The eight amino acid matching searches were performed using word search algorithm of the query sequences against all proteins in AllergenOnline.org version 20.

3.3.4 BLASTP of NCBI Entrez without a keyword limit. The BLASTP is available on the NCBI Entrez website (http://www.ncbi.nlm.nih.gov/BLAST/). The current version is BLASTP +2.10.0 (22 March 2020). A BLASTP search was used comparing the Fibroin four proteins and control proteins Ber e 1, and Ricin sequences against the entire Entrez Protein database. Since the NCBI removed the option for a keyword limit, the entire matched sequences must be reviewed to understand potential risks. The purpose of this BLASTP search is to ensure that a significant match with a newly discovered allergenic sequence that has not yet been entered into AllergenOnline.org is not overlooked and also for toxins since

there is no dedicated single toxin database. Evaluation of the *E* value, the length of the alignment and the percent identity of any identified match is necessary to judge the significance of any alignment using BLASTP. Default BLASTP parameters were used, with Word size = 6, Expect value =10, Gapcosts = 11,1, Matrix = BLOSUM 62, Threshold =21.

4.0 Results and Discussion. The summary results for the PubMed search using the various protein sources and search terms, and the amino acid sequences of the Cambridge Crops four Fibroin sequences and control proteins Ber e 1 and Ricin are presented.

4.1 PubMed Searches. The PubMed scientific literature database was searched for evidence that the proteins of *Bombyx mori* (silkworm) are linked to allergy or toxicity. The search demonstrated that there is published literature for allergy related to consumption of the pupae from silkworm and four proteins (arginine kinase, tropomyosin, chitinase and paramyosin) have published evidence of allergy or at least IgE binding using sera from subjects claiming allergy to consumption of silkworm pupae. However, no evidence was found to suggest that the silk fibroin proteins (Fibroin heavy chain, Fibroin light chain, Fibroin P25 or Sericin) are allergens or that they bind IgE from allergic subjects. In addition, no evidence was found for toxic proteins from the silkworm. There is one report from Thailand that silkworm pupae are sometimes contaminated with histamine and that can cause allergic-like symptoms. The results are compiled in PDF documents that are shared with Cambridge Crops, Inc.

4.1.1 Allergen and allergy. The search phrase "*Bombyx mori*" and alternatively, "silkworm" AND "allergen" as well as "allergy" were used to search PubMed for evidence of allergy from the protein.

For allergen with silkworm 38 references were found. One publication described and characterized the presence of the allergen arginine kinase, (AK) with UniProt accession Q2F5T5 as an allergen (Liu et al., 2009). One publication described tropomyosin (TM) in UniProt accession Q1HQ0 as the allergen (Jeong et al., 2017). One publication described the identification of both paramyosin (PM) UniProt accession B3VTP0 and chitinase (CT) UniProt accession Q869E2 by 2D-immunoblot using (1) a pool of sera from patients with symptoms indicating severe allergy upon consumption of silkworm pupae and (2) mass spectrometry to identify the protein sequence, matched to genomic sequences (Zhao et al., 2015). A review paper by de Grier and Verhoeckx (2018) discussed that paper, however they mislabeled the chitinase as chitin, which is the carbohydrate shell of insects and crustacea. The four proteins: arginine kinase, tropomyosin, paramyosin and chitinase were used as targets in the proteomics evaluation of Harvard Proteomics facility, performed by [redacted] of the University of Nebraska-Lincoln. Thioredoxin was used as a control protein by Dr. Johnson as it has been identified as a minor allergen, with IgE binding in one subject to allergic to moths, using *Plodia interpunctella,* Indianmeal moth (Hoflehner et al., 2012).

A search for allergens with *Bombyx mori* identified only 34 papers, otherwise replicating the list from silkworm. One paper by Jeong et al. (2016) describes characterization of a 27 kDa glycoprotein as if it is an allergen, but their inhibition results and the authors' conclusion was that it was not able to inhibit binding and thus was not an allergen.

A search for allergy using silkworm identified 66 publications. When *Bombyx mori* was used, only 56 publications were found, with essentially an overlap of papers. Most publications described case reports of allergy to consumption of pupae although there were publications of worker exposure and asthma, or to individuals reacting to exposure to "wild-silk" scarves or sweaters. The full text articles described "wild-silk" usually as a mixture of silks that were not of cleaned, industrial type silk, but more of crude fibers that likely had other contaminants. No individual proteins were described for those studies.

The conclusion of the literature searches indicates that consumption of the pupae of silkworms does cause allergy in some consumers, reported mostly from China and Japan. The only allergens (IgE binding proteins) that were conclusively identified were: arginine kinase (AK), tropomyosin (TM), paramyosin (PM) and chitinase (CN). There were no publications indicating allergy to the four proteins of the silkworm fibroin product (fibroin heavy chain, fibroin light chain, fibroin P25 or sericin).

Importantly, Cambridge Crops asked Dr. [redacted] of the University of Nebraska-Lincoln to evaluate the mass spectrum data from Harvard University Proteomic facility to determine whether those allergens were present in the Fibroin powder product. The protocol is described further in Dr. Johnson's report. In sum, Cambridge Crops sent samples of the pupa, the cocoon, and their fibroin powder product (which they call Mori Silk) to undergo mass spectrometry. This was done to ensure that the allergens identified from pupae of *Bombyx mori* are not present in the cocoon or the fibroin powder product itself.

While the four allergens were identifiable in the sample of the pupae, there were no allergens that could be conclusively identified in the cocoon sample or in the samples of fibroin powder.

To be more precise: TM, AK, CN and PM were readily identifiable in the samples of pupae, there was a single peptide of TM identified in a single powder sample. However, a single detection of one peptide in a sample is not sufficient to be considered a "positive identification" under the commonly accepted Human Proteome Organization (HUPO)—Proteomic Standards Initiative.

4.1.2 Toxicity. A search of PubMed using the protein name "*Bombyx mori*" or "silkworm" AND "toxin" or "toxic" did not identify any proteins as having toxic reactions to humans or other mammals. The only report of toxicity, was reactions to histamine by consumption of silkworm pupae that have residual, heat stable

compound, presumably due to bacterial contamination (Chomchai and Chomchai, 2017). The conclusion is that there are no reports of toxicity from preparations of silk fiber or from the proteins in Fibroin.

4.2 Sequence comparison of Fibroin four proteins and control Ber e 1 allergens. The amino acid sequences of four silk proteins that dominate silk structure of natural Fibroin and the control allergen Ber e 1 are listed in Table 1. These were compared to all known and putative allergens in AllergenOnline.org version 20 using a full-length FASTA alignment search and a sliding window of 80 comparison as well as an eight contiguous amino acid match. Additionally, a BLASTP search was performed against the NCBI database. It is important to note that sericin is of very low abundance in the fibroin powder based on production steps, and that is backed up by the proteomic assay of fibroin powder.

4.2.1 Full length FASTA3 vs. AllergenOnline.org with the four Fibroin proteins. Results of the full-length FASTA3 searches of the Fibroin proteins are presented in Table 2. None of them produced an identify of >50% identity over any extended AA length, with any allergen with an *E* score less than 1. The low identity matches to the two putative (unproven) allergens does not raise concerns of potential cross-reactivity (Aalberse, 2000; Goodman, 2006; Goodman et al., 2008).

4.2.2 Full length FASTA3 vs. AllergenOnline with Allergen Positive Control Ber e 1. Results of the full length FASTA3 searches of the Ber e 1 protein against AllergenOnline.org version 20 identified a 100% identity match to Ber e 1 as expected, and more than 15 alignments with other putative or proven allergens. Some of these matches were more than 40% identity, but 138 or more AA, and only two proteins to Hazelnut (*Corylus avellana)*, allergens were found at >40% identity. Scoring results for the Ber e 1 showed one alignment to itself, Ber e 1, with an *E* score of 8e-20 and 100% identity. Matching patterns such as that would require serum IgE tests using sera from subjects allergic to the matched sources as some would likely demonstrate IgE cross-reactivity.

Table 2. Full-length FASTA3 alignments to AllergenOnline.org version 20, with highest scoring 3 alignments shown. The identity, *E* scores, Identity % and AA length of the alignment are shown. Only control, Ber e 1 showed significant matches.

Fibroin Heavy Chain – 5301 AA			
Identity of match	**E score**	**ID %**	**Length of alignment**
GI:27806257 Collagen	1.9e-26	26.1%	1082AA
GI:71084277 HMW gluten	5.3e-11	25.7%	654 AA
GI:736319 gluten Triticum	1.5e-8	26.1%	710 AA
Fibroin Light Chain – 262 AA			

GI:1707911 Globin CTT-IX	0.14	30.8%	78 AA
GI:155676684 SXP/RAL-2	0.98	24.8%	153 AA
GI:155676636 SXP/RAL-2	0.98	24.8%	153 AA
Fibroin P25 – 220 AA			
GI:51093373 Sol I 1	0.89	26.1%	115 AA
Sericin – 560 AA			
GI:1871444 Gal g 6.0101	5.7e-10	27.9%	330 AA
GI:85701160 Disulfide isomerase	0.98e-2	30.8%	104 AA
GI:980951555 Conglutin beta	0.02	18.8%	415 AA
Ber e 1 Control – 560 AA			
GI:112754 2S Ber e 1	4.1e-31	100%	146AA
GI:226437844 2S Corylus avellana	3.5e-11	45.9%	146AA
GI:1794252 Albumin precur	7.3e-10	76.1%	138AA

4.2.3 Sliding 80-amino acid window FASTA3 vs. AllergenOnline.org database with Fibroin proteins. Results of the comparison of the four Fibroin protein amino acid sequences were tested against the sequences in Allergenonline.org version 20 (Table 3). The comparison did identify a few matches for Fibroin and to Sericin may be considered significant based on CODEX standards (>35% identity over 80 AA), but given the overall short alignments and level of identity matches, it is clear these are dissimilar and unlikely to share IgE epitopes for productive binding and stimulation of cross-reactive IgE binding and resulting allergic reactions. The low identity matches of the level seen in these alignments does not raise concerns of potential cross-reactivity (Aalberse, 2000; Goodman, 2006; Goodman et al., 2008).

Details of the sixteen allergens from AllergenOnline.org version 20 were found to have identity matches of >35% over 80 or more amino acids as seen is Table 3. A detailed analysis was performed looking at individual alignments for each of the 16 allergens to determine where in the 5263 AA of Fibroin matches were occurring and to evaluate the apparent sequence homology. Surprisingly the matches were all from the repetitive long internal segment of Fibroin with semi-repeated AA (GAGSGAGAGSGAGYA with occasional P. E and L). It was rare to see three or four AA identity matches in a row, and not uncommon to have gaps of matches or gaps in sequence of from one to four AA. The details of individual segment alignments are shown in Annex 2. The Sericin protein had two matches (*Gallus gallus* Gal g 6 and *Fusarium culmorum* helix-loop-helix protein) that were very low in overall identity (29% and 22% respectively), but

above 35% identity over 80 for short segments. The detailed alignments are not shown as the *E* scores for each were larger than 1,000 and considered irrelevant.

Table 3. Sliding 80mer alignments of FASTA3 to AllergenOnline.org version 20, with highest scoring 3 alignments shown. The identity, *E* scores, Identity % and AA length of the alignment are shown. Ber e 1 showed clearly significant matches. Fibroin heavy chain had matches over 35% ID but considering the overall length they are not likely to be cross-reactive. Sericin had one match over 35% ID but considering the length of the alignment and overall identity, it is unlikely to be important.

Fibroin Heavy Chain – 5301 AA			
Identity of match	**Best 80mer % ID**	**# 80mers >35% ID out of 5222 segments of 80 AA in Fibroin**	**Overall ID%**
GI:291482310 Ragweed Art v 1 pollen homologue	45%	4358/5222	37.9%
GI:291197394 Ragweed Art v 1 pollen homologue	44.4%	3442/5222	42.4%
GI:285005079 Ragweed Art v 1 pollen homologue	44.4%	3442/5222	40.7%
GI:291482308 Ragweed Art v 1 pollen homologue	42.5%	3392/5222	40.7%
GI:817033923 *Parthenium hysterophorus* pollen allergen	41.3%	1549/5222	37.8%
GI:27806257 *Bos taurus* collagen alpha-2	38.2%	119/5222	26.1%
GI:240254706 *Glycine max* seed biotinylated protein	37.8%	5/5222	26.3%
GI:56550550 *Cryptomeria japonica* chitinase	37.5%	74/5222	37%
GI:168576 *Zea mays* phospholipid transfer protein	36.6%	48/5222	36.4%
GI:193507493 *Cochliobolus lunatus* subtilisin like protease	36.2%	5/5222	24.7%
Gi:260401081 *Zea mays* chitinase	36.2%	84/5222	30.8%
GI:323575361 *Anisakis simplex* Ani s 11 allergen	36.2%	10/5222	28.6%
GI:71084277 HMW glutenin	35.8%	13/5222	25/7%
GI:116329 *Zea mays*	35.7%	5/5222	33.7%

endochitinase A			
GI:21751 *Triticum aestivum* HMW glutenin	35%	2/5222	25.4%
GI:21779 *Triticum aestivum* HMW glutenin	35%	2/5222	24.8%
Fibroin Light Chain – 262 AA			
No matches	No matches	No matches	No matches
Fibroin P25 – 220 AA			
No matches	No matches	No matches	No matches
Sericin – 560 AA			
GI:1871444 Gal g 6.0101	46.2%	64	27.9%
Ber e 1 Control – 560 AA			
GI:112754 2S Ber e 1	100%	94	100%
GI:226437844 2S Corylus avellana	51.2%	92	45.9%
GI:1794252 Albumin precur	48.8%	79	42%

4.2.4 Eight amino acid match search. Some countries still require a search for any exact match of 8 or more contiguous amino acids between the GM protein and any known allergen even though the criteria have not been shown to be predictive. In addition, 8mer matches for long proteins, especially with repeating sequence segments is unlikely to be useful. This search was performed out of an abundance of caution. None of the Fibroin proteins had a match of 8 AA to any allergen in version 20 of AllergenOnline.org. The positive Control Ber e 1 did have 139 matches from the 139 AA proteins as this query sequence is in AllergenOnline.org ver 20 database. The results of the 8 AA match were negative for Heavy Chain Fibroin, Light Chain Fibroin, Fibroin P25 and Sericin.

4.2.5 BLASTP of the four Fibroin proteins to NCBI Protein Entrez. The full-length amino acid sequences of the four Fibroin proteins were tested using the BLASTP search algorithm on NCBI Protein on 22 March 2020. It is not possible to use a keyword limit, thus the first 100 matches were to the most closely related proteins that had to be manually visualized to look for allergens or common proteins.

The BLASTP algorithm would not accept the full-length sequence of Fibroin Heavy Chain 5263 AA protein. The N-terminal 402 AA of Fibroin Heavy Chain was used in the search and only matched Fibroin sequences including the full-length of NP_001106733.1 and some partial sequences of Fibroin were matched. No other proteins were identity matched. The C-terminal 409 AA of the Fibroin Heavy Chain protein was also used and again, matches were to fibroin full length and partial sequences. There do not appear to be any other relevant matches to this protein in any protein sequences which would include both allergens and toxins.

The Fibroin Light Chain did have matches to many fibroin sequences of various *Bombyx* species and those of many other Lepidopteran species. All matched proteins were viewed as homologues of the intended sequence. There were no matches to proteins that were labeled as allergens or toxins.

Fibroin P25, also identified homologues from *Bombyx* and proteins of other Lepidopteran species with high identities and very small *E* scores. No matches were found that were labeled as allergens or toxins.

Sericin also had matches to many homologous proteins from *Bombyx* sp. and to various other Lepidoptera species. No sequences labeled as allergens or toxins were found.

The toxin control protein, Ricin matched many proteins labeled as ricin. No other proteins or species were identified with high scoring matches. This demonstrates that the BLASP for identifying allergens and toxins was working.

4.3 Bioinformatics summary for Cambridge Crops fibroin proteins. The literature searches for evidence of allergy and toxicity to silkworm and Bombyx mori as well as the Fibroin proteins helps to demonstrate that there is no expected risk of allergy or toxicity associated with the Fibroin prepared proteins. The AA sequence comparisons of the four Fibroin proteins, three of which (Fibroin heavy chain, Fibroin light chain and Fibroin P25) form the majority of the powdered product were searched against known and putative allergen sequences and did not uncover matches that suggest any reasonable level of possible risks.

5.0 Conclusions

In using the criteria recommended by the Codex Alimentarius Commission for food safety (2003 and 2009), I find that there are no added risks from the consumption of Cambridge Crops' fibroin proteins that are expected to be used for food preservation. Clearly a strict application of the rule of >35% identity over 80 AA would lead to a conclusion that serum IgE tests are necessary, but given the overall low identity matches and dissimilarity of proteins, there are no clear risks for those allergic to the matched allergens.

6.0 References

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7.0 Appendix: Allergenonline.org database, version 20 10 February 2020

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Acarus siro	Mite	Aca s 13	Aero Mite	Acarus Aca s 13	IgE but no biological test	131	ABL09307.1	118638268	9
Acarus siro	Mite	Unassigned	Aero Insect	Acarus siro Group 4 allergen	IgE but no biological test	517	ABL09312.1	118638278	9
Actinidia arguta	Hardy Kiwi	Unassigned	Food Plant	Actinidia arguta kiwellin	IgE but no biological test	213	AGC39172.1	441482362	14
Actinidia arguta	Hardy Kiwi	Unassigned	Food Plant	Actinidia arguta kiwellin	IgE but no biological test	213	AGC39173.1	441482364	14
Actinidia arguta	Hardy Kiwi	Unassigned	Food Plant	Actinidia arguta kiwellin	IgE but no biological test	213	AGC39174.1	441482366	14
Actinidia chinensis	Kiwi	Unassigned	Food Plant	Actinidia Act c 1 Act d 1 Actinidin	IgE plus basophil+ or SPT+	380	P00785.4	190358935	9
Actinidia chinensis	Kiwi	Unassigned	Food Plant	Actinidia Act c 1 Act d 1 Actinidin	IgE plus basophil+ or SPT+	380	BBA83994.1	1373811525	19
Actinidia chinensis	Kiwi	Act c 10	Food Plant	Actinidia Act c 10 LTP	IgE plus basophil+ or SPT+	15	P85204.1	378548410	13
Actinidia chinensis	Kiwi	Act c 5.0102	Food Plant	Actinidia Act c 5 kiwellin	IgE but no biological test	213	AGC39168.1	441482354	14
Actinidia chinensis	Kiwi	Act c 8.0101	Food Plant	Actinidia Act c 8 Act d 8 PR-10	IgE but no biological test	159	CAM31908.1	281552896	11
Actinidia chinensis	Kiwi	Act d 12.0102	Food Plant	Actinidia Act d 12	IgE plus basophil+ or SPT+	462	ABB77213.1	82469930	16
Actinidia chinensis	Kiwi	Unassigned	Food Plant	Actinidia Act d 2 thaumatin like protein	IgE plus basophil+ or SPT+	20	P83958.1	68064399	7
Actinidia chinensis	Kiwi	Unassigned	Food Plant	Actinidia Act d 2 thaumatin like protein	IgE plus basophil+ or SPT+	225	AGC39176.1	441482370	14
Actinidia deliciosa	Kiwi	Act d 1.0101	Food Plant	Actinidia Act c 1 Act d 1 Actinidin	IgE plus basophil+ or SPT+	380	CAA34486.1	15984	7
Actinidia deliciosa	Kiwi	Unassigned	Food Plant	Actinidia Act c 1 Act d 1 Actinidin	IgE plus basophil+ or SPT+	380	AAA32629.1	166317	7
Actinidia deliciosa	Kiwi	Unassigned	Food Plant	Actinidia Act c 1 Act d 1 Actinidin	IgE plus basophil+ or SPT+	380	A5HII1.1	193806686	12
Actinidia deliciosa	Kiwi	Act d 8.0101	Food Plant	Actinidia Act c 8 Act d 8 PR-10	IgE but no biological test	157	CAM31909.1	281552898	11
Actinidia deliciosa	Kiwi	Act d 10.0201	Food Plant	Actinidia Act d 10 LTP	IgE plus basophil+ or SPT+	92	P85206.1	378548411	13
Actinidia deliciosa	Kiwi	Act d 10.0101	Food Plant	Actinidia Act d 10 LTP	IgE plus basophil+ or SPT+	92	P86137.2	378405189	13
Actinidia deliciosa	Kiwi	Act d 11.0101	Food Plant	Actinidia Act d 11 Kirola MLP	IgE but no biological test	150	P85524.1	332319679	12
Actinidia deliciosa	Kiwi	Act d 2.0101	Food Plant	Actinidia Act d 2 thaumatin like protein	IgE plus basophil+ or SPT+	225	CAI38795.2	71057064	7
Actinidia deliciosa	Kiwi	Unassigned	Food Plant	Actinidia Act d 2 thaumatin like protein	IgE plus basophil+ or SPT+	201	ABQ42566.1	146737976	9
Actinidia deliciosa	Kiwi	Act d 4.0101	Food Plant	Actinidia Act d 4 Phytocystatin	IgE plus basophil+ or SPT+	116	AAR92223.1	40807635	7
Actinidia deliciosa	Kiwi	Act d 5.0101	Food Plant	Actinidia Act d 5 kiwellin	IgE but no biological test	189	P84527.1	85701136	7
Actinidia deliciosa	Kiwi	Unassigned	Food Plant	Actinidia Act d 5 kiwellin	IgE but no biological test	213	AGC39164.1	441482346	14
Actinidia deliciosa	Kiwi	Unassigned	Food Plant	Actinidia Act d 5 kiwellin	IgE but no biological test	213	AGC39165.1	441482348	14
Actinidia deliciosa	Kiwi	Unassigned	Food Plant	Actinidia Act d 5 kiwellin	IgE but no biological test	213	AGC39166.1	441482350	14
Actinidia deliciosa	Kiwi	Unassigned	Food Plant	Actinidia Act d 5 kiwellin	IgE but no biological test	213	AGC39167.1	441482352	14
Actinidia deliciosa	Kiwi	Unassigned	Food Plant	Actinidia Act d 5 kiwellin	IgE but no biological test	189	4X9U_B	906848988	17
Actinidia deliciosa	Kiwi	Act d 9.0101	Food Plant	Actinidia Act d 9, profilin	IgE but no biological test	109	C0HL99.1	1407892581	19
Actinidia eriantha	Climber (plant)	Unassigned	Food Plant	Actinidia eriantha kiwellin	IgE but no biological test	213	AGC39169.1	441482356	14
Actinidia eriantha	Climber (plant)	Unassigned	Food Plant	Actinidia eriantha kiwellin	IgE but no biological test	213	AGC39170.1	441482358	14
Actinidia eriantha	Climber (plant)	Unassigned	Food Plant	Actinidia eriantha kiwellin	IgE but no biological test	213	AGC39171.1	441482360	14
Aedes aegypti	Yellow fever mosquito	Aed a 1.0101	Venom or Salivary	Aedes Aed a 1 apyrase	IgE plus basophil+ or SPT+	562	AAC37218.1	556272	7
Aedes aegypti	Yellow fever mosquito	Unassigned	Venom or Salivary	Aedes Aed a 1 apyrase	IgE plus basophil+ or SPT+	562	P50635.2	193806340	10
Aedes aegypti	Yellow fever mosquito	Aed a 11	Venom or Salivary	Aedes Aed a 11 Lysosomal protease	IgE but no biological test	387	XP_001657556.2	1218215869	18
Aedes aegypti	Yellow fever mosquito	Aed a 2	Venom or Salivary	Aedes Aed a 2	IgE plus basophil+ or SPT+	321	P18153.2	205525919	9
Aedes aegypti	Yellow fever mosquito	Aed a 3.0101	Venom or Salivary	Aedes Aed a 3	IgE plus basophil+ or SPT+	253	AAB58417.1	2114497	7
Aedes aegypti	Yellow fever mosquito	Unassigned	Venom or Salivary	Aedes Aed a 3	IgE plus basophil+ or SPT+	273	ABF18122.1	94468546	7
Aedes aegypti	Yellow fever mosquito	Aed a 5.0101	Venom or Salivary	Aedes Aed a 5 Sarcoplasmic Ca+ bind	IgE but no biological test	191	XP_001653462.1	157119961	17
Aedes aegypti	Yellow fever mosquito	Aed a 7.0101	Venom or Salivary	Aedes Aed a 7	IgE but no biological test	204	XP_001654291.1	157125324	17
Aedes aegypti	Yellow fever mosquito	Aed a 8.0101	Venom or Salivary	Aedes Aed a 8 HSP70	IgE but no biological test	655	ABF18258.1	94468818	17
Aedes aegypti	Yellow fever mosquito	Aed a 10.0201	Venom or Salivary	Aedes aegypti Aed a 10	IgE but no biological test	284	XP_001655948.1	157131813	16
Aedes aegypti	Yellow fever mosquito	Aed a 10.0101	Venom or Salivary	Aedes aegypti Aed a 10	IgE but no biological test	285	XP_001655954.1	157131825	16
Aedes aegypti	Yellow fever mosquito	Aed a 4.0101	Venom or Salivary	Aedes aegypti Aed a 4 alpha glucosidase	IgE but no biological test	579	P13080.1	126713	17
Agrostis alba	Bent grass	Unassigned	Aero Plant	Agrostis Agr a 1	IgE but no biological test	26	E37396	320606	7
Agrostis alba	Bent grass	Unassigned	Aero Plant	Agrostis Agr a 1	IgE but no biological test	35	Q7M1X7	75139987	7
Agrostis alba	Bent grass	Unassigned	Aero Plant	Agrostis Agr a 1	IgE but no biological test	35	Q7M1X9	75139989	7
Alnus glutinosa	Alder	Aln g 1.0101	Aero Plant	Alnus Aln g 1	IgE plus basophil+ or SPT+	160	AAB24432.1	261407	7
Alnus glutinosa	Alder	Aln g 4.0101	Aero Plant	Alnus Aln g 4	IgE plus basophil+ or SPT+	85	CAA76831.1	3319651	7
Alternaria alternata	Fungus	Alt a 1.0101	Aero Fungi	Alternaria Alt a 1	IgE plus basophil+ or SPT+	157	AAB47552.1	1842045	7
Alternaria alternata	Fungus	Unassigned	Aero Fungi	Alternaria Alt a 1	IgE plus basophil+ or SPT+	115	AAM77471.1	21913174	7
Alternaria alternata	Fungus	Alt a 1.0102	Aero Fungi	Alternaria Alt a 1	IgE plus basophil+ or SPT+	157	AAS75297.1	45680856	7
Alternaria alternata	Fungus	Unassigned	Aero Fungi	Alternaria Alt a 1	IgE plus basophil+ or SPT+	133	3V0R_A	390980892	13
Alternaria alternata	Fungus	Unassigned	Aero Fungi	Alternaria Alt a 1	IgE plus basophil+ or SPT+	130	4AUD_B	508123617	15
Alternaria alternata	Fungus	Alt a 10.01	Aero Fungi	Alternaria Alt a 10 ADH	IgE but no biological test	497	CAA55071.2	76666767	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Alternaria alternata	Fungus	Alt a 12.0101	Aero Fungi	Alternaria Alt a 12 Ribosomal BP P1	IgE but no biological test	110	P49148.1	1350779	7
Alternaria alternata	Fungus	Alt a 13.0101	Aero Fungi	Alternaria Alt a 13	IgE plus basophil+ or SPT+	231	Q6R4B4.1	74611808	10
Alternaria alternata	Fungus	Alt a 3.0101	Aero Fungi	Alternaria Alt a 3 HSP	IgE but no biological test	152	P78983.2	14423730	7
Alternaria alternata	Fungus	Alt a 4.0101	Aero Fungi	Alternaria Alt a 4 thioredoxin	IgE but no biological test	436	Q00002.2	85701160	7
Alternaria alternata	Fungus	Alt a 5.0101	Aero Fungi	Alternaria Alt a 5 ribosomal P2	IgE but no biological test	113	AAB48041.1	1850540	7
Alternaria alternata	Fungus	Unassigned	Aero Fungi	Alternaria Alt a 5 ribosomal P2	IgE but no biological test	113	P42037.1	1173071	10
Alternaria alternata	Fungus	Alt a 6.0101	Aero Fungi	Alternaria Alt a 6 enolase	IgE but no biological test	438	Q9HDT3.2	14423684	7
Alternaria alternata	Fungus	Alt a 7.0101	Aero Fungi	Alternaria Alt a 7 flavodoxin	IgE but no biological test	204	P42058.1	1168402	9
Alternaria alternata	Fungus	Unassigned	Aero Fungi	Alternaria Alt a 7 flavodoxin	IgE but no biological test	261	OWY50380.1	1213711549	18
Alternaria alternata	Fungus	Alt a 8.0101	Aero Fungi	Alternaria Alt a 8 (mannitol dehydrogenase)	IgE plus basophil+ or SPT+	266	AAO91800.1	37780013	8
Alternaria alternata	Fungus	Unassigned	Aero Fungi	Alternaria Alt a 8 (mannitol dehydrogenase)	IgE plus basophil+ or SPT+	266	P0C0Y4.2	118595439	8
Alternaria alternata	Fungus	Alt a 14.0101	Aero Fungi	Alternaria MnSOD Alt a 14	IgE but no biological test	191	AGS80276.1	529279957	15
Alternaria alternata	Fungus	Unassigned	Aero Fungi	Alternaria Nuc Transport 2	IgE plus basophil+ or SPT+	124	CAD38167.1	21748153	7
Alternaria alternata	Fungus	Unassigned	Aero Fungi	Alternaria TCTP IgE binding	IgE but no biological test	169	ABI26088.1	112824341	11
Amaranthus retroflexus	Common Amaranth	Ama r 2.0101	Aero Plant	Amaranthus Ama r 2 Proflin	IgE plus basophil+ or SPT+	133	ACP43298.1	227937304	10
Amaranthus retroflexus	Common Amaranth	Ama r 1.0101	Aero Plant	Amaranthus retroflexus Ama r 1	IgE but no biological test	168	AKV72168.1	914410010	16
Ambrosia artemisiifolia	Short ragweed	Amb a 1.0101	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	396	P27759.1	113475	7
Ambrosia artemisiifolia	Short ragweed	Amb a 1.0201	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	398	P27760.1	113476	7
Ambrosia artemisiifolia	Short ragweed	Amb a 1.0301	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	397	P27761.1	113477	7
Ambrosia artemisiifolia	Short ragweed	Amb a 1.0401	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	392	P28744.1	113478	7
Ambrosia artemisiifolia	Short ragweed	Amb a 1.0303	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	397	AAA32669.1	166443	7
Ambrosia artemisiifolia	Short ragweed	Amb a 1.0501	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	397	AAA32671.1	166447	11
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	396	CBW30986.1	302127810	12
Ambrosia artemisiifolia	Short ragweed	Amb a 1.0202	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	398	CBW30987.1	302127812	12
Ambrosia artemisiifolia	Short ragweed	Amb a 1.0304	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	397	CBW30988.1	302127814	12
Ambrosia artemisiifolia	Short ragweed	Amb a 1.0305	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	397	CBW30989.1	302127816	12
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	397	CBW30990.1	302127818	12
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	397	CBW30991.1	302127820	12
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	397	CBW30992.1	302127822	12
Ambrosia artemisiifolia	Short ragweed	Amb a 1.0402	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	387	CBW30993.1	302127824	12
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	397	CBW30994.1	302127826	12
Ambrosia artemisiifolia	Short ragweed	Amb a 1.0502	Aero Plant	Ambrosia Amb a 1	IgE plus basophil+ or SPT+	397	CBW30995.1	302127828	12
Ambrosia artemisiifolia	Short ragweed	Amb a 10.0101	Aero Plant	Ambrosia Amb a 10	IgE but no biological test	160	AAX77686.1	62249491	7
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 4	IgE but no biological test	164	CBJ24286.1	285005079	11
Ambrosia artemisiifolia	Short ragweed	Amb a 4.0101	Aero Plant	Ambrosia Amb a 4	IgE but no biological test	164	CBK52317.1	291197394	12
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 4	IgE but no biological test	111	CBK62693.1	291482306	12
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 4	IgE but no biological test	140	CBK62694.1	291482308	12
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 4	IgE but no biological test	134	CBK62695.1	291482310	12
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 4	IgE but no biological test	96	CBK62697.1	291482314	12
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 4	IgE but no biological test	110	CBK62698.1	291482316	12
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 4	IgE but no biological test	116	CBK62699.1	291482318	12
Ambrosia artemisiifolia	Short ragweed	Amb a 6.0101	Aero Plant	Ambrosia Amb a 6	IgE but no biological test	118	O04004.1	14285595	7
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 8 profilin	IgE plus basophil+ or SPT+	133	AAP15203.1	34851182	7
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 8 profilin	IgE plus basophil+ or SPT+	131	AAP15202.1	34851180	7
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 8 profilin	IgE plus basophil+ or SPT+	131	AAP15201.1	34851178	7
Ambrosia artemisiifolia	Short ragweed	Amb a 8.0101	Aero Plant	Ambrosia Amb a 8 profilin	IgE plus basophil+ or SPT+	133	AAX77687.1	62249502	7
Ambrosia artemisiifolia	Short ragweed	Amb a 8.0102	Aero Plant	Ambrosia Amb a 8 profilin	IgE plus basophil+ or SPT+	133	AAX77688.1	62249512	7
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 8 profilin	IgE plus basophil+ or SPT+	135	5EM1_A	1035439203	18
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia Amb a 8 profilin	IgE plus basophil+ or SPT+	134	5EV0_B	1035439209	18
Ambrosia artemisiifolia	Short ragweed	Amb a 9.0101	Aero Plant	Ambrosia Amb a 9	IgE plus basophil+ or SPT+	83	AAX77684.1	62249470	7
Ambrosia artemisiifolia	Short ragweed	Amb a 9.0102	Aero Plant	Ambrosia Amb a 9	IgE plus basophil+ or SPT+	83	AAX77685.1	62249481	7
Ambrosia artemisiifolia	Short ragweed	Amb a 11.0101	Aero Plant	Ambrosia artemisiifolia Amb a 11	IgE plus basophil+ or SPT+	386	AHA56102.1	558482540	15
Ambrosia artemisiifolia	Short ragweed	Unassigned	Aero Plant	Ambrosia artemisiifolia Amb a 11	IgE plus basophil+ or SPT+	385	5EGW_B	1023176264	17
Ambrosia artemisiifolia (elatior)	Short ragweed	Amb a 3.0101	Aero Plant	Ambrosia Amb a 3	IgE plus basophil+ or SPT+	101	P00304.2	416636	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Ambrosia artemisiifolia (elatior)	Short ragweed	Amb a 5.0101	Aero Plant	Ambrosia Amb a 5 Ra5 Amb p 5	IgE plus basophil+ or SPT+	45	P02878.1	114090	7
Ambrosia psilostachya	Western ragweed	Amb p 5.0101	Aero Plant	Ambrosia Amb a 5 Ra5 Amb p 5	IgE plus basophil+ or SPT+	77	AAA20065.1	515953	7
Ambrosia psilostachya	Western ragweed	Unassigned	Aero Plant	Ambrosia Amb a 5 Ra5 Amb p 5	IgE plus basophil+ or SPT+	77	AAA20067.1	515954	7
Ambrosia psilostachya	Western ragweed	Amb p 5.0201	Aero Plant	Ambrosia Amb a 5 Ra5 Amb p 5	IgE plus basophil+ or SPT+	77	AAA20064.1	515955	7
Ambrosia psilostachya	Western ragweed	Unassigned	Aero Plant	Ambrosia Amb a 5 Ra5 Amb p 5	IgE plus basophil+ or SPT+	77	AAA20066.1	515956	7
Ambrosia psilostachya	Western ragweed	Unassigned	Aero Plant	Ambrosia Amb a 5 Ra5 Amb p 5	IgE plus basophil+ or SPT+	77	AAA20068.1	515957	7
Ambrosia trifida	Giant ragweed	Amb t 5.0101	Aero Plant	Ambrosia Amb t 5 Ra5G	IgE but no biological test	73	P10414.2	114091	7
Amphioctopus fangsiao	Octopus	Unassigned	Food Animal	Amphioctopus arginine kinase	IgE but no biological test	348	AEK65120.1	340742817	12
Anacardium occidentale	Cashew	Ana 0 1.0102	Food Plant	Anacardium Ana o 1	IgE plus basophil+ or SPT+	536	AAM73729.1	21666498	7
Anacardium occidentale	Cashew	Ana 0 1.0101	Food Plant	Anacardium Ana o 1	IgE plus basophil+ or SPT+	538	AAM73730.2	21914823	7
Anacardium occidentale	Cashew	Ana o 2.0101	Food Plant	Anacardium Ana o 2	IgE plus basophil+ or SPT+	457	AAN76862.1	25991543	7
Anacardium occidentale	Cashew	Ana o 3.0101	Food Plant	Anacardium Ana o 3	IgE but no biological test	138	AAL91665.1	24473800	7
Ananas comosus	Pineapple	Ana c 2.0101	Aero Plant	Ananas Ana c 2 Bromelain precursor	IgE plus basophil+ or SPT+	351	O23791.1	75277440	7
Ananas comosus	Pineapple	Ana c 1.0101	Food Plant	Ananas profilin Ana c 1	IgE but no biological test	131	Q94JN2.1	75306610	10
Anisakis pegreffii	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 12	IgE but no biological test	264	AGC60026.1	442577845	14
Anisakis pegreffii	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 12	IgE but no biological test	264	AGC60027.1	442577847	14
Anisakis pegreffii	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 12	IgE but no biological test	264	AGC60028.1	442577849	14
Anisakis pegreffii	Parasitic fish worm	Unassigned	Important Worm (parasite)	Anisakis Ani s 2 paramyosin	IgE but no biological test	869	AGC60020.1	442577833	14
Anisakis simplex	Parasitic fish worm	Ani s 1.0101	Food Animal	Anisakis Ani s 1 protease inhibitor	IgE plus basophil+ or SPT+	194	Q7Z1K3.1	47605452	7
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 1 protease inhibitor	IgE plus basophil+ or SPT+	163	AGC60035.1	442577863	14
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 1 protease inhibitor	IgE plus basophil+ or SPT+	163	AGC60036.1	442577865	14
Anisakis simplex	Parasitic fish worm	Ani s 10.0101	Food Animal	Anisakis Ani s 10	IgE but no biological test	231	ACZ95445.1	272574378	11
Anisakis simplex	Parasitic fish worm	Ani s 11.0101	Food Animal	Anisakis Ani s 11	IgE but no biological test	307	BAJ78220.1	323575361	12
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 11	IgE but no biological test	160	BAJ78221.1	323575363	12
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 11	IgE but no biological test	287	BAJ78222.1	323575365	12
Anisakis simplex	Parasitic fish worm	Ani s 12.0101	Food Animal	Anisakis Ani s 12	IgE but no biological test	295	BAJ78223.1	323575367	12
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 12	IgE but no biological test	264	AGC60029.1	442577851	14
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 12	IgE but no biological test	264	AGC60030.1	442577853	14
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 12	IgE but no biological test	264	AGC60031.1	442577855	14
Anisakis simplex	Parasitic fish worm	Ani s 14.0101	Food Animal	Anisakis Ani s 14	IgE but no biological test	217	BAT62430.1	957554293	17
Anisakis simplex	Parasitic fish worm	Ani s 2.0101	Food Animal	Anisakis Ani s 2 paramyosin	IgE but no biological test	473	AAF75225.1	8453086	7
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 2 paramyosin	IgE but no biological test	869	Q9NJA9.1	42559536	9
Anisakis simplex	Parasitic fish worm	Ani s 3.0101	Food Animal	Anisakis Ani s 3 tropomyosin	IgE plus basophil+ or SPT+	284	Q9NAS5.1	14423976	7
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 3 tropomyosin	IgE plus basophil+ or SPT+	284	AEQ28167.1	350285785	13
Anisakis simplex	Parasitic fish worm	Ani s 4.0101	Food Animal	Anisakis Ani s 4	IgE plus basophil+ or SPT+	14	P83885.1	47605398	7
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 4	IgE plus basophil+ or SPT+	115	CAK50389.1	110346534	8
Anisakis simplex	Parasitic fish worm	Ani s 5.0101	Food Animal	Anisakis Ani s 5 SXP/RAL-2 family protein	IgE but no biological test	152	BAF43534.1	121308878	8
Anisakis simplex	Parasitic fish worm	Ani s 7.0101	Food Animal	Anisakis Ani s 7 UA3-recognized allergen	IgE but no biological test	1096	ABL77410.1	119524036	9
Anisakis simplex	Parasitic fish worm	Ani s 8.0101	Food Animal	Anisakis Ani s 8 SXP/RAL-2 family protein 2	IgE but no biological test	150	BAF75681.1	155676636	9
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 8 SXP/RAL-2 family protein 2	IgE but no biological test	150	BAF75704.1	155676682	9
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 8 SXP/RAL-2 family protein 2	IgE but no biological test	150	BAF75705.1	155676684	9
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 8 SXP/RAL-2 family protein 2	IgE but no biological test	150	BAF75706.1	155676686	9
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 8 SXP/RAL-2 family protein 2	IgE but no biological test	150	BAF75707.1	155676688	9
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 8 SXP/RAL-2 family protein 2	IgE but no biological test	150	BAF75708.1	155676690	9
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 8 SXP/RAL-2 family protein 2	IgE but no biological test	150	BAF75709.1	155676692	9
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 8 SXP/RAL-2 family protein 2	IgE but no biological test	150	BAF75710.1	155676694	9
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 8 SXP/RAL-2 family protein 2	IgE but no biological test	150	BAF75711.1	155676696	9
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis Ani s 8 SXP/RAL-2 family protein 2	IgE but no biological test	150	BAF75712.1	155676698	9

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Anisakis simplex	Parasitic fish worm	Ani s 9.0101	Food Animal	Anisakis Ani s 9	IgE but no biological test	147	ABV55106.1	157418806	9
Anisakis simplex	Parasitic fish worm	Unassigned	Food Animal	Anisakis simplex troponin-like	IgE but no biological test	161	CAB58171.1	6065738	7
Anthoxanthum odoratum	Sweet vernal grass	Unassigned	Aero Plant	Anthoxanthum Ant o 1	IgE but no biological test	26	G37396	320607	7
Anthoxanthum odoratum	Sweet vernal grass	Ant o 1.0101	Aero Plant	Anthoxanthum Ant o 1	IgE but no biological test	32	Q7M1X6	75139986	7
Anthoxanthum odoratum	Sweet vernal grass	Unassigned	Aero Plant	Anthoxanthum Ant o 1	IgE but no biological test	32	Q7M1Y0	75139990	7
Apis cerana	Indian honeybee	Unassigned	Venom or Salivary	Apis Api m 1 Api d 1 Api c 1	IgE plus basophil+ or SPT+	134	A59055	7435005	7
Apis cerana cerana	Indian honeybee	Api d 1	Venom or Salivary	Apis Api m 1 Api d 1 Api c 1	IgE plus basophil+ or SPT+	134	AAK09361.1	12958583	15
Apis dorsata	Giant honeybee	Api d 1.0101	Venom or Salivary	Apis Api m 1 Api d 1 Api c 1	IgE plus basophil+ or SPT+	134	Q7M4I5.1	47117012	7
Apis dorsata	Giant honeybee	Unassigned	Venom or Salivary	Apis Api m 4 Melittin	IgE but no biological test	26	P01502.1	126955	7
Apis mellifera	Honeybee	Api m 1.0101	Venom or Salivary	Apis Api m 1 Api d 1 Api c 1	IgE plus basophil+ or SPT+	167	P00630.3	24418862	7
Apis mellifera	Honeybee	Unassigned	Venom or Salivary	Apis Api m 10 icarapin	IgE but no biological test	223	ABF21077.1	94471622	7
Apis mellifera	Honeybee	Api m 10.0101	Venom or Salivary	Apis Api m 10 icarapin	IgE but no biological test	175	ABF21078.1	94471624	7
Apis mellifera	Honeybee	Api m 2.0101	Venom or Salivary	Apis Api m 2	IgE plus basophil+ or SPT+	382	Q08169.1	585279	7
Apis mellifera	Honeybee	Unassigned	Venom or Salivary	Apis Api m 3 acid phosphatase	IgE but no biological test	388	ACI25605.1	208342441	10
Apis mellifera	Honeybee	Api m 3.0101	Venom or Salivary	Apis Api m 3 acid phosphatase	IgE but no biological test	388	Q5BLY5.1	74835477	12
Apis mellifera	Honeybee	Api m 4.0101	Venom or Salivary	Apis Api m 4 Melittin	IgE but no biological test	70	CAA26038.1	5622	7
Apis mellifera	Honeybee	Unassigned	Venom or Salivary	Apis Api m 4 Melittin	IgE but no biological test	27	MEHB2	69552	7
Apis mellifera	Honeybee	Api m 5.0101	Venom or Salivary	Apis Api m 5 dipeptidylpeptidase	IgE plus basophil+ or SPT+	775	NP_001119715.1	187281543	15
Apis mellifera	Honeybee	Api m 6.01	Venom or Salivary	Apis Api m 6	IgE but no biological test	92	NP_001035360.1	94400907	7
Apis mellifera	Honeybee	Unassigned	Venom or Salivary	Apis Api m 6	IgE but no biological test	94	ABD51779.1	88770352	10
Apis mellifera	Honeybee	Api m 11.0101	Venom or Salivary	Apis mellifera Api m 11	IgE but no biological test	416	NP_001011564.1	58585070	15
Apis mellifera	Honeybee	Api m 11.0201	Venom or Salivary	Apis mellifera Api m 11	IgE but no biological test	423	AAY21180.1	62910925	15
Apis mellifera	Honeybee	Api m 12.0101	Venom or Salivary	Apis mellifera Api m 12	IgE but no biological test	1770	CAD56944.1	29329817	15
Apis mellifera carnica	Honeybee	Unassigned	Venom or Salivary	Apis Api m 10 icarapin	IgE but no biological test	12	AHM25038.1	594708629	16
Apis mellifera carnica	Honeybee	Unassigned	Venom or Salivary	Apis Api m 10 icarapin	IgE but no biological test	19	AHM25037.1	594708627	16
Apis mellifera carnica	Honeybee	Unassigned	Venom or Salivary	Apis Api m 10 icarapin	IgE but no biological test	25	AHM25036.1	594708625	16
Apis mellifera carnica	Honeybee	Unassigned	Venom or Salivary	Apis Api m 10 icarapin	IgE but no biological test	41	AHM25035.1	594708623	16
Apium graveolens	Celery	Api g 1.0101	Food Plant	Apium Api g 1	IgE plus basophil+ or SPT+	154	P49372.1	1346568	7
Apium graveolens	Celery	Api g 1.0201	Food Plant	Apium Api g 1	IgE plus basophil+ or SPT+	159	P92918.1	14423646	9
Apium graveolens	Celery	Api g 2.0101	Food Plant	Apium Api g 2	IgE plus basophil+ or SPT+	118	ACV04796.1	256600126	12
Apium graveolens	Celery	Api g 4.0101	Food Plant	Apium Api g 4	IgE plus basophil+ or SPT+	134	AAD29409.1	4761578	7
Apium graveolens	Celery	Api g 5.0101	Food Plant	Apium Api g 5	IgE but no biological test	86	P81943.3	33300920	10
Apium graveolens Rapaceum Group	Celery	Api g 6.0101	Food Plant	Apium graveolens Api g 6 LTP 2	IgE but no biological test	67	P86809.1	550540827	15
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Agglutinin (lectin)	IgE but no biological test	273	AAB22817.1	253289	7
Arachis hypogaea	Peanut	Ara h 1	Food Plant	Arachis Ara h 1	IgE plus basophil+ or SPT+	614	P43237.1	1168390	7
Arachis hypogaea	Peanut	Ara h 1.0101	Food Plant	Arachis Ara h 1	IgE plus basophil+ or SPT+	626	P43238.1	1168391	7
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 1	IgE plus basophil+ or SPT+	299	AAT00595.1	46560474	7
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 1	IgE plus basophil+ or SPT+	303	AAT00594.1	46560472	7
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 1	IgE plus basophil+ or SPT+	428	AAT00596.1	46560476	7
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 1	IgE plus basophil+ or SPT+	619	ADQ53858.1	312233063	12
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 1	IgE plus basophil+ or SPT+	418	3SMH_A	375332427	13
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 1	IgE plus basophil+ or SPT+	418	3S7E_A	347447588	13
Arachis hypogaea	Peanut	Ara h 12.0101	Food Plant	Arachis Ara h 12	IgE but no biological test	71	B3EWP3.1	1018736824	17
Arachis hypogaea	Peanut	Ara h 13.0102	Food Plant	Arachis Ara h 13 defensin	IgE but no biological test	72	C0HJZ1.1	1018736837	17
Arachis hypogaea	Peanut	Ara h 13.0101	Food Plant	Arachis Ara h 13 defensin	IgE but no biological test	79	B3EWP4.1	1018736830	17
Arachis hypogaea	Peanut	Ara h 2.0201	Food Plant	Arachis Ara h 2	IgE plus basophil+ or SPT+	172	AAN77576.1	26245447	7
Arachis hypogaea	Peanut	Ara a 2	Food Plant	Arachis Ara h 2	IgE plus basophil+ or SPT+	169	AAM78596.1	31322017	7
Arachis hypogaea	Peanut	Ara h 2.0101	Food Plant	Arachis Ara h 2	IgE plus basophil+ or SPT+	156	AAK96887.1	15418705	10
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 2	IgE plus basophil+ or SPT+	158	ACN62248.1	224747150	10
Arachis hypogaea	Peanut	Ara h 3.0101	Food Plant	Arachis Ara h 3 Glycinin	IgE plus basophil+ or SPT+	507	AAC63045.1	3703107	7
Arachis hypogaea	Peanut	Ara h 3.0201	Food Plant	Arachis Ara h 3 Glycinin	IgE plus basophil+ or SPT+	530	AAD47382.1	5712199	7
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 3 Glycinin	IgE plus basophil+ or SPT+	538	AAM46958.1	21314465	7
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 3 Glycinin	IgE plus basophil+ or SPT+	219	AAM93157.1	22135348	7
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 3 Glycinin	IgE plus basophil+ or SPT+	512	ABI17154.1	112380623	8
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 3 Glycinin	IgE plus basophil+ or SPT+	530	ACH91862.1	199732457	10

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 3 Glycinin	IgE plus basophil+ or SPT+	510	3C3V_A	224036293	10
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 3 Glycinin	IgE plus basophil+ or SPT+	512	ADQ53859.1	312233065	12
Arachis hypogaea	Peanut	Ara h 5.0101	Food Plant	Arachis Ara h 5	IgE plus basophil+ or SPT+	131	AAD55587.1	5902968	7
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 5	IgE plus basophil+ or SPT+	131	ADB96066.1	284810529	11
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 5	IgE plus basophil+ or SPT+	131	AGA84056.1	431812555	14
Arachis hypogaea	Peanut	Ara h 6.0101	Food Plant	Arachis Ara h 6	IgE plus basophil+ or SPT+	129	AAD56337.1	5923742	7
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 6	IgE plus basophil+ or SPT+	144	AAL37561.1	17225991	7
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 6	IgE plus basophil+ or SPT+	127	1W2Q_A	159163254	9
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 6	IgE plus basophil+ or SPT+	145	Q647G9.1	75114094	10
Arachis hypogaea	Peanut	Ara h 7.0201	Food Plant	Arachis Ara h 7	IgE but no biological test	164	ABW17159.1	158121995	10
Arachis hypogaea	Peanut	Ara h 8.0101	Food Plant	Arachis Ara h 8	IgE plus basophil+ or SPT+	157	AAQ91847.1	37499626	7
Arachis hypogaea	Peanut	Ara h 8.0201	Food Plant	Arachis Ara h 8	IgE plus basophil+ or SPT+	153	ABP97433.1	145904610	9
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 8	IgE plus basophil+ or SPT+	157	ACA79908.1	169786740	9
Arachis hypogaea	Peanut	Unassigned	Food Plant	Arachis Ara h 8	IgE plus basophil+ or SPT+	157	ABG85155.1	110676574	12
Arachis hypogaea	Peanut	Ara h 9.0101	Food Plant	Arachis Ara h 9 LTP isoallergens	IgE but no biological test	116	ABX56711.1	161087230	10
Arachis hypogaea	Peanut	Ara h 9.0201	Food Plant	Arachis Ara h 9 LTP isoallergens	IgE but no biological test	92	ABX75045.1	161610580	10
Arachis hypogaea	Peanut	Ara h 10.0101	Food Plant	Arachis hypogaea Ara h 10	IgE but no biological test	169	AAU21499.2	113200509	15
Arachis hypogaea	Peanut	Ara h 10.0102	Food Plant	Arachis hypogaea Ara h 10	IgE but no biological test	150	AAU21500.1	52001239	15
Arachis hypogaea	Peanut	Ara h 11.0101	Food Plant	Arachis hypogaea Ara h 11	IgE but no biological test	137	AAZ20276.1	71040655	15
Arachis hypogaea	Peanut	Ara h 11.0102	Food Plant	Arachis hypogaea Ara h 11	IgE but no biological test	137	Q45W86	122218540	16
Arachis hypogaea	Peanut	Ara h 15.0101	Food Plant	Arachis hypogaea oleosin Ara h 15	IgE plus basophil+ or SPT+	166	AAU21501.1	52001241	15
Argas reflexus	European pigeon tick	Arg r 1.0101	Venom or Salivary	Argas Arg r 1	IgE plus basophil+ or SPT+	159	CAG26895.1	58371884	7
Argas reflexus	European pigeon tick	Unassigned	Venom or Salivary	Argas Arg r 1	IgE plus basophil+ or SPT+	144	2X45_A	322812205	12
Artemisia absinthium		Unassigned	Aero Plant	Artemisia vulgaris like Art v 1	IgE but no biological test	108	AHF71021.1	573005946	17
Artemisia annua		Unassigned	Aero Plant	Art an 7 putative galactose oxidase	IgE but no biological test	594	ARQ16437.1	1190354092	19
Artemisia annua		Unassigned	Aero Plant	Artemisia vulgaris like Art v 1	IgE but no biological test	132	ANC85007.1	1026259951	18
Artemisia annua		Unassigned	Aero Plant	Artemisia vulgaris like Art v 1	IgE but no biological test	132	ANC85006.1	1026259949	18
Artemisia argyi		Unassigned	Aero Plant	Art an 7 putative galactose oxidase	IgE but no biological test	594	ARQ16438.1	1190354094	19
Artemisia capillaris		Unassigned	Aero Plant	Art an 7 putative galactose oxidase	IgE but no biological test	594	ARQ16439.1	1190354096	19
Artemisia gmelinii		Unassigned	Aero Plant	Art an 7 putative galactose oxidase	IgE but no biological test	594	ARQ16440.1	1190354098	19
Artemisia lavandulifolia		Unassigned	Aero Plant	Art an 7 putative galactose oxidase	IgE but no biological test	594	ARQ16441.1	1190354100	19
Artemisia ludoviciana		Unassigned	Aero Plant	Artemisia vulgaris like Art v 1	IgE but no biological test	108	AHF71025.1	573005954	17
Artemisia sieversiana		Unassigned	Aero Plant	Art an 7 putative galactose oxidase	IgE but no biological test	595	ARQ16442.1	1190354102	19
Artemisia tridentata		Unassigned	Aero Plant	Artemisia vulgaris like Art v 1	IgE but no biological test	108	AHF71026.1	573005956	17
Artemisia vulgaris	Mugwort	Unassigned	Aero Plant	Art an 7 putative galactose oxidase	IgE but no biological test	594	ARQ16443.1	1190354104	19
Artemisia vulgaris	Mugwort	Art v 1.0101	Aero Plant	Artemisia Art v 1	IgE plus basophil+ or SPT+	132	AAO24900.1	27818335	7
Artemisia vulgaris	Mugwort	Art v 2.0101	Aero Plant	Artemisia Art v 2	IgE but no biological test	162	CAK50834.1	148887203	9
Artemisia vulgaris	Mugwort	Art v 3.0101	Aero Plant	Artemisia Art v 3	IgE plus basophil+ or SPT+	37	P0C088.1	73621307	7
Artemisia vulgaris	Mugwort	Art v 3.0201	Aero Plant	Artemisia Art v 3	IgE plus basophil+ or SPT+	114	ACE07186.1	189544578	11
Artemisia vulgaris	Mugwort	Art v 3.0202	Aero Plant	Artemisia Art v 3	IgE plus basophil+ or SPT+	116	ACE07187.1	189544584	11
Artemisia vulgaris	Mugwort	Art v 3.0301	Aero Plant	Artemisia Art v 3	IgE plus basophil+ or SPT+	117	ACE07188.1	189544590	11
Artemisia vulgaris	Mugwort	Unassigned	Aero Plant	Artemisia Art v 3	IgE plus basophil+ or SPT+	117	ACE07189.1	189544595	11
Artemisia vulgaris	Mugwort	Unassigned	Aero Plant	Artemisia Art v 3	IgE plus basophil+ or SPT+	92	6FRR_A	1595430506	20
Artemisia vulgaris	Mugwort	Art v 4.0101	Aero Plant	Artemisia Art v 4	IgE but no biological test	133	CAD12861.1	25955969	15
Artemisia vulgaris	Mugwort	Art v 4.0201	Aero Plant	Artemisia Art v 4	IgE but no biological test	133	CAD12862.1	25955971	15
Artemisia vulgaris	Mugwort	Unassigned	Aero Plant	Artemisia Art v 4	IgE but no biological test	135	5EM0_A	1035439202	18
Artemisia vulgaris	Mugwort	Unassigned	Aero Plant	Artemisia Art v 4	IgE but no biological test	136	6B6J_A	1486941866	20
Artemisia vulgaris	Mugwort	Art v 6.0101	Aero Plant	Artemisia Art v 6 pectate lyase	IgE but no biological test	396	AAX85388.1	62530263	8
Artemisia vulgaris	Mugwort	Art v 5.0101	Aero Plant	Artemisia mugwort Art v 5	IgE plus basophil+ or SPT+	82	AAX85389.1	62530265	15
Arthroderma benhamiae	Fungus	Unassigned	Contact	Trichophyton (Arthroderma) Tri m 4	IgE plus basophil+ or SPT+	726	CAD23611.1	23894232	7
Arthroderma benhamiae	Fungus	Unassigned	Contact	Trichophyton (Arthroderma) Tri r 2	IgE plus basophil+ or SPT+	292	CAD23613.1	23894240	7
Arthroderma benhamiae	Fungus	Unassigned	Contact	Trichophyton (Arthroderma) Tri r 2	IgE plus basophil+ or SPT+	404	CAD23614.1	23894244	7
Arthroderma vanbreuseghemii	Fungus	Unassigned	Contact	Trichophyton (Arthroderma) Tri m 4	IgE plus basophil+ or SPT+	726	BAH09387.1	219687753	10
Ascaris lumbricoides	Parasitic roundworm	Unassigned	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	134	AAD13644.1	2735096	7
Ascaris lumbricoides	Parasitic roundworm	Unassigned	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	134	AAD13645.1	2735098	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Ascaris lumbricoides	Parasitic roundworm	Unassigned	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	133	AAD13647.1	2735102	7
Ascaris lumbricoides	Parasitic roundworm	Unassigned	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	133	AAD13649.1	2735106	7
Ascaris lumbricoides	Parasitic roundworm	Unassigned	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	267	AAD13650.1	2735108	7
Ascaris lumbricoides	Parasitic roundworm	Unassigned	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	267	AAD13651.1	2735110	7
Ascaris lumbricoides	Parasitic roundworm	Unassigned	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	267	AAD13652.1	2735112	7
Ascaris lumbricoides	Parasitic roundworm	Unassigned	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	134	AAB93837.1	2735114	7
Ascaris lumbricoides	Parasitic roundworm	Unassigned	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	134	AAB93839.1	2735118	7
Ascaris lumbricoides	Parasitic roundworm	Unassigned	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	134	AAD13646.1	2735100	7
Ascaris lumbricoides	Parasitic roundworm	Asc l 3.0101	Worm (parasite)	Ascaris tropomyosin Asc l 3	IgE but no biological test	287	ACN32322.1	224016002	10
Ascaris suum	Parasitic roundworm	Asc s 1	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	68	AAB26195.1	299550	7
Ascaris suum	Parasitic roundworm	Asc s 1.0101	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	1365	Q06811.2	77416849	7
Ascaris suum	Parasitic roundworm	Unassigned	Worm (parasite)	Ascaris Asc s 1	IgE but no biological test	134	2XV9_A	343197079	12
Ascaris suum	Parasitic roundworm	Asc s 13.0101	Worm (parasite)	Ascaris lumbricoides/suum Glutathione S-transfera	IgE plus basophil+ or SPT+	206	P46436.3	1170109	15
Aspergillus flavus	Fungus	Unassigned	Aero Fungi	Aspergillus Oryzin Asp o 13, fl 13	IgE but no biological test	403	Q9UVU3	74665726	7
Aspergillus fumigatus	Fungus	Asp f 1	Aero Fungi	Aspergillus Asp f 1	IgE plus basophil+ or SPT+	125	CAA06305.1	3021324	7
Aspergillus fumigatus	Fungus	Asp f 1	Aero Fungi	Aspergillus Asp f 1	IgE plus basophil+ or SPT+	150	AAF86369.1	9280360	7
Aspergillus fumigatus	Fungus	Unassigned	Aero Fungi	Aspergillus Asp f 1	IgE plus basophil+ or SPT+	176	P67875.1	54039254	7
Aspergillus fumigatus	Fungus	Asp f 10.0101	Aero Fungi	Aspergillus Asp f 10	IgE but no biological test	395	CAA59419.1	963013	7
Aspergillus fumigatus	Fungus	Asp f 11.0101	Aero Fungi	Aspergillus Asp f 11	IgE plus basophil+ or SPT+	178	CAB44442.1	5019414	7
Aspergillus fumigatus	Fungus	Asp f 18.0101	Aero Fungi	Aspergillus Asp f 18 and Asp n 18	IgE but no biological test	495	CAA73782.1	2143220	7
Aspergillus fumigatus	Fungus	Asp f 2	Aero Fungi	Aspergillus Asp f 2	IgE but no biological test	250	AAB07620.1	664852	7
Aspergillus fumigatus	Fungus	Asp f 2.0101	Aero Fungi	Aspergillus Asp f 2	IgE but no biological test	310	P79017.2	83300352	7
Aspergillus fumigatus	Fungus	Asp f 22.0101	Aero Fungi	Aspergillus Asp f 22	IgE but no biological test	438	AAK49451.1	13925873	7
Aspergillus fumigatus	Fungus	Unassigned	Aero Fungi	Aspergillus Asp f 22	IgE but no biological test	438	Q96X30.3	83288046	7
Aspergillus fumigatus	Fungus	Asp f 23.0101	Aero Fungi	Aspergillus Asp f 23	IgE but no biological test	392	AAM43909.1	21215170	7
Aspergillus fumigatus	Fungus	Unassigned	Aero Fungi	Aspergillus Asp f 23	IgE but no biological test	392	Q8NKF4.2	83305621	7
Aspergillus fumigatus	Fungus	Asp f 27.0101	Aero Fungi	Aspergillus Asp f 27	IgE but no biological test	163	CAI78448.1	91680605	7
Aspergillus fumigatus	Fungus	Asp f 28.0101	Aero Fungi	Aspergillus Asp f 28	IgE but no biological test	108	CAI78449.1	91680607	7
Aspergillus fumigatus	Fungus	Asp f 29.0101	Aero Fungi	Aspergillus Asp f 29	IgE but no biological test	110	CAI78450.1	91680609	7
Aspergillus fumigatus	Fungus	Asp f 3.0101	Aero Fungi	Aspergillus Asp f 3	IgE plus basophil+ or SPT+	168	AAB95638.1	2769700	7
Aspergillus fumigatus	Fungus	Asp f 34.0101	Aero Fungi	Aspergillus Asp f 34	IgE plus basophil+ or SPT+	185	CAM54066.1	133920236	8
Aspergillus fumigatus	Fungus	Asp f 4.0101	Aero Fungi	Aspergillus Asp f 4	IgE plus basophil+ or SPT+	286	CAA04959.1	3005839	7
Aspergillus fumigatus	Fungus	Unassigned	Aero Fungi	Aspergillus Asp f 4	IgE plus basophil+ or SPT+	322	O60024.2	83300369	7
Aspergillus fumigatus	Fungus	Asp f 5.0101	Aero Fungi	Aspergillus Asp f 5	IgE but no biological test	634	CAA83015.1	3776613	7
Aspergillus fumigatus	Fungus	Unassigned	Aero Fungi	Aspergillus Asp f 5	IgE but no biological test	634	P46075.3	85541646	11
Aspergillus fumigatus	Fungus	Asp f 6.0101	Aero Fungi	Aspergillus Asp f 6	IgE plus basophil+ or SPT+	221	AAB60779.1	1648970	7
Aspergillus fumigatus	Fungus	Unassigned	Aero Fungi	Aspergillus Asp f 6	IgE plus basophil+ or SPT+	210	Q92450.3	83305645	7
Aspergillus fumigatus	Fungus	Asp f 7.0101	Aero Fungi	Aspergillus Asp f 7	IgE but no biological test	270	O42799.2	83300389	7
Aspergillus fumigatus	Fungus	Asp f 8.0101	Aero Fungi	Aspergillus Asp f 8	IgE plus basophil+ or SPT+	111	CAB64688.1	6686524	7
Aspergillus fumigatus	Fungus	Unassigned	Aero Fungi	Aspergillus Asp f 8	IgE plus basophil+ or SPT+	111	Q9UUZ6.2	83305635	7
Aspergillus fumigatus	Fungus	Asp f 9.0101	Aero Fungi	Aspergillus Asp f 9	IgE but no biological test	302	CAA11266.1	2879890	7
Aspergillus fumigatus	Fungus	Unassigned	Aero Fungi	Aspergillus Endo-chitosanase	IgE but no biological test	238	Q875I9.1	74629604	16
Aspergillus fumigatus	Fungus	Unassigned	Aero Fungi	Aspergillus fumigatus Asp f 13	IgE but no biological test	403	CAA77666.1	2295	15
Aspergillus fumigatus	Fungus	Unassigned	Aero Fungi	Aspergillus fumigatus Asp f 13	IgE but no biological test	341	CAA75805.1	3549630	16
Aspergillus fumigatus Af293	Fungus	Unassigned	Aero Fungi	Aspergillus Asp f 2	IgE but no biological test	304	EAL89830.1	66849502	7
Aspergillus fumigatus Af293	Fungus	Unassigned	Aero Fungi	Aspergillus Endo-chitosanase	IgE but no biological test	242	Q4WB37.1	74666748	16
Aspergillus fumigatus var. RP-2014	Fungus	Unassigned	Aero Fungi	Aspergillus Asp f 4	IgE plus basophil+ or SPT+	322	KEY81716.1	666434194	16
Aspergillus fumigatus var. RP-2014	Fungus	Unassigned	Aero Fungi	Aspergillus Asp f 7	IgE but no biological test	270	KEY78748.1	666431137	16
Aspergillus niger	Fungus	Unassigned	Aero Fungi	Aspergillus Asp f 18 and Asp n 18	IgE but no biological test	533	AAA32702.1	289172	7
Aspergillus niger	Fungus	Asp n 14	Aero Fungi	Aspergillus Asp n 14	IgE but no biological test	804	CAB06417.1	2181180	7
Aspergillus niger	Fungus	Asp n 14.0101	Aero Fungi	Aspergillus Asp n 14	IgE but no biological test	804	AAD13106.1	4235093	7
Aspergillus oryzae	Fungus	Asp o 21	Aero Fungi	Aspergillus Asp o 21	IgE plus basophil+ or SPT+	499	P0C1B3.1	94706935	7
Aspergillus oryzae	Fungus	Asp o 21.0101	Aero Fungi	Aspergillus Asp o 21	IgE plus basophil+ or SPT+	499	AAA32708.1	166531	15

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Aspergillus oryzae	Fungus	Asp f o 13.0101	Aero Fungi	Aspergillus Oryzin Asp o 13, fl 13	IgE but no biological test	403	P12547.2	129235	7
Aspergillus versicolor	Fungus	Asp v 13.0101	Aero Fungi	Aspergillus versicolor serine protease	IgE but no biological test	403	ADE74975.1	294441150	16
Bacillus lentus	Bacteria	Unassigned	Bacteria airway	Bacillus lentus subtilisin	IgE but no biological test	269	P29600.1	267048	9
Bacillus licheniformis	Bacteria	Unassigned	Bacteria airway	Bacillus licheniformis subtlilisin	IgE plus basophil+ or SPT+	379	P00780.1	135016	9
Bacillus licheniformis	Bacteria	Unassigned	Bacteria airway	Bacillus licheniformis subtlilisin	IgE plus basophil+ or SPT+	374	AAG31026.1	11127680	9
Bacillus sp.	Bacteria	Unassigned	Bacteria airway	Bacillus lentus Esperase	IgE but no biological test	361	BAA05540.1	1225905	9
Balanus rostratus	Crustacean	Unassigned	Food Animal	Balanus r tropomyosin	IgE but no biological test	284	BAF46896.1	125659386	9
Bassia scoparia	summer cypress	Koc s 1.0101	Aero Plant	Kochia scoparia Koc s 1	IgE but no biological test	167	AKV72169.1	914410012	16
Bassia scoparia	summer cypress	Koc 2 2.0101	Aero Plant	Kochia scoparia Koc s 2.01	IgE but no biological test	133	AIV43661.1	701225194	17
Batillus cornutus	Japanese turban shell	Unassigned	Food Animal	Batillus Tur c1	IgE but no biological test	284	BAH10149.1	219806588	10
Bertholletia excelsa	Brazil nut	Ber e 1.0101	Food Plant	Bertholletia Ber e 1	IgE plus basophil+ or SPT+	146	P04403.2	112754	7
Bertholletia excelsa	Brazil nut	Ber e 2.0101	Food Plant	Bertholletia Ber e 2	IgE but no biological test	465	AAO38859.1	30313867	7
Bertholletia excelsa	Brazil nut	Unassigned	Food Plant	Bertholletia Ber e 2	IgE but no biological test	426	6B4S_A	1534918238	20
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	51	A45786	320545	7
Betula pendula	European white birch	Bet v 1.0301	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA54696.1	534898	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	CAA54695.1	534900	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA54694.1	534910	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA96546.1	1321714	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA96539.1	1321716	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA96540.1	1321718	7
Betula pendula	European white birch	Bet v 1.0205	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA96541.1	1321720	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA96542.1	1321722	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA96543.1	1321724	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA96544.1	1321726	7
Betula pendula	European white birch	Bet v 1.0115	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA96547.1	1321728	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	P43186.2	1168710	7
Betula pendula	European white birch	Bet v 1.0108	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAB02155.1	1542861	7
Betula pendula	European white birch	Bet v 1.0109	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAB02156.1	1542863	7
Betula pendula	European white birch	Bet v 1.0110	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAB02157.1	1542865	7
Betula pendula	European white birch	Bet v 1.0111	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAB02158.1	1542867	7
Betula pendula	European white birch	Bet v 1.0117	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAB02159.1	1542869	7
Betula pendula	European white birch	Bet v 1.0113	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAB02160.1	1542871	7
Betula pendula	European white birch	Bet v 1.0114	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAB02161.1	1542873	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA96545.1	2414158	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA05186.1	2564220	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA05187.1	2564222	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA05188.1	2564224	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA05190.1	2564228	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA07318.1	4006928	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA07319.1	4006945	7
Betula pendula	European white birch	Bet v 1.0117	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA07323.1	4006953	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA07324.1	4006955	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA07325.1	4006957	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA07326.1	4006959	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA07327.1	4006961	7
Betula pendula	European white birch	Bet v 1.0118	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA07329.1	4006965	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA07330.1	4006967	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	CAA04823.1	4376216	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	CAA04826.1	4376219	7
Betula pendula	European white birch	Bet v 1.0116	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	CAA04827.1	4376220	7
Betula pendula	European white birch	Bet v 1.0206	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	CAA04828.1	4376221	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	CAA04829.1	4376222	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	AAD26560.1	4590392	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	AAD26561.1	4590394	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	AAD26562.1	4590396	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	P43180.2	1168706	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	1QMR_A	11514622	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	21	AAP37482.1	30908931	7
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	1LLT_A	38492423	7
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	43	AAB20452.1	239734	7
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	120	CAA07328.1	4006963	7
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	120	CAA07320.1	4006947	7
Betula pendula	European white birch	Bet v 1.0203	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA54488.1	452742	8
Betula pendula	European white birch	Bet v 1.0207	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	150	ABC41592.1	83722317	8
Betula pendula	European white birch	Bet v 1.0119	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	150	ABC41615.1	83722364	8
Betula pendula	European white birch		Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	1B6F_A	159162097	9
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	4BK7_A	560188693	15
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	4B9R_A	550544347	15
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	4BKC_A	565807648	15
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	4BKD_A	560188694	15
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	4BK6_B	560188692	15
Betula pendula	European white birch	Bet v 1.0101	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA33887.1	17938	15
Betula pendula	European white birch	Bet v 1.0102	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA54482.1	452732	15
Betula pendula	European white birch	Bet v 1.0103	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA54483.1	452734	15
Betula pendula	European white birch	Bet v 1.0104	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA54484.1	452736	15
Betula pendula	European white birch	Bet v 1.0106	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA54487.1	452740	15
Betula pendula	European white birch	Bet v 1.0107	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA54489.1	452744	15
Betula pendula	European white birch	Bet v 1.0201	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA54421.1	450885	15
Betula pendula	European white birch	Bet v 1.0202	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	CAA54481.1	452730	15
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	4BTZ_A	661918055	16
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	159	4Z3L_D	955264732	17
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 1b	IgE plus basophil+ or SPT+	51	B45786	320546	7
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 2	IgE plus basophil+ or SPT+	133	1CQA_A	157830684	9
Betula pendula	European white birch	Bet v 2.0101	Aero Plant	Betula Bet v 2	IgE plus basophil+ or SPT+	133	AAA16522.1	166953	11
Betula pendula	European white birch	Unassigned	Aero Plant	Betula Bet v 2	IgE plus basophil+ or SPT+	133	A4K9Z8.1	576017922	15
Betula pendula	European white birch	Bet v 3.0101	Aero Plant	Betula Bet v 3	IgE but no biological test	205	CAA55854.1	488605	15
Betula pendula	European white birch	Bet v 4.0101	Aero Plant	Betula Bet v 4	IgE but no biological test	85	CAA60628.1	809536	15
Betula pendula	European white birch	Bet v 6.0102	Aero Plant	Betula Bet v 6	IgE but no biological test	308	AAG22740.1	10764491	7
Betula pendula	European white birch	Bet v 7.0101	Aero Plant	Betula Bet v 7	IgE but no biological test	173	CAC84116.1	21886603	7
Betula pendula	European white birch	Bet v 8.0101	Aero Plant	Betula Bet v 8 glutathione S-transferase	IgE plus basophil+ or SPT+	237	AHF71027.1	573005958	16
Betula platyphylla	Japanese white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	BAB21489.1	12583681	7
Betula platyphylla	Japanese white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	BAB21490.1	12583683	7
Betula platyphylla	Japanese white birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	160	BAB21491.1	12583685	7
Betula sp.	Birch	Unassigned	Aero Plant	Betula Bet v 1	IgE plus basophil+ or SPT+	51	AAB25850.1	298736	7
Betula sp.	Birch	Unassigned	Aero Plant	Betula Bet v 1b	IgE plus basophil+ or SPT+	51	AAB25851.1	298737	7
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella chymotrypsin-like	IgE but no biological test	252	AJO53282.1	757943154	16
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella 36 kDa allergen	IgE but no biological test	20	AAB29344.1	544618	7
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella 36 kDa allergen	IgE but no biological test	25	AAB29345.1	544619	7
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella arginine kinase Bla g 9	IgE but no biological test	356	ACM24358.1	221602737	10
Blattella germanica	German cockroach	Bla g 9.0101	Aero Insect	Blattella arginine kinase Bla g 9	IgE but no biological test	356	ABC86902.1	86160922	18
Blattella germanica	German cockroach	Bla g 1.0201	Aero Insect	Blattella Bla g 1	IgE plus basophil+ or SPT+	492	AAD13531.1	4240395	7
Blattella germanica	German cockroach	Bla g 1.0101	Aero Insect	Blattella Bla g 1	IgE plus basophil+ or SPT+	412	AAD13530.2	4572592	7
Blattella germanica	German cockroach	Bla g 11.0101	Aero Insect	Blattella Bla g 11 alpha Amylase	IgE but no biological test	515	ABC68516.1	85002763	15
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella Bla g 2	IgE plus basophil+ or SPT+	330	1YG9_A	62738637	7
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella Bla g 2	IgE plus basophil+ or SPT+	352	ABP35603.1	145105726	9
Blattella germanica	German cockroach	Bla g 2.0101	Aero Insect	Blattella Bla g 2	IgE plus basophil+ or SPT+	352	AAA86744.1	1176397	11
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella Bla g 2	IgE plus basophil+ or SPT+	334	3LIZ_A	315113421	12
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella Bla g 3	IgE but no biological test	657	ACY40650.1	262272875	11
Blattella germanica	German cockroach	Bla g 3.0101	Aero Insect	Blattella Bla g 3	IgE but no biological test	657	ACY40651.1	262272877	11
Blattella germanica	German cockroach	Bla g 4.0101	Aero Insect	Blattella Bla g 4	IgE plus basophil+ or SPT+	182	AAA87851.1	1166573	7
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella Bla g 4	IgE plus basophil+ or SPT+	182	ABP04043.1	144952778	9
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella Bla g 4	IgE plus basophil+ or SPT+	181	ACJ37389.1	212675308	10

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella Bla g 4	IgE plus basophil+ or SPT+	191	ACF53836.1	194350815	11
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella Bla g 4	IgE plus basophil+ or SPT+	190	ACF53837.1	194350817	11
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella Bla g 5	IgE plus basophil+ or SPT+	200	ABP04044.1	144952780	9
Blattella germanica	German cockroach	Bla g 5.0101	Aero Insect	Blattella Bla g 5	IgE plus basophil+ or SPT+	200	AAB72147.1	2326190	11
Blattella germanica	German cockroach	Bla g 6.0101	Aero Insect	Blattella Bla g 6	IgE but no biological test	151	ABB89296.1	82704032	8
Blattella germanica	German cockroach	Bla g 6.0201	Aero Insect	Blattella Bla g 6	IgE but no biological test	151	ABB89297.1	82704034	8
Blattella germanica	German cockroach	Bla g 6.0301	Aero Insect	Blattella Bla g 6	IgE but no biological test	154	ABB89298.1	82704036	8
Blattella germanica	German cockroach	Bla g 7.0101	Aero Insect	Blattella Bla g 7	IgE but no biological test	284	AAF72534.1	8101069	7
Blattella germanica	German cockroach	Unassigned	Aero Insect	Blattella delta GST	IgE but no biological test	216	ABX57814.1	161137518	11
Blomia tropicalis	Mite	Blo t 1.0101	Aero Mite	Blomia Blo t 1.01	IgE but no biological test	221	AAK58415.1	14276828	7
Blomia tropicalis	Mite	Blo t 1.0201	Aero Mite	Blomia Blo t 1.02	IgE but no biological test	333	AAQ24541.1	33667928	8
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 1.02	IgE but no biological test	333	5JT8_B	1199299190	18
Blomia tropicalis	Mite	Blo t 10.0101	Aero Mite	Blomia Blo t 10	IgE plus basophil+ or SPT+	284	ABU97466.1	156938889	9
Blomia tropicalis	Mite	Blo t 11.0101	Aero Mite	Blomia Blo t 11	IgE plus basophil+ or SPT+	875	AAM83103.1	21954740	7
Blomia tropicalis	Mite	Blo t 12.0101	Aero Mite	Blomia Blo t 12	IgE plus basophil+ or SPT+	144	AAA78904.1	902012	7
Blomia tropicalis	Mite	Unassigned	Aero Insect	Blomia Blo t 12	IgE plus basophil+ or SPT+	69	2MFK_A	723586656	16
Blomia tropicalis	Mite	Blo t 13.0101	Aero Mite	Blomia Blo t 13.01	IgE but no biological test	130	AAC80579.1	1377859	7
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 21	IgE plus basophil+ or SPT+	129	ABH06350.1	111120432	8
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 21	IgE plus basophil+ or SPT+	129	ABH06347.1	111494253	8
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 21	IgE plus basophil+ or SPT+	129	ABH06346.1	111120424	8
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 21	IgE plus basophil+ or SPT+	129	ABH06348.1	111120428	8
Blomia tropicalis	Mite	Blo t 21.0101	Aero Insect	Blomia Blo t 21	IgE plus basophil+ or SPT+	129	AAX34047.1	60679570	9
Blomia tropicalis	Mite	Blo t 3.0101	Aero Mite	Blomia Blo t 3	IgE but no biological test	266	AAM10779.1	25989482	7
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 3	IgE but no biological test	266	AAQ24542.1	33667930	8
Blomia tropicalis	Mite	Blo t 4.0101	Aero Insect	Blomia Blo t 4 alpha amylase	IgE plus basophil+ or SPT+	506	AAQ24543.1	33667932	8
Blomia tropicalis	Mite	Blo t 5.0101	Aero Mite	Blomia Blo t 5	IgE plus basophil+ or SPT+	134	AAD10850.1	4204917	7
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 5	IgE plus basophil+ or SPT+	134	ABH06352.1	111120436	9
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 5	IgE plus basophil+ or SPT+	134	ABH06359.1	111120450	9
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 5	IgE plus basophil+ or SPT+	119	2JMH_A	160285626	9
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 5	IgE plus basophil+ or SPT+	135	APU87558.1	1131385191	18
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 5	IgE plus basophil+ or SPT+	133	APU87557.1	1131385189	18
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 5	IgE plus basophil+ or SPT+	135	APU87556.1	1131385187	18
Blomia tropicalis	Mite	Unassigned	Aero Mite	Blomia Blo t 5	IgE plus basophil+ or SPT+	134	APU87554.1	1131385183	18
Blomia tropicalis	Mite	Unassigned	Aero Insect	Blomia Blo t 7	IgE but no biological test	192	AAQ24545.1	33667936	8
Blomia tropicalis	Mite	Blo t 7.0101	Aero Mite	Blomia Blo t 7	IgE but no biological test	195	ASX95438.1	1241067909	18
Blomia tropicalis	Mite	Unassigned	Aero Insect	Blomia Blo t 8	IgE but no biological test	236	AAP35069.1	37958149	8
Blomia tropicalis	Mite	Blo t 8.0101	Aero Insect	Blomia Blo t 8	IgE but no biological test	236	ACV04860.1	256665455	11
Bombus pennsylvanicus	Bumblebee	Bom p 1.0101	Venom or Salivary	Bombus Bom p 1	IgE but no biological test	136	Q7M4I6.1	47117013	12
Bombus pennsylvanicus	Bumblebee	Bom p 4.0101	Venom or Salivary	Bombus Bom p 4 protease	IgE but no biological test	243	Q7M4I3.1	75009997	12
Bombus terrestris	Bumblebee	Bom t 1.0101	Venom or Salivary	Bombus Bom t 1	IgE but no biological test	136	P82971.1	14423832	7
Bombus terrestris	Bumblebee	Bom t 4.0101	Venom or Salivary	Bombus Bom t 4 protease	IgE but no biological test	20	P0CH88.1	313471465	12
Bombyx mori	Silkworm	Bomb m 1.0101	Aero Insect	Bombyx Bomb m 1	IgE but no biological test	355	ABB88514.1	82658675	15
Bos grunniens mutus	Yak	Bos d 11.0101	Food Animal	Bos Bos d 11 beta casein	IgE plus basophil+ or SPT+	259	XP_005902099.2	942073448	16
Bos taurus	Bovine	Unassigned	Food Animal	Bos Alpha-s1 casein	IgE plus basophil+ or SPT+	93	AAA62707.1	162650	7
Bos taurus	Bovine	Unassigned	Food Animal	Bos Alpha-s1 casein	IgE plus basophil+ or SPT+	214	AAA30429.1	162794	7
Bos taurus	Bovine	Unassigned	Food Animal	Bos Alpha-s1 casein	IgE plus basophil+ or SPT+	76	AAA30478.1	162927	7
Bos taurus	Bovine	Bos d 9.0101	Food Animal	Bos Alpha-s1 casein	IgE plus basophil+ or SPT+	214	NP_851372.1	30794348	8
Bos taurus	Bovine	Unassigned	Food Animal	Bos Alpha-s1 casein	IgE plus basophil+ or SPT+	205	ABW98943.1	159793197	9
Bos taurus	Bovine	Unassigned	Food Animal	Bos Alpha-s1 casein	IgE plus basophil+ or SPT+	172	ABW98945.1	159793201	9
Bos taurus	Bovine	Unassigned	Food Animal	Bos Alpha-s1 casein	IgE plus basophil+ or SPT+	129	ABW98953.1	159793217	9
Bos taurus	Bovine	Bos d 10.0101	Food Animal	Bos Bos d 10	IgE plus basophil+ or SPT+	222	NP_776953.1	27806963	15
Bos taurus	Bovine	Unassigned	Food Animal	Bos Bos d 11 beta casein	IgE plus basophil+ or SPT+	224	AAA30430.1	162797	7
Bos taurus	Bovine	Bos d 11.0101	Food Animal	Bos Bos d 11 beta casein	IgE plus basophil+ or SPT+	224	AAA30431.1	162805	7
Bos taurus	Bovine	Unassigned	Food Animal	Bos Bos d 11 beta casein	IgE plus basophil+ or SPT+	224	AAB29137.1	459292	7
Bos taurus	Bovine	Unassigned	Food Animal	Bos Bos d 12	IgE plus basophil+ or SPT+	190	AAA30433.1	162811	7
Bos taurus	Bovine	Bos d 12.0101	Food Animal	Bos Bos d 12	IgE plus basophil+ or SPT+	190	NP_776719.1	27881412	15

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Bos taurus	Bovine	Bos d 2.0101	Aero Animal	Bos Bos d 2	IgE but no biological test	172	AAB08720.1	886215	7
Bos taurus	Bovine	Bos d 3.0101	Aero Animal	Bos Bos d 3	IgE but no biological test	101	Q28050.1	2493414	7
Bos taurus	Bovine	Unassigned	Food Animal	Bos Bos d 4	IgE plus basophil+ or SPT+	142	CAA29664.1	295774	7
Bos taurus	Bovine	Bos d 4.0101	Food Animal	Bos Bos d 4	IgE plus basophil+ or SPT+	142	AAA30615.1	163283	15
Bos taurus	Bovine	Bos d 5.0101	Food Animal	Bos Bos d 5	IgE plus basophil+ or SPT+	178	CAA32835.1	520	7
Bos taurus	Bovine	Unassigned	Food Animal	Bos Bos d 5	IgE plus basophil+ or SPT+	178	P02754.3	125910	9
Bos taurus	Bovine	Unassigned	Food Animal	Bos Bos d 5	IgE plus basophil+ or SPT+	178	ACG59280.1	195957138	10
Bos taurus	Bovine	Bos d 6.0101	Food Animal	Bos Bos d 6	IgE plus basophil+ or SPT+	607	AAA51411.1	162648	7
Bos taurus	Bovine	Unassigned	Food Animal	Bos Bos d 6	IgE plus basophil+ or SPT+	607	CAA76847.1	3336842	7
Bos taurus	Bovine	Unassigned	Vaccine	Bos collagen alpha2	IgE plus basophil+ or SPT+	1364	NP_776945.1	27806257	11
Bos taurus	Bovine	Unassigned	Food Animal	Bos lactotransferrin	IgE but no biological test	708	NP_851341.1	30794292	8
Brassica juncea	Mustard	Bra j 1.0101	Food Plant	Brassica Bra j 1 2S albumin	IgE but no biological test	129	P80207.1	32363444	9
Brassica napus	Rape	Bra n 1.0101	Food Plant	Bra n 1	IgE but no biological test	125	P80208.1	75107016	9
Brassica napus	Rape	Unassigned	Aero Plant	Bra n Bra r 2	IgE but no biological test	83	S65144	2129801	7
Brassica napus	Rape	Unassigned	Aero Plant	Bra n Bra r 2	IgE but no biological test	83	S65145	2129802	7
Brassica napus	Rape	Unassigned	Food Plant	Brassica napus 2S albumin	IgE but no biological test	109	AAN86249.1	26985163	7
Brassica oleracea var. oleracea	Wild cabbage	Bra o 3.0101	Aero Plant	Brassica Bra o 3 LTP full length	IgE plus basophil+ or SPT+	112	XP_013623213.1	922434456	16
Brassica rapa	Turnip	Unassigned	Aero Plant	Bra n Bra r 2	IgE but no biological test	80	S65143	2129805	7
Brassica rapa	Turnip	Bra r 1.0101	Food Plant	Brassica Bra r 1	IgE but no biological test	178	CAA46782.1	17697	9
Brassica rapa	Turnip	Bra r 5.0101	Food Plant	Brassica Calcim binding protein Group I	IgE but no biological test	79	BAA09634.1	1255540	15
Brassica rapa subsp. rapa	Turnip	Unassigned	Aero Plant	Bra n Bra r 2	IgE but no biological test	83	P69199.1	59800146	7
Brassica rapa subsp. rapa	Turnip	Bra r 2.0101	Contact	Brassica Bra r 2	IgE but no biological test	91	P81729.1	32363456	9
Candida albicans	Yeast	Cand a 1.0101	Contact	Candida Cand a 1 Alcohol dehydrogenase	IgE but no biological test	350	CAA57342.1	608690	15
Candida albicans	Yeast	Cand a 3.0101	Contact	Candida Cand a 3 Peroxysomal protein	IgE but no biological test	236	AAN11300.1	37548637	7
Candida albicans	Yeast	Unassigned	Contact	Candida Enolase 1	IgE plus basophil+ or SPT+	440	P30575.1	232054	7
Canis familiaris	Dog	Can f 1.0101	Aero Animal	Canis Can f 1 Lipocalin	IgE plus basophil+ or SPT+	174	AAC48794.1	2598974	11
Canis familiaris	Dog	Can f 2	Aero Animal	Canis Can f 2 Lipocalin	IgE plus basophil+ or SPT+	177	CAD82911.1	29292272	7
Canis familiaris	Dog	Can f 2	Aero Animal	Canis Can f 2 Lipocalin	IgE plus basophil+ or SPT+	179	CAD82912.1	29292274	7
Canis familiaris	Dog	Can f 2.0101	Aero Animal	Canis Can f 2 Lipocalin	IgE plus basophil+ or SPT+	180	AAC48795.1	2598976	11
Canis familiaris	Dog	Can f 3	Aero Animal	Canis Can f 3 Serum albumin	IgE plus basophil+ or SPT+	265	AAB30434.1	633938	7
Canis familiaris	Dog	Can f 3	Aero Animal	Canis Can f 3 Serum albumin	IgE plus basophil+ or SPT+	585	CAA76841.1	3319897	7
Canis familiaris	Dog	Can f 3.0101	Aero Animal	Canis Can f 3 Serum albumin	IgE plus basophil+ or SPT+	608	BAC10663.1	22531688	15
Canis familiaris	Dog	Can f 4.0101	Aero Animal	Canis Can f 4 epithelial 18 kDa	IgE but no biological test	174	ACY38525.1	262232390	12
Canis familiaris	Dog	Unassigned	Aero Animal	Canis Can f 4 epithelial 18 kDa	IgE but no biological test	174	AHY24648.1	625295108	16
Canis familiaris	Dog	Can f 5.0101	Aero Animal	Canis Can f 5	IgE but no biological test	260	CAA68720.1	868	15
Canis familiaris	Dog	Can f 6.0101	Aero Animal	Canis Can f 6 Lipocalin	IgE but no biological test	190	CCF72371.1	374092884	13
Canis familiaris	Dog	Unassigned	Aero Animal	Canis Can f 6 Lipocalin	IgE but no biological test	177	5X7Y_D	1374502923	19
Canis familiaris	Dog	Can f 7.0101	Aero Animal	Canis familiarisCan f 7	IgE but no biological test	149	AAB34263.1	945179	16
Cannabis sativa	Hemp	Can s 3.0101	Aero Plant	Cannabis LTP Can s 3	IgE plus basophil+ or SPT+	91	CCK33472.1	571256597	15
Capsicum annuum	Bell pepper	Cap a 1.0101	Food Plant	Capsicum Cap a 1	IgE but no biological test	246	CAC34055.2	16609959	7
Capsicum annuum	Bell pepper	Cap a 2.0101	Food Plant	Capsicum Cap a 2	IgE but no biological test	131	CAD10376.1	16555785	7
Carica papaya	Papaya	Cari p 1.0101	Food Plant	Cari p 1.0101 endo polygalacturonase	IgE plus basophil+ or SPT+	494	ACV85695.1	258640138	18
Carica papaya	Papaya		Aero Plant	Carica papain (Car p 1 not IUIS)	IgE plus basophil+ or SPT+	345	AAB02650.1	167391	7
Carpinus betulus	Hornbeam	Car b 1.0102	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	159	CAA47357.1	402745	7
Carpinus betulus	Hornbeam	Car b 1.0103	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	160	CAB02206.1	1545875	7
Carpinus betulus	Hornbeam	Car b 1.0104	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	160	CAB02207.1	1545877	7
Carpinus betulus	Hornbeam	Car b 1.0105	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	160	CAB02208.1	1545879	7
Carpinus betulus	Hornbeam	Car b 1.0108	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	160	CAB02215.1	1545893	7
Carpinus betulus	Hornbeam	Car b 1.0301	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	161	CAB02216.1	1545895	7
Carpinus betulus	Hornbeam	Car b 1.0302	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	161	CAB02217.1	1545897	7
Carpinus betulus	Hornbeam	Unassigned	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	40	AAB20453.1	239735	7
Carpinus betulus	Hornbeam	Car b 1.0113	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	160	ABZ81044.1	167472845	10
Carpinus betulus	Hornbeam	Car b 1.0109	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	160	ABZ81040.1	167472837	10
Carpinus betulus	Hornbeam	Car b 1.0112	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	160	ABZ81043.1	167472843	10
Carpinus betulus	Hornbeam	Car b 1.0111	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	160	ABZ81042.1	167472841	10

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Carpinus betulus	Hornbeam	Car b 1.0110	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	160	ABZ81041.1	167472839	10
Carpinus betulus	Hornbeam	Unassigned	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	80	AAB34907.1	1008578	12
Carpinus betulus	Hornbeam	Unassigned	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	80	AAB34908.1	1008579	12
Carpinus betulus	Hornbeam	Unassigned	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	80	AAB34909.1	1008580	12
Carpinus betulus	Hornbeam	Car b 1.0101	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	159	CAA47366.1	402743	15
Carpinus betulus	Hornbeam	Car b 1.0106	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	160	CAB02209.1	1545881	15
Carpinus betulus	Hornbeam	Car b 1.0107	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	160	CAB02213.1	1545889	15
Carpinus betulus	Hornbeam	Car b 1.0201	Aero Plant	Carpinus Car b 1	IgE plus basophil+ or SPT+	159	CAA47367.1	402747	15
Carya illinoinensis	Pecan	Car i 1.0101	Food Plant	Carya Car i 1 Seed storage protein	IgE but no biological test	143	AAO32314.1	28207731	7
Carya illinoinensis	Pecan	Car i 4.0101	Food Plant	Carya Car i 4 11s legumin	IgE but no biological test	505	ABW86978.1	158998780	14
Carya illinoinensis	Pecan	Unassigned	Food Plant	Carya Car i 4 11s legumin	IgE but no biological test	505	ABW86979.1	158998782	14
Carya illinoinensis	Pecan	Car i 2.0101	Food Plant	Carya i Car i 2.0101 vicilin	IgE but no biological test	792	ABV49590.1	157384600	15
Carya illinoinensis	Pecan		Food Plant	Carya i Car i 2.0101 vicilin	IgE but no biological test	426	5E1R_F	1052244924	18
Caryota mitis	Fishtail Palm	Unassigned	Aero Plant	Caryota profilin	IgE but no biological test	131	ABM53030.1	121277849	8
Castanea sativa	European chestnut		Aero Plant	Castanea Cas s 1	IgE but no biological test	160	CAD10374.1	16555781	7
Castanea sativa	European chestnut	Unassigned	Aero Plant	Castanea Cas s 1	IgE but no biological test	159	ACJ23862.1	212291466	10
Castanea sativa	European chestnut	Cas s 1.0101	Aero Plant	Castanea Cas s 1	IgE but no biological test	159	ACJ23861.1	212291464	10
Castanea sativa	European chestnut	Unassigned	Aero Plant	Castanea Cas s 1	IgE but no biological test	159	ACJ23863.1	212291468	10
Castanea sativa	European chestnut	Cas s 5.0101	Food Plant	Castanea Cas s 5	IgE plus basophil+ or SPT+	316	CAA64868.1	1359600	7
Castanea sativa	European chestnut	Unassigned	Food Plant	Castanea Cas s 5	IgE plus basophil+ or SPT+	298	ADN39439.1	307159110	12
Catharanthus roseus	Madagascar periwinkle	Cat r 1.0101	Aero Plant	Catharanthus cyclophilin	IgE plus basophil+ or SPT+	172	CAA59468.1	1220142	13
Cavia porcellus	Domestic guinea pig	Cav p 1.0101	Aero Animal	Cavia Cav p 1	IgE but no biological test	166	VEV85353.1	1604536255	20
Cavia porcellus	Domestic guinea pig	Cav p 1.0102	Aero Animal	Cavia Cav p 1	IgE but no biological test	166	VEV85354.1	1604536257	20
Cavia porcellus	Domestic guinea pig	Cav p 2.0101	Aero Animal	Cavia Cav p 2	IgE plus basophil+ or SPT+	170	CAX62129.1	325910590	12
Cavia porcellus	Domestic guinea pig	Cav p 3.0101	Aero Animal	Cavia Cav p 3 lipocalin	IgE plus basophil+ or SPT+	170	CAX62130.1	325910592	12
Chamaecyparis obtusa	Japanese cypress	Cha o 1.0101	Aero Plant	Chamaecyparis Cha o 1	IgE but no biological test	375	BAA08246.1	1514943	7
Chamaecyparis obtusa	Japanese cypress	Cha o 2.0101	Aero Plant	Chamaecyparis Cha o 2	IgE but no biological test	514	Q7M1E7.1	47606004	7
Chamaecyparis obtusa	Japanese cypress	Unassigned	Aero Plant	Chamaecyparis Cha o 2	IgE but no biological test	419	BAF32143.1	114841683	8
Chamaecyparis obtusa	Japanese cypress	Cha o 3.0101	Aero Plant	Chamaecyparis obtusa Cha o 3	IgE plus basophil+ or SPT+	556	C0HLA0.1	1407868342	19
Charybdis feriatus	Crab	Cha f 1.0101	Food Animal	Charybdis Cha f 1	IgE but no biological test	264	AAF35431.1	7024506	7
Chenopodium album	Pigweed	Che a 1.0101	Aero Plant	Chenopodium Che a 1	IgE but no biological test	168	AAL07319.1	22074346	7
Chenopodium album	Pigweed	Che a 2.0101	Aero Plant	Chenopodium Che a 2	IgE plus basophil+ or SPT+	131	AAL92870.1	29465666	7
Chenopodium album	Pigweed	Unassigned	Aero Plant	Chenopodium Che a 2	IgE plus basophil+ or SPT+	133	ACR77509.1	238886048	11
Chenopodium album	Pigweed	Che a 3.0101	Aero Plant	Chenopodium Che a 3	IgE but no biological test	86	AAL92871.1	29465668	7
Chionoecetes opilio	Snow Crab	Unassigned	Food Animal	Chionoecetes tropomyosin	IgE but no biological test	284	A2V735.1	308191588	12
Chironomus kiiensis	Midge	Chi k 10.0101	Aero Insect	Chironomus Chi k 10	IgE but no biological test	285	CAA09938.2	7321108	7
Chironomus thummi thummi	Midge	Chi t 1.0101	Aero Insect	Chironomus Chi t 1	IgE but no biological test	151	P02229.2	121219	7
Chironomus thummi thummi	Midge	Chi t 1.0201	Aero Insect	Chironomus Chi t 1	IgE but no biological test	151	P02230.1	121227	7
Chironomus thummi thummi	Midge	Chi t 2.0101	Aero Insect	Chironomus Chi t 2	IgE but no biological test	158	P02221.2	2506460	7
Chironomus thummi thummi	Midge	Chi t 3.0601	Aero Insect	Chironomus Chi t 3	IgE but no biological test	161	P84296.1	56405052	7
Chironomus thummi thummi	Midge	Chi t 3.0901	Aero Insect	Chironomus Chi t 3	IgE but no biological test	151	P02227.1	121237	7
Chironomus thummi thummi	Midge	Chi t 3.0501	Aero Insect	Chironomus Chi t 3	IgE but no biological test	161	P12548.1	121244	7
Chironomus thummi thummi	Midge	Chi t 3.0701	Aero Insect	Chironomus Chi t 3	IgE but no biological test	161	P84298.1	56405054	7
Chironomus thummi thummi	Midge	Chi t 3.0702	Aero Insect	Chironomus Chi t 3	IgE but no biological test	161	P12549.1	121248	7
Chironomus thummi thummi	Midge	Chi t 3.0801	Aero Insect	Chironomus Chi t 3	IgE but no biological test	162	P12550.1	121249	7
Chironomus thummi thummi	Midge	Chi t 3.0301	Aero Insect	Chironomus Chi t 3	IgE but no biological test	161	P02226.2	56405306	7
Chironomus thummi thummi	Midge	Chi t 3.0101	Aero Insect	Chironomus Chi t 3	IgE but no biological test	160	P02222.2	1707908	7
Chironomus thummi thummi	Midge	Chi t 3.0401	Aero Insect	Chironomus Chi t 3	IgE but no biological test	161	P02223.2	1707911	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Chironomus thummi thummi	Midge	Chi t 3.0201	Aero Insect	Chironomus Chi t 3	IgE but no biological test	162	P02224.2	2506461	7
Chironomus thummi thummi	Midge	Chi t 4.0101	Aero Insect	Chironomus Chi t 4	IgE but no biological test	151	P02231.1	121256	7
Chironomus thummi thummi	Midge	Chi t 9.0101	Aero Insect	Chironomus Chi t 9	IgE but no biological test	151	P02228.1	121259	7
Chortoglyphus arcuatus		Unassigned	Aero Mite	Cho a 10.0101	IgE but no biological test	284	AEX31649.1	371500880	13
Citrullus lanatus		Citr l 2.0101	Food Plant	Citrullus lanatus Citr l 2	IgE plus basophil+ or SPT+	131	AAU43733.1	52352489	17
Citrus limon	Lemon	Cit l 3.0101	Food Plant	Citrus LTP Cit s 3/Cit l 3	IgE plus basophil+ or SPT+	20	P84160.1	52783176	7
Citrus sinensis	Navel orange	Cit s 1.0101	Food Plant	Citrus Cit s 1	IgE plus basophil+ or SPT+	25	P84159.1	52782810	7
Citrus sinensis	Navel orange	Cit s 2.0101	Food Plant	Citrus Cit s 2	IgE plus basophil+ or SPT+	131	CAI23765.1	56000996	7
Citrus sinensis	Navel orange	Cit s 3.0101	Food Plant	Citrus LTP Cit s 3/Cit l 3	IgE plus basophil+ or SPT+	20	P84161.1	52783177	7
Citrus sinensis	Navel orange	Cit s 3.0102	Food Plant	Citrus LTP Cit s 3/Cit l 3	IgE plus basophil+ or SPT+	91	CAH03799.1	50199132	7
Citrus sinensis	Navel orange	Cit s 7	Food Plant	Citrus sinensis Cit s 7	IgE plus basophil+ or SPT+	88	XP_006472264.1	568836465	20
Cladosporium cladosporioides	Fungus	Cla c 14.0101	Aero Fungi	Cladosporium Cla c 14	IgE but no biological test	325	ADK47394.1	301015198	15
Cladosporium cladosporioides	Fungus	Cla c 9.0101	Aero Fungi	Cladosporium Cla c 9 Davidiella	IgE but no biological test	388	ABQ59329.1	148361511	11
Clupea harengus	Atlantic herring	Clu h 1.0101	Food Animal	Clupea Clu h 1	IgE but no biological test	109	CAQ72970.1	242253963	11
Clupea harengus	Atlantic herring	Clu h 1.0201	Food Animal	Clupea Clu h 1	IgE but no biological test	110	CAQ72971.1	242253965	11
Clupea harengus	Atlantic herring	Clu h 1.0301	Food Animal	Clupea Clu h 1	IgE but no biological test	109	CAQ72972.1	242253967	11
Cochliobolus lunatus	Fungus	Cur l 2.0101	Aero Fungi	Curvularia lunata enolase Cur l 2.01 Cochliobolus	IgE but no biological test	440	AAK67491.1	14585753	8
Cochliobolus lunatus	Fungus	Cur l 3.0101	Aero Fungi	Curvularia lunatua Cur l 3 Cochliobolus	IgE plus basophil+ or SPT+	108	AAK67492.1	14585755	15
Cochliobolus lunatus	Fungus	Cur l 4.0101	Aero Fungi	Curvularia Cur l 4	IgE plus basophil+ or SPT+	506	ACF19589.1	193507493	15
Cochliobolus lunatus	Fungus	Unassigned	Aero Fungi	Curvularia lunata alcohol dehydrogenase	IgE but no biological test	352	ABC88428.1	86278351	17
Coffea arabica	Coffee	Cof a 3.0101	Food Plant	Coffea Cof a 3	IgE but no biological test	65	AGL34968.1	494319676	15
Coffea arabica	Coffee	Cof a 1.0101	Food Plant	Coffea Cof a 1	IgE but no biological test	263	ADH10372.1	296399179	15
Coffea arabica	Coffee	Cof a 2.0101	Food Plant	Coffea Cof a 2	IgE but no biological test	80	AGL34967.1	494319674	15
Coprinus comatus	Shaggy mane	Cop c 1.0101	Food Fungi	Coprinus Cop c 1	IgE but no biological test	81	CAB39376.1	4538529	7
Coptotermes formosanus		Unassigned	Food Animal	Coptotermes Copt f 7	IgE but no biological test	256	AGM32377.1	506968067	19
Corylus avellana	European hazelnut	Cor a 1.0103	Aero Plant	Corylus Cor a 1	IgE plus basophil+ or SPT+	160	CAA50325.1	22684	7
Corylus avellana	European hazelnut	Cor a 1.0104	Aero Plant	Corylus Cor a 1	IgE plus basophil+ or SPT+	160	CAA50326.1	22686	7
Corylus avellana	European hazelnut	Cor a 1.0102	Aero Plant	Corylus Cor a 1	IgE plus basophil+ or SPT+	160	CAA50328.1	22690	7
Corylus avellana	European hazelnut	Cor a 1.0201	Aero Plant	Corylus Cor a 1	IgE plus basophil+ or SPT+	160	CAA96548.1	1321731	7
Corylus avellana	European hazelnut	Cor a 1.0301	Aero Plant	Corylus Cor a 1	IgE plus basophil+ or SPT+	160	CAA96549.1	1321733	7
Corylus avellana	European hazelnut	Cor a 1.0401	Food Plant	Corylus Cor a 1	IgE plus basophil+ or SPT+	161	AAD48405.1	5726304	7
Corylus avellana	European hazelnut	Cor a 1.0402	Food Plant	Corylus Cor a 1	IgE plus basophil+ or SPT+	161	AAG40329.1	11762102	7
Corylus avellana	European hazelnut	Cor a 1.0403	Food Plant	Corylus Cor a 1	IgE plus basophil+ or SPT+	161	AAG40330.1	11762104	7
Corylus avellana	European hazelnut	Cor a 1.0404	Food Plant	Corylus Cor a 1	IgE plus basophil+ or SPT+	161	AAG40331.1	11762106	7
Corylus avellana	European hazelnut	Cor a 1.0101	Food Plant	Corylus Cor a 1	IgE plus basophil+ or SPT+	160	CAA50327.1	22688	15
Corylus avellana	European hazelnut	Cor a 11.0101	Food Plant	Corylus Cor a 11	IgE plus basophil+ or SPT+	448	AAL86739.1	19338630	7
Corylus avellana	European hazelnut	Cor a 12.0101	Food Plant	Corylus Cor a 12	IgE plus basophil+ or SPT+	159	AAO67349.2	49617323	15
Corylus avellana	European hazelnut	Cor a 13.0101	Food Plant	Corylus Cor a 13 Oleosin	IgE but no biological test	140	AAO65960.1	29170509	7
Corylus avellana	European hazelnut	Cor a 14.0101	Food Plant	Corylus Cor a 14 2S albumin	IgE plus basophil+ or SPT+	147	ACO56333.1	226437844	11
Corylus avellana	European hazelnut	Cor a 2.0101	Aero Plant	Corylus Cor a 2 profilins	IgE but no biological test	131	AAK01235.1	12659206	7
Corylus avellana	European hazelnut	Cor a 2.0102	Aero Plant	Corylus Cor a 2 profilins	IgE but no biological test	131	AAK01236.1	12659208	7
Corylus avellana	European hazelnut	Unassigned	Food Plant	Corylus Cor a 2 profilins	IgE but no biological test	131	A4KA41.1	576017879	15
Corylus avellana	European hazelnut	Unassigned	Food Plant	Corylus Cor a 2 profilins	IgE but no biological test	133	A4KA40.1	576017878	15
Corylus avellana	European hazelnut	Unassigned	Food Plant	Corylus Cor a 2 profilins	IgE but no biological test	133	A4KA44.1	576017819	15
Corylus avellana	European hazelnut	Unassigned	Food Plant	Corylus Cor a 2 profilins	IgE but no biological test	131	A4KA43.1	576017779	15
Corylus avellana	European hazelnut	Unassigned	Food Plant	Corylus Cor a 2 profilins	IgE but no biological test	133	A4KA45.1	576017777	15
Corylus avellana	European hazelnut	Unassigned	Food Plant	Corylus Cor a 2 profilins	IgE but no biological test	133	A4KA39.1	576017776	15
Corylus avellana	European hazelnut	Cor a 8.0101	Food Plant	Corylus Cor a 8	IgE but no biological test	115	AAK28533.1	13507262	7
Corylus avellana	European hazelnut	Cor 1 9.0101	Food Plant	Corylus Cor a 9	IgE plus basophil+ or SPT+	515	AAL73404.1	18479082	7
Corylus avellana	European hazelnut	Unassigned	Aero Plant	Corylus Cor a 9	IgE plus basophil+ or SPT+	514	AHA36627.1	557792009	16
Crangon crangon	Shrimp	Cra c 1.0101	Food Animal	Crangon Cra c 1 tropomyosin	IgE but no biological test	284	ACR43473.1	238477263	12
Crangon crangon	Shrimp	Cra c 2.0101	Food Animal	Crangon Cra c 2 arginine kinase	IgE but no biological test	356	ACR43474.1	238477265	12

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Crangon crangon	Shrimp	Cra c 4.0101	Food Animal	Crangon Cra c 4 sarcoplasmic calcium-binding prote	IgE but no biological test	193	ACR43475.1	238477327	12
Crangon crangon	Shrimp	Cra c 5.0101	Food Animal	Crangon Cra c 5 myosin light chain	IgE but no biological test	153	ACR43477.1	238477331	12
Crangon crangon	Shrimp	Cra c 6.0101	Food Animal	Crangon Cra c 6 troponin C	IgE but no biological test	150	ACR43478.1	238477333	12
Crangon crangon	Shrimp	Cra c 8.0101	Food Animal	Crangon Cra c 8 triosephosphate isomerase	IgE but no biological test	249	ACR43476.1	238477329	12
Crassostrea gigas	American oyster	Cra g 1.0102	Food Animal	Crassostrea Tropomyosin Cra g 1	IgE but no biological test	284	BAH10152.1	219806594	10
Crassostrea gigas	American oyster	Cra g 1.0101	Food Animal	Crassostrea Tropomyosin Cra g 1	IgE but no biological test	284	ARX70262.1	1203820203	18
Crassostrea virginica	Eastern oyster	Unassigned	Food Animal	Crassostrea Tropomyosin Cra g 1	IgE but no biological test	160	AAC61869.1	3668408	7
Crocus sativus	Saffron crocus	Cro s 1.0101	Aero Plant	Crocus Cro s 1	IgE but no biological test	168	AAX93750.1	62720370	7
Crocus sativus	Saffron crocus	Cro s 2.0101	Aero Plant	Crocus profilin Cro s 2	IgE but no biological test	131	AAW81034.1	58700651	7
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria class IV chitinase	IgE but no biological test	281	BAD77932.1	56550550	7
Cryptomeria japonica	Japanese cedar	Cry j 1.0102	Aero Plant	Cryptomeria Cry j 1	IgE but no biological test	374	BAA05543.1	493634	8
Cryptomeria japonica	Japanese cedar	Cry j 1.0101	Aero Plant	Cryptomeria Cry j 1	IgE but no biological test	374	BAA05542.1	493632	15
Cryptomeria japonica	Japanese cedar	Cry j 1.0103	Aero Plant	Cryptomeria Cry j 1	IgE but no biological test	374	BAA07020.1	516728	15
Cryptomeria japonica	Japanese cedar		Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	P43212.1	1171004	7
Cryptomeria japonica	Japanese cedar		Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAC23082.1	24898904	7
Cryptomeria japonica	Japanese cedar		Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAC23083.1	24898906	7
Cryptomeria japonica	Japanese cedar		Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAC23084.1	24898908	7
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAF32105.1	114841607	8
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAF32110.1	114841617	8
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAF32116.1	114841629	8
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAF32119.1	114841635	8
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAF32122.1	114841641	8
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAF32128.1	114841653	8
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAF32130.1	114841657	8
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAF32133.1	114841663	8
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAF32134.1	114841665	8
Cryptomeria japonica	Japanese cedar	Cry j 2.0101	Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	514	BAA06172.1	506858	9
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria Cry j 2	IgE plus basophil+ or SPT+	65	BAF45320.1	123299282	9
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria Isoflavone reductase-like protein	IgE but no biological test	306	AAK27264.1	19847822	7
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria pollen allergen CJP-8	IgE but no biological test	165	BAI94503.1	291621332	12
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria pollen allergen CPA63	IgE but no biological test	472	BAJ04354.1	293329689	12
Cryptomeria japonica	Japanese cedar	Unassigned	Aero Plant	Cryptomeria thaumatin like Cry j 3.8	IgE plus basophil+ or SPT+	225	BAF51970.1	139002766	8
Cucumis melo	Muskmelon	Cuc m 1.0101	Food Plant	Cucumis Cuc m 1	IgE but no biological test	731	BAA06905.1	807698	7
Cucumis melo	Muskmelon	Unassigned	Food Plant	Cucumis Cuc m 2	IgE plus basophil+ or SPT+	131	CAD92666.1	31559374	7
Cucumis melo	Muskmelon	Cuc m 2.0101	Food Plant	Cucumis Cuc m 2	IgE plus basophil+ or SPT+	131	AAW69549.1	58263793	7
Cucumis melo	Muskmelon	Cuc m 3.0101	Food Plant	Cucumis Cuc m 3	IgE plus basophil+ or SPT+	41	P83834.1	46396595	9
Cucumis melo var. inodorus	Muskmelon	Unassigned	Food Plant	Cucumis Cuc m 3	IgE plus basophil+ or SPT+	151	ACB45874.1	171464770	9
Cucumis melo var. reticulatus	Netted muskmelon	Unassigned	Food Plant	Cucumis Cuc m 2	IgE plus basophil+ or SPT+	131	AAP13533.2	57021110	7
Culicoides nubeculosus	Farmyyard midge	Unassigned	Venom or Salivary	Culicoides antigen 5 by similarity	IgE but no biological test	263	ACM40909.1	221768795	10
Culicoides nubeculosus	Farmyyard midge	Unassigned	Venom or Salivary	Culicoides antigen 5 by similarity	IgE but no biological test	219	ACM40888.1	221768626	10
Cupressus arizonica	Arizona Cypress	Cup a 1.0101	Aero Plant	Cupressus Cup a 1/Cup s 1	IgE plus basophil+ or SPT+	346	CAB62551.1	6562326	7
Cupressus arizonica	Arizona Cypress		Aero Plant	Cupressus Cup a 1/Cup s 1	IgE plus basophil+ or SPT+	367	CAC37790.2	19069497	7
Cupressus arizonica	Arizona Cypress	Unassigned	Aero Plant	Cupressus Cup a 1/Cup s 1	IgE plus basophil+ or SPT+	347	ABK78766.1	118197955	8
Cupressus arizonica	Arizona Cypress	Unassigned	Aero Plant	Cupressus Cup a 4	IgE but no biological test	165	ACY01951.1	261865475	11
Cupressus arizonica	Arizona Cypress	Unassigned	Aero Plant	Cupressus Cup s 3	IgE but no biological test	199	CAC05258.1	9929163	7
Cupressus sempervirens	Mediterranean Cypress	Cup s 1.0101	Aero Plant	Cupressus Cup a 1/Cup s 1	IgE plus basophil+ or SPT+	367	AAF72625.1	8101711	7
Cupressus sempervirens	Mediterranean Cypress	Cup s 1.0102	Aero Plant	Cupressus Cup a 1/Cup s 1	IgE plus basophil+ or SPT+	367	AAF72626.1	8101713	7
Cupressus sempervirens	Mediterranean Cypress	Cup s 1.0103	Aero Plant	Cupressus Cup a 1/Cup s 1	IgE plus basophil+ or SPT+	367	AAF72627.1	8101715	7
Cupressus sempervirens	Mediterranean Cypress	Cup s 1.0104	Aero Plant	Cupressus Cup a 1/Cup s 1	IgE plus basophil+ or SPT+	367	AAF72628.1	8101717	7
Cupressus sempervirens	Mediterranean Cypress	Cup s 1.0105	Aero Plant	Cupressus Cup a 1/Cup s 1	IgE plus basophil+ or SPT+	367	AAF72629.1	8101719	7
Cupressus sempervirens	Mediterranean Cypress	Cup s 3.0102	Aero Plant	Cupressus Cup s 3	IgE but no biological test	225	AAR21074.1	38456228	7
Cupressus sempervirens	Mediterranean Cypress	Cup s 3.0101	Aero Plant	Cupressus Cup s 3	IgE but no biological test	225	AAR21073.1	38456226	11
Cynodon dactylon	Bermuda grass		Aero Plant	Cynodon Cyn d 1	IgE plus basophil+ or SPT+	25	AAB28566.1	451274	7

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Cynodon dactylon	Bermuda grass		Aero Plant	Cynodon Cyn d 1	IgE plus basophil+ or SPT+	38	AAB28567.1	451275	7
Cynodon dactylon	Bermuda grass		Aero Plant	Cynodon Cyn d 1	IgE plus basophil+ or SPT+	34	AAB32317.1	691726	7
Cynodon dactylon	Bermuda grass	Cyn d 1.0204	Aero Plant	Cynodon Cyn d 1	IgE plus basophil+ or SPT+	244	AAF80379.2	10314021	7
Cynodon dactylon	Bermuda grass	Cyn d 1.0201	Aero Plant	Cynodon Cyn d 1	IgE plus basophil+ or SPT+	244	AAK96255.1	15384338	7
Cynodon dactylon	Bermuda grass	Cyn d 1.0202	Aero Plant	Cynodon Cyn d 1	IgE plus basophil+ or SPT+	262	AAL14077.1	16076693	7
Cynodon dactylon	Bermuda grass		Aero Plant	Cynodon Cyn d 1	IgE plus basophil+ or SPT+	262	AAL14078.1	16076695	7
Cynodon dactylon	Bermuda grass	Cyn d 1.0203	Aero Plant	Cynodon Cyn d 1	IgE plus basophil+ or SPT+	262	AAL14079.1	16076697	7
Cynodon dactylon	Bermuda grass	Cyn d 1.0101	Aero Plant	Cynodon Cyn d 1	IgE plus basophil+ or SPT+	246	AAB50734.2	7687901	10
Cynodon dactylon	Bermuda grass	Cyn d 12.0101	Aero Plant	Cynodon Cyn d 12	IgE but no biological test	131	CAA69670.1	2154730	7
Cynodon dactylon	Bermuda grass	Unassigned	Aero Plant	Cynodon Cyn d 7	IgE but no biological test	71	CAA01909.1	1247373	7
Cynodon dactylon	Bermuda grass	Unassigned	Aero Plant	Cynodon Cyn d 7	IgE but no biological test	73	CAA01910.1	1247375	7
Cynodon dactylon	Bermuda grass	Cyn d 7.0101	Aero Plant	Cynodon Cyn d 7	IgE but no biological test	82	CAA62634.1	1871507	7
Cynodon dactylon	Bermuda grass	Unassigned	Aero Plant	Cynodon Group 4 like-allergen FAD-linked oxidoredu	IgE but no biological test	522	AAS02108.1	41393750	7
Cyprinus carpio	Carp	Cyp c 1.0101	Food Animal	Cyprinus Cyp c 1 Parvalbumin	IgE plus basophil+ or SPT+	109	CAC83658.1	17977825	7
Cyprinus carpio	Carp	Cyp c 1.0201	Food Animal	Cyprinus Cyp c 1 Parvalbumin	IgE plus basophil+ or SPT+	109	CAC83659.1	17977827	7
Dactylis glomerata	Orchard grass		Aero Plant	Dactylis Dac g 1	IgE plus basophil+ or SPT+	264	CAD20406.1	18093991	7
Dactylis glomerata	Orchard grass	Dac g 1.0101	Aero Plant	Dactylis Dac g 1	IgE plus basophil+ or SPT+	240	AAP96759.1	33149333	7
Dactylis glomerata	Orchard grass	Dac g 2.0101	Aero Plant	Dactylis Dac g 2	IgE but no biological test	196	2103117A	1093120	7
Dactylis glomerata	Orchard grass		Aero Plant	Dactylis Dac g 2	IgE but no biological test	122	CAA10345.1	4007040	7
Dactylis glomerata	Orchard grass	Dac g 3.0101	Aero Plant	Dactylis Dac g 3	IgE but no biological test	96	AAB42200.1	1825459	7
Dactylis glomerata	Orchard grass	Dac g 4.0101	Aero Plant	Dactylis Dac g 4	IgE but no biological test	55	P82946.1	32363463	9
Dactylis glomerata	Orchard grass		Aero Plant	Dactylis Dac g 5	IgE but no biological test	290	AAK62278.1	14423124	7
Dactylis glomerata	Orchard grass		Aero Plant	Dactylis Dac g 5	IgE but no biological test	265	CAD20405.1	18093971	7
Daucus carota	Carrot	Unassigned	Food Plant	Daucus cyclophilin	IgE but no biological test	171	AEY79726.1	373939374	13
Daucus carota	Carrot	Dau c 1.0101	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	168	AAB01092.1	1335877	7
Daucus carota	Carrot	Dau c 1.0102	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	BAA13604.1	1663522	7
Daucus carota	Carrot	Dau c 1.0103	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	CAB03715.1	2154732	7
Daucus carota	Carrot	Dau c 1.0104	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	CAB03716.1	2154734	7
Daucus carota	Carrot	Dau c 1.0105	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	CAB06416.1	2154736	7
Daucus carota	Carrot	Dau c 1.0201	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	AAL76932.1	18652047	7
Daucus carota	Carrot	Unassigned	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	BAB88129.1	19912791	7
Daucus carota	Carrot	Dau c 1.0301	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	ADL32660.1	302379147	12
Daucus carota	Carrot	Unassigned	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	ADL32661.1	302379149	12
Daucus carota	Carrot	Unassigned	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	ADL32662.1	302379151	12
Daucus carota	Carrot	Unassigned	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	ADL32663.1	302379153	12
Daucus carota	Carrot	Unassigned	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	ADL32664.1	302379155	12
Daucus carota	Carrot	Unassigned	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	ADL32665.1	302379157	12
Daucus carota	Carrot	Unassigned	Food Plant	Daucus Dau c 1	IgE plus basophil+ or SPT+	154	ADL32666.1	302379159	12
Daucus carota	Carrot	Dau c 4.0101	Food Plant	Daucus Dau c 4	IgE plus basophil+ or SPT+	134	AAL76933.1	18652049	7
Daucus carota	Carrot	Dau c 5.0101	Food Plant	Daucus Dau c 5 isoflavone reductase	IgE but no biological test	306	AEY79728.1	373939378	13
Daucus carota	Carrot	Unassigned	Food Plant	Daucus Dau c 5 isoflavone reductase	IgE but no biological test	306	AEY79727.1	373939376	13
Davidiella tassiana	Fungus	Cla h 10.0101	Aero Fungi	Cladosporium / Davidiella Cla h 10	IgE but no biological test	496	CAA55072.2	76666769	7
Davidiella tassiana	Fungus	Cla h 5.0101	Aero Fungi	Cladosporium / Davidiella Cla h 5	IgE but no biological test	111	CAA55067.2	5777795	10
Davidiella tassiana	Fungus	Cla h 6.0101	Aero Fungi	Cladosporium / Davidiella Cla h 6	IgE but no biological test	440	CAA55070.1	467660	7
Davidiella tassiana	Fungus		Aero Fungi	Cladosporium / Davidiella Cla h 6	IgE but no biological test	440	P42040.2	6015094	7
Davidiella tassiana	Fungus	Cla h 7.0101	Aero Fungi	Cladosporium / Davidiella Cla h 7	IgE but no biological test	204	CAA55068.1	467629	10
Davidiella tassiana	Fungus	Cla h 8.0101	Aero Fungi	Cladosporium / Davidiella Cla h 8	IgE plus basophil+ or SPT+	267	AAO91801.1	37780015	8
Davidiella tassiana	Fungus	Cla h 9.0101	Aero Fungi	Cladosporium / Davidiella Cla h 9 vacuolar serine	IgE but no biological test	518	AAX14379.1	60116876	10
Davidiella tassiana	Fungus	Unassigned	Aero Fungi	Cladosporium / Davidiella Heat shock 70 kDa protei	IgE but no biological test	643	P40918.1	729764	7
Davidiella tassiana	Fungus	Unassigned	Aero Fungi	Cladosporium / Davidiella Hydrophobin	IgE plus basophil+ or SPT+	105	CAD42710.1	22796153	7
Davidiella tassiana	Fungus	Unassigned	Aero Fungi	Cladosporium / Davidiella putative hydrolase	IgE but no biological test	274	ABA42918.1	76446100	10
Davidiella tassiana	Fungus	Unassigned	Aero Fungi	Cladosporium / Davidiella Putative nuclear transpo	IgE plus basophil+ or SPT+	125	CAD38166.1	21748151	7
Davidiella tassiana	Fungus	Unassigned	Aero Fungi	Cladosporium Davidiella TCTP	IgE but no biological test	169	A1KXP4.1	1679357707	20

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Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Der f 36 from Proteome	IgE but no biological test	229	ATI08931.1	1250175279	18
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Der f alpha actinin	IgE plus basophil+ or SPT+	885	L7UZ85.1	1160577980	18
Dermatophagoides farinae	House dust mite	Der f 13.0101	Aero Mite	Dermatophagoides Der f 13	IgE plus basophil+ or SPT+	131	AAP35078.1	37958167	11
Dermatophagoides farinae	House dust mite	Der f 15.0101	Aero Mite	Dermatophagoides Der f 15 Der p 15	IgE but no biological test	555	AAD52672.1	5815436	7
Dermatophagoides farinae	House dust mite	Der f 16.0101	Aero Mite	Dermatophagoides Der f 16	IgE but no biological test	480	AAM64112.1	21591547	7
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 20 / Der p 20	IgE but no biological test	356	AAP57094.1	37785884	8
Dermatophagoides farinae	House dust mite	Der f 20.0201	Aero Mite	Dermatophagoides Der f 20 / Der p 20	IgE but no biological test	356	ABU97470.1	156938897	9
Dermatophagoides farinae	House dust mite	Der f 20.0101	Aero Mite	Dermatophagoides Der f 20 / Der p 20	IgE but no biological test	356	AIO08850.1	685432792	15
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 23 like	IgE plus basophil+ or SPT+	174	ALU66112.1	970836006	17
Dermatophagoides farinae	House dust mite	Der f 24.0101	Aero Mite	Dermatophagoides Der f 24 and Der p 24 Ubiquinol	IgE but no biological test	118	AGI78542.1	477541860	14
Dermatophagoides farinae	House dust mite	Der f 25.0101	Aero Mite	Dermatophagoides Der f 25	IgE but no biological test	247	AGC56216.1	442565872	14
Dermatophagoides farinae	House dust mite	Der f 25.0201	Aero Mite	Dermatophagoides Der f 25	IgE but no biological test	247	AIO08860.1	685432812	15
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 27	IgE plus basophil+ or SPT+	427	AAP35082.1	37958175	8
Dermatophagoides farinae	House dust mite	Der p 1.0102	Aero Mite	Dermatophagoides Der f 27	IgE plus basophil+ or SPT+	427	AIO08851.1	685432794	15
Dermatophagoides farinae	House dust mite	Der f 28.0101	Aero Mite	Dermatophagoides Der f 28	IgE but no biological test	659	AGC56218.1	442565876	14
Dermatophagoides farinae	House dust mite	Der f 28.0201	Aero Mite	Dermatophagoides Der f 28	IgE but no biological test	654	AIO08848.1	685432788	15
Dermatophagoides farinae	House dust mite	Der f 29.0101	Aero Mite	Dermatophagoides Der f 29	IgE plus basophil+ or SPT+	164	AAP35065.1	37958141	8
Dermatophagoides farinae	House dust mite	Der f 30.0101	Aero Mite	Dermatophagoides Der f 30	IgE plus basophil+ or SPT+	171	AGC56219.1	442565878	14
Dermatophagoides farinae	House dust mite	Der f 31.0101	Aero Mite	Dermatophagoides Der f 31	IgE plus basophil+ or SPT+	148	AIO08870.1	685432832	15
Dermatophagoides farinae	House dust mite	Der f 33.0101	Aero Mite	Dermatophagoides Der f 33	IgE but no biological test	461	AIO08861.1	685432814	15
Dermatophagoides farinae	House dust mite	Der f 35.0101	Aero Mite	Dermatophagoides Der f 35	IgE but no biological test	143	BAX34757.1	1187443130	18
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 5-like	IgE but no biological test	132	BAE45865.1	76880188	7
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 5-like	IgE but no biological test	132	AAP35068.1	37958147	8
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 5-like	IgE but no biological test	132	ABO84970.1	140089345	9
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 5-like	IgE but no biological test	132	ABO84971.1	140089347	9
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 5-like	IgE but no biological test	132	ABO84972.1	140089349	9
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 5-like	IgE but no biological test	132	ABO84973.1	140089351	9
Dermatophagoides farinae	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	321	P16311.2	730035	7
Dermatophagoides farinae	House dust mite	Der f 1.0101	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	321	BAC53948.1	27530349	7
Dermatophagoides farinae	House dust mite	Der f 1.0102	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	276	ABA39436.1	76097507	7
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	321	ABU49605.1	156106765	9
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	263	AAP35075.1	37958161	12
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	305	AFJ68066.1	387178006	13
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	303	ADM52184.1	305387429	15
Dermatophagoides farinae	House dust mite	Der f 1.0108	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	321	ABL84749.1	119633260	15
Dermatophagoides farinae	House dust mite	Der f 1.0109	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	321	ABL84750.1	119633262	15
Dermatophagoides farinae	House dust mite	Der f 1.0110	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	321	ABL84751.1	119633264	15
Dermatophagoides farinae	House dust mite	Der f 10.0101	Aero Mite	Dermatophagoides Der p 10 / Der f 10	IgE plus basophil+ or SPT+	299	BAA04557.1	1359436	7
Dermatophagoides farinae	House dust mite	Der f 11.0101	Aero Mite	Dermatophagoides Der p 11 / Der f 11	IgE plus basophil+ or SPT+	692	AAK39511.1	13785807	7
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 11 / Der f 11	IgE plus basophil+ or SPT+	876	AIO08864.1	685432820	16
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 14 / Der f 14	IgE but no biological test	341	P39673.1	729979	7
Dermatophagoides farinae	House dust mite	Der f 14.0101	Aero Mite	Dermatophagoides Der p 14 / Der f 14	IgE but no biological test	349	BAA04558.1	1545803	7
Dermatophagoides farinae	House dust mite	Der f 2.0102	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	146	BAA01240.1	217306	7
Dermatophagoides farinae	House dust mite	Der f 2.0103	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	138	BAA01241.1	217308	7
Dermatophagoides farinae	House dust mite	Der f 2.0105	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	AAL47677.1	17978844	7
Dermatophagoides farinae	House dust mite	Der f 2.0108	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	146	CAI05850.1	55859470	7
Dermatophagoides farinae	House dust mite	Der f 2.0107	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	146	CAI05849.1	55859468	7
Dermatophagoides farinae	House dust mite	Der f 2.0106	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	146	CAI05848.1	55859466	7
Dermatophagoides farinae	House dust mite	Der f 2.0109	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	ABA39438.1	76097511	7
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	146	BAD74060.2	256631558	11
Dermatophagoides farinae	House dust mite	Der f 2.0112	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	140	AAP35073.1	37958157	12
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	AFJ68072.1	387178018	13
Dermatophagoides farinae	House dust mite	Der f 2.0101	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	138	BAA01239.1	217304	15
Dermatophagoides farinae	House dust mite	Der f 2.0116	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	146	ABN14313.1	124696217	15
Dermatophagoides farinae	House dust mite		Aero Mite	Dermatophagoides Der p 3 / Der f 3	IgE but no biological test	232	AAA99805.1	1314736	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 3 / Der f 3	IgE but no biological test	259	ABY28115.1	163638970	9
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 3 / Der f 3	IgE but no biological test	259	ACK76291.1	218203816	10
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 3 / Der f 3	IgE but no biological test	259	ACK76292.1	218203818	10
Dermatophagoides farinae	House dust mite	Der f 3.0101	Aero Mite	Dermatophagoides Der p 3 / Der f 3	IgE but no biological test	259	BAA09920.1	1311457	15
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 6 / Der f 6	IgE but no biological test	20	AAB27594.1	404371	7
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 6 / Der f 6	IgE but no biological test	279	ACK76296.1	218203826	10
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 6 / Der f 6	IgE but no biological test	279	ACK76297.1	218203828	10
Dermatophagoides farinae	House dust mite	Der f 6.0101	Aero Mite	Dermatophagoides Der p 6 / Der f 6	IgE but no biological test	279	AAF28423.1	6808530	11
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 7 / Der f 7	IgE plus basophil+ or SPT+	213	AAP35077.1	37958165	8
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 7 / Der f 7	IgE plus basophil+ or SPT+	213	ACK76299.1	218203832	10
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 7 / Der f 7	IgE plus basophil+ or SPT+	213	AIO08853.1	685432798	16
Dermatophagoides farinae	House dust mite	Der f 18.0101	Aero Mite	Dermatophagoides farinae Der f 18 Der p 18	IgE but no biological test	462	AAM19082.1	27550039	7
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	136	ABO84963.1	140089314	9
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	136	ABO84964.1	140089316	9
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	136	ABO84966.1	140089320	9
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	136	ABO84967.1	140089322	9
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	136	ABO84968.1	140089324	9
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	136	ABO84969.1	140089326	9
Dermatophagoides farinae	House dust mite	Der f 21.0101	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	136	AHC94806.1	567768173	15
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	118	5YNX_A	1595430102	20
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	118	5YNX_B	1595430103	20
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	128	5YNY_A	1595430105	20
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	128	5YNY_B	1595430106	20
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	128	5YNY_C	1595430107	20
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 21 Chew	IgE but no biological test	128	5YNY_D	1595430108	20
Dermatophagoides farinae	House dust mite	Der f 34.0101	Aero Mite	Dermatophagoides farinae Der f 34	IgE but no biological test	128	BAV90601.1	1098871171	17
Dermatophagoides farinae	House dust mite	Der f 4.0101	Aero Mite	Dermatophagoides farinae Der f 4	IgE but no biological test	525	AHX03180.1	612487835	15
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 4	IgE but no biological test	525	AIP86946.1	685848330	16
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 4	IgE but no biological test	525	AIP86945.1	685848328	16
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 4	IgE but no biological test	525	AIP86944.1	685848326	16
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 4	IgE but no biological test	525	AIP86943.1	685848324	16
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 4	IgE but no biological test	525	AIP86942.1	685848322	16
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 4	IgE but no biological test	525	AIP86941.1	685848320	16
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 4	IgE but no biological test	525	AIP86940.1	685848318	16
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 4	IgE but no biological test	525	AIP86939.1	685848316	16
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Der f 4	IgE but no biological test	525	AJF93907.1	751425403	16
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Pseudo-Der f 8	IgE but no biological test	219	AAP35080.1	37958171	12
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides farinae Pseudo-Der f 8	IgE but no biological test	221	AIO08867.1	685432826	16
Dermatophagoides farinae	House dust mite	Unassigned	Aero Mite	Dermatophagoides Profilin	IgE but no biological test	130	AIO08866.1	685432824	16
Dermatophagoides microceras	House dust mite	Der m 1.0101	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	30	P16312.1	127205	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Der p 36	IgE but no biological test	227	ATI08932.1	1250175281	18
Dermatophagoides pteronyssinus	House dust mite	Der p 15.0101	Aero Mite	Dermatophagoides Der f 15 Der p 15	IgE but no biological test	532	AAY84565.1	67975089	7
Dermatophagoides pteronyssinus	House dust mite	Der p 15.0102	Aero Mite	Dermatophagoides Der f 15 Der p 15	IgE but no biological test	558	AAY84564.2	78128018	7
Dermatophagoides pteronyssinus	House dust mite	Der p 20.0101	Aero Mite	Dermatophagoides Der f 20 / Der p 20	IgE but no biological test	356	ACD50950.1	188485735	10
Dermatophagoides pteronyssinus	House dust mite	Der p 24.0101	Aero Mite	Dermatophagoides Der f 24 and Der p 24 Ubiquinol	IgE but no biological test	118	ALA65345.1	922664427	16
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 30	IgE plus basophil+ or SPT+	180	AAG02250.1	15072346	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 33	IgE but no biological test	460	AUX14773.1	1338184716	19
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der f 35	IgE but no biological test	143	ATI08948.1	1250329008	19

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	CAD38361.1	21725560	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	CAD38362.1	21725562	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	CAD38363.1	21725564	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	CAD38364.1	21725566	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	CAD38365.1	21725568	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	CAD38366.1	21725570	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	CAD38367.1	21725572	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	CAD38368.1	21725574	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	CAD38369.1	21725576	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	CAD38370.1	21725578	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	CAD38371.1	21725580	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	216	AAX47076.1	61608445	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	2AS8_B	83754033	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	223	ABV66255.1	157696052	9
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	222	3F5V_B	223365887	10
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	320	ACG58378.1	195933901	10
Dermatophagoides pteronyssinus	House dust mite	Der p 1.0124	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	302	CAQ68250.1	256095986	11
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	96	AAA28296.1	387592	11
Dermatophagoides pteronyssinus	House dust mite	Der p 1.0101	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	320	AAB60215.1	511953	12
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	304	AFJ68065.1	387178004	13
Dermatophagoides pteronyssinus	House dust mite	Der p 1.0113	Aero Mite	Dermatophagoides Der p 1 Der f 1 Der m 1	IgE plus basophil+ or SPT+	302	ABA39435.1	76097505	15
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 10 / Der f 10	IgE plus basophil+ or SPT+	284	AAB69424.1	2353266	7
Dermatophagoides pteronyssinus	House dust mite	Der p 10.0101	Aero Mite	Dermatophagoides Der p 10 / Der f 10	IgE plus basophil+ or SPT+	284	CAA75141.1	2440053	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 10 / Der f 10	IgE plus basophil+ or SPT+	281	ABB52642.1	80553470	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 10 / Der f 10	IgE plus basophil+ or SPT+	284	ACI32128.1	208970286	10
Dermatophagoides pteronyssinus	House dust mite	Der p 11.0101	Aero Mite	Dermatophagoides Der p 11 / Der f 11	IgE plus basophil+ or SPT+	875	AAO73464.1	37778944	7
Dermatophagoides pteronyssinus	House dust mite	Der p 13.0101	Aero Mite	Dermatophagoides Der p 13	IgE but no biological test	131	ADK92390.1	302035350	12
Dermatophagoides pteronyssinus	House dust mite	Der p 14.0101	Aero Mite	Dermatophagoides Der p 14 / Der f 14	IgE but no biological test	1662	AAM21322.1	20385544	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	1KTJ_A	21465915	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAD38372.1	21725582	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAD38373.1	21725584	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAD38374.1	21725586	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAD38375.1	21725588	7

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Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAD38376.1	21725590	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAD38377.1	21725592	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAD38378.1	21725594	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAD38379.1	21725596	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAD38381.1	21725600	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAD38382.1	21725602	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAD38383.1	21725604	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	ABA39437.1	76097509	7
Dermatophagoides pteronyssinus	House dust mite	Der p 2.0114	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	146	CAK22338.1	99644635	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	130	ABG76196.1	110560872	9
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	1A9V_A	157829757	9
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	145	ABY53034.1	164415595	9
Dermatophagoides pteronyssinus	House dust mite	Der p 2.0101	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	145	AAF86462.1	9280543	10
Dermatophagoides pteronyssinus	House dust mite	Der p 2.0110	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	CAQ68249.1	256095984	11
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	AFJ68070.1	387178014	13
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	129	AFJ68067.1	387178008	13
Dermatophagoides pteronyssinus	House dust mite	Der p 21.0101	Aero Mite	Dermatophagoides Der p 21	IgE plus basophil+ or SPT+	140	ABC73706.1	85687540	7
Dermatophagoides pteronyssinus	House dust mite	Der p 23.0101	Aero Mite	Dermatophagoides Der p 23 Peritrophin-like protein	IgE plus basophil+ or SPT+	90	ACB46292.1	171466145	14
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 23 Peritrophin-like protein	IgE plus basophil+ or SPT+	50	4ZCE_A	955264737	17
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 23 Peritrophin-like protein	IgE plus basophil+ or SPT+	99	ALA22869.1	920684621	17
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 23 Peritrophin-like protein	IgE plus basophil+ or SPT+	98	ALA22868.1	920684619	17
Dermatophagoides pteronyssinus	House dust mite	Der p 3.0101	Aero Mite	Dermatophagoides Der p 3 / Der f 3	IgE but no biological test	261	AAA19973.1	511476	7
Dermatophagoides pteronyssinus	House dust mite	Der p 4.0101	Aero Mite	Dermatophagoides Der p 4	IgE but no biological test	496	AAD38942.1	5059162	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 4	IgE but no biological test	19	P49274.1	1351935	7
Dermatophagoides pteronyssinus	House dust mite	Der p 5.0102	Aero Mite	Dermatophagoides Der p 5	IgE plus basophil+ or SPT+	132	AAB32842.1	913285	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 5	IgE plus basophil+ or SPT+	132	CAD69036.1	28798085	7
Dermatophagoides pteronyssinus	House dust mite	Der p 5.0101	Aero Mite	Dermatophagoides Der p 5	IgE plus basophil+ or SPT+	148	CAA35692.1	9072	15
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 6 / Der f 6	IgE but no biological test	20	P49277.1	1352239	7
Dermatophagoides pteronyssinus	House dust mite	Der p 7.0101	Aero Mite	Dermatophagoides Der p 7 / Der f 7	IgE plus basophil+ or SPT+	215	AAA80264.1	1045602	7
Dermatophagoides pteronyssinus	House dust mite		Aero Mite	Dermatophagoides Der p 7 / Der f 7	IgE plus basophil+ or SPT+	215	CAC09234.1	10189811	7
Dermatophagoides pteronyssinus	House dust mite	Der f 7.0101	Aero Mite	Dermatophagoides Der p 7 / Der f 7	IgE plus basophil+ or SPT+	213	AAB35977.1	1311689	10
Dermatophagoides pteronyssinus	House dust mite	Der p 8.0101	Aero Mite	Dermatophagoides Der p 8	IgE but no biological test	219	AAB32224.1	807138	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 8	IgE but no biological test	219	AAX37326.1	60920878	7

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Dermatophagoides pteronyssinus	House dust mite	Der p 18.0101	Aero Mite	Dermatophagoides farinae Der f 18 Der p 18	IgE but no biological test	462	AAY84563.1	67975085	7
Dermatophagoides pteronyssinus	House dust mite	Unassigned	Aero Mite	Dermatophagoides Profilin	IgE but no biological test	130	AUX14776.1	1338184722	19
Dermatophagoides siboney	House dust mite	Unassigned	Aero Mite	Dermatophagoides Der p 2 / Der f 2	IgE plus basophil+ or SPT+	146	ABC96702.1	86450747	7
Dolichovespula arenaria	Yellow jacket		Venom or Salivary	Dolichovespula Venom allergen 5	IgE plus basophil+ or SPT+	203	AAA28303.1	156719	11
Dolichovespula maculata	Whiteface hornet	Dol m 1.02	Venom or Salivary	Dolichovespula Dol m 1 Phospholipase A1B	IgE plus basophil+ or SPT+	303	P53357.1	1709542	7
Dolichovespula maculata	Whiteface hornet	Dol m 1.0101	Venom or Salivary	Dolichovespula Dol m 1 Phospholipase A1B	IgE plus basophil+ or SPT+	317	CAA47341.1	288917	8
Dolichovespula maculata	Whiteface hornet	Dol m 2.0101	Venom or Salivary	Dolichovespula Dol m 2 Hyaluronidase	IgE plus basophil+ or SPT+	331	AAA68279.1	511604	11
Dolichovespula maculata	Whiteface hornet	Dol m 5.0101	Venom or Salivary	Dolichovespula Venom allergen 5	IgE plus basophil+ or SPT+	227	AAA28301.1	156715	11
Dolichovespula maculata	Whiteface hornet	Dol m 5.02	Venom or Salivary	Dolichovespula Venom allergen 5	IgE plus basophil+ or SPT+	212	AAA28302.1	552080	11
Epicoccum nigrum	Fungus	Epi p 1.0101	Aero Fungi	Epicoccum Epi p 1	IgE plus basophil+ or SPT+	18	P83340.1	24636820	9
Equus asinus		Equ a 6	Food Animal	Equus asinus / caballas Equ a 6 Equ c 6 lysozyme	IgE plus basophil+ or SPT+	148	XP_014705584.1	958727973	18
Equus caballus	Horse	Equ c 6	Food Animal	Equus asinus / caballas Equ a 6 Equ c 6 lysozyme	IgE plus basophil+ or SPT+	129	P11376.1	126614	18
Equus caballus	Horse	Equ c 1.0101	Aero Animal	Equus Equ c 1	IgE but no biological test	187	AAC48691.1	1575778	11
Equus caballus	Horse	Equ c 2.0101	Aero Animal	Equus Equ c 2	IgE but no biological test	29	P81216.1	3121755	7
Equus caballus	Horse	Equ c 2.0102	Aero Animal	Equus Equ c 2	IgE but no biological test	19	P81217.1	3121756	7
Equus caballus	Horse	Unassigned	Aero Animal	Equus Equ c 2	IgE but no biological test	174	AYL64456.1	1492010380	20
Equus caballus	Horse	Equ c 3.0101	Aero Animal	Equus Equ c 3	IgE plus basophil+ or SPT+	607	CAA52194.1	399672	7
Equus caballus	Horse	Equ c 4.0101	Aero Animal	Equus Equ c 4 and Equ c 5	IgE but no biological test	228	AAM09530.3	126514234	8
Erimacrus isenbeckii	Horsehair crab	Unassigned	Food Animal	Erimacrus tropomyosin	IgE but no biological test	284	BAF47268.1	125995169	8
Erimacrus isenbeckii	Horsehair crab	Unassigned	Food Animal	Erimacrus tropomyosin	IgE but no biological test	284	BAF47269.1	125995171	8
Eriocheir sinensis	Chinese mitten crab	Eri s 2.0101	Food Animal	Eriocheir sinensis Eri s 2	IgE plus basophil+ or SPT+	252	AAO73305.1	37778438	16
Eriocheir sinensis	Chinese mitten crab	Unassigned	Food Animal	Eriocheir tropomyosin	IgE but no biological test	284	ABO71783.1	134305330	8
Euphausia pacifica	North Pacific Krill	Unassigned	Food Animal	Euphausia	IgE plus basophil+ or SPT+	284	BAF76431.1	156712754	9
Euphausia superba	Krill	Unassigned	Food Animal	Euphausia	IgE plus basophil+ or SPT+	284	BAF76430.1	156712752	9
Euroglyphus maynei	House dust mite	Eur m 1.0101	Aero Mite	Euroglyphus Eur m 1	IgE but no biological test	321	AAC82351.1	3941388	7
Euroglyphus maynei	House dust mite	Unassigned	Aero Mite	Euroglyphus Eur m 1	IgE but no biological test	327	AAC82352.1	3941390	7
Euroglyphus maynei	House dust mite	Eur m 2.0102	Aero Mite	Euroglyphus Eur m 2	IgE but no biological test	135	AAC82350.1	3941386	7
Euroglyphus maynei	House dust mite	Eur m 2.0101	Aero Mite	Euroglyphus Eur m 2	IgE but no biological test	145	AAC82349.1	3941384	11
Evynnis japonica	Crimson seabream	Unassigned	Food Animal	Evynnis parvalbumin	IgE but no biological test	109	BAK09233.1	327342663	12
Evynnis japonica	Crimson seabream	Unassigned	Food Animal	Evynnis parvalbumin	IgE but no biological test	108	BAK09232.1	327342661	12
Fagopyrum esculentum	Buckwheat	Unassigned	Food Plant	Fagopyrum BW 8 kDa protein	IgE but no biological test	133	BAB79444.1	17907758	7
Fagopyrum esculentum	Buckwheat	Unassigned	Food Plant	Fagopyrum esculentum 13S globulins IgE binding	IgE but no biological test	453	BAO50872.1	584592120	15
Fagopyrum esculentum	Buckwheat	Unassigned	Food Plant	Fagopyrum esculentum 13S globulins IgE binding	IgE but no biological test	453	BAO50870.1	584592116	15
Fagopyrum esculentum	Buckwheat	Unassigned	Food Plant	Fagopyrum Fag e 2 Fag t 2	IgE but no biological test	127	AAX57578.1	61970231	7
Fagopyrum esculentum	Buckwheat	Fag e 2.0101	Food Plant	Fagopyrum Fag e 2 Fag t 2	IgE but no biological test	149	ABC18306.1	83416591	7
Fagopyrum esculentum	Buckwheat	Unassigned	Food Plant	Fagopyrum Legumin-like protein	IgE but no biological test	565	O23878.1	29839254	9
Fagopyrum esculentum	Buckwheat	Unassigned	Food Plant	Fagopyrum Legumin-like protein	IgE but no biological test	504	O23880.1	29839255	9
Fagopyrum esculentum	Buckwheat	Unassigned	Food Plant	Fagopyrum Legumin-like protein	IgE but no biological test	538	Q9XFM4.1	29839419	9
Fagopyrum esculentum	Buckwheat	Fag e 3.0101	Food Plant	Fagopyrum vicilin-like Fag e 3	IgE but no biological test	136	ABQ10638.1	146217148	9
Fagopyrum esculentum	Buckwheat	Unassigned	Food Plant	Fagopyrum vicilin-like Fag e 3	IgE but no biological test	136	BAT21117.1	939106201	17
Fagopyrum tataricum	Buckwheat	Unassigned	Food Plant	Fagopyrum BW 8 kDa protein	IgE but no biological test	133	ABO93594.1	144228127	8
Fagopyrum tataricum	Buckwheat	Fag t 2.0101	Food Plant	Fagopyrum Fag e 2 Fag t 2	IgE but no biological test	149	ADW27428.1	320445237	12
Fagopyrum tataricum	Buckwheat	Unassigned	Food Plant	Fagopyrum Legumin-like protein	IgE but no biological test	515	ABI32184.1	113200131	9
Fagus sylvatica	European Beech	Unassigned	Aero Plant	Fagus Fag s 1	IgE plus basophil+ or SPT+	160	ACJ23865.1	212291472	10
Fagus sylvatica	European Beech	Fag s 1.0101	Aero Plant	Fagus Fag s 1	IgE plus basophil+ or SPT+	160	ACJ23864.1	212291470	10
Fagus sylvatica	European Beech	Unassigned	Aero Plant	Fagus Fag s 1	IgE plus basophil+ or SPT+	160	ACJ23866.1	212291474	10
Farfantepenaeus aztecus	Brown shrimp	Pen a 1.0101	Food Animal	Farfantepenaeus Pen a 1	IgE plus basophil+ or SPT+	284	AAZ76743.1	73532979	7
Felis catus	Cat		Aero Animal	Felis Fel d 1 Chain 1	IgE plus basophil+ or SPT+	88	CAA44343.1	1364212	7
Felis catus	Cat		Aero Animal	Felis Fel d 1 Chain 1	IgE plus basophil+ or SPT+	92	CAA44344.1	1364213	7
Felis catus	Cat		Aero Animal	Felis Fel d 1 Chain 1	IgE plus basophil+ or SPT+	92	P30438.2	1169665	7
Felis catus	Cat	Fel d 1.0101	Aero Animal	Felis Fel d 1 Chain 1	IgE plus basophil+ or SPT+	92	AAC37318.1	163825	7

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Felis catus	Cat	Unassigned	Aero Animal	Felis Fel d 1 Chain 1	IgE plus basophil+ or SPT+	88	NP_001041618.1	114326420	8
Felis catus	Cat	Unassigned	Aero Animal	Felis Fel d 1 chain 2	IgE plus basophil+ or SPT+	107	CAA44345.1	395407	8
Felis catus	Cat	Fel d 1.0101	Aero Animal	Felis Fel d 1 chain 2	IgE plus basophil+ or SPT+	109	AAC41616.1	163823	12
Felis catus	Cat	Fel d 2.0101	Aero Animal	Felis Fel d 2	IgE but no biological test	608	CAA59279.1	886485	7
Felis catus	Cat	Fel d 3.0101	Aero Animal	Felis Fel d 3	IgE but no biological test	98	AAL49391.1	17939981	7
Felis catus	Cat	Fel d 4.0101	Aero Animal	Felis Fel d 4	IgE but no biological test	186	AAS77253.1	45775300	7
Felis catus	Cat	Fel d 7.0101	Aero Animal	Felis Fel d 7	IgE but no biological test	180	ADK56160.1	301072397	12
Felis catus	Cat	Fel d 8.0101	Aero Animal	Felis Fel d 8 latherin-like	IgE but no biological test	228	ADM15668.1	303387468	12
Fenneropenaeus chinensis	Chinese white shrimp	Unassigned	Food Animal	Fenneropenaeus Arginine kinase	IgE but no biological test	53	AAS98889.1	46486948	9
Fenneropenaeus chinensis	Chinese white shrimp	Unassigned	Food Animal	Fenneropenaeus Arginine kinase	IgE but no biological test	53	AAS98890.1	46486951	9
Fenneropenaeus chinensis	Chinese white shrimp	Unassigned	Food Animal	Penaeus chinensis allergen	IgE plus basophil+ or SPT+	365	QBO59887.1	1595306268	20
Fenneropenaeus merguiensis	Banana Prawn	Unassigned	Food Animal	Fenneropenaeus hemocyanin banana shrimp	IgE but no biological test	661	AGT20779.1	530340505	15
Fenneropenaeus merguiensis	Banana Prawn	Unassigned	Food Animal	Fenneropenaeus enolase	IgE but no biological test	117	AEM89226.1	344049993	15
Forcipomyia taiwana	biting midges	For t 1.0101	Venom or Salivary	Forcipomyia For t 1	IgE but no biological test	118	ACD65080.1	188572341	10
Forcipomyia taiwana	biting midges	For t 1.0101	Venom or Salivary	Forcipomyia For t 2	IgE but no biological test	325	ACD65081.1	188572343	10
Fragaria x ananassa	Strawberry		Food Plant	Fragaria Fra a 1	IgE plus basophil+ or SPT+	160	CAJ85646.1	90185692	7
Fragaria x ananassa	Strawberry		Food Plant	Fragaria Fra a 1	IgE plus basophil+ or SPT+	159	CAJ85644.1	90185688	7
Fragaria x ananassa	Strawberry	Fra a 1	Food Plant	Fragaria Fra a 1	IgE plus basophil+ or SPT+	160	CAJ85642.1	90185684	7
Fragaria x ananassa	Strawberry		Food Plant	Fragaria Fra a 1	IgE plus basophil+ or SPT+	160	CAJ85641.1	90185682	7
Fragaria x ananassa	Strawberry	Fra a 1.0102	Food Plant	Fragaria Fra a 1	IgE plus basophil+ or SPT+	160	ABD39049.1	88082485	7
Fragaria x ananassa	Strawberry	Unassigned	Food Plant	Fragaria Fra a 1	IgE plus basophil+ or SPT+	160	ACX47057.1	260600660	11
Fragaria x ananassa	Strawberry	Unassigned	Food Plant	Fragaria Fra a 1	IgE plus basophil+ or SPT+	159	ACX47058.1	260600662	11
Fragaria x ananassa	Strawberry	Unassigned	Food Plant	Fragaria Fra a 1	IgE plus basophil+ or SPT+	160	BBE27860.1	1394298081	19
Fragaria x ananassa	Strawberry	Fra a 3.0101	Food Plant	Fragaria Fra a 3	IgE plus basophil+ or SPT+	117	CAC86258.1	18477856	15
Fragaria x ananassa	Strawberry	Fra a 3.0102	Food Plant	Fragaria Fra a 3	IgE plus basophil+ or SPT+	117	AAY83342.1	67937767	15
Fragaria x ananassa	Strawberry	Fra a 3.0201	Food Plant	Fragaria Fra a 3	IgE plus basophil+ or SPT+	117	AAY83341.1	67937765	15
Fragaria x ananassa	Strawberry	Fra a 3.0202	Food Plant	Fragaria Fra a 3	IgE plus basophil+ or SPT+	117	AAY83345.1	67937773	15
Fraxinus excelsior	European ash	Unassigned	Aero Plant	Fraxinus excelsior polcalcinnot WHO IUIS	IgE but no biological test	84	AHL24661.1	589912891	15
Fraxinus excelsior	European ash	Unassigned	Aero Plant	Fraxinus excelsior profilin not in WHO IUIS	IgE but no biological test	134	AHL24660.1	589912889	15
Fraxinus excelsior	European ash	Fra e 1.0201	Aero Plant	Fraxinus Fra e 1	IgE plus basophil+ or SPT+	146	AAQ83588.1	34978692	7
Fraxinus excelsior	European ash	Fra e 1.0102	Aero Plant	Fraxinus Fra e 1	IgE plus basophil+ or SPT+	145	AAV74343.1	56122438	7
Fraxinus excelsior	European ash	Fra e 1.0101	Aero Plant	Fraxinus Fra e 1	IgE plus basophil+ or SPT+	145	AAQ08947.1	33327133	7
Fulvia mutica	Mollusc	Unassigned	Food Animal	Fulvia tropomyosin	IgE but no biological test	284	BAH10153.1	219806596	10
Fusarium culmorum	Fungus	Unassigned	Aero Fungi	Fusarium claimed Fus c 3	IgE but no biological test	450	AAN73248.1	25361513	7
Fusarium culmorum	Fungus	Fus c 1.0101	Aero Fungi	Fusarium Fus c 1	IgE plus basophil+ or SPT+	109	AAL79930.1	19879657	7
Fusarium culmorum	Fungus	Fus c 2.0101	Aero Fungi	Fusarium Fus c 2	IgE but no biological test	121	AAL79931.1	19879659	7
Fusarium proliferatum	Fungus	Fus p 4.0101	Aero Fungi	Fusarium Fus p 4	IgE but no biological test	323	AHY02994.1	619498167	15
Fusarium proliferatum	Fungus	Fus p 9	Aero Fungi	Fusarium proliferatum Fus p 9	IgE but no biological test	386	AJA79001.1	739057410	17
Gadus callarias	Baltic cod	Gad c 1.0101	Food Animal	Gadus Gad c 1 Gad m 1	IgE plus basophil+ or SPT+	113	P02622.1	131112	7
Gadus morhua	Atlantic cod	Gad m 1.0101	Food Animal	Gadus Gad c 1 Gad m 1	IgE plus basophil+ or SPT+	109	AAK63086.1	14531014	7
Gadus morhua	Atlantic cod	Gad m 1.0201	Food Animal	Gadus Gad c 1 Gad m 1	IgE plus basophil+ or SPT+	109	AAK63087.1	14531016	7
Gadus morhua	Atlantic cod	Gad m 1.0102	Food Animal	Gadus Gad c 1 Gad m 1	IgE plus basophil+ or SPT+	109	CAM56785.1	148356691	9
Gadus morhua	Atlantic cod	Gad m 1.0202	Food Animal	Gadus Gad c 1 Gad m 1	IgE plus basophil+ or SPT+	109	CAM56786.1	148356693	9
Gadus morhua	Atlantic cod	Gad m 2.0101	Food Animal	Gadus Morhua Gad m 2	IgE but no biological test	11	B3A0L6.1	576011130	15
Gadus morhua	Atlantic cod		Food Animal	Gadus morhua Gad m 3	IgE but no biological test	15	P86980.1	576011086	15
Gallus gallus	Chicken	Gal d 9.0101	Food Animal	Gallus enolase Gal d 9	IgE plus basophil+ or SPT+	434	NP_990450.1	46048765	18
Gallus gallus	Chicken	Gal d 1.0101	Food Animal	Gallus Gal d 1	IgE plus basophil+ or SPT+	210	P01005.1	124757	7
Gallus gallus	Chicken	Unassigned	Food Animal	Gallus Gal d 1	IgE plus basophil+ or SPT+	210	ACJ04729.1	209979542	10
Gallus gallus	Chicken		Food Animal	Gallus Gal d 2	IgE plus basophil+ or SPT+	155	CAA23681.1	63052	7
Gallus gallus	Chicken	Gal d 2.0101	Food Animal	Gallus Gal d 2	IgE plus basophil+ or SPT+	386	P01012.2	129293	7
Gallus gallus	Chicken		Food Animal	Gallus Gal d 2	IgE plus basophil+ or SPT+	386	CAA23682.1	808969	7
Gallus gallus	Chicken		Food Animal	Gallus Gal d 2	IgE plus basophil+ or SPT+	385	1JTI_A	15826578	7
Gallus gallus	Chicken	Unassigned	Food Animal	Gallus Gal d 2	IgE plus basophil+ or SPT+	385	1UHG_D	34811333	7
Gallus gallus	Chicken	Gal d 3.0101	Food Animal	Gallus Gal d 3	IgE plus basophil+ or SPT+	705	CAA26040.1	757851	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Gallus gallus	Chicken		Food Animal	Gallus Gal d 3	IgE plus basophil+ or SPT+	705	P02789.2	1351295	7
Gallus gallus	Chicken		Food Animal	Gallus Gal d 4	IgE plus basophil+ or SPT+	147	P00698.1	126608	7
Gallus gallus	Chicken		Food Animal	Gallus Gal d 4	IgE plus basophil+ or SPT+	24	AAA48944.1	212279	7
Gallus gallus	Chicken	Gal d 4.0101	Food Animal	Gallus Gal d 4	IgE plus basophil+ or SPT+	147	CAA23711.1	63581	15
Gallus gallus	Chicken	Gal d 5.0101	Food Animal	Gallus Gal d 5	IgE plus basophil+ or SPT+	615	CAA43098.1	63748	7
Gallus gallus	Chicken	Gal d 6	Food Animal	Gallus Gal d 6 YGP42	IgE but no biological test	284	manual	1871444	14
Gallus gallus	Chicken		Food Animal	Gallus gallus Gal d 7	IgE but no biological test	192	P02604.3	55584149	16
Gallus gallus	Chicken	Gal d 8.0101	Food Animal	Gallus parvalbumin Gal d 8	IgE plus basophil+ or SPT+	110	CAX32963.1	225877920	10
Glossina morsitans morsitans	Tsetse fly	Unassigned	Venom or Salivary	Glossina Glo m 5	IgE but no biological test	258	ADD18879.1	289740263	11
Glossina morsitans morsitans	Tsetse fly	Unassigned	Venom or Salivary	Glossina Glo m 5	IgE but no biological test	259	ADD19985.1	289742475	11
Glossina morsitans morsitans	Tsetse fly	Unassigned	Venom or Salivary	Glossina Glo m 5	IgE but no biological test	222	ADD19989.1	289742483	11
Glossina morsitans morsitans	Tsetse fly	Glo m 5.0101	Venom or Salivary	Glossina Glo m 5	IgE but no biological test	259	AAF82096.1	8927462	11
Glycine max	Soybean	Gly m 7.0101	Food Plant	Glycine 68kDa biotinylated protein	IgE plus basophil+ or SPT+	643	ACS49840.1	240254706	11
Glycine max	Soybean	Gly m 1.0101	Aero Plant	Glycine Gly m 1	IgE but no biological test	80	P24337.1	123506	12
Glycine max	Soybean	Gly m 3.0102	Food Plant	Glycine Gly m 3	IgE but no biological test	131	CAA11755.1	3021373	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 3	IgE but no biological test	131	ABU97472.1	156938901	9
Glycine max	Soybean	Gly m 3.0101	Food Plant	Glycine Gly m 3	IgE but no biological test	131	CAA11756.1	3021375	15
Glycine max	Soybean	Gly m 4.0101	Food Plant	Glycine Gly m 4	IgE plus basophil+ or SPT+	158	CAA42646.1	18744	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 5.0101 alpha subunit beta congl	IgE but no biological test	605	CAA35691.1	18536	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 5.0101 alpha subunit beta congl	IgE but no biological test	218	AAA33947.1	169927	7
Glycine max	Soybean	Gly m 5.0101	Food Plant	Glycine Gly m 5.0101 alpha subunit beta congl	IgE but no biological test	543	BAA23360.2	9967357	15
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 5.0201 alpha prime beta congly	IgE but no biological test	639	AAB01374.1	169929	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 5.0201 alpha prime beta congly	IgE but no biological test	621	BAB64303.1	15425631	15
Glycine max	Soybean	Gly m 5.0201	Food Plant	Glycine Gly m 5.0201 alpha prime beta congly	IgE but no biological test	559	BAA74452.2	9967361	15
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 5.0301 beta sub unit beta congl	IgE but no biological test	439	BAB64306.1	15425637	15
Glycine max	Soybean	Gly m 5.0301	Food Plant	Glycine Gly m 5.0301 beta sub unit beta congl	IgE but no biological test	439	P25974.1	121282	15
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 5.0301 beta sub unit beta congl	IgE but no biological test	439	F7J077.1	1559988709	20
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 6.0101	IgE but no biological test	495	CAA26723.1	18615	7
Glycine max	Soybean	Gly m 6.0101	Food Plant	Glycine Gly m 6.0101	IgE but no biological test	495	AAA33966.1	169973	15
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 6.0201	IgE but no biological test	485	CAA26575.1	18609	7
Glycine max	Soybean	Gly m 6.0201	Food Plant	Glycine Gly m 6.0201	IgE but no biological test	485	BAA00154.1	218265	15
Glycine max	Soybean	Gly m 6.0301	Food Plant	Glycine Gly m 6.0301	IgE but no biological test	481	CAA33217.1	18639	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 6.0401	IgE but no biological test	562	CAA37044.1	18641	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 6.0401	IgE but no biological test	562	CAA26478.1	732706	7
Glycine max	Soybean	Gly m 6.0401	Food Plant	Glycine Gly m 6.0401	IgE but no biological test	563	BAA74953.1	4249568	15
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 6.0501	IgE but no biological test	516	AAA33964.1	169969	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 6.0501	IgE but no biological test	240	AAA33965.1	169971	7
Glycine max	Soybean	Gly m 6.0501	Food Plant	Glycine Gly m 6.0501	IgE but no biological test	517	BAB15802.1	10566449	15
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m 8 2s albumin	IgE but no biological test	155	AAD09630.1	4097894	14
Glycine max	Soybean	Gly m 8.0101	Food Plant	Glycine Gly m 8 2s albumin	IgE but no biological test	158	NP_001238443.1	351727517	15
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m Bd 28K	IgE but no biological test	373	ACD36976.1	187766751	10
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m Bd 28K	IgE but no biological test	373	ACD36975.1	187766749	10
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m Bd 28K	IgE but no biological test	373	ACD36974.1	187766747	10
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m Bd 28K	IgE but no biological test	455	ACD36978.1	187766755	10
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m Bd 28K	IgE but no biological test	476	BAB21619.2	410067729	15
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m Bd 30 kDa	IgE but no biological test	379	P22895.1	129353	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m Bd 30 kDa	IgE but no biological test	379	AAB09252.1	1199563	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Glycine max	Soybean	Unassigned	Food Plant	Glycine Gly m Bd 30 kDa	IgE but no biological test	379	BAA25899.1	3097321	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Major Gly 50 kDa allergen	IgE but no biological test	17	P82947.1	85681057	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Trypsin inhibitor	IgE but no biological test	217	CAA45777.1	18770	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Trypsin inhibitor	IgE but no biological test	217	CAA45778.1	18772	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Trypsin inhibitor	IgE but no biological test	216	AAB23464.1	256429	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Trypsin inhibitor	IgE but no biological test	203	AAB23482.1	256635	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Trypsin inhibitor	IgE but no biological test	204	AAB23483.1	256636	7
Glycine max	Soybean	Unassigned	Food Plant	Glycine Trypsin inhibitor	IgE but no biological test	208	CAA56343.1	510515	7
Glycine soja	Soybean	Unassigned	Food Plant	Glycine Gly m 6.0401	IgE but no biological test	563	CAA60533.1	806556	7
Glycyphagus domesticus	Storage mite	Gly d 2.0101	Aero Mite	Glycyphagus Gly d 2	IgE but no biological test	128	CAB59976.1	6179520	7
Glycyphagus domesticus	Storage mite	Gly d 2.0201	Aero Mite	Glycyphagus Gly d 2	IgE but no biological test	125	CAB76459.1	7160811	7
Glycyphagus domesticus	Storage mite	Unassigned	Aero Mite	Glycyphagus Gly d 2	IgE but no biological test	141	AAQ54603.1	33772588	7
Haliotis discus discus	Disk abalone	Unassigned	Food Animal	Haliotis Hal m 1 tropomyosin	IgE but no biological test	284	BAH10148.1	219806586	10
Haliotis discus discus	Disk abalone	Unassigned	Food Animal	Haliotis paramyosin	IgE but no biological test	860	BAJ61596.1	318609972	12
Haliotis diversicolor	Abalone	Unassigned	Food Animal	Haliotis Hal m 1 tropomyosin	IgE but no biological test	284	AAG08987.1	9954249	7
Haliotis laevigata x Haliotis rubra		Hal l 1.0101	Food Animal	Haliotis Hal m 1 tropomyosin	IgE but no biological test	284	APG42675.1	1109557549	18
Helianthus annuus	Sunflower	Hel a 6	Aero Plant	Hel a 6	IgE but no biological test	394	OTF85892.1	1191633749	18
Helianthus annuus	Sunflower	Hel a 2.0101	Aero Plant	Helianthus Hel a 2	IgE but no biological test	133	CAA75506.1	3581965	7
Helianthus annuus	Sunflower	Hel a 3.0101	Food Plant	Helianthus Hel a 3	IgE but no biological test	116	AAP47226.1	31324341	15
Helianthus annuus	Sunflower	Unassigned	Food Plant	Helianthus Seed 2S albumin	IgE but no biological test	141	P23110.1	112745	9
Helix aspersa	Brown garden snail	Hel as 1.0101	Food Animal	Helix Hel as 1 tropomyosin	IgE but no biological test	284	CAB38044.1	4468224	7
Hevea brasiliensis	Para rubber tree	Hev b 1.0101	Contact	Hevea Hev b 1	IgE plus basophil+ or SPT+	138	CAA39880.1	18839	15
Hevea brasiliensis	Para rubber tree	Hev b 10.0101	Contact	Hevea Hev b 10	IgE but no biological test	233	AAA16792.1	348137	7
Hevea brasiliensis	Para rubber tree	Hev b 10.0102	Contact	Hevea Hev b 10	IgE but no biological test	205	CAB53458.1	5777414	7
Hevea brasiliensis	Para rubber tree	Hev b 10.0103	Contact	Hevea Hev b 10	IgE but no biological test	205	CAC13961.1	10862818	7
Hevea brasiliensis	Para rubber tree	Hev b 11.0101	Contact	Hevea Hev b 11	IgE but no biological test	295	CAC42881.1	14575525	7
Hevea brasiliensis	Para rubber tree	Hev b 12.0101	Contact	Hevea Hev b 12	IgE but no biological test	116	AAL25839.1	20135538	7
Hevea brasiliensis	Para rubber tree	Hev b 13.0101	Contact	Hevea Hev b 13	IgE but no biological test	391	AAP37470.1	30909057	7
Hevea brasiliensis	Para rubber tree	Hev b 14.0101	Contact	Hevea Hev b 14 hevamine	IgE but no biological test	208	ADR82196.1	313870530	12
Hevea brasiliensis	Para rubber tree	Hev b 15.0101	Contact	Hevea Hev b 15	IgE but no biological test	70	CCW27997.1	571257122	15
Hevea brasiliensis	Para rubber tree	Hev b 2.0101	Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	374	AAA87456.1	1184668	7
Hevea brasiliensis	Para rubber tree		Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	374	AAP87281.1	32765543	7
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	374	ABN03965.1	124294783	8
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	374	ABN03966.1	124294785	8
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	374	ABN09653.1	124365249	8
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	374	ABN09654.1	124365251	8
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	374	ABN09655.1	124365253	8
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	374	ACY91851.1	268037674	11
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	374	ACZ74626.1	270315180	11
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	373	AEV41413.1	359359690	13
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	374	AFJ97275.1	387778882	13
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 2	IgE plus basophil+ or SPT+	374	AFJ97274.1	387778880	13
Hevea brasiliensis	Para rubber tree	Hev b 3.0101	Contact	Hevea Hev b 3	IgE plus basophil+ or SPT+	204	AAC82355.1	3818475	11
Hevea brasiliensis	Para rubber tree	Hev b 4.0101	Contact	Hevea Hev b 4	IgE but no biological test	366	AAR98518.1	46410859	7
Hevea brasiliensis	Para rubber tree	Hev b 5.0101	Contact	Hevea Hev b 5	IgE plus basophil+ or SPT+	151	AAC49447.1	1480457	7
Hevea brasiliensis	Para rubber tree		Contact	Hevea Hev b 6	IgE plus basophil+ or SPT+	187	CAA05978.1	2832430	7
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 6	IgE plus basophil+ or SPT+	43	1WKX_A	73535415	7
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 6	IgE plus basophil+ or SPT+	204	ABW34946.1	158342650	9
Hevea brasiliensis	Para rubber tree	Hev b 7.01	Contact	Hevea Hev b 7	IgE plus basophil+ or SPT+	388	AAC27724.1	1916805	7
Hevea brasiliensis	Para rubber tree	Hev b 7.02	Contact	Hevea Hev b 7	IgE plus basophil+ or SPT+	388	CAA11041.1	3087805	7
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 7	IgE plus basophil+ or SPT+	388	CAA11042.1	3288200	7
Hevea brasiliensis	Para rubber tree		Contact	Hevea Hev b 7	IgE plus basophil+ or SPT+	388	AAF25553.1	6707018	7
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 7	IgE plus basophil+ or SPT+	387	CAE85467.1	41581137	7
Hevea brasiliensis	Para rubber tree	Hev b 8.0101	Contact	Hevea Hev b 8	IgE plus basophil+ or SPT+	131	CAA75312.1	3183706	7
Hevea brasiliensis	Para rubber tree		Contact	Hevea Hev b 8	IgE plus basophil+ or SPT+	131	1G5U_A	11513601	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Hevea brasiliensis	Para rubber tree	Hev b 8.0201	Contact	Hevea Hev b 8	IgE plus basophil+ or SPT+	131	AAF34341.1	6979167	11
Hevea brasiliensis	Para rubber tree	Hev a 9.0101	Contact	Hevea Hev b 8	IgE plus basophil+ or SPT+	131	AAF34342.1	6979169	11
Hevea brasiliensis	Para rubber tree	Hev b 8.0203	Aero Mite	Hevea Hev b 8	IgE plus basophil+ or SPT+	131	AAF34343.1	6979171	11
Hevea brasiliensis	Para rubber tree	Hev b 8.0102	Contact	Hevea Hev b 8	IgE plus basophil+ or SPT+	131	CAB51914.1	5689740	15
Hevea brasiliensis	Para rubber tree	Hev b 8.0204	Contact	Hevea Hev b 8	IgE plus basophil+ or SPT+	131	CAB96215.1	8919948	15
Hevea brasiliensis	Para rubber tree	Hev a 9.0101	Contact	Hevea Hev b 9	IgE but no biological test	445	CAC00532.1	9581744	7
Hevea brasiliensis	Para rubber tree	Unassigned	Contact	Hevea Hev b 9	IgE but no biological test	445	Q9LEI9.1	14423687	9
Hevea brasiliensis subsp. brasiliensis	Para rubber tree	Hev b 11.0102	Contact	Hevea Hev b 11	IgE but no biological test	295	CAD24068.1	27526732	7
Holcus lanatus	Velvet grass	Hol l 1.0101	Aero Plant	Holcus Hol l 1	IgE but no biological test	265	CAA81610.1	414703	7
Holcus lanatus	Velvet grass	Hol l 1.0102	Aero Plant	Holcus Hol l 1	IgE but no biological test	248	CAA93121.1	1167836	7
Holcus lanatus	Velvet grass	Unassigned	Aero Plant	Holcus Hol l 1	IgE but no biological test	263	CAA10140.1	3860384	7
Holcus lanatus	Velvet grass	Unassigned	Aero Plant	Holcus Hol l 5	IgE plus basophil+ or SPT+	20	Q7M262	75140046	7
Holcus lanatus	Velvet grass	Hol l 5.0201	Aero Plant	Holcus Hol l 5	IgE plus basophil+ or SPT+	240	CAB10766.1	2266623	7
Holcus lanatus	Velvet grass	Hol l 5.0101	Aero Plant	Holcus Hol l 5	IgE plus basophil+ or SPT+	264	CAB10765.1	2266625	7
Holcus lanatus	Velvet grass	Unassigned	Aero Plant	Holcus Hol l 5	IgE plus basophil+ or SPT+	296	AAG42255.1	11991229	7
Homarus americanus	American lobster	Hom a 1.0102	Food Animal	Homarus Hom a 1	IgE plus basophil+ or SPT+	284	AAC48288.1	2660868	7
Homarus americanus	American lobster	Hom a 1.0101	Food Animal	Homarus Hom a 1	IgE plus basophil+ or SPT+	284	AAC48287.1	2660866	15
Hordeum vulgare	Barley	Unassigned	Aero Plant	Hordeum Alpha-amylase inhibitor component CMb	IgE plus basophil+ or SPT+	149	P32936.2	585290	7
Hordeum vulgare	Barley	Unassigned	Food Plant	Hordeum Hor v 20	IgE plus basophil+ or SPT+	289	P80198.1	1708280	15
Hordeum vulgare	Barley	Hor v 20.0101	Food Plant	Hordeum Hor v 20	IgE plus basophil+ or SPT+	286	CAA51204.1	288709	15
Hordeum vulgare	Barley	Unassigned	Food Plant	Hordeum LTP 1	IgE but no biological test	134	CAA42832.1	19039	7
Hordeum vulgare	Barley	Unassigned	Aero Plant	Hordeum LTP 1	IgE but no biological test	117	AAA32970.1	167077	7
Hordeum vulgare	Barley	Unassigned	Aero Plant	Hordeum Trypsin inhibitor CMe	IgE plus basophil+ or SPT+	144	CAA35188.1	1405736	7
Hordeum vulgare subsp. vulgare	Barley	Unassigned	Aero Plant	Hordeum Alpha-amylase inhibitor BDAI-1	IgE plus basophil+ or SPT+	152	CAA08836.1	3367714	7
Hordeum vulgare subsp. vulgare	Barley	Unassigned	Aero Plant	Hordeum Alpha-amylase inhibitor component Cma	IgE plus basophil+ or SPT+	144	CAA41956.1	18955	7
Hordeum vulgare subsp. vulgare	Barley	Unassigned	Aero Plant	Hordeum Alpha-amylase inhibitor component Cma	IgE plus basophil+ or SPT+	145	CAA49555.1	439275	7
Hordeum vulgare subsp. vulgare	Barley	Hor v 15.0101	Food Plant	Hordeum Hor v 15	IgE plus basophil+ or SPT+	146	CAA45085.1	19003	15
Hordeum vulgare subsp. vulgare	Barley	Unassigned	Aero Plant	Hordeum Trypsin inhibitor CMe	IgE plus basophil+ or SPT+	148	CAA46705.1	19009	7
Humulus japonicus	Japanese hop	Hum j 1.0101	Aero Plant	Humulus Humj1	IgE but no biological test	155	AAP94213.1	33113263	7
Humulus scandens	Japanese hop	Unassigned	Aero Plant	Humulus profilin-like protein	IgE but no biological test	131	AAP15200.1	34851176	7
Humulus scandens	Japanese hop	Unassigned	Aero Plant	Humulus profilin-like protein	IgE but no biological test	131	AAP15199.1	34851174	7
Juglans nigra	Black walnut	Jug n 1.0101	Food Plant	Juglans Jug r 1 Jug n 1	IgE but no biological test	161	AAM54365.1	31321942	7
Juglans nigra	Black walnut	Jug n 2.0101	Food Plant	Juglans Jug r 2	IgE but no biological test	481	AAM54366.1	31321944	7
Juglans nigra	Black walnut	Jug n 4.0101	Food Plant	Juglans nigra Jug n 4 legumin	IgE but no biological test	510	APR62629.1	1126299828	18
Juglans regia	English walnut	Jug r 1.0101	Food Plant	Juglans Jug r 1 Jug n 1	IgE but no biological test	139	AAB41308.1	1794252	7
Juglans regia	English walnut		Food Plant	Juglans Jug r 2	IgE but no biological test	593	AAF18269.1	6580762	7
Juglans regia	English walnut	Jug r 3.0101	Food Plant	Juglans Jug r 3	IgE but no biological test	119	ACI47547.1	209484145	11
Juglans regia	English walnut	Jug r 4.0101	Food Plant	Juglans Jug r 4 seed storage protein	IgE but no biological test	507	AAW29810.1	56788031	7
Juglans regia	English walnut	Jug r 6.0101	Food Plant	Juglans Jug r 6	IgE but no biological test	502	XP_018814692.1	1098817075	19
Juglans regia	English walnut	Jug r 5.0101	Food Plant	Juglans regia Jug r 5	IgE plus basophil+ or SPT+	160	APD76154.1	1104688661	17
Juglans regia	English walnut	Unassigned	Food Plant	Juglans regia Walnut profilin	IgE but no biological test	131	AVD53651.1	1343184140	20
Juniperus ashei	Mountain cedar	Jun a 2.0101	Aero Plant	Juniperus Jun a 2	IgE but no biological test	507	CAC05582.1	9955725	7
Juniperus ashei	Mountain cedar	Jun a 3.0101	Aero Plant	Juniperus Jun a 3	IgE but no biological test	225	P81295.1	9087177	8
Juniperus ashei	Mountain cedar	Jun a 1.0101	Aero Plant	Juniperus Jun a/v 1	IgE but no biological test	367	AAD03608.1	4138877	7
Juniperus oxycedrus	Juniper	Unassigned	Aero Plant	Juniperus Jun a/v 1	IgE but no biological test	367	CAC48400.1	15139849	7
Juniperus oxycedrus	Juniper	Jun o 4.0101	Aero Plant	Juniperus Jun o 4	IgE but no biological test	165	AAC15474.2	5391446	7
Juniperus rigida	Cedar	Unassigned	Aero Plant	Juniperus Jun a 3	IgE but no biological test	225	AAR21072.1	38456224	7
Juniperus rigida	Cedar	Unassigned	Aero Plant	Juniperus Jun a 3	IgE but no biological test	225	AAR21071.1	38456222	7
Juniperus virginiana	Red cedar	Unassigned	Aero Plant	Juniperus Jun a 3	IgE but no biological test	110	Q9LD79.2	51316532	7
Juniperus virginiana	Red cedar	Jun v 1.0102	Aero Plant	Juniperus Jun a/v 1	IgE but no biological test	367	AAF80164.1	8843917	7
Juniperus virginiana	Red cedar	Jun v 1.0101	Aero Plant	Juniperus Jun a/v 1	IgE but no biological test	367	AAF80166.1	8843921	7

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Lactuca sativa	Garden lettuce	Lac s 1	Food Plant	Lactuca sativa LTP	IgE plus basophil+ or SPT+	117	A0A2J6KL39.1	1559988728	20
Lates calcarifer	Asian Seabass	Lat c 1.0101	Food Animal	Lates Lat c 1	IgE but no biological test	109	AAV97933.1	56553743	15
Lates calcarifer	Asian Seabass	Lat c 1.0201	Food Animal	Lates Lat c 1	IgE but no biological test	109	AAT45383.1	48526356	15
Lens culinaris	Lentil	Len c 3.0101	Food Plant	Lens Len c 3	IgE but no biological test	118	AAX35807.1	60735410	15
Lens culinaris	Lentil	Len c 1.0101	Food Plant	Lens Len c 1	IgE but no biological test	418	CAD87730.1	29539109	7
Lens culinaris	Lentil	Len c 1.0102	Food Plant	Lens Len c 1	IgE but no biological test	415	CAD87731.1	29539111	7
Lepidoglyphus destructor	Storage mite	Unassigned	Aero Mite	Blomia Blo t 12	IgE plus basophil+ or SPT+	143	AAQ55550.1	33943777	7
Lepidoglyphus destructor	Storage mite	Lep d 10.0101	Aero Mite	Lepidoglyphus Lep d 10	IgE but no biological test	284	CAB71342.1	6900304	15
Lepidoglyphus destructor	Storage mite	Lep d 13.0101	Aero Mite	Lepidoglyphus Lep d 13	IgE but no biological test	131	CAB62213.1	6523380	15
Lepidoglyphus destructor	Storage mite	Lep d 2.0102	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	CAD32313.1	21213898	7
Lepidoglyphus destructor	Storage mite	Lep d 2.0202	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	CAD32314.1	21213900	7
Lepidoglyphus destructor	Storage mite		Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	2118249B	1582223	7
Lepidoglyphus destructor	Storage mite		Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	2118249A	1582222	7
Lepidoglyphus destructor	Storage mite	Unassigned	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	AAQ73484.1	34495274	7
Lepidoglyphus destructor	Storage mite	Unassigned	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	AAQ73486.1	34495278	7
Lepidoglyphus destructor	Storage mite	Unassigned	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	140	AAQ73487.1	34495280	7
Lepidoglyphus destructor	Storage mite	Unassigned	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	AAQ73488.1	34495282	7
Lepidoglyphus destructor	Storage mite	Unassigned	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	AAQ73489.1	34495284	7
Lepidoglyphus destructor	Storage mite	Unassigned	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	AAQ73490.1	34495286	7
Lepidoglyphus destructor	Storage mite	Unassigned	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	AAQ73491.1	34495288	7
Lepidoglyphus destructor	Storage mite	Unassigned	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	AAQ73492.1	34495290	7
Lepidoglyphus destructor	Storage mite	Lep d 2.0101	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	98	CAA57160.1	587450	15
Lepidoglyphus destructor	Storage mite	Lep d 2.0201	Aero Mite	Lepidoglyphus Lep d 2	IgE but no biological test	141	CAA58755.1	999458	15
Lepidoglyphus destructor	Storage mite	Lep d 5.0102	Aero Mite	Lepidoglyphus Lep d 5	IgE but no biological test	171	AAQ73493.1	34495292	7
Lepidoglyphus destructor	Storage mite	Lep d 5.0103	Aero Mite	Lepidoglyphus Lep d 5	IgE but no biological test	169	AAQ73494.1	34495294	7
Lepidoglyphus destructor	Storage mite	Lep d 5.0101	Aero Mite	Lepidoglyphus Lep d 5	IgE but no biological test	110	CAB62212.1	6523378	15
Lepidoglyphus destructor	Storage mite	Lep d 7.0101	Aero Mite	Lepidoglyphus Lep d 7	IgE but no biological test	216	CAB65963.1	6706282	15
Lepidorhombus whiffiagonis	Flat fish	Lep w 1.0101	Food Animal	Lepidorhombus Lep w 1 parvalbumin	IgE but no biological test	109	CAP17694.1	208608078	10
Lepisma saccharina	Silverfish	Lep s 1.0101	Aero Insect	Lepisma Tropomyosin	IgE plus basophil+ or SPT+	284	CAC84590.2	20387027	7
Lepisma saccharina	Silverfish	Unassigned	Aero Insect	Lepisma Tropomyosin	IgE plus basophil+ or SPT+	243	CAC84593.2	20387029	7
Ligustrum vulgare	Privet	Lig v 1.0101	Aero Plant	Ligustrum Lig v 1	IgE but no biological test	145	CAA54818.1	3256210	7
Ligustrum vulgare	Privet	Lig v 1.0102	Aero Plant	Ligustrum Lig v 1	IgE but no biological test	145	CAA54819.1	3256212	7
Lilium longiflorum	Trumpet lily	Unassigned	Aero Plant	Lilium polygalacturonase	IgE but no biological test	413	AAZ91659.1	73913442	8
Liposcelis bostrychophila	booklice	Lip b 1.0101	Aero Insect	Liposcelis Lip b 1 Fragments	IgE but no biological test	254	BAW03243.1	1109516247	18
Liposcelis bostrychophila	booklice	Lip b 1.0102	Aero Insect	Liposcelis Lip b 1 Fragments	IgE but no biological test	254	BAW03242.1	1109516245	18
Litchi chinensis	Lychee nut	Lit c 1.0101	Food Plant	Litchi Lit c 1	IgE but no biological test	131	AAL07320.1	15809696	7
Litchi chinensis	Lychee nut	Unassigned	Food Plant	Litchi Lit c 1	IgE but no biological test	131	ABC02750.1	83317152	7
Litopenaeus vannamei	Whiteleg Shrimp	Lit v 4.0101	Food Animal	Litopenaeus Lit v 4 sarcoplasmic Ca+ binding	IgE plus basophil+ or SPT+	193	ACM89179.1	223403273	11
Litopenaeus vannamei	Whiteleg Shrimp	Lit v 1.0101	Food Animal	Litopenaeus Lit v 1 tropomyosin	IgE but no biological test	284	ACB38288.1	170791252	10
Litopenaeus vannamei	Whiteleg Shrimp	Lit v 2.0101	Food Animal	Litopenaeus Lit v 2	IgE but no biological test	356	ABI98020.1	115492980	8
Litopenaeus vannamei	Whiteleg Shrimp	Unassigned	Food Animal	Litopenaeus Lit v 2	IgE but no biological test	356	B0FRF9.1	1679377515	20
Litopenaeus vannamei	Whiteleg Shrimp	Lit v 3.0101	Food Animal	Litopenaeus Lit v 3 myosin	IgE but no biological test	177	ACC76803.1	184198734	10
Lolium perenne	Perennial ryegrass		Aero Plant	Lolium Lol p 1	IgE plus basophil+ or SPT+	263	P14946.2	126385	7
Lolium perenne	Perennial ryegrass	Lol p 1.0102	Aero Plant	Lolium Lol p 1	IgE plus basophil+ or SPT+	252	AAA63278.1	168314	7
Lolium perenne	Perennial ryegrass	Lol p 1.0101	Aero Plant	Lolium Lol p 1	IgE plus basophil+ or SPT+	263	AAA63279.1	168316	10
Lolium perenne	Perennial ryegrass	Lol p 1.0103	Aero Plant	Lolium Lol p 1	IgE plus basophil+ or SPT+	263	CAB63699.1	6599300	10
Lolium perenne	Perennial ryegrass	Lol p 11.0101	Aero Plant	Lolium Lol p 11	IgE plus basophil+ or SPT+	134	Q7M1X5.1	47605808	7
Lolium perenne	Perennial ryegrass	Lol p 2.0101	Aero Plant	Lolium Lol p 2	IgE plus basophil+ or SPT+	97	P14947.1	126386	7
Lolium perenne	Perennial ryegrass		Aero Plant	Lolium Lol p 2	IgE plus basophil+ or SPT+	88	CAA51775.1	939932	7
Lolium perenne	Perennial ryegrass	Lol p 3.0101	Aero Plant	Lolium Lol p 3	IgE but no biological test	97	P14948.1	126387	7
Lolium perenne	Perennial ryegrass	Lol p 4.0101	Aero Plant	Lolium Lol p 4	IgE plus basophil+ or SPT+	423	CAH92637.1	55859464	7
Lolium perenne	Perennial ryegrass		Aero Plant	Lolium Lol p 5	IgE plus basophil+ or SPT+	301	AAD20386.1	4416516	7
Lolium perenne	Perennial ryegrass		Aero Plant	Lolium Lol p 5	IgE plus basophil+ or SPT+	301	CAB64344.1	6634467	7
Lolium perenne	Perennial ryegrass	Lol p 5.0101	Aero Plant	Lolium Lol p 5	IgE plus basophil+ or SPT+	339	AAA33405.1	455288	10
Lolium perenne	Perennial ryegrass	Lol p 5.0102	Aero Plant	Lolium Lol p 5	IgE plus basophil+ or SPT+	307	Q40240.2	332278195	12

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Lupinus albus	white lupine	Unassigned	Food Plant	Lupinus albus congluten beta	IgE but no biological test	531	CAI84850.2	89994190	14
Lupinus albus	white lupine	Unassigned	Food Plant	Lupinus albus congluten beta	IgE but no biological test	533	Q6EBC1.1	75121065	17
Lupinus angustifolius	blue lupin	Unassigned	Food Plant	Lupinus Lup an 1 conglutin beta	IgE but no biological test	521	ABR21771.1	149208401	9
Lupinus angustifolius	blue lupin	Unassigned	Food Plant	Lupinus Lup an 1 conglutin beta	IgE but no biological test	455	ABR21772.1	149208403	9
Lupinus angustifolius	blue lupin	Lup an 1.0101	Food Plant	Lupinus Lup an 1 conglutin beta	IgE but no biological test	611	ACB05815.1	169950562	10
Lupinus angustifolius	blue lupin	Unassigned	Food Plant	Lupinus Lup an 1 conglutin beta	IgE but no biological test	605	F5B8W5.1	980951568	17
Lupinus angustifolius	blue lupin	Unassigned	Food Plant	Lupinus Lup an 1 conglutin beta	IgE but no biological test	593	F5B8W4.1	980951565	17
Lupinus angustifolius	blue lupin	Unassigned	Food Plant	Lupinus Lup an 1 conglutin beta	IgE but no biological test	637	F5B8W3.1	980951561	17
Lupinus angustifolius	blue lupin	Unassigned	Food Plant	Lupinus Lup an 1 conglutin beta	IgE but no biological test	590	F5B8W2.1	980951555	17
Lupinus angustifolius	blue lupin	Unassigned	Food Plant	Lupinus Lup an 1 conglutin beta	IgE but no biological test	580	F5B8W1.1	980951550	17
Lupinus angustifolius	blue lupin	Unassigned	Food Plant	Lupinus Lup an 1 conglutin beta	IgE but no biological test	603	F5B8W0.1	980951548	17
Lupinus angustifolius	blue lupin	Unassigned	Food Plant	Lupinus Lup an 1 conglutin beta	IgE but no biological test	611	F5B8V9.1	980951518	17
Lycium barbarum	wolfberry	Unassigned	Food Plant	Lycium ltp	IgE but no biological test	51	B3A0N2.1	363805423	13
Macrobrachium rosenbergii	Giant River Prawn	Mac r 1.0101	Food Animal	Macrobrachium rosenbergii shrimp tropomyosin	IgE but no biological test	284	ADC55380.1	288819271	11
Macrobrachium rosenbergii	Giant River Prawn	Unassigned	Food Animal	Macrobrachium rosenbergii shrimp tropomyosin	IgE but no biological test	284	AHA85706.1	558698675	15
Macruronus magellanicus	Patagonian Grenadier	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	98	P86739.1	308191450	12
Macruronus magellanicus	Patagonian Grenadier	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86741.1	308191461	12
Macruronus magellanicus	Patagonian Grenadier	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	74	P86740.1	308191474	12
Macruronus novaezelandiae	Blue hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	83	P86742.1	308191475	12
Malassezia furfur	Yeast	Mala f 2.0101	Contact	Malassezia Mala f 2	IgE but no biological test	177	BAA32435.1	3445490	7
Malassezia furfur	Yeast	Mala f 3.0101	Contact	Malassezia Mala f 3	IgE but no biological test	166	BAA32436.1	3445492	7
Malassezia furfur	Yeast	Mala f 4.0101	Contact	Malassezia Mala f 4	IgE but no biological test	342	AAD25927.1	4587985	7
Malassezia sympodialis	Yeast	Mala s 1.0101	Contact	Malassezia Mala s 1	IgE plus basophil+ or SPT+	350	CAA65341.1	1261972	7
Malassezia sympodialis	Yeast	Mala s 10.0101	Contact	Malassezia Mala s 10 heat shock protein	IgE but no biological test	773	CAD20981.3	28564467	14
Malassezia sympodialis	Yeast	Mala s 11.0101	Contact	Malassezia Mala s 11 first 38 aa signal	IgE but no biological test	237	CAD68071.1	28569698	7
Malassezia sympodialis	Yeast	Mala s 12.0101	Contact	Malassezia Mala s 12	IgE but no biological test	618	CAI43283.4	78038796	7
Malassezia sympodialis	Yeast	Mala s 5.0101	Contact	Malassezia Mala s 5	IgE but no biological test	172	CAA09883.1	4138171	7
Malassezia sympodialis	Yeast	Mala s 6.0101	Contact	Malassezia Mala s 6	IgE but no biological test	162	CAA09884.1	4138173	7
Malassezia sympodialis	Yeast	Mala s 7.0101	Contact	Malassezia Mala s 7	IgE but no biological test	187	CAA09885.1	4138175	7
Malassezia sympodialis	Yeast	Mala s 8.0101	Contact	Malassezia Mala s 8	IgE but no biological test	179	CAA09886.2	7271239	7
Malassezia sympodialis	Yeast	Mala s 9.0101	Contact	Malassezia Mala s 9	IgE but no biological test	342	CAA09887.4	19069920	7
Malassezia sympodialis ATCC 42132	Yeast	Unassigned	Contact	Malassezia Mala s 10 heat shock protein	IgE but no biological test	773	CCU97864.1	465797105	14
Malassezia sympodialis ATCC 42132	Yeast	Unassigned	Contact	Malassezia Mala s 11 first 38 aa signal	IgE but no biological test	202	CCV00099.1	465795607	14
Malassezia sympodialis ATCC 42132	Yeast	Mala s 13	Contact	Malassezia Mala s 13 Thioredoxin Rev	IgE plus basophil+ or SPT+	107	CCU98198.1	465793078	14
Malassezia sympodialis ATCC 42132	Yeast	Unassigned	Contact	Malassezia Mala s 5	IgE but no biological test	172	CCU99457.1	465794772	14
Malassezia sympodialis ATCC 42132	Yeast	Unassigned	Contact	Malassezia Mala s 7	IgE but no biological test	200	SHO79205.1	1129841119	18
Malassezia sympodialis ATCC 42132	Yeast	Unassigned	Contact	Malassezia Mala s 9	IgE but no biological test	342	CCU99206.1	465794420	14
Malus x domestica	Apple	Mal d 1.0301	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	CAA96534.1	1313966	7
Malus x domestica	Apple	Mal d 1.0401	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	160	CAA96535.1	1313968	7
Malus x domestica	Apple	Mal d 1.0402	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	160	CAA96536.1	1313970	7
Malus x domestica	Apple	Mal d 1.0403	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	160	CAA96537.1	1313972	7
Malus x domestica	Apple	Mal d 1.0206	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAD13683.1	2443824	7
Malus x domestica	Apple	Mal d 1.0103	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAD26546.1	4590364	7
Malus x domestica	Apple	Mal d 1.0203	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAD26547.1	4590366	7
Malus x domestica	Apple	Mal d 1.0204	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAD26548.1	4590368	7
Malus x domestica	Apple	Mal d 1.0104	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAD26552.1	4590376	7
Malus x domestica	Apple	Mal d 1.0105	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAD26553.1	4590378	7
Malus x domestica	Apple	Mal d 1.0106	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAD26554.1	4590380	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Malus x domestica	Apple	Mal d 1.0107	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAD26555.1	4590382	7
Malus x domestica	Apple	Mal d 1.0205	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAD26558.1	4590388	7
Malus x domestica	Apple	Mal d 1.0208	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	158	CAD32318.1	21685277	7
Malus x domestica	Apple	Mal d 1.0304	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAO25113.1	27922941	7
Malus x domestica	Apple	Mal d 1.0108	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAD29671.1	4768879	11
Malus x domestica	Apple	Mal d 1.0201	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAB01362.1	862307	11
Malus x domestica	Apple	Mal d 1.0102	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	CAA88833.1	886683	11
Malus x domestica	Apple	Mal d 1.0101	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	CAA58646.1	747852	15
Malus x domestica	Apple	Mal d 1.0109	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAK13029.1	15418742	15
Malus x domestica	Apple	Mal d 1.0207	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAK13030.1	15418744	15
Malus x domestica	Apple	Mal d 1.0302	Food Plant	Malus Mal d 1	IgE plus basophil+ or SPT+	159	AAK13027.1	15418738	15
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 2	IgE but no biological test	26	AAB35897.1	1478293	7
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 2	IgE but no biological test	246	AAX19848.1	60418842	7
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 2	IgE but no biological test	246	AAX19851.1	60418848	7
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 2	IgE but no biological test	246	Q9FSG7.1	30316292	8
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 2	IgE but no biological test	158	CAT99612.1	218059718	10
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 2	IgE but no biological test	158	CAT99611.1	218059715	10
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 2	IgE but no biological test	193	AFM77001.1	392507603	13
Malus x domestica	Apple	Mal d 2.0101	Food Plant	Malus Mal d 2	IgE but no biological test	245	AAC36740.1	3643249	15
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 2	IgE but no biological test	159	APG29330.1	1109403341	18
Malus x domestica	Apple	Mal d 3.0201	Food Plant	Malus Mal d 3	IgE plus basophil+ or SPT+	115	AAF26450.1	6715522	7
Malus x domestica	Apple	Mal d 3.0203	Food Plant	Malus Mal d 3	IgE plus basophil+ or SPT+	115	AAT80665.1	50659891	7
Malus x domestica	Apple	Mal d 3.0202	Food Plant	Malus Mal d 3	IgE plus basophil+ or SPT+	115	AAT80664.1	50659889	7
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 3	IgE plus basophil+ or SPT+	115	AAT80662.1	50659885	7
Malus x domestica	Apple		Food Plant	Malus Mal d 3	IgE plus basophil+ or SPT+	115	AAT80659.1	50659879	7
Malus x domestica	Apple	Mal d 3.0102	Food Plant	Malus Mal d 3	IgE plus basophil+ or SPT+	115	AAT80649.1	50659859	7
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 3	IgE plus basophil+ or SPT+	115	AAR22488.1	38492338	7
Malus x domestica	Apple	Mal d 4.0302	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	CAD46559.1	28881453	7
Malus x domestica	Apple	Mal d 4.0102	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	CAD46561.1	28881457	7
Malus x domestica	Apple	Mal d 4.0202	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	CAD46560.1	28881455	7
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	AAX19854.1	60418854	7
Malus x domestica	Apple		Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	AAX19856.1	60418858	7
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	AAX19858.1	60418862	7
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	AAX19860.1	60418866	7
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	CAK93713.1	164510842	9
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	CAK93753.1	164510858	9
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	CAK93757.1	164510860	9
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	77	CAT99618.1	218059730	10
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	115	CAT99619.1	218059733	10
Malus x domestica	Apple	Unassigned	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	CAT99617.1	218059728	10
Malus x domestica	Apple	Mal d 4.0301	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	AAD29412.1	4761584	11
Malus x domestica	Apple	Mal d 4.0201	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	AAD29413.1	4761586	11
Malus x domestica	Apple	Mal d 4.0101	Food Plant	Malus Mal d 4	IgE plus basophil+ or SPT+	131	AAD29414.1	4761588	11
Manihot esculenta	Cassava	Unassigned	Food Plant	Manihot Man e 5.0101	IgE but no biological test	177	AAM55492.1	21585695	7
Manihot esculenta	Cassava	Man e 5.0101	Food Plant	Manihot Man e 5.0101	IgE but no biological test	177	AEE98392.1	332713934	14
Manilkara zapota	Sapodilla plum	Unassigned	Food Plant	Manilkara Thaumatin like protein 1	IgE but no biological test	12	B3EWS0.1	442580988	14
Manilkara zapota	Sapodilla plum	Unassigned	Food Plant	Manilkara Thaumatin like protein 1	IgE but no biological test	9	B3EWE5.3	442570282	14
Manilkara zapota	Sapodilla plum	Unassigned	Food Plant	Manilkara Thaumatin like protein 1	IgE but no biological test	207	G5DC91.2	663434113	15
Marsupenaeus japonicus	Kuruma Shrimp	Unassigned	Food Animal	Marsupenaeus tropomyosin	IgE but no biological test	284	BAF47263.1	125995159	8
Melicertus latisulcatus	King Prawn	Mel I 1.0101	Food Animal	Melicertus tropomyosin	IgE but no biological test	284	AGF86397.1	451935062	14
Mercurialis annua	Annual mercury grass	Mer a 1.0101	Aero Plant	Mercurialis Mer a 1	IgE but no biological test	133	CAA73720.1	2959898	7
Merluccius australis australis	southern hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86745.1	308191452	12
Merluccius australis polylepis	Southern hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86749.1	308191453	12
Merluccius australis polylepis	Southern hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86750.1	308191464	12

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Merluccius bilinearis	Silver hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86752.1	308191465	12
Merluccius bilinearis	Silver hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86753.1	308191478	12
Merluccius bilinearis	Silver hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	94	P86754.1	308191488	12
Merluccius capensis	Shallow-water cape hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86757.1	308191466	12
Merluccius gayi	Southern Pacific hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86761.1	308191455	12
Merluccius gayi	Southern Pacific hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	91	P86760.1	308191489	12
Merluccius merluccius	European hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P02620.1	131116	12
Merluccius merluccius	European hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86765.1	308191469	12
Merluccius paradoxus	Deep-water cape hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86768.1	308191457	12
Merluccius paradoxus	Deep-water cape hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86769.1	308191470	12
Merluccius paradoxus	Deep-water cape hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	95	P86770.1	308191483	12
Merluccius polli	Benguela hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86771.1	308191471	12
Merluccius polli	Benguela hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	69	P86772.1	308191484	12
Merluccius productus	North Pacific hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86774.1	308191459	12
Merluccius productus	North Pacific hake	Unassigned	Food Animal	Merluccius sp. Macruronus sp. Parvalbumin Hake	IgE but no biological test	108	P86775.1	308191472	12
Mesocricetus auratus	Golden hamster	Mes a 1.0101	Aero Animal	Mesocricetus auratus Mes a 1	IgE but no biological test	172	AAD55792.2	13124669	16
Mesocricetus auratus	Golden hamster	Unassigned	Aero Animal	Mesocricetus auratus Mes a 1	IgE but no biological test	172	Q99MG7.1	81916647	17
Metapenaeus ensis	Greasyback shrimp	Met e 1.0101	Food Animal	Metapenaeus Met e 1 Tropomyosin	IgE but no biological test	274	AAA60330.1	607633	7
Mimachlamys nobilis	Noble scallop	Unassigned	Food Animal	Mimachlamys Tropomyosin	IgE plus basophil+ or SPT+	284	AAG08989.1	9954253	7
Morus alba var. atropurpurea	White Mulberry	Unassigned	Food Plant	Morus winter accumulating protein	IgE but no biological test	157	AHW81906.1	610664572	15
Morus bombycis	Mulberry	Unassigned	Food Plant	Morus winter accumulating protein	IgE but no biological test	157	AAV33670.1	54311115	12
Morus bombycis	Mulberry	Unassigned	Food Plant	Morus winter accumulating protein	IgE but no biological test	157	AAV33672.1	54311119	12
Morus nigra	Black mulberry	Mor n 3.0101	Food Plant	Morus Mor n 3 mulberry LTP	IgE plus basophil+ or SPT+	91	P85894.1	288561913	11
Mus musculus	Mouse		Aero Animal	Mus Mus m 1	IgE plus basophil+ or SPT+	180	P02762.2	20178291	7
Mus musculus	Mouse	Mus m 1.0101	Aero Animal	Mus Mus m 1	IgE plus basophil+ or SPT+	180	CAA26953.1	295910	15
Mus musculus	Mouse	Unassigned	Aero Animal	Mus Mus m 1	IgE plus basophil+ or SPT+	181	A2BIM8.1	980952242	17
Mus musculus domesticus	Mouse	Mus m 1.0102	Aero Animal	Mus Mus m 1	IgE plus basophil+ or SPT+	180	AAA39768.1	199881	15
Musa acuminata	Banana	Mus a 1.0101	Food Plant	Musa acuminata Mus a 1 profilin banana	IgE but no biological test	131	AAK54834.1	14161635	7
Musa acuminata	Banana	Unassigned	Food Plant	Musa acuminata Mus a 5 Endo-Beta-1,3-Glucanase	IgE plus basophil+ or SPT+	312	2CYG_A	83754908	7
Musa acuminata	Banana	Mus a 4.0101	Food Plant	Musa Mus a 4	IgE plus basophil+ or SPT+	200	1Z3Q_A	88191901	7
Musa acuminata	Banana	Mus a 2.0101	Food Plant	Musa Mus s 2	IgE but no biological test	318	CAC81811.1	17932710	15
Musa acuminata AAA Group	Banana	Unassigned	Food Plant	Musa acuminata Mus a 5 Endo-Beta-1,3-Glucanase	IgE plus basophil+ or SPT+	340	AAB82772.2	6073860	14
Mustelus griseus		Unassigned	Food Animal	Mustelus griseus parvalbumin	IgE but no biological test	110	5ZGM_A	1446210823	20
Mustelus griseus		Unassigned	Food Animal	Mustelus griseus parvalbumin	IgE but no biological test	107	5ZH6_A	1446210825	20
Myrmecia banksi	Giant Bull Ant	Myr p 3.0101	Venom or Salivary	Myrmecia Myr p 3 listed as Myrmecia banksi	IgE but no biological test	84	BAD36780.1	51241753	15
Myrmecia pilosula	Jumper ant	Unassigned	Venom or Salivary	Myrmecia Myr p 1	IgE but no biological test	112	AAB50883.1	1911819	7
Myrmecia pilosula	Jumper ant	Myr p 1.0101	Venom or Salivary	Myrmecia Myr p 1	IgE but no biological test	112	CAA49760.1	312284	15
Myrmecia pilosula	Jumper ant		Venom or Salivary	Myrmecia Myr p 2	IgE but no biological test	75	2206305A	1587177	7
Myrmecia pilosula	Jumper ant	Myr p 2.0101	Venom or Salivary	Myrmecia Myr p 2	IgE but no biological test	75	AAB36316.1	1438761	10
Neptunea polycostata	Wrinkled Neptune	Unassigned	Food Animal	Neptunea tropomyosin	IgE but no biological test	284	BAH10150.1	219806590	10
Nicotiana tabacum	Tobacco	Unassigned	Aero Plant	Nicotiana villin	IgE but no biological test	520	CAE17317.1	57283139	7
Nicotiana tabacum	Tobacco	Unassigned	Aero Plant	Nicotiana villin	IgE but no biological test	559	CAE17316.1	57283137	7
Octopus vulgaris	Octopus	Unassigned	Food Animal	Octopus tropomyosin	IgE but no biological test	284	BAE54433.1	83715936	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Olea europaea	Olive tree	Unassigned	Aero Plant	Ole e 14 Olea europea polygalacturonase	IgE but no biological test	379	AHL24656.1	589912881	15
Olea europaea	Olive tree	Ole e 13.0101	Aero Plant	Olea e 13 in WHO IUIS	IgE but no biological test	226	E3SU11.1	449061783	14
Olea europaea	Olive tree	Ole e 1.0102	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	145	P19963.2	14424429	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	137	I53806	1362128	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	136	E53806	1362129	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	136	F53806	1362130	7
Olea europaea	Olive tree	Ole e 1.0104	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	145	C53806	1362131	7
Olea europaea	Olive tree		Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	137	A38968	1362132	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	136	G53806	1362133	7
Olea europaea	Olive tree	Ole e 1.0103	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	145	B53806	1362136	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	136	H53806	1362137	7
Olea europaea	Olive tree	Ole e 1.0105	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	146	CAA73038.1	2465127	7
Olea europaea	Olive tree	Ole e 1.0106	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	146	CAA73037.1	2465129	7
Olea europaea	Olive tree	Ole e 1.0107	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	146	CAA73036.1	2465131	7
Olea europaea	Olive tree	Ole e 1.0101	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	130	AAB32652.2	13195753	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	134	AAO22133.1	37724597	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	135	AAO22132.1	37724593	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	132	AAN18044.1	37548753	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	131	AAQ10281.1	33329758	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	132	AAQ10280.1	33329756	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	132	AAQ10279.1	33329754	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	131	AAQ10278.1	33329752	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	131	AAQ10277.1	33329750	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	129	AAQ10276.1	33329748	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	131	AAQ10274.1	33329744	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	132	AAQ10271.1	33329738	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	132	AAQ10268.1	33329732	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	132	AAQ08190.1	33325115	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	140	ABP58632.1	145313982	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	140	ABP58633.1	145313984	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	140	ABP58635.1	145313988	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	140	ABP58636.1	145313990	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 1	IgE plus basophil+ or SPT+	140	ABP58637.1	145313992	9
Olea europaea	Olive tree	Ole e 10.0101	Aero Plant	Olea Ole e 10	IgE plus basophil+ or SPT+	123	AAL92578.1	29465664	7
Olea europaea	Olive tree		Aero Plant	Olea Ole e 11.0101 and 0102	IgE but no biological test	364	AAY88919.1	68270856	11
Olea europaea	Olive tree	Ole e 11.0101	Aero Plant	Olea Ole e 11.0101 and 0102	IgE but no biological test	364	ACZ57582.1	269996495	11
Olea europaea	Olive tree	Ole e 12.0101	Aero Plant	olea Ole e 12 in WHO IUIS	IgE but no biological test	308	E1U332.1	449061782	14
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 15 cyclophilin	IgE but no biological test	172	AVV30163.1	1373739558	20
Olea europaea	Olive tree		Aero Plant	Olea Ole e 2	IgE but no biological test	134	O24170.1	3914427	7
Olea europaea	Olive tree		Aero Plant	Olea Ole e 2	IgE but no biological test	134	O24171.1	3914428	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 2	IgE but no biological test	131	A4GFC0.1	576017874	15
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 2	IgE but no biological test	131	A4GFC3.1	576017774	15
Olea europaea	Olive tree	Ole e 2.0101	Aero Plant	Olea Ole e 2	IgE but no biological test	134	CAA73035.1	2465133	15
Olea europaea	Olive tree	Ole e 3.0101	Aero Plant	Olea Ole e 3	IgE plus basophil+ or SPT+	84	AAD05375.1	3337403	7
Olea europaea	Olive tree		Aero Plant	Olea Ole e 3	IgE plus basophil+ or SPT+	52	AAO33897.1	37725377	7
Olea europaea	Olive tree	Ole e 5.0101	Aero Plant	Olea Ole e 5	IgE but no biological test	30	P80740.2	122064581	8
Olea europaea	Olive tree		Aero Plant	Olea Ole e 5	IgE but no biological test	152	CAD21706.2	39840779	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABP58627.1	145313972	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX26131.1	160347106	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	144	ABX26132.1	160347108	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX26134.1	160347112	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX26138.1	160347120	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX26139.1	160347122	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX26140.1	160347124	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX26141.1	160347126	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX26143.1	160347130	9

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX26145.1	160347134	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX26147.1	160347138	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX54842.1	160962543	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX54844.1	160962547	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX54849.1	160962557	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX54855.1	160962569	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX54859.1	160962577	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX54862.1	160962583	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	144	ABX54864.1	160962587	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX54866.1	160962591	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX54869.1	160962597	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX54876.1	160962611	9
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 5	IgE but no biological test	152	ABX54877.1	160962613	9
Olea europaea	Olive tree	Ole e 6.0101	Aero Plant	Olea Ole e 6	IgE but no biological test	50	AAB66909.1	2276458	11
Olea europaea	Olive tree	Ole e 7.0101	Aero Plant	Olea Ole e 7	IgE but no biological test	21	P81430.2	22002032	7
Olea europaea	Olive tree		Aero Plant	Olea Ole e 8	IgE but no biological test	171	AAF31152.1	6901654	7
Olea europaea	Olive tree	Ole e 8.0101	Aero Plant	Olea Ole e 8	IgE but no biological test	171	AAF31151.1	6901652	11
Olea europaea	Olive tree	Ole e 9.0101	Aero Plant	Olea Ole e 9	IgE plus basophil+ or SPT+	460	AAK58515.1	14279169	7
Olea europaea	Olive tree	Unassigned	Aero Plant	Olea Ole e 9	IgE plus basophil+ or SPT+	101	2JON_A	166235350	9
Ommastrephes bartramii	red squid	Unassigned	Food Animal	Ommastrephes tropomyosin	IgE but no biological test	284	BAE54432.1	83715934	7
Onchocerca volvulus	Parasitic nematode	Unassigned	Worm (parasite)	Onchocerca tropomyosin	IgE plus basophil+ or SPT+	284	Q25632.1	42559586	12
Oncorhynchus keta	chum salmon	Onc k 5.0101	Food Animal	Oncorhynchus Onc k 5	IgE but no biological test	193	BAJ07603.1	296040357	15
Oncorhynchus mykiss	rainbow trout	Onc m 1.0101	Food Animal	Oncorhynchus Rainbow trout parv Onc m 1	IgE but no biological test	108	P86431.1	288559139	11
Oncorhynchus mykiss	rainbow trout	Onc m 1.0201	Food Animal	Oncorhynchus Rainbow trout parv Onc m 1	IgE but no biological test	107	P86432.1	288559140	11
Oncorhynchus mykiss	rainbow trout	Unassigned	Food Animal	Oncorhynchus Rainbow trout parv Onc m 1	IgE but no biological test	97	AOO96842.1	1064270801	19
Oratosquilla oratoria	mantis shrimp	Unassigned	Food Animal	Oratosquilla tropomyosin	IgE plus basophil+ or SPT+	284	BAF95206.1	162286975	9
Oreochromis mossambicus	Mozambique tilapia	Ore m 4.0101	Food Animal	Oreochromis Ore m 4 tropomyosin	IgE but no biological test	284	AFV53352.1	410060781	14
Oryctolagus cuniculus	European rabbit	Ory c 3.A.0101	Aero Animal	Oryctolagus Ory c 3	IgE plus basophil+ or SPT+	93	AAG42806.1	11993600	15
Oryctolagus cuniculus	European rabbit	Ory c 3.B.0101	Aero Animal	Oryctolagus Ory c 3	IgE plus basophil+ or SPT+	90	AAG42802.1	11993592	15
Oryctolagus cuniculus	European rabbit	Ory c 4.0101	Aero Animal	Oryctolagus Ory c 4	IgE but no biological test	172	CCC15303.1	557943216	15
Oryza sativa	Rice	Unassigned	Food Plant	Oryza Glyoxalase I	IgE but no biological test	291	Q948T6.2	84029333	7
Oryza sativa	Rice	Ory s 1.0101	Aero Plant	Oryza Ory s 1	IgE but no biological test	263	AAA86533.1	1173557	8
Oryza sativa	Rice	Unassigned	Aero Plant	Oryza Ory s 1	IgE but no biological test	267	AAF72991.1	8118439	7
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Glyoxalase I	IgE but no biological test	291	BAB71741.1	16580747	7
Oryza sativa (japonica cultivar-group)	Rice		Aero Plant	Oryza Ory s 1	IgE but no biological test	267	Q40638.2	109913547	8
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Aero Plant	Oryza putative polcalcin Phl p 7	IgE but no biological test	82	BAD13150.1	45736119	7
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	157	BAC20657.1	23616954	8
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	165	BAA01998.1	218193	7
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	157	BAA01996.1	218197	7
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	111	BAA07772.1	1304216	7
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	109	BAA07773.1	1304217	7
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	113	BAA07774.1	1304218	7
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	166	BAA07710.1	1398913	7
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	160	BAA07711.1	1398915	7
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	157	BAA07712.1	1398916	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	160	BAA07713.1	1398918	7
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	157	AAB99797.1	2827316	7
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	166	Q01882.2	114152865	8
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	163	Q01883.2	114152864	8
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	160	BAC19997.1	23495787	8
Oryza sativa (japonica cultivar-group)	Rice	Unassigned	Food Plant	Oryza Trypsin alpha-amylase inhibitor	IgE but no biological test	160	BAC20650.1	23616947	7
Ostrya carpinifolia	European hop hornbeam	Ost c 1.0101	Aero Plant	Ostrya Ost c 1pollen allergen	IgE plus basophil+ or SPT+	160	ADK39021.1	300872535	12
Pachycondyla chinensis	Asian needle ant	Pac c 3.0101	Venom or Salivary	Pachycondyla Pac c 3 allergen	IgE but no biological test	199	ACA96507.1	169822894	10
Pandalus borealis	caribean shrimp	Pan b 1.0101	Food Animal	Pandalus Pan b 1	IgE but no biological test	284	CBY17558.1	312831088	12
Panulirus stimpsoni	Lobster	Pan s 1.0101	Food Animal	Panulirus Pan s 1	IgE plus basophil+ or SPT+	274	AAC38996.1	3080761	11
Paralithodes camtschaticus	Kamchatka crab	Unassigned	Food Animal	Paralithodes tropomyosin	IgE but no biological test	284	BAF47265.1	125995163	8
Paralithodes camtschaticus	Kamchatka crab	Unassigned	Food Animal	Paralithodes tropomyosin	IgE but no biological test	284	BAF47266.1	125995165	8
Parietaria judaica	Weed		Aero Plant	Parietaria Par j 1	IgE plus basophil+ or SPT+	143	2008179A	741844	7
Parietaria judaica	Weed	Par j 1.0102	Aero Plant	Parietaria Par j 1	IgE plus basophil+ or SPT+	176	CAA65123.1	1532058	7
Parietaria judaica	Weed	Par j 1.0101	Aero Plant	Parietaria Par j 1	IgE plus basophil+ or SPT+	133	CAA54587.1	992612	15
Parietaria judaica	Weed	Par j 1.0103	Aero Plant	Parietaria Par j 1	IgE plus basophil+ or SPT+	139	CAI94601.1	95007033	15
Parietaria judaica	Weed		Aero Plant	Parietaria Par j 1	IgE plus basophil+ or SPT+	138	CAA59370.1	706811	15
Parietaria judaica	Weed	Par j 2.0102	Aero Plant	Parietaria Par j 2	IgE plus basophil+ or SPT+	133	CAA65122.1	1532056	7
Parietaria judaica	Weed	Par j 2.0101	Aero Plant	Parietaria Par j 2	IgE plus basophil+ or SPT+	133	P55958.1	2497750	7
Parietaria judaica	Weed	Par j 3.0102	Aero Plant	Parietaria Par j 3 profilin	IgE plus basophil+ or SPT+	131	Q9T0M8.1	14423869	7
Parietaria judaica	Weed	Par j 3.0101	Aero Plant	Parietaria Par j 3 profilin	IgE plus basophil+ or SPT+	132	Q9XG85.1	14423876	7
Parietaria judaica	Weed	Par j 3.0201	Aero Plant	Parietaria Par j 3 profilin	IgE plus basophil+ or SPT+	131	CCP19647.1	444175753	14
Parietaria judaica	Weed	Par j 4.0101	Aero Plant	Parietaria Par j 4	IgE plus basophil+ or SPT+	84	CAP05019.1	201071363	15
Parietaria officinalis	Weed	Par o 1.0101	Aero Plant	Parietaria Par o 1	IgE but no biological test	12	Q7M1E8	75139847	7
Parietaria officinalis	Weed		Aero Plant	Parietaria Par o 1	IgE but no biological test	17	AAB36008.1	1311509	7
Parietaria officinalis	Weed		Aero Plant	Parietaria Par o 1	IgE but no biological test	15	AAB36009.1	1311510	7
Parietaria officinalis	Weed		Aero Plant	Parietaria Par o 1	IgE but no biological test	15	AAB36010.1	1311511	7
Parietaria officinalis	Weed		Aero Plant	Parietaria Par o 1	IgE but no biological test	15	AAB36011.1	1311512	7
Parietaria officinalis	Weed		Aero Plant	Parietaria Par o 1	IgE but no biological test	30	AAB36012.1	1311513	7
Parietaria officinalis	Weed		Aero Plant	Parietaria Par o 1	IgE but no biological test	24	AAB46820.1	1836011	7
Parietaria officinalis	Weed	Unassigned	Aero Plant	Parietaria Par o 1	IgE but no biological test	25	AAB46819.1	1836010	7
Parthenium hysterophorus		Par h 1.0101	Aero Plant	Parthenium hysterophorus Par h 1	IgE but no biological test	156	AKF12278.1	817033923	17
Paspalum notatum	Bahia grass	Unassigned	Aero Plant	Paspalum group 13 pollen allergen	IgE plus basophil+ or SPT+	169	CBM42667.1	338930686	12
Paspalum notatum	Bahia grass	Unassigned	Aero Plant	Paspalum group 13 pollen allergen	IgE plus basophil+ or SPT+	169	CBM42666.1	338930684	12
Paspalum notatum	Bahia grass	Unassigned	Aero Plant	Paspalum group 13 pollen allergen	IgE plus basophil+ or SPT+	169	CBM42665.1	338930682	12
Paspalum notatum	Bahia grass	Unassigned	Aero Plant	Paspalum group 13 pollen allergen	IgE plus basophil+ or SPT+	169	CBM42664.1	338930680	12
Paspalum notatum	Bahia grass	Unassigned	Aero Plant	Paspalum group 13 pollen allergen	IgE plus basophil+ or SPT+	393	CBM42663.1	338930678	12
Paspalum notatum	Bahia grass	Unassigned	Aero Plant	Paspalum group 13 pollen allergen	IgE plus basophil+ or SPT+	393	CBM42662.1	338930676	12
Paspalum notatum	Bahia grass	Unassigned	Aero Plant	Paspalum group 13 pollen allergen	IgE plus basophil+ or SPT+	391	CBM42661.1	338930674	12
Paspalum notatum	Bahia grass	Unassigned	Aero Plant	Paspalum group 13 pollen allergen	IgE plus basophil+ or SPT+	395	CBM42660.1	338930672	12
Paspalum notatum	Bahia grass	Pas n 1.0101	Aero Plant	Paspalum Pas n 1 beta expansin	IgE plus basophil+ or SPT+	265	ACA23876.1	168419914	10
Penaeus monodon	Black tiger shrimp	Pen m 1.0101	Food Animal	Penaeus Pen m 1 tropomyosin	IgE but no biological test	284	AAX37288.1	60892782	15
Penaeus monodon	Black tiger shrimp	Pen m 2.0101	Food Animal	Penaeus Pen m 2	IgE plus basophil+ or SPT+	356	AAO15713.1	27463265	7
Penaeus monodon	Black tiger shrimp	Unassigned	Food Animal	Penaeus Pen m 2	IgE plus basophil+ or SPT+	356	C7E3T4.1	308154236	12
Penaeus monodon	Black tiger shrimp	Pen m 3.0101	Food Animal	Penaeus Pen m 3 myosin light chain	IgE but no biological test	177	ADV17342.1	317383196	12
Penaeus monodon	Black tiger shrimp	Pen m 4.0101	Food Animal	Penaeus Pen m 4 sarcoplasmic calcium binding	IgE but no biological test	193	ADV17343.1	317383198	12
Penicillium brevicompactum	Fungus	Pen b 26.0101	Aero Fungi	Penicillium Pen b 26	IgE but no biological test	107	AAX11194.1	59894749	7
Penicillium chrysogenum	Fungus	Pen ch 18.0101	Aero Fungi	Penicillium Pen 18	IgE but no biological test	494	AAF71379.1	7963902	7
Penicillium chrysogenum	Fungus		Aero Fungi	Penicillium Pen 18	IgE but no biological test	494	AAG44693.2	14215732	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Penicillium chrysogenum	Fungus	Pen ch 13.0101	Aero Fungi	Penicillium Pen ch 13	IgE plus basophil+ or SPT+	397	AAF23726.1	6684758	7
Penicillium chrysogenum	Fungus		Aero Fungi	Penicillium Pen ch 13	IgE plus basophil+ or SPT+	398	AAM33821.1	21069093	7
Penicillium chrysogenum	Fungus	Pen ch 20.0101	Aero Fungi	Penicillium Pen ch 20	IgE but no biological test	117	AAB34785.1	999009	7
Penicillium chrysogenum	Fungus	Pen ch 35.0101	Aero Fungi	Penicillium Pen ch 35	IgE but no biological test	324	ADK27483.1	300679427	15
Penicillium citrinum	Fungus	Unassigned	Aero Fungi	Penicillium Pen 18	IgE but no biological test	457	AAD25995.1	4588118	7
Penicillium citrinum	Fungus	Unassigned	Aero Fungi	Penicillium Pen 18	IgE but no biological test	358	AAG44480.1	12005501	7
Penicillium citrinum	Fungus	Pen c 19.0101	Aero Fungi	Penicillium Pen c 19	IgE but no biological test	503	Q92260.1	14423733	7
Penicillium citrinum	Fungus	Pen c 22.0101	Aero Fungi	Penicillium Pen c 22	IgE but no biological test	438	AAK51201.1	13991101	7
Penicillium citrinum	Fungus	Pen c 24.0101	Aero Fungi	Penicillium Pen c 24	IgE but no biological test	228	AAR17475.1	38326693	7
Penicillium citrinum	Fungus	Pen c 3.0101	Aero Fungi	Penicillium Pen c 3	IgE but no biological test	167	AAD42074.1	5326864	7
Penicillium citrinum	Fungus	Pen c 30.0101	Aero Fungi	Penicillium Pen c 30	IgE but no biological test	733	ABB89950.1	82754305	7
Penicillium citrinum	Fungus	Pen c 32.0101	Aero Fungi	Penicillium Pen c 32	IgE but no biological test	290	ABM60783.1	121584258	8
Penicillium citrinum	Fungus	Pen c 3.0101	Aero Fungi	Penicillium Pen ch 13	IgE plus basophil+ or SPT+	397	AAD25926.1	4587983	7
Penicillium crustosum	Fungus	Pen cr 26.0101	Aero Fungi	Penicillium crustosum Pen cr 26 60s P1	IgE but no biological test	107	AEX34122.1	371537645	13
Penicillium oxalicum	Fungus	Pen o 18.0101	Aero Fungi	Penicillium Pen 18	IgE but no biological test	503	AAG44478.1	12005497	7
Periplaneta americana	American cockroach	Per a 5.0101	Aero Insect	Per a 5 Periplaneta GST	IgE plus basophil+ or SPT+	216	AAX33729.1	60678789	7
Periplaneta americana	American cockroach	Per a 5.0102	Aero Insect	Per a 5 Periplaneta GST	IgE plus basophil+ or SPT+	216	AEV23867.1	359326557	15
Periplaneta americana	American cockroach	Unassigned	Aero Insect	Per a 5 Periplaneta GST	IgE plus basophil+ or SPT+	216	AUW37958.1	1337340498	19
Periplaneta americana	American cockroach	Per a 11.0101	Aero Insect	Periplaneta americana Per a 11	IgE plus basophil+ or SPT+	494	AKH04310.1	821092692	16
Periplaneta americana	American cockroach	Per a 12.0101	Aero Insect	Periplaneta americana Per a 12	IgE plus basophil+ or SPT+	407	AKH04311.1	821092694	16
Periplaneta americana	American cockroach	Unassigned	Aero Insect	Periplaneta Not in IUIS Per a 4	IgE but no biological test	183	AAX33728.1	60678787	7
Periplaneta americana	American cockroach	Unassigned	Aero Insect	Periplaneta Not in IUIS Per a 4	IgE but no biological test	163	3EBW_A	215794707	10
Periplaneta americana	American cockroach	Per a 11.0101	Aero Insect	Periplaneta Not in IUIS Per a 4	IgE but no biological test	167	ACJ37391.1	212675312	10
Periplaneta americana	American cockroach	Per a 1.0201	Aero Insect	Periplaneta Per a 1	IgE plus basophil+ or SPT+	446	AAC34736.1	2231297	7
Periplaneta americana	American cockroach	Per a 1.0104	Aero Insect	Periplaneta Per a 1	IgE plus basophil+ or SPT+	274	AAC34737.1	2253610	7
Periplaneta americana	American cockroach	Per a 1.0103	Aero Insect	Periplaneta Per a 1	IgE plus basophil+ or SPT+	395	AAB82404.1	2580504	7
Periplaneta americana	American cockroach	Per a 1.0102	Aero Insect	Periplaneta Per a 1	IgE plus basophil+ or SPT+	228	AAC34312.1	2897849	7
Periplaneta americana	American cockroach	Per a 1.0101	Aero Insect	Periplaneta Per a 1	IgE plus basophil+ or SPT+	231	AAD13533.1	4240399	7
Periplaneta americana	American cockroach	Unassigned	Aero Insect	Periplaneta Per a 1	IgE plus basophil+ or SPT+	124	AAP13554.1	30144660	7
Periplaneta americana	American cockroach	Unassigned	Aero Insect	Periplaneta Per a 1	IgE plus basophil+ or SPT+	395	ADB92492.1	284518361	11
Periplaneta americana	American cockroach	Per a 10.0101	Aero Insect	Periplaneta Per a 10 ser protease	IgE plus basophil+ or SPT+	256	AAX33734.1	60678799	7
Periplaneta americana	American cockroach	Unassigned	Aero Insect	Periplaneta Per a 2	IgE but no biological test	351	AAX33727.1	60678785	7
Periplaneta americana	American cockroach	Per a 2.0101	Aero Insect	Periplaneta Per a 2	IgE but no biological test	351	ADR82198.1	313870534	12
Periplaneta americana	American cockroach	Per a 3.0201	Aero Insect	Periplaneta Per a 3	IgE plus basophil+ or SPT+	631	AAB09632.1	1531589	7
Periplaneta americana	American cockroach	Per a 3.0202	Aero Insect	Periplaneta Per a 3	IgE plus basophil+ or SPT+	470	AAB62731.1	1580794	7
Periplaneta americana	American cockroach	Per a 3.0203	Aero Insect	Periplaneta Per a 3	IgE plus basophil+ or SPT+	393	AAB63595.1	1580797	7
Periplaneta americana	American cockroach	Per a 3.0101	Aero Insect	Periplaneta Per a 3	IgE plus basophil+ or SPT+	685	Q25641.1	2833325	9
Periplaneta americana	American cockroach	Unassigned	Aero Insect	Periplaneta Per a 3	IgE plus basophil+ or SPT+	688	ADB92493.1	284518363	11
Periplaneta americana	American cockroach	Unassigned	Aero Insect	Periplaneta Per a 3	IgE plus basophil+ or SPT+	685	ADD17628.1	289721058	11
Periplaneta americana	American cockroach	Per a 6.0101	Aero Insect	Periplaneta Per a 6	IgE but no biological test	151	AAX33730.1	60678791	8
Periplaneta americana	American cockroach	Per a 7.0102	Aero Insect	Periplaneta Per a 7	IgE plus basophil+ or SPT+	284	AAD19606.1	4378573	7
Periplaneta americana	American cockroach	Per a 7.0101	Aero Insect	Periplaneta Per a 7	IgE plus basophil+ or SPT+	284	CAB38086.1	4468639	7
Periplaneta americana	American cockroach	Per a 6.0101	Aero Insect	Periplaneta Per a 7	IgE plus basophil+ or SPT+	284	ACS14052.1	239740599	11
Periplaneta americana	American cockroach	Unassigned	Aero Insect	Periplaneta Per a 7	IgE plus basophil+ or SPT+	284	P0DSM7.1	1679373733	20
Periplaneta americana	American cockroach	Unassigned	Aero Insect	Periplaneta Per a 9	IgE but no biological test	356	AAT77152.1	50428904	8
Periplaneta americana	American cockroach	Per a 9.0101	Aero Insect	Periplaneta Per a 9	IgE but no biological test	356	ACA00204.1	167782135	9
Periplaneta fuliginosa	Smokybrown cockroach	Unassigned	Aero Insect	Periplaneta Per a 7	IgE plus basophil+ or SPT+	284	AAL86701.1	19310971	7
Perna viridis	Asian green mussell	Unassigned	Food Animal	Perna Tropomyosin	IgE but no biological test	284	AAG08988.1	9954251	7
Persea americana	Avocado	Pers a 1.0101	Food Plant	Persea Pers a 1	IgE but no biological test	326	CAB01591.1	3201547	7
Phalaris aquatica	Canary grass	Unassigned	Aero Plant	Phalaris Pha a 1	IgE but no biological test	20	AAB27445.1	409328	7
Phalaris aquatica	Canary grass	Pha a 1.0101	Aero Plant	Phalaris Pha a 1	IgE but no biological test	269	Q41260.1	2498576	7
Phalaris aquatica	Canary grass	Pha a 5.0101	Aero Plant	Phalaris Pha a 5	IgE but no biological test	320	P56164.1	2498577	7
Phalaris aquatica	Canary grass	Unassigned	Aero Plant	Phalaris Pha a 5	IgE but no biological test	305	P56165.1	2498578	7
Phalaris aquatica	Canary grass	Unassigned	Aero Plant	Phalaris Pha a 5	IgE but no biological test	294	P56166.1	2498579	7
Phalaris aquatica	Canary grass	Unassigned	Aero Plant	Phalaris Pha a 5	IgE but no biological test	175	P56167.1	2498580	7
Phaseolus vulgaris	Kidney bean	Pha v 3.0101	Food Plant	Phaseolus Pha v 3	IgE plus basophil+ or SPT+	115	ADC80502.1	289064177	11

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Phaseolus vulgaris	Kidney bean	Pha v 3.0201	Food Plant	Phaseolus Pha v 3	IgE plus basophil+ or SPT+	118	ADC80503.1	289064179	11
Phleum pratense	Common timothy	Phl p 1.0102	Aero Plant	Phleum Phl p 1	IgE plus basophil+ or SPT+	263	CAA55390.1	473360	7
Phleum pratense	Common timothy	Phl p 1.0101	Aero Plant	Phleum Phl p 1	IgE plus basophil+ or SPT+	263	CAA81613.1	3901094	7
Phleum pratense	Common timothy	Phl p 2.0101	Aero Plant	Phleum Phl p 1	IgE plus basophil+ or SPT+	241	1N10_A	28373838	7
Phleum pratense	Common timothy		Aero Plant	Phleum Phl p 1	IgE plus basophil+ or SPT+	240	CAG24374.1	45823012	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 1	IgE plus basophil+ or SPT+	262	2118271A	1582250	10
Phleum pratense	Common timothy	Phl p 11.0101	Aero Plant	Phleum Phl p 11	IgE plus basophil+ or SPT+	143	AAN32987.1	23452313	7
Phleum pratense	Common timothy	Phl p 12.0103	Aero Plant	Phleum Phl p 12	IgE but no biological test	131	CAA70609.1	2415700	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 12	IgE but no biological test	131	ABG81289.1	110644906	8
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 12	IgE but no biological test	131	ABG81290.1	110644908	8
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 12	IgE but no biological test	131	ABG81291.1	110644910	8
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 12	IgE but no biological test	131	ABG81292.1	110644912	8
Phleum pratense	Common timothy		Aero Plant	Phleum Phl p 12	IgE but no biological test	131	ABG81293.1	110644914	8
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 12	IgE but no biological test	131	ABG81294.1	110644916	8
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 12	IgE but no biological test	131	ABG81295.1	110644918	8
Phleum pratense	Common timothy	Phl p 12.0102	Aero Plant	Phleum Phl p 12	IgE but no biological test	131	CAA70608.1	2415698	10
Phleum pratense	Common timothy	Phl p 12.0101	Aero Plant	Phleum Phl p 12	IgE but no biological test	131	CAA54686.1	453976	15
Phleum pratense	Common timothy	Phl p 13.0101	Aero Plant	Phleum Phl p 13	IgE plus basophil+ or SPT+	394	CAB42886.1	4826572	7
Phleum pratense	Common timothy	Phl p 2.0101	Aero Plant	Phleum Phl p 2	IgE but no biological test	122	CAA53529.1	415896	7
Phleum pratense	Common timothy	Phl p 4.0101	Aero Plant	Phleum Phl p 4	IgE plus basophil+ or SPT+	508	CAD54670.2	54144332	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 4	IgE plus basophil+ or SPT+	500	CAF32567.2	45108973	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 4	IgE plus basophil+ or SPT+	500	CAF32566.2	45108967	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 4	IgE plus basophil+ or SPT+	500	CAQ55938.1	189014266	10
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 4	IgE plus basophil+ or SPT+	500	CAQ55939.1	189014268	10
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 4	IgE plus basophil+ or SPT+	500	CAQ55940.1	189014270	10
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 4	IgE plus basophil+ or SPT+	500	CAQ55941.1	189014272	10
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 4	IgE plus basophil+ or SPT+	500	3TSH_A	405944794	14
Phleum pratense	Common timothy	Phl p 4.0201	Aero Plant	Phleum Phl p 4	IgE plus basophil+ or SPT+	508	CAD54671.2	54144334	15
Phleum pratense	Common timothy	Phl p 5.0101	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	312	CAA52753.1	398830	7
Phleum pratense	Common timothy		Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	257	S32101	422005	7
Phleum pratense	Common timothy		Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	280	S38584	481397	7
Phleum pratense	Common timothy		Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	24	Q7M1L8	75139900	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	285	2023228A	1092249	7
Phleum pratense	Common timothy	Phl p 5.0202	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	281	CAB05371.1	1684718	7
Phleum pratense	Common timothy	Phl p 5.0104	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	276	CAB05372.1	1684720	7
Phleum pratense	Common timothy	Phl p 5.0102	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	286	CAA50281.1	2398757	7
Phleum pratense	Common timothy	Phl p 5.0105	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	276	AAC16525.1	3135497	7
Phleum pratense	Common timothy	Phl p 5.0106	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	276	AAC16526.1	3135499	7
Phleum pratense	Common timothy	Phl p 5.0107	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	276	AAC16527.1	3135501	7
Phleum pratense	Common timothy	Phl p 5.0108	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	276	AAC16528.1	3135503	7
Phleum pratense	Common timothy		Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	312	AAC25994.1	3309039	7
Phleum pratense	Common timothy	Phl p 5.0203	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	295	AAC25995.1	3309041	7
Phleum pratense	Common timothy	Phl p 5.0206	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	290	AAC25997.1	3309045	7
Phleum pratense	Common timothy	Phl p 5.0207	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	AAC25998.1	3309047	7
Phleum pratense	Common timothy		Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	275	AAK25823.1	13430402	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38384.1	21725606	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38385.1	21725608	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38386.1	21725610	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38387.1	21725612	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38388.1	21725614	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38389.1	21725616	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38390.1	21725618	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38391.1	21725620	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38392.1	21725622	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38393.1	21725624	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38394.1	21725626	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38395.1	21725628	7
Phleum pratense	Common timothy		Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38396.1	21725630	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	287	CAD38397.1	21725632	7
Phleum pratense	Common timothy		Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	102	1L3P_A	28948464	7
Phleum pratense	Common timothy	Phl p 5.0109	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	284	CAD87529.1	29500897	7
Phleum pratense	Common timothy	Phl p 5.0201	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	284	CAA81609.1	2398759	10
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 5	IgE plus basophil+ or SPT+	309	CCD28287.1	345108717	13
Phleum pratense	Common timothy	Phl p 6.0102	Aero Plant	Phleum Phl p 6	IgE plus basophil+ or SPT+	138	CAA76556.1	3004465	7
Phleum pratense	Common timothy	Phl p 6.0101	Aero Plant	Phleum Phl p 6	IgE plus basophil+ or SPT+	138	CAA76557.1	3004467	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 6	IgE plus basophil+ or SPT+	106	CAA76558.1	3004469	7
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum Phl p 6	IgE plus basophil+ or SPT+	111	1NLX_N	28374072	7
Phleum pratense	Common timothy	Phl p 7.0101	Aero Plant	Phleum Polcalin (Phl p 7)	IgE plus basophil+ or SPT+	78	CAA76887.1	3367732	10
Phleum pratense	Common timothy	Unassigned	Aero Plant	Phleum pollen allergen group 3	IgE plus basophil+ or SPT+	100	3FT1_A	283806867	11
Phodopus sungorus	Siberian hamster	Phod s 1.0101	Aero Plant	Phodopus sungorus lipocalin	IgE plus basophil+ or SPT+	151	AGT28425.1	530376029	16
Phoenix dactylifera	Date palm	Phl p 2.0101	Aero Plant	Phoenix Pho d 2	IgE but no biological test	131	CAD10390.1	21322677	7
Pinus koraiensis		Pin k 2.0101	Food Plant	Pinus koraiensis vicilin Pin k 2.0101	IgE but no biological test	463	AHC94918.1	567773309	15
Pinus pinea	Pine	Unassigned	Food Plant	Pinus pinea albumin AAI	IgE but no biological test	110	CEJ95862.1	749495809	16
Pinus pinea	Pine	Pin p 1.0101	Food Plant	Pinus pinea Pin p 1 2S	IgE plus basophil+ or SPT+	164	CTQ87571.1	916237486	16
Pistacia vera	pistachio	Unassigned	Food Plant	Pistacia 11S globulin	IgE but no biological test	472	ABU42022.1	156001070	9
Pistacia vera	pistachio	Pis v 2.0101	Food Plant	Pistacia 11S globulin	IgE but no biological test	496	ABG73109.1	110349083	10
Pistacia vera	pistachio	Pis v 2.0201	Food Plant	Pistacia 11S globulin	IgE but no biological test	472	ABG73110.1	110349085	10
Pistacia vera	pistachio	Pis v 1.0101	Food Plant	Pistacia Pis v 1 2S albumin	IgE but no biological test	149	ABG73108.1	110349081	10
Pistacia vera	pistachio	Pis v 3.0101	Food Plant	Pistacia Pis v 3 vicilin	IgE but no biological test	519	ABO36677.1	133711974	10
Pistacia vera	pistachio	Pis v 4.0101	Food Plant	Pistacia Pis v 4	IgE but no biological test	230	ABR29644.1	149786150	9
Pisum sativum	Pea	Pis s 1.0102	Food Plant	Pisum Pis s 1	IgE but no biological test	415	CAF25233.1	42414629	7
Pisum sativum	Pea	Pis s 1.0101	Food Plant	Pisum Pis s 1	IgE but no biological test	415	CAF25232.1	42414627	7
Pisum sativum	Pea	Pis s 2.0101	Food Plant	Pisum Pis s 2	IgE but no biological test	613	CAB82855.1	7339551	15
Pisum sativum	Pea	Pis s 3.0101	Food Plant	Pisum sativum Pis s 3	IgE but no biological test	120	AJG44053.1	752855036	17
Pisum sativum	Pea	Unassigned	Food Plant	Pisum sativum Pis s 3	IgE but no biological test	120	A0A158V755.1	1064302992	18
Pisum sativum	Pea	Unassigned	Food Plant	Pisum sativum Pis s 3	IgE but no biological test	119	A0A158V976.1	1064302965	18
Pisum sativum	Pea	Unassigned	Food Plant	Pisum sativum Pis s 3	IgE but no biological test	95	2N81_A	1026943499	18
Plantago lanceolata	Narrow-leaved plantain	Pla l 1.0101	Aero Plant	Plantago Pla l 1	IgE but no biological test	131	CAC41633.1	14422359	7
Plantago lanceolata	Narrow-leaved plantain	Pla l 1.0102	Aero Plant	Plantago Pla l 1	IgE but no biological test	131	CAC41634.1	14422361	7
Plantago lanceolata	Narrow-leaved plantain	Pla l 1.0103	Aero Plant	Plantago Pla l 1	IgE but no biological test	131	CAC41635.1	14422363	7
Plantago lanceolata	Narrow-leaved plantain	Unassigned	Aero Plant	Plantago Pla l 1	IgE but no biological test	65	CAD80019.1	29163773	7
Platanus orientalis	oriental plane	Pla or 1.0101	Aero Plant	Platanus Pla or 1	IgE but no biological test	170	ABY21305.1	162949336	9
Platanus orientalis	oriental plane	Pla or 2.0101	Aero Plant	Platanus Pla or 2	IgE but no biological test	378	ABY21306.1	162949338	9
Platanus x acerifolia	London plane tree	Pla a 3.0101	Aero Plant	Platanus acerifolia Pla a 3	IgE plus basophil+ or SPT+	93	ALF39466.1	930156468	16
Platanus x acerifolia	London plane tree	Pla a 3.0201	Aero Plant	Platanus acerifolia Pla a 3	IgE plus basophil+ or SPT+	118	ALF00099.1	928541035	17
Platanus x acerifolia	London plane tree	Pla a 1.0101	Aero Plant	Platanus Pla a 1	IgE plus basophil+ or SPT+	179	CAD20556.1	26190140	7
Platanus x acerifolia	London plane tree	Pla a 2.0101	Aero Plant	Platanus Pla a 2	IgE plus basophil+ or SPT+	377	CAE52833.1	49523394	7
Plodia interpunctella	Indian meal moth	Plo i 1.0101	Aero Insect	Plodia Plo i 1 Arginine kinase	IgE plus basophil+ or SPT+	355	CAC85911.1	15886861	7
Plodia interpunctella	Indian meal moth	Plo i 2.0101	Aero Insect	Plodia Plo i 2 thioredoxin	IgE but no biological test	106	CBW45298.1	308193268	12
Poa pratensis	Kentucky bluegrass	Unassigned	Aero Plant	Poa not IUIS Poa p 9 like Poa p 5	IgE but no biological test	373	P22284.1	113560	7
Poa pratensis	Kentucky bluegrass	Unassigned	Aero Plant	Poa not IUIS Poa p 9 like Poa p 5	IgE but no biological test	307	P22286.1	113562	7
Poa pratensis	Kentucky bluegrass	Unassigned	Aero Plant	Poa not IUIS Poa p 9 like Poa p 5	IgE but no biological test	131	A60373	539056	7
Poa pratensis	Kentucky bluegrass	Unassigned	Aero Plant	Poa not IUIS Poa p 9 like Poa p 5	IgE but no biological test	333	P22285.1	113561	7
Poa pratensis	Kentucky bluegrass		Aero Plant	Poa Poa p 1	IgE but no biological test	20	A60372	280414	7
Poa pratensis	Kentucky bluegrass		Aero Plant	Poa Poa p 1	IgE but no biological test	26	F37396	320620	7
Poa pratensis	Kentucky bluegrass	Poa p 1.0101	Aero Plant	Poa Poa p 1	IgE but no biological test	263	CAA10520.1	4090265	7
Poa pratensis	Kentucky bluegrass	Poa p 5.0101	Aero Plant	Poa Poa p 5	IgE but no biological test	303	AAG42254.1	11991227	7
Polistes annularis	Paper wasp	Pol a 5.0101	Venom or Salivary	Polistes Pol 5	IgE plus basophil+ or SPT+	209	AAA29793.1	160780	7
Polistes annularis	Paper wasp	Pol a 1.0101	Venom or Salivary	Polistes Pol a 1 Pol d 1	IgE but no biological test	301	AAD52615.1	5815249	11
Polistes annularis	Paper wasp	Pol a 2.0101	Venom or Salivary	Polistes Pol a 2	IgE but no biological test	367	AAD52616.1	5815251	11
Polistes dominula		Unassigned	Venom or Salivary	Polistes Pol d 3	IgE plus basophil+ or SPT+	775	XP_015174445.1	972185860	19
Polistes dominulus	Paper wasp	Pol d 5.0101	Venom or Salivary	Polistes Pol 5	IgE plus basophil+ or SPT+	227	AAT95010.1	51093377	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Polistes dominulus	Paper wasp	Pol d 1.0104	Venom or Salivary	Polistes Pol a 1 Pol d 1	IgE but no biological test	316	AAS67044.1	45510893	7
Polistes dominulus	Paper wasp	Pol d 1.0103	Venom or Salivary	Polistes Pol a 1 Pol d 1	IgE but no biological test	316	AAS67043.1	45510891	7
Polistes dominulus	Paper wasp	Pol d 1.0102	Venom or Salivary	Polistes Pol a 1 Pol d 1	IgE but no biological test	316	AAS67042.1	45510889	7
Polistes dominulus	Paper wasp	Pol d 1.0101	Venom or Salivary	Polistes Pol a 1 Pol d 1	IgE but no biological test	337	AAS67041.1	45510887	7
Polistes dominulus	Paper wasp	Pol d 4.0101	Venom or Salivary	Polistes Venom serine protease	IgE but no biological test	277	AAP37412.1	30909091	7
Polistes exclamans	Paper wasp	Pol e 5.0101	Venom or Salivary	Polistes Pol 5	IgE plus basophil+ or SPT+	226	AAT95009.1	51093375	7
Polistes fuscatus	Paper wasp	Pol f 5.0101	Venom or Salivary	Polistes Pol 5	IgE plus basophil+ or SPT+	205	P35780.1	549188	7
Polistes gallicus	Paper wasp	Pol g 5.0101	Venom or Salivary	Polistes Pol 5	IgE plus basophil+ or SPT+	206	P83377.1	25091511	7
Polistes gallicus	Paper wasp	Pol g 1.0101	Venom or Salivary	Polistes Pol a 1 Pol d 1	IgE but no biological test	42	P83542.1	41017429	7
Polybia paulista	wasp	Poly p 1.0101	Venom or Salivary	Polybia Pol p 1.0101 phospholipase	IgE but no biological test	322	A2VBC4.1	166216292	9
Polybia paulista	wasp	Poly p 5.0101	Venom or Salivary	Polybia Pol p 1.0101 phospholipase	IgE but no biological test	302	ADT89774.1	315190620	12
Polybia paulista	wasp	Unassigned	Venom or Salivary	Polybia Poly p 2 hyaluronidase	IgE but no biological test	345	ADL09135.1	302201583	12
Polybia paulista	wasp	Poly p 2.0101	Venom or Salivary	Polybia Poly p 2 hyaluronidase	IgE but no biological test	288	P86687.1	302425085	12
Polybia paulista	wasp	Unassigned	Venom or Salivary	Polybia Poly p 5, Poly s 5 venom allergen	IgE but no biological test	141	ADD63684.1	290792375	11
Polybia paulista	wasp	Poly p 5.0102	Venom or Salivary	Polybia Poly p 5, Poly s 5 venom allergen	IgE but no biological test	207	P86686.1	302595972	12
Polybia scutellaris rioplatensis	Wasp	Unassigned	Venom or Salivary	Polybia Poly p 5, Poly s 5 venom allergen	IgE but no biological test	207	Q7Z156.2	47117356	7
Pontastacus leptodactylus	Danube crayfish	Pon l 4.0101	Food Animal	Pontastacus Pon l 4	IgE but no biological test	192	P05946.1	134309	15
Portunus pelagicus	blue swimmer crab	Por p 1.0101	Food Animal	Portunus Por p 1 tropomyosin	IgE plus basophil+ or SPT+	284	AGE44125.1	448278534	14
Portunus sanguinolentus	Crab	Unassigned	Food Animal	Portunus Por s and t tropomyosin	IgE but no biological test	284	ABL89183.1	119674937	8
Portunus trituberculatus	Crab	Unassigned	Food Animal	Portunus Por s and t tropomyosin	IgE but no biological test	284	ABS12234.1	151505281	9
Procambarus clarkii	red swamp crayfish	Pro c 5.0101	Food Animal	Procambarus Pro c 5 MLC 1	IgE but no biological test	153	AFP95338.1	401606251	19
Procambarus clarkii	red swamp crayfish	Pro c 8.0101	Food Animal	Procambarus Pro c 8	IgE but no biological test	248	AEB54655.1	328900101	19
Procambarus clarkii	red swamp crayfish	Pro c 2.0101	Food Animal	Procambarus red crayfish arginine kinase	IgE but no biological test	357	AFA45339.1	375298901	13
Procambarus clarkii	red swamp crayfish	Pro c 1.0101	Food Animal	Procambarus tropomysin	IgE but no biological test	284	ACN87223.1	225348412	10
Prosopis juliflora	mesquite	Pro j 1.0101	Aero Plant	Prosopis juliflora Pro j 1.0101	IgE but no biological test	150	AKV72167.1	914410008	16
Prosopis juliflora	mesquite	Pro j 2.0101	Aero Plant	Prosopis Pro j 2	IgE but no biological test	133	AHY24177.1	625293889	15
Protortonia cacti	Arthropod	Unassigned	Food Animal	Protortonia	IgE but no biological test	335	BAH59276.1	237769615	11
Prunus armeniaca	Apricot	Unassigned	Food Plant	Prunus armeniaca Pru ar 5	IgE but no biological test	168	AAD32205.1	4887129	7
Prunus armeniaca	Apricot	Pru ar 1.0101	Food Plant	Prunus PRP (Bet v 1 family)	IgE plus basophil+ or SPT+	160	AAB97141.1	2677826	7
Prunus armeniaca	Apricot	Unassigned	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	119	ADR66945.1	313575730	12
Prunus armeniaca	Apricot	Unassigned	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	117	ADR66946.1	313575732	12
Prunus armeniaca	Apricot	Pru ar 3.0101	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	117	ADR66947.1	313575734	12
Prunus armeniaca	Apricot	Unassigned	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	117	ADR66948.1	313575736	12
Prunus avium	Cherry	Unassigned	Food Plant	Prunus avium Pru av 7.01 Gibberellin	IgE but no biological test	88	XP_021820299.1	1220067778	20
Prunus avium	Cherry	Pru av 1.0101	Food Plant	Prunus PRP (Bet v 1 family)	IgE plus basophil+ or SPT+	160	AAC02632.1	1513216	7
Prunus avium	Cherry	Pru av 1.0203	Food Plant	Prunus PRP (Bet v 1 family)	IgE plus basophil+ or SPT+	160	AAS47037.1	44409496	7
Prunus avium	Cherry	Pru av 1.0202	Food Plant	Prunus PRP (Bet v 1 family)	IgE plus basophil+ or SPT+	160	AAS47036.1	44409474	7
Prunus avium	Cherry	Pru av 1.0201	Food Plant	Prunus PRP (Bet v 1 family)	IgE plus basophil+ or SPT+	160	AAS47035.1	44409451	7
Prunus avium	Cherry	Unassigned	Food Plant	Prunus PRP (Bet v 1 family)	IgE plus basophil+ or SPT+	159	1H2O_A	159162378	9
Prunus avium	Cherry	Pru av 3.0101	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	117	AAF26449.1	6715520	7
Prunus avium	Cherry	Unassigned	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	117	ADR66943.1	313575726	12
Prunus avium	Cherry	Unassigned	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	117	ADR66944.1	313575728	12
Prunus avium	Cherry	Pru av 4.0101	Food Plant	Prunus Pru 4 Profilin peach cherry almond	IgE plus basophil+ or SPT+	131	AAD29411.1	4761582	7
Prunus avium	Cherry	Pru av 2.0101	Food Plant	Prunus Pru av 2	IgE but no biological test	245	AAB38064.1	1144346	7
Prunus domestica	Plum	Pru d 3.0101	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	91	P82534.1	9297015	7
Prunus dulcis	Almond	Unassigned	Food Plant	Pru du 8 Antimicrobial protein	IgE but no biological test	264	QDO73345.1	1706883247	20
Prunus dulcis	Almond	Unassigned	Food Plant	Pru du x Prunus dulcis vicilin	IgE but no biological test	547	QFG58557.1	1757285428	20
Prunus dulcis	Almond	Unassigned	Food Plant	Prunus persica Pru p 2 IUIS	IgE plus basophil+ or SPT+	241	ACE80974.1	190613941	10
Prunus dulcis	Almond	Pru du 4.0101	Food Plant	Prunus Pru 4 Profilin peach cherry almond	IgE plus basophil+ or SPT+	131	AAL91662.1	24473794	7
Prunus dulcis	Almond	Unassigned	Food Plant	Prunus Pru du 6 Amandin	IgE but no biological test	531	3EHK_A	258588247	11
Prunus dulcis	Almond	Unassigned	Food Plant	Prunus Pru du 6 Amandin	IgE but no biological test	178	AGR27935.1	523916668	15
Prunus dulcis	Almond	Pru du 6.0101	Food Plant	Prunus Pru du 6 Amandin	IgE but no biological test	551	ADN39440.1	307159112	15
Prunus dulcis	Almond	Pru du 6.0201	Food Plant	Prunus Pru du 6 Amandin	IgE but no biological test	504	ADN39441.1	307159114	15
Prunus dulcis	Almond	Unassigned	Food Plant	Prunus Seed allergenic protein 2 (Conglutin gamma)	IgE but no biological test	25	P82952.1	75107131	8

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Prunus dulcis x Prunus persica	Plant hybrid	Unassigned	Food Plant	Prunus persica Pru p 2 IUIS	IgE plus basophil+ or SPT+	160	ACE80939.1	190613871	10
Prunus dulcis x Prunus persica	Plant hybrid	Unassigned	Food Plant	Prunus persica Pru p 2 IUIS	IgE plus basophil+ or SPT+	246	ACE80956.1	190613905	10
Prunus dulcis x Prunus persica	Plant hybrid	Unassigned	Food Plant	Prunus persica Pru p 2 IUIS	IgE plus basophil+ or SPT+	246	ACE80958.1	190613909	10
Prunus dulcis x Prunus persica	Plant hybrid	Pru p 2.0201	Food Plant	Prunus persica Pru p 2 IUIS	IgE plus basophil+ or SPT+	246	ACE80957.1	190613907	10
Prunus dulcis x Prunus persica	Plant hybrid	Pru p 2.0101	Food Plant	Prunus persica Pru p 2 IUIS	IgE plus basophil+ or SPT+	246	ACE80959.1	190613911	10
Prunus dulcis x Prunus persica	Plant hybrid	Pru p 2.0301	Food Plant	Prunus persica Pru p 2 IUIS	IgE plus basophil+ or SPT+	242	ACE80955.1	190613903	10
Prunus dulcis x Prunus persica	Plant hybrid	Unassigned	Food Plant	Prunus Pru 4 Profilin peach cherry almond	IgE plus basophil+ or SPT+	131	ACE80972.1	190613937	10
Prunus persica	Peach	Unassigned	Food Plant	Pru p 9 peach a PR-1 protein Cys rich	IgE plus basophil+ or SPT+	161	XP_007199020.1	595790543	20
Prunus persica	Peach	Unassigned	Food Plant	Prunus persica Pru p 2 IUIS	IgE plus basophil+ or SPT+	246	P83332.1	25091405	12
Prunus persica	Peach	Unassigned	Food Plant	Prunus persica Pru p 2 IUIS	IgE plus basophil+ or SPT+	242	P83335.1	25091406	12
Prunus persica	Peach	Unassigned	Food Plant	Prunus persica Pru p 2 IUIS	IgE plus basophil+ or SPT+	246	AEV57471.1	359744030	13
Prunus persica	Peach	Pru p 1.0101	Food Plant	Prunus PRP (Bet v 1 family)	IgE plus basophil+ or SPT+	160	ABB78006.1	82492265	7
Prunus persica	Peach	Pru p 1.0301	Food Plant	Prunus PRP (Bet v 1 family)	IgE plus basophil+ or SPT+	160	AJE61291.1	748758672	16
Prunus persica	Peach	Pru p 1.0201	Food Plant	Prunus PRP (Bet v 1 family)	IgE plus basophil+ or SPT+	160	AJE61290.1	748758670	16
Prunus persica	Peach	Pru p 3.0101	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	91	P81402.1	3287877	7
Prunus persica	Peach	Unassigned	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	117	AAV40850.1	54793477	7
Prunus persica	Peach	Unassigned	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	117	ADR66939.1	313575718	12
Prunus persica	Peach	Unassigned	Food Plant	Prunus Pru 3	IgE plus basophil+ or SPT+	117	AGW21344.1	544369592	15
Prunus persica	Peach	Pru p 4.0101	Food Plant	Prunus Pru 4 Profilin peach cherry almond	IgE plus basophil+ or SPT+	131	CAD37201.1	27528310	7
Prunus persica	Peach	Pru p 4.0201	Food Plant	Prunus Pru 4 Profilin peach cherry almond	IgE plus basophil+ or SPT+	131	CAD37202.1	27528312	7
Prunus persica	Peach	Pru p 7.0101	Food Plant	Prunus Pru p 7 Pru m 7 Peamaclein	IgE plus basophil+ or SPT+	63	P86888.1	408407790	14
Pseudocardium sachalinensis	Mollusc	Unassigned	Food Animal	Pseudocardium tropomyosin	IgE but no biological test	284	BAH10154.1	219806598	10
Punica granatum	Pomegranate	Unassigned	Food Plant	Punica chitinase putative Put g 14	IgE but no biological test	299	G1UH28.1	1679362782	20
Punica granatum	Pomegranate	Pun g 7	Food Plant	Punica peptide Pommaclein Pun g 7	IgE but no biological test	20	C0HKC0.1	1179881437	18
Punica granatum	Pomegranate	Pun g 1.0101	Food Plant	Punica Pun g 1	IgE but no biological test	120	AHB19227.1	559797767	15
Punica granatum	Pomegranate	Pun g 1.0201	Food Plant	Punica Pun g 1	IgE but no biological test	120	AHB19226.1	559797765	15
Punica granatum	Pomegranate	Pun g 1.0301	Food Plant	Punica Pun g 1	IgE but no biological test	120	AHB19225.1	559797763	15
Pyrus communis	Pear	Pyr c 3.0101	Food Plant	Pyrus LTP Pyr c 3 IUIS	IgE but no biological test	115	AAF26451.1	6715524	11
Pyrus communis	Pear	Unassigned	Food Plant	Pyrus LTP Pyr c 3 IUIS	IgE but no biological test	94	AET05733.1	355525862	13
Pyrus communis	Pear	Unassigned	Food Plant	Pyrus LTP Pyr c 3 IUIS	IgE but no biological test	94	AET05732.1	355525860	13
Pyrus communis	Pear	Unassigned	Food Plant	Pyrus LTP Pyr c 3 IUIS	IgE but no biological test	94	AET05730.1	355525856	13
Pyrus communis	Pear	Pyr c 1.0101	Food Plant	Pyrus Pyr c 1	IgE plus basophil+ or SPT+	159	O65200.1	14423877	9
Pyrus communis	Pear	Pyr c 4.0101	Food Plant	Pyrus Pyr c 4	IgE plus basophil+ or SPT+	131	AAD29410.1	4761580	7
Pyrus communis	Pear	Pyr c 5.0101	Food Plant	Pyrus Pyr c 5	IgE plus basophil+ or SPT+	308	AAC24001.1	3243234	7
Quercus alba	Oak	Que a 1.0201	Aero Plant	Quercus Que a 1 Que m 1	IgE plus basophil+ or SPT+	159	ABZ81045.1	167472847	10
Quercus alba	Oak	Que a 1.0401	Aero Plant	Quercus Que a 1 Que m 1	IgE plus basophil+ or SPT+	160	ABZ81047.1	167472851	10
Quercus alba	Oak	Que a 1.0301	Aero Plant	Quercus Que a 1 Que m 1	IgE plus basophil+ or SPT+	160	ABZ81046.1	167472849	10
Quercus mongolica		Unassigned	Aero Plant	Quercus Que a 1 Que m 1	IgE plus basophil+ or SPT+	160	AUH28179.1	1316209040	19
Rana esculenta	Frog	Ran e 1.0101	Food Animal	Rana Ran e 1	IgE but no biological test	110	CAC83046.1	20796729	7
Rana esculenta	Frog	Ran e 2.0101	Food Animal	Rana Ran e 2	IgE but no biological test	109	CAC95152.1	20797081	7
Rana sp. CH-2001	Frog	Unassigned	Food Animal	Rana Ran e 1	IgE but no biological test	110	CAC83047.1	20796733	7
Rana sp. CH-2001	Frog	Unassigned	Food Animal	Rana Ran e 2	IgE but no biological test	109	CAC95153.1	20797085	7
Rastrelliger kanagurta		Ras k 1.0101	Food Animal	Rastrelliger Ras k 1 parvalbumin	IgE but no biological test	109	ANW10058.1	1046811129	18
Rattus norvegicus	Rat		Aero Animal	Rattus Rat n 1	IgE but no biological test	181	P02761.1	127533	7
Rattus norvegicus	Rat		Aero Animal	Rattus Rat n 1	IgE but no biological test	181	Q63213	81890324	7
Rattus norvegicus	Rat	Rat n 1.0101	Aero Animal	Rattus Rat n 1	IgE but no biological test	177	AAA41198.1	204261	15
Rhizopus oryzae	Fungus	Unassigned	Aero Fungi	Rhizopus Rhi o 1.0101	IgE plus basophil+ or SPT+	401	AIS82657.1	695094784	16
Rhodotorula mucilaginosa	Fungus	Rho m 1.0101	Aero Fungi	Rhodotorula Rho m 1	IgE but no biological test	439	AAP30720.1	30314940	11
Rhodotorula mucilaginosa	Fungus	Rho m 2.0101	Aero Fungi	Rhodotorula Rho m 2	IgE but no biological test	342	AAT37679.1	54654335	7
Ricinus communis	Castor bean	Ric c 1.0101	Food Plant	Ricinus Ric c 1	IgE plus basophil+ or SPT+	258	CAA38097.1	21068	15
Rubus idaeus	raspberry	Rub i 1.0101	Food Plant	Rubus Rub i 1	IgE but no biological test	137	ABG54495.1	110180525	8

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Rubus idaeus	raspberry	Rub i 3.0101	Food Plant	Rubus Rub i 3	IgE but no biological test	117	ABG54494.1	110180523	8
Saccostrea glomerata		Sac g 1	Food Animal	Saccostrea glomerata Sac g 1	IgE but no biological test	284	AVD53650.1	1343184138	19
Salmo salar	Salmon		Food Animal	Salmo Sal s 1	IgE plus basophil+ or SPT+	108	Q91483.3	18281421	7
Salmo salar	Salmon	Unassigned	Food Animal	Salmo Sal s 1	IgE plus basophil+ or SPT+	109	ACI68103.1	209734468	10
Salmo salar	Salmon	Sal s 1.0101	Food Animal	Salmo Sal s 1	IgE plus basophil+ or SPT+	109	CAA66403.1	1322183	15
Salmo salar	Salmon	Unassigned	Food Animal	Salmo Sal s 2 enolase	IgE plus basophil+ or SPT+	432	CBL79146.1	385145180	13
Salmo salar	Salmon	Sal s 2.0101	Food Animal	Salmo Sal s 2 enolase	IgE plus basophil+ or SPT+	434	ACH70931.1	197632415	15
Salmo salar	Salmon	Sal s 3.0101	Food Animal	Salmo Sal s 3 aldolase	IgE plus basophil+ or SPT+	363	ACH70901.1	197632355	13
Salmo salar	Salmon	Unassigned	Food Animal	Salmo Sal s 3 aldolase	IgE plus basophil+ or SPT+	363	CBL79147.1	385145176	13
Salsola kali	Thistle	Unassigned	Aero Plant	Salsola kali Sal k 6.01	IgE plus basophil+ or SPT+	381	AHL24657.1	589912883	15
Salsola kali	Thistle	Sal k 6.0101	Aero Plant	Salsola kali Sal k 6.01	IgE plus basophil+ or SPT+	401	ARS33724.1	1194995727	18
Salsola kali	Thistle	Sal k 1.0201	Aero Plant	Salsola pectin methylesterase Sal k 1.01 & 1.02	IgE but no biological test	362	AAT99258.1	51242679	8
Salsola kali	Thistle	Sal k 1.0302	Aero Plant	Salsola pectin methylesterase Sal k 1.01 & 1.02	IgE but no biological test	339	AAX11261.1	59895728	8
Salsola kali	Thistle	Sal k 1.0301	Aero Plant	Salsola pectin methylesterase Sal k 1.01 & 1.02	IgE but no biological test	339	AAX11262.1	59895730	8
Salsola kali	Thistle	Unassigned	Aero Plant	Salsola pectin methylesterase Sal k 1.01 & 1.02	IgE but no biological test	339	ACO34813.1	225810597	10
Salsola kali	Thistle	Sal k 1.0101	Aero Plant	Salsola Sal k 1	IgE plus basophil+ or SPT+	42	P83181.1	25090947	10
Salsola kali	Thistle	Sal k 3.0101	Aero Plant	Salsola Sal k 3 pollen allergen	IgE plus basophil+ or SPT+	757	ACO34814.1	225810599	10
Salsola kali	Thistle	Sal k 4.0101	Aero Plant	Salsola Sal k 4 profilin	IgE plus basophil+ or SPT+	133	ACS34771.1	239916566	11
Salsola kali	Thistle	Unassigned	Aero Plant	Salsola Sal k 4 profilin	IgE plus basophil+ or SPT+	133	AHL24658.1	589912885	15
Salsola kali	Thistle	Sal k 4.0201	Aero Plant	Salsola Sal k 4 profilin	IgE plus basophil+ or SPT+	133	ADK22841.1	300490499	15
Salsola kali	Thistle	Sal k 6.0101	Aero Plant	Salsola Sal k 5	IgE but no biological test	151	ADK22842.1	300490501	15
Salvelinus fontinalis	Brook trout	Unassigned	Food Animal	Salvelinus parvalbumin	IgE but no biological test	109	CAX32966.1	288557438	11
Salvelinus fontinalis	Brook trout	Unassigned	Food Animal	Salvelinus parvalbumin	IgE but no biological test	108	CAX32967.1	288557440	11
Sarcoptes scabiei	mite	Unassigned	Venom or Salivary	Sarcoptes scabiei paramyosin	IgE but no biological test	828	SHD75397.1	1109598142	18
Sarcoptes scabiei type hominis	Scabies mite	Unassigned	Venom or Salivary	Sarcoptes Apolipoprotein Ssag1.2	IgE but no biological test	330	AAO15613.1	27462848	7
Sarcoptes scabiei type hominis	Scabies mite	Unassigned	Venom or Salivary	Sarcoptes cysteine protease CO8	IgE but no biological test	340	AAS93669.1	46406002	7
Sarcoptes scabiei type hominis	Scabies mite	Unassigned	Venom or Salivary	Sarcoptes cysteine proteases FO4	IgE but no biological test	338	AAS93674.1	46406012	7
Sarcoptes scabiei type hominis	Scabies mite	Unassigned	Venom or Salivary	Sarcoptes cysteine proteases FO4	IgE but no biological test	339	AAS93675.1	46406014	7
Sarcoptes scabiei type hominis	Scabies mite	Unassigned	Venom or Salivary	Sarcoptes cysteine proteases FO4	IgE but no biological test	273	AAS93676.1	46406016	7
Sarcoptes scabiei type hominis	Scabies mite	Unassigned	Venom or Salivary	Sarcoptes Glutathione S-transferase Mu	IgE but no biological test	219	AAO15607.1	27462836	7
Sarcoptes scabiei type hominis	Scabies mite	Unassigned	Venom or Salivary	Sarcoptes Glutathione S-transferase Mu	IgE but no biological test	219	AAX37321.1	60920770	7
Sarcoptes scabiei type suis	Scabies mite	Unassigned	Aero Mite	Sarcoptes Apolipoprotein Ssag1.2	IgE but no biological test	310	AGM48615.1	507480520	15
Sardinops sagax	South American pilchard	Sar sa 1.0101	Food Animal	Sardinops Sar sa 1 parvalbumin	IgE but no biological test	109	CAQ68366.1	193247972	10
Scapharca broughtonii	Clam	Unassigned	Food Animal	Scapharca tropomyosin	IgE but no biological test	284	BAH10151.1	219806592	10
Schedonorus arundinaceus	Tall fescue	Unassigned	Aero Plant	Festuca group 1 allergen	IgE but no biological test	35	Q7M1Y1	75139991	7
Schedonorus arundinaceus	Tall fescue	Unassigned	Venom or Salivary	Festuca group 1 allergen	IgE but no biological test	17	C37396	320610	7
Schedonorus arundinaceus	Tall fescue	Unassigned	Aero Plant	Festuca group 1 allergen	IgE but no biological test	20	D37396	320611	7
Schistosoma japonicum	Schistosoma	Unassigned	Protozoan	Schistosoma profilin	IgE but no biological test	129	AAP06493.1	29841461	7
Schistosoma japonicum	Schistosoma	Unassigned	Protozoan	Schistosoma tegumental antigen	IgE but no biological test	191	AAC67308.1	2739154	7
Schizophyllum commune H4-8	Mushroom	Sch c 1.0101	Aero Fungi	Schizophyllum Sch c 1	IgE but no biological test	576	XP_003030591.1	302681819	15
Scomber japonicus	Chub mackerel	Sco j 1	Food Animal	Scomber Parvalbumin Sco s 1	IgE but no biological test	109	BAC66618.1	29420793	7
Scomber scombrus	Atlantic mackerel	Sco s 1.0101	Food Animal	Scomber Parvalbumin Sco s 1	IgE but no biological test	109	CAX32965.1	288557436	11
Scylla paramamosain	green mud crab	Scy p 2.0101	Food Animal	Scylla arginine kinase Scy p 2	IgE but no biological test	357	AFA45340.1	375298903	13
Scylla paramamosain	green mud crab	Unassigned	Food Animal	Scylla arginine kinase Scy p 2	IgE but no biological test	357	5ZHQ_A	1597623661	20
Scylla paramamosain	green mud crab	Unassigned	Food Animal	Scylla paramamosain filamin C	IgE plus basophil+ or SPT+	847	QFI57017.1	1759300245	20
Scylla paramamosain	green mud crab	Scy p 4.0101	Food Animal	Scylla paramamosain Scy p 4 Sarc Ca Binding Ptn	IgE but no biological test	193	AFJ80778.1	387571563	18

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Scylla paramamosain	green mud crab	Scy p 8.0101	Food Animal	Scylla paramamosain Triosphosphate Isomerase	IgE but no biological test	248	APP94292.1	1122816254	18
Scylla serrata	giant mud crab	Unassigned	Food Animal	Scylla arginine kinase Scy p 2	IgE but no biological test	356	C9EIP1.1	1679377517	20
Scylla serrata	giant mud crab	Unassigned	Food Animal	Scylla sp. (mud crab) tropomyosin	IgE but no biological test	284	ABS12233.1	151505279	9
Sebastes marinus	ocean perch (red fish)	Seb m 1.0101	Food Animal	Sebastes Seb m 1	IgE but no biological test	109	CAQ72968.1	242253959	11
Sebastes marinus	ocean perch (red fish)	Seb m 1.0201	Food Animal	Sebastes Seb m 1	IgE but no biological test	110	CAQ72969.1	242253961	11
Secale cereale	Rye	Sec c 20.0101	Food Plant	Secale Sec c 20	IgE plus basophil+ or SPT+	23	AAB37403.1	1699225	15
Secale cereale	Rye	Sec c 20.0201	Food Plant	Secale Sec c 20	IgE plus basophil+ or SPT+	29	AAB37406.1	1699228	15
Secale cereale	Rye	Sec c 38.0101	Aero Plant	Secale Sec c 38.01	IgE plus basophil+ or SPT+	26		75198875	7
Secale cereale	Rye	Unassigned	Aero Plant	Secale Sec c 4	IgE but no biological test	520	CAH92630.1	55859456	7
Secale cereale	Rye	Unassigned	Aero Plant	Secale Sec c 4	IgE but no biological test	518	CAH92627.1	55859454	7
Secale cereale	Rye	Unassigned	Aero Plant	Secale Sec c 5	IgE but no biological test	16	Q7M263	75140047	7
Secale cereale	Rye	Sec c 5.0101	Food Plant	Secale Sec c 5	IgE but no biological test	292	CBG76811.1	332205751	12
Sepia esculenta	cuttlefish	Unassigned	Food Animal	Sepia tropomyosin	IgE but no biological test	284	BAE54429.1	83715928	7
Sepioteuthis lessoniana	bigfin reef squid	Unassigned	Food Animal	Sepioteuthis tropomyosin	IgE but no biological test	284	BAE54430.1	83715930	7
Sesamum indicum	Sesame	Unassigned	Food Plant	Sesamum seed maturation-like protein	IgE but no biological test	345	ACB55491.1	171853012	16
Sesamum indicum	Sesame	Ses i 1.0101	Food Plant	Sesamum Ses i 1	IgE but no biological test	153	AAK15088.1	13183175	7
Sesamum indicum	Sesame	Unassigned	Food Plant	Sesamum Ses i 1	IgE but no biological test	153	ACI41244.1	209165427	10
Sesamum indicum	Sesame	Ses i 2.0101	Food Plant	Sesamum Ses i 2	IgE but no biological test	148	AAD42943.1	5381323	7
Sesamum indicum	Sesame	Ses i 3.0101	Food Plant	Sesamum Ses i 3	IgE but no biological test	585	AAK15089.1	13183177	7
Sesamum indicum	Sesame	Ses i 4.0101	Food Plant	Sesamum Ses i 4 oleosin	IgE but no biological test	166	AAG23840.1	10834827	13
Sesamum indicum	Sesame	Unassigned	Food Plant	Sesamum Ses i 5 oleosin	IgE but no biological test	145	ACH85188.1	198250343	10
Sesamum indicum	Sesame	Ses i 5.0101	Food Plant	Sesamum Ses i 5 oleosin	IgE but no biological test	145	AAD42942.1	5381321	15
Sesamum indicum	Sesame	Ses i 6.0101	Food Plant	Sesamum Ses i 6	IgE plus basophil+ or SPT+	459	AAD42944.1	5381325	15
Sesamum indicum	Sesame	Ses i 7.0101	Food Plant	Sesamum Ses i 7	IgE but no biological test	497	AAK15087.1	13183173	15
Simulium vittatum	black fly	Unassigned	Venom or Salivary	Simulium vit antigen 5 by similarity	IgE but no biological test	277	ACH56843.1	197260686	10
Simulium vittatum	black fly	Unassigned	Venom or Salivary	Simulium vit antigen 5 by similarity	IgE but no biological test	277	ACH56844.1	197260688	10
Sinapis alba	White mustard		Food Plant	Sinapis Sin a 1.01	IgE plus basophil+ or SPT+	145	CAA62909.1	1009434	7
Sinapis alba	White mustard		Food Plant	Sinapis Sin a 1.01	IgE plus basophil+ or SPT+	145	CAA62910.1	1009436	7
Sinapis alba	White mustard		Food Plant	Sinapis Sin a 1.01	IgE plus basophil+ or SPT+	145	CAA62911.1	1009438	7
Sinapis alba	White mustard		Food Plant	Sinapis Sin a 1.01	IgE plus basophil+ or SPT+	145	CAA62912.1	1009440	7
Sinapis alba	White mustard		Food Plant	Sinapis Sin a 1.01	IgE plus basophil+ or SPT+	145	CAA62908.1	1009442	7
Sinapis alba	White mustard	Sin a 1.0101	Food Plant	Sinapis Sin a 1.01	IgE plus basophil+ or SPT+	145	P15322.2	51338758	7
Sinapis alba	White mustard	Sin a 2.0101	Food Plant	Sinapis Sin a 2.01 11S globulin	IgE plus basophil+ or SPT+	510	AAX77383.1	62240390	7
Sinapis alba	White mustard	Unassigned	Food Plant	Sinapis Sin a 2.01 11S globulin	IgE plus basophil+ or SPT+	523	AAX77384.1	62240392	7
Sinapis alba	White mustard	Sin a 3.0101	Food Plant	Sinapis Sin a 3.01 LTP	IgE but no biological test	92	ABU95411.1	156778059	12
Sinapis alba	White mustard	Sin a 4.0101	Food Plant	Sinapis Sin a 4.01 profilin	IgE but no biological test	131	ABU95412.1	156778061	12
Sinonovacula constricta	Chinese razor clam	Unassigned	Food Animal	Sinonovacula tropomyosin [Song paper]	IgE but no biological test	284	ABU53681.1	156145810	15
Solanum lycopersicum (Lycopersicon esculentum)	Tomato	Sola l 6.0101	Food Plant	Solanum lycopersicum Sola l 6	IgE plus basophil+ or SPT+	96	NP_001306883.1	985801667	17
Solanum lycopersicum (Lycopersicon esculentum)	Tomato	Sola l 7.0101	Food Plant	Solanum lycopersicum Sola l 7	IgE plus basophil+ or SPT+	115	XP_004229753.1	460367790	16
Solanum lycopersicum (Lycopersicon esculentum)	Tomato	Sola l 1.0101	Food Plant	Solanum Sola l 1 profilin (Lyc e 1)	IgE plus basophil+ or SPT+	131	CAD10377.1	16555787	7
Solanum lycopersicum (Lycopersicon esculentum)	Tomato		Food Plant	Solanum Sola l 1 profilin (Lyc e 1)	IgE plus basophil+ or SPT+	131	AAL29690.1	17224229	7
Solanum lycopersicum (Lycopersicon esculentum)	Tomato	Sola l 2.0101	Food Plant	Solanum Sola l 2 Beta-fructofuranosidase (Lyc e 2)	IgE but no biological test	553	AAL75449.1	18542113	7
Solanum lycopersicum (Lycopersicon esculentum)	Tomato	Sola l 2.0201	Food Plant	Solanum Sola l 2 Beta-fructofuranosidase (Lyc e 2)	IgE but no biological test	636	AAL75450.1	18542115	7
Solanum lycopersicum (Lycopersicon esculentum)	Tomato	Unassigned	Food Plant	Solanum Sola l 3 LTP (Lyc e 3)	IgE plus basophil+ or SPT+	114	CAJ19705.1	71360928	7
Solanum lycopersicum (Lycopersicon esculentum)	Tomato	Sola l 3.0101	Food Plant	Solanum Sola l 3 LTP (Lyc e 3)	IgE plus basophil+ or SPT+	114	AAB42069.1	1816535	15
Solanum lycopersicum (Lycopersicon esculentum)	Tomato	Sola l 4.0101	Food Plant	Solanum Sola l 4 PR-10 (Lyc e 4)	IgE but no biological test	178	CAA75803.1	2887310	14
Solanum lycopersicum (Lycopersicon esculentum)	Tomato	Sola l 4.0201	Food Plant	Solanum Sola l 4 PR-10 (Lyc e 4)	IgE but no biological test	160	AHC08074.1	565380268	15
Solanum lycopersicum (Lycopersicon esculentum)	Tomato	Unassigned	Food Plant	Solanum Sola l 4 PR-10 (Lyc e 4)	IgE but no biological test	160	AHC08073.1	565380238	15

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Solanum melongena	Eggplant	Unassigned	Food Plant	Solanum melalongena Sola m 1	IgE plus basophil+ or SPT+	159	QEQ43417.1	1743129991	20
Solanum tuberosum	Potato	Unassigned	Food Plant	Solanum profilin-like	IgE but no biological test	131	ABA81885.1	77416979	7
Solanum tuberosum	Potato	Unassigned	Food Plant	Solanum profilin-like	IgE but no biological test	131	ABB16985.1	77999277	7
Solanum tuberosum	Potato	Unassigned	Food Plant	Solanum Sola t 1	IgE plus basophil+ or SPT+	386	CAA31575.1	21510	7
Solanum tuberosum	Potato	Unassigned	Food Plant	Solanum Sola t 1	IgE plus basophil+ or SPT+	386	CAA27571.1	21512	7
Solanum tuberosum	Potato	Unassigned	Food Plant	Solanum Sola t 1	IgE plus basophil+ or SPT+	386	CAA27588.1	21514	7
Solanum tuberosum	Potato	Unassigned	Food Plant	Solanum Sola t 1	IgE plus basophil+ or SPT+	386	AAA33819.1	169500	7
Solanum tuberosum	Potato		Food Plant	Solanum Sola t 1	IgE plus basophil+ or SPT+	386	P15476.2	158517845	9
Solanum tuberosum	Potato	Sola t 2.0101	Food Plant	Solanum Sola t 2	IgE plus basophil+ or SPT+	188	P16348.1	124148	7
Solanum tuberosum	Potato		Food Plant	Solanum Sola t 3	IgE plus basophil+ or SPT+	222	P20347.3	20141344	7
Solanum tuberosum	Potato	Sola t 3.0101	Food Plant	Solanum Sola t 3	IgE plus basophil+ or SPT+	186	AAB63099.1	1575306	15
Solanum tuberosum	Potato	Sola t 4.0101	Food Plant	Solanum Sola t 4	IgE plus basophil+ or SPT+	221	BAA04149.1	994779	15
Solen strictus	Gould's razor shell	Unassigned	Food Animal	Solen tropomyosin	IgE but no biological test	284	BAH10156.1	219806602	10
Solenopsis geminata	Tropical Fire Ant	Sol g 4.0101	Venom or Salivary	Solenopsis Sol g 4 Sol i 4	IgE but no biological test	137	AAF65312.1	7638028	7
Solenopsis geminata	Tropical Fire Ant		Venom or Salivary	Solenopsis Sol g 4 Sol i 4	IgE but no biological test	137	AAF65313.1	7638030	7
Solenopsis invicta	Red fire ant		Venom or Salivary	Solenopsis Sol g 4 Sol i 4	IgE but no biological test	137	AAC97370.1	4038411	7
Solenopsis invicta	Red fire ant	Sol i 4.0101	Venom or Salivary	Solenopsis Sol g 4 Sol i 4	IgE but no biological test	137	AAC97369.1	4038409	11
Solenopsis invicta	Red fire ant	Unassigned	Venom or Salivary	Solenopsis Sol i 1	IgE but no biological test	58	AAB36117.1	1336809	7
Solenopsis invicta	Red fire ant	Unassigned	Venom or Salivary	Solenopsis Sol i 1	IgE but no biological test	25	AAB36119.1	1336811	7
Solenopsis invicta	Red fire ant	Unassigned	Venom or Salivary	Solenopsis Sol i 1	IgE but no biological test	26	AAB36120.1	1336812	7
Solenopsis invicta	Red fire ant	Unassigned	Venom or Salivary	Solenopsis Sol i 1	IgE but no biological test	26	AAB36121.1	1336813	7
Solenopsis invicta	Red fire ant	Sol i 1.0101	Venom or Salivary	Solenopsis Sol i 1	IgE but no biological test	346	AAT95008.1	51093373	7
Solenopsis invicta	Red fire ant	Sol i 2.0101	Venom or Salivary	Solenopsis Sol i and Sol r Venom allergen II	IgE but no biological test	138	P35775.1	549179	7
Solenopsis invicta	Red fire ant	Sol i 3.0101	Venom or Salivary	Solenopsis Venom allergen III	IgE but no biological test	234	AAB65434.1	2293571	11
Solenopsis richteri	Black fire ant	Sol r 2.0101	Venom or Salivary	Solenopsis Sol i and Sol r Venom allergen II	IgE but no biological test	119	P35776.2	6136162	7
Solenopsis richteri	Black fire ant	Sol r 3.0101	Venom or Salivary	Solenopsis Venom allergen III	IgE but no biological test	211	P35779.2	6136163	7
Solenopsis saevissima	Brazilian fire ant	Unassigned	Venom or Salivary	Solenopsis Sol g 4 Sol i 4	IgE but no biological test	137	ADD74392.1	291092710	12
Sorghum halepense	Johnson grass	Sor h 2.0201	Aero Plant	Sorghum halepens group 2 allergen	IgE but no biological test	121	AIL01319.1	674275735	16
Sorghum halepense	Johnson grass	Sor h 2.0101	Aero Plant	Sorghum halepens group 2 allergen	IgE but no biological test	119	AIL01318.1	674275733	16
Sorghum halepense	Johnson grass	Sor h 1.0101	Aero Plant	Sorghum Sor h 1	IgE but no biological test	266	AIL01316.1	674275729	15
Sorghum halepense	Johnson grass	Sor h 1.0201	Aero Plant	Sorghum Sor h 1	IgE but no biological test	266	AIL01317.1	674275731	15
Sorghum halepense	Johnson grass	Sor h 13.0101	Aero Plant	Sorghum Sor h 13	IgE but no biological test	422	AIL01320.1	674275737	15
Sorghum halepense	Johnson grass	Sor h 13.0201	Aero Plant	Sorghum Sor h 13	IgE but no biological test	410	AIL01321.1	674275739	15
Stachybotrys chartarum	Fungus	Sta 3.0101	Aero Fungi	Stachybotrys Sta c 3	IgE but no biological test	144	ACT37324.1	253970748	14
Staphylococcus aureus	Bacteria	Unassigned	Bacteria skin	Staphylococcus enterotoxin SEA	IgE plus basophil+ or SPT+	233	1ESF_B	1633233	9
Staphylococcus aureus	Bacteria	Unassigned	Bacteria skin	Staphylococcus enterotoxin SEB	IgE plus basophil+ or SPT+	254	CAJ43561.1	83308249	9
Staphylococcus aureus	Bacteria	Unassigned	Bacteria skin	Staphylococcus enterotoxin SEC	IgE but no biological test	266	P34071.1	462026	9
Staphylococcus aureus	Bacteria	Unassigned	Bacteria skin	Staphylococcus enterotoxin SED	IgE but no biological test	258	P20723.1	119654	9
Staphylococcus aureus	Bacteria	Unassigned	Bacteria skin	Staphylococcus enterotoxin TSST 1	IgE plus basophil+ or SPT+	234	P06886.1	136457	9
Stemphylium callistephi	Fungus	Unassigned	Aero Fungi	Stemphylium major allergen alt a1-like	IgE but no biological test	137	AAT66567.1	49476467	7
Stemphylium sp. CID1012	Fungus	Unassigned	Aero Fungi	Stemphylium major allergen alt a1-like	IgE but no biological test	137	ABS29033.1	152060760	9
Stemphylium vesicarium	Fungus	Unassigned	Aero Fungi	Stemphylium major allergen alt a1-like	IgE but no biological test	137	AAT66566.1	49476465	7
Strongyloides stercoralis	Parasitic nematode	Unassigned	Worm (parasite)	Strongyloides L3NieAg.01	IgE plus basophil+ or SPT+	229	AAD46493.1	5669875	7
Suidasia medanensis	Mite	Unassigned	Aero Mite	Suidasia putative not official Sui m 2	IgE but no biological test	141	AAS75831.1	45738062	7
Sus scrofa	Pig	Unassigned	Aero Animal	Sus Porcine Pepsin	IgE but no biological test	385	P00791.3	118572685	11
Sus scrofa	Pig	Sus s 1.0101	Aero Animal	Sus s serum albumin	IgE but no biological test	605	AAA30988.1	164318	17
Sus scrofa	Pig	Unassigned	Aero Animal	Sus s serum albumin	IgE but no biological test	607	NP_001005208.1	52353352	17
Syringa vulgaris	Lilac	Syr v 3.0101	Aero Plant	Syringa Syr v 3	IgE but no biological test	81	P58171.1	14423847	7
Syringa vulgaris	Lilac	Syr v 1.0101	Aero Plant	Syringa Syr v I	IgE but no biological test	145	S43242	631911	7
Syringa vulgaris	Lilac	Syr v 1.0102	Aero Plant	Syringa Syr v I	IgE but no biological test	145	S43243	631912	7
Syringa vulgaris	Lilac	Syr v 1.0103	Aero Plant	Syringa Syr v I	IgE but no biological test	145	S43244	631913	7
Tabanus yao	Horse Fly	Tab y 1.0101	Venom or Salivary	Tabanus Tab y 1 Apyrase	IgE plus basophil+ or SPT+	554	ADX78255.1	323473390	12
Tabanus yao	Horse Fly	Tab y 2.0101	Venom or Salivary	Tabanus Tab y 2 Hyaluronidase	IgE but no biological test	349	ADM18346.1	304273371	12
Tabanus yao	Horse Fly	Tab y 5.0101	Venom or Salivary	Tabanus Tab y 5	IgE but no biological test	256	ADM18345.1	304273369	12
Tenebrio molitor	Yellow mealworm	Unassigned	Food insect	Tenebrio molitor tropomyosin mealworm	IgE plus basophil+ or SPT+	284	QBM01048.1	1591440921	20

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Thaumetopoea pityocampa	Pine moth	Tha p 1.0101	Contact	Thaumetopoea Tha p 1 full length	IgE but no biological test	126	ADK47876.1	301030229	12
Thaumetopoea pityocampa	Pine moth	Tha p 2.0101	Contact	Thaumetopoea Tha p 2	IgE but no biological test	115	P86360.1	408387552	14
Thaumetopoea pityocampa	Pine moth	Unassigned	Contact	Thaumetopoea Tha p 2	IgE but no biological test	104	CEE03319.1	1056731906	18
Thaumetopoea solitaria		Unassigned	Contact	Thaumetopoea Tha p 2	IgE but no biological test	100	CEE03318.1	1056731899	18
Theragra chalcogramma	Alaska pollock	Unassigned	Food Animal	Theragra parvalbumin	IgE plus basophil+ or SPT+	109	AAK63089.1	14531020	7
Theragra chalcogramma	Alaska pollock	Unassigned	Food Animal	Theragra parvalbumin	IgE plus basophil+ or SPT+	109	AAK63088.1	14531018	7
Thunnus albacares	Yellowfin tuna	Unassigned	Food Animal	Thunnus Thu a 2 enolase	IgE plus basophil+ or SPT+	12	P86978.1	576011132	15
Thunnus albacares	Yellowfin tuna	Thu a 2.0101	Food Animal	Thunnus Thu a 2 enolase	IgE plus basophil+ or SPT+	432	I0J1J1.1	576011129	15
Thunnus albacares	Yellowfin tuna	Unassigned	Food Animal	Thunnus Thu a 3 aldolase	IgE plus basophil+ or SPT+	364	CAX62602.1	291195949	12
Thunnus albacares	Yellowfin tuna	Thu a 3.0101	Food Animal	Thunnus Thu a 3 aldolase	IgE plus basophil+ or SPT+	37	P86979.1	576011088	15
Todarodes pacificus	Japanese flying squid	Unassigned	Food Animal	Todarodes Tod p 1	IgE but no biological test	284	BAE54431.1	83715932	7
Trachurus japonicus	Japanese horse mackerel	Unassigned	Food Animal	Trachurus parvalbumin	IgE but no biological test	107	BAE46763.1	77799800	7
Tresus keenae	clam	Unassigned	Food Animal	Tresus tropomyosin	IgE but no biological test	284	BAH10155.1	219806600	10
Triatoma protracta	Western conenose	Tria p 1.0101	Venom or Salivary	Triatoma Tria p 1	IgE but no biological test	169	AAF07903.2	15426413	7
Trichophyton rubrum	Fungus	Tri r 2.0101	Contact	Trichophyton (Arthroderma) Tri r 2	IgE plus basophil+ or SPT+	412	AAD52013.1	5813790	7
Trichophyton rubrum	Fungus	Tri r 4.0101	Contact	Trichophyton tri 4 allergen (Arthroderma)	IgE plus basophil+ or SPT+	726	AAD52012.1	5813788	7
Trichophyton schoenleinii	Fungus	Unassigned	Contact	Trichophyton (Arthroderma) Tri r 2	IgE plus basophil+ or SPT+	405	Q8J077.1	74663809	12
Trichophyton schoenleinii	Fungus	Unassigned	Contact	Trichophyton tri 4 allergen (Arthroderma)	IgE plus basophil+ or SPT+	726	CAD23374.1	23894227	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 14 LTP_amylase inhibitor	IgE plus basophil+ or SPT+	113	P24296.2	417370	11
Triticum aestivum	Wheat	Tri a 40.0101	Aero Plant	Triticum aestivum Tri a 40	IgE but no biological test	143	CAA42453.1	21711	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum aestivum Tri a 40	IgE but no biological test	143	ACG59281.1	195957140	10
Triticum aestivum	Wheat	Tri a 41.0101	Aero Plant	Triticum aestivum Tri a 41	IgE but no biological test	60	AKJ77988.1	827354845	16
Triticum aestivum	Wheat	Tri a 42.0101	Aero Plant	Triticum aestivum Tri a 42	IgE but no biological test	76	AKJ77986.1	827354790	16
Triticum aestivum	Wheat	Tri a 43.0101	Aero Plant	Triticum aestivum Tri a 43	IgE but no biological test	108	AKJ77987.1	827354822	16
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum aestivum Tri a 44	IgE but no biological test	94	CAI64398.1	66840998	7
Triticum aestivum	Wheat	Tri a 44.0101	Aero Plant	Triticum aestivum Tri a 44	IgE but no biological test	107	AKJ77990.1	827354912	16
Triticum aestivum	Wheat	Tri a 45.0101	Aero Plant	Triticum aestivum Tri a 45	IgE but no biological test	89	AKJ77985.1	827354784	16
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	307	CAA35238.1	21673	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	286	CAA25593.1	21755	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	296	CAA26383.1	21757	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	286	CAA26384.1	21761	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	313	CAA26385.1	21765	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	318	AAA34275.1	170710	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	291	AAA34276.1	170712	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	313	AAA34279.1	170718	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	286	AAA34280.1	170720	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	262	AAA34281.1	170722	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	297	AAA34282.1	170724	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	282	AAA34283.1	170726	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	186	AAA34284.1	170728	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	259	BAA12318.1	1304264	7
Triticum aestivum	Wheat	Unassigned	Aero Plant	Triticum Bakers asthma allergen #4	IgE but no biological test	27	P81496.1	3913017	7
Triticum aestivum	Wheat	Unassigned	Aero Plant	Triticum flour Glutathione Transferase	IgE plus basophil+ or SPT+	222	ACE82289.1	190684057	11
Triticum aestivum	Wheat	Tri a 19.0101	Food Plant	Triticum omega-5 gliadin Tri a 19	IgE plus basophil+ or SPT+	439	BAE20328.1	73912496	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum omega-5 gliadin Tri a 19	IgE plus basophil+ or SPT+	359	CAR82265.1	208605344	10
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum omega-5 gliadin Tri a 19	IgE plus basophil+ or SPT+	272	CAR82266.1	208605346	10
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum omega-5 gliadin Tri a 19	IgE plus basophil+ or SPT+	346	CAR82267.1	208605348	10
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum omega-5 gliadin Tri a 19	IgE plus basophil+ or SPT+	366	BAN29067.1	508732623	15
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum putative leucine-rich repeat protein	IgE but no biological test	137	CAI64397.1	66840996	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum serine carboxypeptidase II	IgE but no biological test	260	CAI64396.1	66840994	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum serine carboxypeptidase II	IgE but no biological test	444	P08819.2	125987805	10
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Thaumatin-like	IgE but no biological test	173	P27357.1	135917	12
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 12	IgE but no biological test	131	ACE82291.1	190684061	11
Triticum aestivum	Wheat	Tri a 12.0103	Food Plant	Triticum Tri a 12	IgE but no biological test	131	CAA61945.2	548948852	14
Triticum aestivum	Wheat	Tri a 12.0101	Food Plant	Triticum Tri a 12	IgE but no biological test	131	CAA61943.2	548948848	15
Triticum aestivum	Wheat	Tri a 12.0102	Food Plant	Triticum Tri a 12	IgE but no biological test	131	CAA61944.2	548948850	15

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Triticum aestivum	Wheat	Tri a 12.0104	Food Plant	Triticum Tri a 12	IgE but no biological test	131	CAQ57979.1	207366248	15
Triticum aestivum	Wheat	Tri a 15.0101	Aero Plant	Triticum Tri a 15	IgE but no biological test	121	CBA13560.1	283465829	11
Triticum aestivum	Wheat	Tri a 17.0101	Food Plant	Triticum Tri a 17	IgE plus basophil+ or SPT+	509	6GER_A	1540347225	19
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum Tri a 20	IgE plus basophil+ or SPT+	302	AAA34272.1	170702	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum Tri a 20	IgE plus basophil+ or SPT+	291	AAA34274.1	170708	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum Tri a 20	IgE plus basophil+ or SPT+	251	AAA34288.1	170736	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum Tri a 20	IgE plus basophil+ or SPT+	327	AAA34289.1	170738	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum Tri a 20	IgE plus basophil+ or SPT+	279	BAA11251.1	1063270	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum Tri a 20	IgE plus basophil+ or SPT+	285	CAI78902.1	62484809	7
Triticum aestivum	Wheat	Tri a 20.0101	Food Plant	Triticum Tri a 20	IgE plus basophil+ or SPT+	279	BAN29066.1	508732621	15
Triticum aestivum	Wheat	Tri a 21.0101	Food Plant	Triticum Tri a 21 alpha, beta-gliadin	IgE but no biological test	281	CAY54134.1	283476402	11
Triticum aestivum	Wheat	Tri a 25.0101	Aero Plant	Triticum Tri a 25	IgE but no biological test	125	CAB96931.1	8980491	15
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 26	IgE plus basophil+ or SPT+	830	CAA43331.1	21743	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 26	IgE plus basophil+ or SPT+	648	CAA31396.1	21751	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 26	IgE plus basophil+ or SPT+	660	CAA26847.1	21779	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 26	IgE plus basophil+ or SPT+	39	CAA24934.1	21793	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 26	IgE plus basophil+ or SPT+	705	CAA43361.1	22090	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 26	IgE plus basophil+ or SPT+	815	AAB02788.1	170743	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 26	IgE plus basophil+ or SPT+	838	CAA27052.1	736319	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 26	IgE plus basophil+ or SPT+	101	CAA24933.1	897811	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum Tri a 26	IgE plus basophil+ or SPT+	794	BAN29068.1	508732625	15
Triticum aestivum	Wheat	Tri a 26.0101	Food Plant	Triticum Tri a 26	IgE plus basophil+ or SPT+	848	CAA31395.4	288860106	15
Triticum aestivum	Wheat	Tri a 26.0201	Food Plant	Triticum Tri a 26	IgE plus basophil+ or SPT+	795	AAZ23584.1	71084277	15
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 27.0101 Thiol reductase	IgE but no biological test	203	BAC76688.1	30793446	7
Triticum aestivum	Wheat	Tri a 28.0101	Food Plant	Triticum Tri a 28	IgE but no biological test	119	CAI84642.1	66841026	7
Triticum aestivum	Wheat	Unassigned	Aero Plant	Triticum Tri a 29	IgE plus basophil+ or SPT+	145	CAA35598.1	21701	7
Triticum aestivum	Wheat	Tri a 29.0101	Aero Plant	Triticum Tri a 29	IgE plus basophil+ or SPT+	120	CAZ76052.1	253783731	11
Triticum aestivum	Wheat	Tri a 29.0201	Aero Plant	Triticum Tri a 29	IgE plus basophil+ or SPT+	120	CBA13559.1	283465827	11
Triticum aestivum	Wheat	Tri a 30.0101	Aero Plant	Triticum Tri a 30	IgE plus basophil+ or SPT+	168	CAA35597.1	21713	7
Triticum aestivum	Wheat	Tri a 31.0101	Aero Plant	Triticum Tri a 31	IgE but no biological test	253	CAC14917.1	11124572	7
Triticum aestivum	Wheat	Unassigned	Aero Plant	Triticum Tri a 32 Peroxiredoxin	IgE plus basophil+ or SPT+	218	ACE82290.1	190684059	11
Triticum aestivum	Wheat	Tri a 32.0101	Aero Plant	Triticum Tri a 32 Peroxiredoxin	IgE plus basophil+ or SPT+	218	Q6W8Q2.1	75324900	14
Triticum aestivum	Wheat	Unassigned	Aero Plant	Triticum Tri a 33 Serine protease inhibitor	IgE but no biological test	399	CAA72273.1	1885350	7
Triticum aestivum	Wheat	Tri a 33.0101	Aero Plant	Triticum Tri a 33 Serine protease inhibitor	IgE but no biological test	398	CAB52710.1	5734506	15
Triticum aestivum	Wheat	Tri a 34.0101	Aero Plant	Triticum Tri a 34 GAPDH	IgE but no biological test	337	CAZ76054.1	253783729	11
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 36	IgE but no biological test	307	CAA31685.1	21773	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 36	IgE but no biological test	356	CAA30570.1	21783	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum Tri a 36	IgE but no biological test	304	AAA34285.1	170730	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum Tri a 36	IgE but no biological test	323	AAA34286.1	170732	7
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum Tri a 36	IgE but no biological test	244	AAA34287.1	170734	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 36	IgE but no biological test	373	O22116	75317968	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 36	IgE but no biological test	229	CAA59338.1	886963	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 36	IgE but no biological test	261	CAA59339.1	886965	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 36	IgE but no biological test	276	CAA59340.1	886967	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 36	IgE but no biological test	285	O22108	75219081	7
Triticum aestivum	Wheat	Unassigned	Food Plant	Triticum Tri a 36	IgE but no biological test	326	CAI79052.1	62550933	7
Triticum aestivum	Wheat	Tri a 36.0101	Food Plant	Triticum Tri a 36	IgE but no biological test	369	AEH31546.1	335331566	12
Triticum aestivum	Wheat	Unassigned	Gliadin	Triticum Tri a 36	IgE but no biological test	283	BAN29069.1	508732627	15
Triticum aestivum	Wheat	Tri a 37.0101	Food Plant	Triticum Tri a 37 alpha purothionin	IgE but no biological test	137	CAA65313.1	4007850	14
Triticum aestivum	Wheat	Unassigned	Aero Plant	Triticum Tri a 39 serine proteinase inhibitor-lik	IgE but no biological test	84	ABS58503.1	154101366	10
Triticum aestivum	Wheat	Unassigned	Aero Plant	Triticum Tri a 39 serine proteinase inhibitor-lik	IgE but no biological test	84	P82977.2	122065237	11
Triticum aestivum	Wheat	Tri a 39.0101	Aero Plant	Triticum Tri a 39 serine proteinase inhibitor-lik	IgE but no biological test	84	CCK33471.1	403213259	14
Triticum aestivum	Wheat	Tri tu 14	Food Plant	Triticum Tri tu 14	IgE plus basophil+ or SPT+	115	CAH69206.1	84617221	19

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Triticum monococcum subsp. aegilopoides		Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	293	APY24042.1	1137166044	18
Triticum turgidum subsp. durum	Wheat	Unassigned	Food Plant	Triticum aestivum Tri a 40	IgE but no biological test	143	CAA34709.1	21916	7
Triticum turgidum subsp. durum	Wheat	Unassigned	Aero Plant	Triticum Tri a 29	IgE plus basophil+ or SPT+	145	CAA39099.1	21920	7
Triticum turgidum subsp. durum	Wheat	Unassigned	Food Plant	Triticum Tri a 36	IgE but no biological test	295	CAA36063.1	21926	7
Triticum turgidum subsp. durum	Wheat	Unassigned	Food Plant	Triticum Tri a 36	IgE but no biological test	285	CAA44473.1	21930	7
Triticum urartu	Wheat	Unassigned	Gliadin	Triticum alpha/beta gliadin	IgE plus basophil+ or SPT+	296	AAA34290.1	170740	7
Tyrophagus putrescentiae	Dust mite	Unassigned	Aero Mite	Tyrophagus Blo-t-5-like loose group	IgE but no biological test	135	AAX34057.1	60679590	9
Tyrophagus putrescentiae	Dust mite	Unassigned	Aero Mite	Tyrophagus Blo-t-5-like loose group	IgE but no biological test	128	AAX34058.1	60679592	9
Tyrophagus putrescentiae	Dust mite	Unassigned	Aero Mite	Tyrophagus Blo-t-5-like loose group	IgE but no biological test	138	AAX34059.1	60679594	9
Tyrophagus putrescentiae	Dust mite	Tyr p 28.0101	Aero Mite	Tyrophagus putrescentiae Tyr p 28	IgE but no biological test	659	AOD75395.1	1055365842	17
Tyrophagus putrescentiae	Dust mite	Tyr p 35.0101	Aero Mite	Tyrophagus putrescentiae Tyr p 35	IgE but no biological test	486	AOD75396.1	1055365860	17
Tyrophagus putrescentiae	Dust mite	Tyr p 36.0101	Aero Mite	Tyrophagus putrescentiae Tyr p 36	IgE but no biological test	131	AOD75399.1	1055365943	17
Tyrophagus putrescentiae	Dust mite	Unassigned	Aero Mite	Tyrophagus Tyr p 10 tropomyosin	IgE but no biological test	284	ABQ96644.1	148615631	9
Tyrophagus putrescentiae	Dust mite	Unassigned	Aero Mite	Tyrophagus Tyr p 10 tropomyosin	IgE but no biological test	201	ABU97479.1	156938915	9
Tyrophagus putrescentiae	Dust mite	Tyr p 10.0101	Aero Mite	Tyrophagus Tyr p 10 tropomyosin	IgE but no biological test	284	AAT40866.1	48249227	9
Tyrophagus putrescentiae	Dust mite	Tyr p 13.0101	Aero Mite	Tyrophagus Tyr p 13	IgE but no biological test	131	AAU11502.1	51860756	7
Tyrophagus putrescentiae	Dust mite	Unassigned	Aero Mite	Tyrophagus Tyr p 13	IgE but no biological test	130	ABM53751.1	121296500	9
Tyrophagus putrescentiae	Dust mite	Unassigned	Aero Mite	Tyrophagus Tyr p 13	IgE but no biological test	131	ABU97480.1	156938917	9
Tyrophagus putrescentiae	Dust mite	Tyr p 2.0101	Aero Mite	Tyrophagus Tyr p 2	IgE but no biological test	141	CAA73221.1	2182106	7
Tyrophagus putrescentiae	Dust mite	Tyr p 34.0101	Aero Mite	Tyrophagus Tyr p 24 Troponin C	IgE but no biological test	153	ACL36923.1	219815476	11
Tyrophagus putrescentiae	Dust mite	Tyr p 3.0101	Aero Mite	Tyrophagus Tyr p 3	IgE plus basophil+ or SPT+	285	ABZ81991.1	167540622	11
Tyrophagus putrescentiae	Dust mite	Unassigned	Aero Mite	Tyrophagus Tyr p 8	IgE plus basophil+ or SPT+	218	AGG10560.1	452215228	14
Ulocladium alternariae	Fungus	Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	138	AAT66607.1	49476547	7
Ulocladium atrum	Fungus	Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	137	AAT66609.1	49476551	7
Ulocladium capsicum		Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	134	ACH42744.1	197110100	10
Ulocladium chartarum	Fungus	Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	137	AAT66610.1	49476553	7
Ulocladium dauci		Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	137	ACJ65836.1	215399749	11
Ulocladium microsporum		Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	138	AGC36415.1	441467668	18
Ulocladium oudemansii		Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	137	ACH42743.1	197110098	10
Ulocladium oudemansii		Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	138	ACI44002.1	209363467	10
Ulocladium sp. CID262		Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	137	ABQ59259.1	148357923	9
Ulocladium sp. CID598		Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	137	ABQ59258.1	148357921	9
Ulocladium sp. CID68		Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	137	ABQ59255.1	148357915	9
Ulocladium sp. HSAUP1144		Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	138	ACJ54737.1	213958825	11
Ulocladium sp. XGZ-2008		Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	137	ACH42741.1	197110094	10
Ulocladium sp. XGZ-2011a		Unassigned	Aero Fungi	Ulocladium alt a1-like	IgE but no biological test	137	AGC36416.1	441467671	18
Urochloa mutica		Unassigned	Aero Plant	Uro m 1 beta expansin	IgE plus basophil+ or SPT+	262	QCB92083.1	1618848552	20
Vachellia farnesiana		Unassigned	Aero Plant	Acacia (Vachellia) Aca f 1	IgE but no biological test	150	AKV72166.1	914410006	17
Vachellia farnesiana		Unassigned	Aero Plant	Acacia (Vachellia) profilin Aca f 2	IgE but no biological test	133	AIV43662.1	701225196	17
Venerupis philippinarum	Clam	Unassigned	Food Animal	Venerupis tropomyosin	IgE but no biological test	284	BAH10157.1	219806573	10
Vespa affinis	Lesser banded hornet	Unassigned	Venom or Salivary	Vespa affinis Phospholipase A1	IgE plus basophil+ or SPT+	334	P0DMB5.1	576011175	15
Vespa affinis	Lesser banded hornet	Unassigned	Venom or Salivary	Vespa affinis Phospholipase A1	IgE plus basophil+ or SPT+	334	P0DMB4.1	576011171	15
Vespa crabro	European hornet	Vesp c 1.0101	Venom or Salivary	Vespa Vesp c 1 phospholipase	IgE but no biological test	301	P0CH87.1	313471397	12
Vespa crabro	European hornet	Vesp c 5.0101	Venom or Salivary	Vespa Vesp c 5 and Vesp m 5	IgE but no biological test	202	P35781.1	549184	7
Vespa crabro	European hornet	Vesp c 5.0102	Venom or Salivary	Vespa Vesp c 5 and Vesp m 5	IgE but no biological test	202	P35782.1	549185	7
Vespa magnifica	Hornet	Unassigned	Venom or Salivary	Vespa magnifica Vesp ma 2 hyaluronidase	IgE plus basophil+ or SPT+	357	CBY83816.1	315133295	12
Vespa magnifica	Hornet	Unassigned	Venom or Salivary	Vespa magnifica Vesp ma 5	IgE plus basophil+ or SPT+	225	CBY93636.1	319801357	12
Vespa mandarinia	Wasp	Vesp m 5.0101	Venom or Salivary	Vespa Vesp c 5 and Vesp m 5	IgE but no biological test	202	P81657.1	6136165	7
Vespula flavopilosa	Wasp	Ves f 5.0101	Venom or Salivary	Vespula antigen 5 Ves f, v, s 5	IgE plus basophil+ or SPT+	204	P35783.1	549189	7
Vespula germanica	Wasp	Ves g 5.0101	Venom or Salivary	Vespula antigen 5 Ves f, v, s 5	IgE plus basophil+ or SPT+	204	P35784.1	549190	7
Vespula germanica	Wasp	Unassigned	Venom or Salivary	Vespula antigen 5 Ves f, v, s 5	IgE plus basophil+ or SPT+	204	CAJ28930.1	74035841	7
Vespula germanica	Wasp	Unassigned	Venom or Salivary	Vespula Phospholipase A1- Ves m/v 1	IgE plus basophil+ or SPT+	300	CAJ28931.1	74035843	7

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Vespula germanica	Wasp	Unassigned	Venom or Salivary	Vespula Ves v 2	IgE plus basophil+ or SPT+	331	CAL59818.1	116174180	8
Vespula germanica	Wasp	Unassigned	Venom or Salivary	Vespula Ves v 2	IgE plus basophil+ or SPT+	323	CAL59819.1	116174182	8
Vespula maculifrons	Wasp	Ves m 5.0101	Venom or Salivary	Vespula antigen 5 Ves f, v, s 5	IgE plus basophil+ or SPT+	204	P35760.1	549191	7
Vespula maculifrons	Wasp	Unassigned	Venom or Salivary	Vespula antigen 5 Ves f, v, s 5	IgE plus basophil+ or SPT+	227	ABC73068.1	85681830	7
Vespula maculifrons	Wasp	Vesp m 1.0101	Venom or Salivary	Vespula Phospholipase A1- Ves m/v 1	IgE plus basophil+ or SPT+	300	P51528.1	1709545	8
Vespula maculifrons	Wasp	Ves m 2.0101	Venom or Salivary	Vespula Ves m 2 Hyaluronidase	IgE but no biological test	31	P0CH89.1	313118253	12
Vespula pensylvanica	Wasp	Ves p 5.0101	Venom or Salivary	Vespula antigen 5 Ves f, v, s 5	IgE plus basophil+ or SPT+	204	P35785.1	549192	7
Vespula squamosa	Wasp	Ves s 5.0101	Venom or Salivary	Vespula antigen 5 Ves f, v, s 5	IgE plus basophil+ or SPT+	205	P35786.1	549193	7
Vespula squamosa	Wasp	Ves s 1.0101	Venom or Salivary	Vespula Ves s 1 phospholipase	IgE but no biological test	298	P0CH86.1	313471398	12
Vespula vidua	Wasp	Ves vi 5.0101	Venom or Salivary	Vespula antigen 5 Ves f, v, s 5	IgE plus basophil+ or SPT+	206	P35787.1	549194	7
Vespula vulgaris	Wasp	Ves v 5.0101	Venom or Salivary	Vespula antigen 5 Ves f, v, s 5	IgE plus basophil+ or SPT+	227	AAA30333.1	162551	7
Vespula vulgaris	Wasp	Ves v 5	Venom or Salivary	Vespula antigen 5 Ves f, v, s 5	IgE plus basophil+ or SPT+	204	CAB42887.1	4826574	7
Vespula vulgaris	Wasp	Ves v 5	Venom or Salivary	Vespula antigen 5 Ves f, v, s 5	IgE plus basophil+ or SPT+	209	1QNX_A	11514279	7
Vespula vulgaris	Wasp	Vesp v 1.0101	Venom or Salivary	Vespula Phospholipase A1- Ves m/v 1	IgE plus basophil+ or SPT+	336	AAB48072.1	897647	7
Vespula vulgaris	Wasp		Venom or Salivary	Vespula Ves v 2	IgE plus basophil+ or SPT+	331	P49370.1	1346323	7
Vespula vulgaris	Wasp	Ves v 2.0101	Venom or Salivary	Vespula Ves v 2	IgE plus basophil+ or SPT+	340	CAI77218.1	62147665	7
Vespula vulgaris	Wasp	Unassigned	Venom or Salivary	Vespula Ves v 2	IgE plus basophil+ or SPT+	331	2ATM_A	109157163	8
Vespula vulgaris	Wasp	Ves v 3.0101	Venom or Salivary	Vespula Ves v 3 dipeptidylpeptidase IV	IgE plus basophil+ or SPT+	776	ACA00159.1	167782086	9
Vigna radiata	mung bean	Vig r 1.0101	Food Plant	Vigna Vig r 1 PR 10	IgE but no biological test	155	AAX19889.1	60418924	7
Vigna radiata	mung bean	Vig r 2.0101	Food Plant	Vigna Vig r 2	IgE but no biological test	453	ABG02262.1	108743976	15
Vigna radiata	mung bean	Vig r 2.0201	Food Plant	Vigna Vig r 2	IgE but no biological test	454	ABW23574.1	158251953	15
Vigna radiata	mung bean	Vig r 6.0101	Food Plant	Vigna Vig r 6 Cytokinin-specific binding protein	IgE but no biological test	155	BAA74451.1	4190976	14
Vigna radiata var. radiata	mung bean	Vig r 4.0101	Food Plant	Vigna Vig r 4	IgE but no biological test	272	CAA50008.1	1000708	15
Vigna radiata var. radiata	mung bean	Unassigned	Food Plant	Vigna Vig r 6 Cytokinin-specific binding protein	IgE but no biological test	155	A0A1S3THR8.1	1559988738	20
Vitis sp.	Grape	Unassigned	Food Plant	Vitis Lipid transfer protein P3	IgE but no biological test	91	P80273.2	145559502	8
Vitis sp.	Grape		Food Plant	Vitis Vit v 1 LTP	IgE but no biological test	37	P80274.1	462719	7
Vitis sp.	Grape	Unassigned	Food Plant	Vitis Vit v 1 LTP	IgE but no biological test	38	P33556.1	462717	7
Xiphias gladius	Swordfish	Xip g 1.0101	Food Animal	Xiphias Xip g 1 beta-parvalbumin	IgE but no biological test	109	CAR48256.1	222352960	10
Zea mays	Corn	Unassigned	Aero Plant	Zea group 13 pollen allergen	IgE but no biological test	410	ABD79096.1	89892725	7
Zea mays	Corn	Unassigned	Aero Plant	Zea group 13 pollen allergen	IgE but no biological test	404	ABD79097.1	89892727	7
Zea mays	Corn	Unassigned	Aero Plant	Zea group 13 pollen allergen	IgE but no biological test	411	ABD79098.1	89892729	7
Zea mays	Corn	Zea m 8.0101	Food Plant	Zea mays Zea m 8	IgE but no biological test	278	ACX37090.1	260401081	17
Zea mays	Corn	Unassigned	Food Plant	Zea mays Zea m 8	IgE but no biological test	280	P29022.1	116329	17
Zea mays	Corn	Unassigned	Aero Plant	Zea pollen specific protein	IgE but no biological test	170	2209273A	1588669	7
Zea mays	Corn	Unassigned	Aero Plant	Zea Zea m 1 beta-expansin	IgE but no biological test	269	AAO45608.1	28630923	7
Zea mays	Corn	Unassigned	Aero Plant	Zea Zea m 1 beta-expansin	IgE but no biological test	269	AAK56124.1	14193761	8
Zea mays	Corn	Unassigned	Aero Plant	Zea Zea m 1 beta-expansin	IgE but no biological test	245	2HCZ_X	114794319	8
Zea mays	Corn	Unassigned	Aero Plant	Zea Zea m 1 beta-expansin	IgE but no biological test	191	AAA33496.1	293902	11
Zea mays	Corn	Unassigned	Aero Plant	Zea Zea m 1 isoform	IgE but no biological test	263	ABD79094.1	89892721	7
Zea mays	Corn	Unassigned	Aero Plant	Zea Zea m 1 isoform	IgE but no biological test	252	ABD79095.1	89892723	7
Zea mays	Corn	Unassigned	Aero Plant	Zea Zea m 1 isoform	IgE but no biological test	99	ABF81661.1	105969543	8
Zea mays	Corn	Unassigned	Aero Plant	Zea Zea m 1 isoform	IgE but no biological test	269	ABF81662.1	105969545	8
Zea mays	Corn	Unassigned	Aero Plant	Zea Zea m 1 isoform	IgE but no biological test	270	Q1ZYQ8.2	115502167	9
Zea mays	Corn	Unassigned	Aero Plant	Zea Zea m 1 isoform	IgE but no biological test	269	P0C1Y5.1	115502168	9
Zea mays	Corn	Zea m 12.0104	Food Plant	Zea Zea m 12 profilin	IgE but no biological test	131	AAB86960.1	2642324	7
Zea mays	Corn	Unassigned	Food Plant	Zea Zea m 12 profilin	IgE but no biological test	131	ABG81312.1	110644952	8
Zea mays	Corn	Unassigned	Food Plant	Zea Zea m 12 profilin	IgE but no biological test	131	ABG81313.1	110644954	8
Zea mays	Corn	Unassigned	Food Plant	Zea Zea m 12 profilin	IgE but no biological test	131	ABG81314.1	110644956	8
Zea mays	Corn	Unassigned	Food Plant	Zea Zea m 12 profilin	IgE but no biological test	131	ABG81315.1	110644958	8
Zea mays	Corn	Unassigned	Food Plant	Zea Zea m 12 profilin	IgE but no biological test	131	ABG81316.1	110644960	8
Zea mays	Corn	Unassigned	Food Plant	Zea Zea m 12 profilin	IgE but no biological test	131	ABG81317.1	110644962	8
Zea mays	Corn	Unassigned	Food Plant	Zea Zea m 12 profilin	IgE but no biological test	130	ABG81318.1	110644964	8
Zea mays	Corn	Zea m 12.0101	Aero Plant	Zea Zea m 12 profilin	IgE but no biological test	131	CAA51718.1	313138	15
Zea mays	Corn	Zea m 12.0102	Aero Plant	Zea Zea m 12 profilin	IgE but no biological test	137	CAA51719.1	313140	15
Zea mays	Corn	Zea m 12.0103	Aero Plant	Zea Zea m 12 profilin	IgE but no biological test	131	CAA51720.1	313142	15

Species	Common	IUISÂ Allergen	Type	Group	Allergenicity	Length	Accession	GI#	First Version
Zea mays	Corn	Zea m 12.0105	Aero Plant	Zea Zea m 12 profilin	IgE but no biological test	131	AAG35601.1	11493677	15
Zea mays	Corn	Unassigned	Aero Plant	Zea Zea m 12 profilin	IgE but no biological test	132	5FEF_A	1064245368	18
Zea mays	Corn	Zea m 14.0101	Food Plant	Zea Zea m 14	IgE but no biological test	120	AAA33493.1	168576	15
Zea mays	Corn	Zea m 14.0102	Food Plant	Zea Zea m 14	IgE but no biological test	99	AAA33494.1	168578	15
Zea mays	Corn	Zea m 25.0101	Aero Plant	Zea Zea m 25 thioredoxin	IgE but no biological test	128	CAI64400.1	66841002	7
Ziziphus mauritiana	Chinese-date	Ziz m 1.0101	Food Plant	Ziziphus Ziz m 1	IgE plus basophil+ or SPT+	330	AAX40948.1	61225281	7

APPENDIX F
ANALYSIS OF POTENTIALLY ALLERGENIC PROTEINS IN SAMPLES DERIVED FROM SILKWORM

Identification and analysis of potentially allergenic proteins in samples derived from the *Bombyx mori* silkworm for Cambridge Crops, Inc.

Analysis by:

[redacted]

Assistant Professor

University of Nebraska—Lincoln

Department of Food Science and Technology

[redacted]

Report completed:
March 19, 2020

Table of Contents

I. Objective of this report

Examine the presence of particular proteins relevant to allergen risk assessment in samples derived from *Bombyx mori* using mass spectrometry (MS) data provided by Cambridge Crops, Inc. (CC) and analytical partners.

A. Samples (information provided by CC)

The following information was provided by Cambridge Crops. Samples sent by Cambridge Crops to their analytical partner at Harvard are below:

- Pupa of *Bombyx mori*
- Cocoon of *Bombyx mori*
- Degummed Fibroin (partially processed product material)
- Fibroin powder product (finished product material)

B. Abbreviations used

MS – mass spectrometry
MWCO – molecular weight cutoff
FASP – filter aided sample preparation
TFA – triflouroacetic acid
EIC – extracted ion chromatogram
TM – tropmyosin
AK – arginine kinase
TR – thioredoxin
CN – chitinase
PM – paramyosin

C. Notes and disclaimers

This report describes the expert opinion of the author. This report should not be taken as an opinion as to the safety or otherwise of any product. Only the data analysis and interpretation were performed by Phil Johnson. I understand that Cambridge Crops provided the samples to the Harvard Center for Mass Spectrometry Proteomics laboratory, and that the Harvard laboratory prepared the samples and the MS analysis. The detail of methodology used for experimental work was provided by Cambridge Crops and the Harvard University laboratory.

Proteins of interest were not selected by Phil Johnson, but were provided by Cambridge Crops after discussion with Dr. Richard Goodman of the Food Allergy Research and Resource Program at the University of Nebraska-Lincoln.

II. Summary of opinions:

Cambridge Crops, along with Dr. Richard Goodman, identified five Proteins of Allergenic Interest. Of the five proteins, only one is a recognized allergen in *B. mori* silkworms—the rest are allergens identified within potentially similar insects.

It is my expert opinion that the fibroin powder product does not contain Proteins of Allergenic Interest that are detectable with the methods used under standardized identification criteria set by the Human Proteome Organization (HUPO)–Proteomics Standards Initiative (PSI).

III. Methodology

A. Cocoon, degummed fibroin and fibroin powder product

The cocoon, degummed fibroin, and fibroin powder product were prepared by CC to meet their own standards. I understand their methodology is described in the Generally Recognized as Safe dossier. Protein concentration of their samples was determined by CC using the BCA assay using 5% fibroin solution as a calibrant. For each sample, protein concentration was estimated at approximately 14mg/ml. Each MS analysis presented in this report is the result of sample processing and MS of individual samples. For the powders and degummed fibroin these were individually weighed powders. For the cocoon, the analysis is of a single whole cocoon.

I understand that the Harvard University laboratory performed the following: 20 µl of dialyzed material (protein concentration approximately 14 mg/ml for a total of approximately 280 µg of protein) was reduced, alkylated and digested under a total 4 µg of trypsin) using a FASP protocol. Samples were dried and resuspended in 30 µl of 0.1 % TFA. 5 ml of this solution was injected for MS analysis (Orbitrap Elite Hybrid Ion Trap-Orbitrap Mass Spectrometer using a WATERS Aquity column (#186008795 nanoEase M/Z Peptide BEH column).

B. Pupa samples

Three individual pupae were analyzed. Each sample was processed and analyzed once. Covaris DF buffer (containing urea) was added to a Bombyx mori pupa (sample 1 = 7.6 mg, sample 2 = 6.62 mg) to give a 1% w/v solution, and sonicated using a Covaris S220 shearing device. Samples (1 = 76 µg, 2 = 66 µg) of the resultant extract were used in FASP and analyzed as described above. An estimated 2.5 µg of pupa material was injected.

C. Source of data used in this analysis

Raw MS data (Thermo.raw files) were provided by the Harvard laboratory. Table 1, below, shows an overview of the data files used in this report. Two separate sets of MS analysis were performed in separate experiments. In total, there are 3 MS runs of pupa material, 1 run of cocoon material, 1 run of degummed fibroin product and 3 runs of fibroin powder product. These files are archived and are available upon request.

Data file	Name used in this report	Date of MS analysis
200204ASYSAM06609_Pupa-FT.raw	Pupa1	20200204
200204ASYSAM06610_Cocoon-FT.raw	Cocoon1	20200204
200204ASYSAM06611_DegummedFibroin-FT.raw	DFib1	20200204
200204ASYSAM06612_FibroinPowderProduct-FT.raw	Powder1	20200204
200211ASYSAM06657_Pupa1-FT2.raw	Pupa2a	20200211
200211ASYSAM06658_Pupa2-FT2.raw	Pupa2b	20200211
200211ASYSAM06659_Powder1-FT2.raw	Powder2a	20200211
200211ASYSAM06660_Powder2-FT2.raw	Powder2b	20200211

Table 1. MS data files and tissue of origin of MS data used in this report. Data generated on the two different dates were obtained using different protein load on column prior to MS. That obtained on 20200204 is detailed in Methodology, above. That obtained on 20200211 was obtained using a reduced protein load.

IV. Data analysis (performed by)

Data were analyzed using PEAKSQ version 8.5. Full settings used are available upon request. Data were taken directly from PEAKS, and label-free data was exported for analysis in MS Excel. Graphpad Prism was used for generating figures. This report only considers data relevant to particular proteins (see below). Data for all proteins is available in a supplemental Excel file available upon request.

A. Note on protein identification quality

The -10lgP score is a measure of quality of protein identification used by PEAKS software. The P-value is converted to -10*log10(P-value) to make it more immediately understandable. A more significant match will have a higher -10lgP value. Additionally, a P-value of 1% is equivalent to -10lgP of 20. This score is dependent upon the database used as well as the number and quality of peptide spectra. The number of peptides identified for each protein sequence is given here as an additional measure of identification quality. Human Proteome Organization (HUPO)–Proteomics Standards Initiative (PSI) demand at least two unique peptides for a protein identification.

B. Proteins of allergenic interest

The following proteins were identified by Cambridge Crops during their discussion with . The proteins of allergenic interest were identified in that they are potentially allergenic. *B. mori* sequences corresponding to each protein of allergenic interest were identified by text search of protein name, and by BLAST searching to identify potentially unnamed members of the protein families. Analytical data pertaining to these identified sequences was used to prepare this report. Importantly, not all of the sequences included in this analysis are known or even suspected allergens. In this report we examine known protein sequences, related by function or homology, to these potential allergens:

- Tropomyosin (TM)
    - TM is a cytoskeletal protein, abundant in muscular tissues. It has not been identified as a *B. mori* allergen but is recognized as a likely 'pan-allergen' in insects and shellfish.
- Arginine Kinase (AK)
    - AK is involved in energy metabolism and is likely a component of all metabolically active tissues. AK is a recognized allergen in *B. mori* and other insects.
- Thioredoxin (TR)
    - TR is involved in redox signaling and is a likely component of all metabolically active tissues. TR is a recognized allergen in moth species, but not *B. mori*.
- Chitinase (CT) (includes 'imaginal disk growth factor' and 'oviduct specific glycoprotein' which are homologous to chitinases and likely share function)
    - CT is involved in molting and development and is likely localized to tissues undergoing developmental change. CT is a recognized allergen in other insect species but not *B. mori*.
- Paramyosin (PM)
    - PM is a cytoskeletal protein, likely most abundant in muscle tissue. PM is a recognized allergen in other insect species but not in *B. mori*.

Together, these proteins will be identified as "Proteins of Allergenic Interest." Only data pertinent to these proteins are discussed in this report.

V. Results and Discussion

A. Preliminary review of MS data quality

Total Ion Chromatograms (TICs) represent the total amount of ions passing through the MS instrument and may be used as a measure of data quality, particularly with respect to chromatography. Maximum TIC (a measure of ion abundance from the sample) for all files was in the range 10^8-10^9 which is generally optimal. Peak resolution was poor but did not appear to adversely affect peptide and protein identification (see below). It is likely that quantitation of observed peptides and proteins by peak integration would be affected. Data presented here comes from two independent experiments, both showing poor peak resolution. The reproducibility of the chromatography indicates that poor resolution may be due to the nature of the samples and therefore difficult to avoid.

B. Data overview - identification of peptides and proteins

Table 1, below, summarizes number of MS2 triggers, as well as number of peptide and protein identifications. Number of identified proteins containing missed cleavages is also indicated. An FDR of 1% (generally accepted standard in the field) is used in each case. Number of MS2 triggers was relatively consistent and indicates properly functioning MS acquisition. The number of identified peptides and proteins decreases in the non-pupa samples. The smaller number of peptide and protein identifications in cocoon, degummed fibroin and powder product are likely the result of decreased sample complexity (i.e. smaller number of proteins in the sample). Data from the second set of analysis (Pupa 2a, Pupa 2b, Powder 2a, Powder 2b) yielded higher numbers of peptide and protein identifications than comparable analyses from the first experiment (Pupa 1, Powder 1). This indicates that the adjustment of procedures resulted in improved detection.

Sample	**#ms2 scans**	**#Peptide-Spectrum Matches**	**#Peptide sequences**	**#Proteins**
Pupa 1	9013	3215	2544	730
Pupa 2a	7243	3754	3193	1018
Pupa 2b	6945	3569	2689	803
Cocoon1	10804	2772	867	178
DFib1	8689	1347	295	92
Powder1	8252	688	166	87
Powder2a	6352	659	202	135
Powder2b	5746	712	197	140

Table 2. Overview of data and database search quality. A false discovery rate (FDR) was set at <1% throughout.'#ms2' scans is the number of times fragmentation and secondary scan was triggered. 'Peptide-spectrum matches' indicate the number of these secondary scans that could be matched to peptides in the B. mori sequence database. '#Peptide sequences' indicate the number of these matched peptide sequences. '#Proteins' indicates the number of individual protein sequences in the B. mori database to which these peptide sequences were matched.

C. Presence of proteins of allergenic interest in samples

Complete information on the detection of Proteins of Allergenic Interest in each sample is given in a supplementary Excel file archived and available upon request. Summary of such information, showing only the highest-quality identification within each protein group, is shown in Table 3. A discussion of identified peptides and protein in each group of samples is given below.

	TM	**AK**	**TR**	**CN**	**PM**
Pupa1	237.67 (7)	318.42(16)	227.14(9)	348.47(13)	159.95(5)
Pupa2a	236.16 (14)	289.72(15)	233.06(8)	229.73(13)	216.88(10)
Pupa2b	225.47 (10)	238.37(10)	212.36(6)	246.08(15)	206.54(8)
Cocoon1	not detected ("nd") (0)	nd (0)	nd (0)	nd (0)	nd (0)
DFib1	nd (0)	nd (0)	nd (0)	nd (0)	nd (0)
Powder1	nd (0)	nd (0)	nd (0)	nd (0)	nd (0)
Powder2a	nd (0)	nd (0)	nd (0)	nd (0)	nd (0)
Powder2b	45.87 (1)	nd (0)	nd (0)	nd (0)	nd (0)

Table 3. Identification of proteins of allergenic interest using data from each indicated sample (TM=tropomyosin, AK = arginine kinase, TR=thioredoxin, CN=chitinase, PM=paramyosin). Only the highest quality (highest -10lgP) protein identification for each protein of allergenic interest is given here. For a complete description of all proteins potentially identified in each sample, refer to the supplementary Excel file. For each protein of allergenic interest, quality criteria for the highest quality identification among the sequences is given. The highest -10logP score (statistically derived measure of protein identification, higher is better) is presented with the number of peptide matches to that sequence in parentheses. nd=not detected.

1. Identification of Proteins of Allergenic Interest in the pupa

Representative sequences from each Protein of Allergenic Interest were readily identifiable, at high confidence, in all three pupae samples. This high-quality identification serves as a positive control, and suggests that the methodology employed is capable of definitive demonstration of protein presence if proteins are present in the sample. In some cases, isoforms of proteins of allergenic interest were identifiable due to the presence of peptides that are unique to one or another isoform. In other cases, only peptides that were shared between isoforms were identified, therefore positively identifying the group of proteins rather than an individual isoform.

2. Identification of Proteins of Allergenic Interest in the cocoon

No identifiable Protein of Allergenic Interest was present in the single degummed fibroin sample.

3. Identification of Proteins of Allergenic Interest in the degummed fibroin

No identifiable Protein of Allergenic Interest was present in the single degummed fibroin sample.

4. Identification of Proteins of Allergenic Interest in the fibroin powder (Mori Silk)

Human Proteome Organization (HUPO)–Proteomics Standards Initiative (PSI) demand at least two unique peptides for a protein identification. That said, one of the three powder samples gave a single peptide match for a TM protein. A separate sample (powder 2a) gave a single peptide match for a TR protein. Further, these matches were of particularly low quality and depended on one peptide only—which would not rise to the HUPO standard. This single peptide was further not detected in the other two powder samples, or in the cocoon sample. This further indicates that TM is not present at detectable levels in the powder product.

The occurrence of the identified TM peptide in B. mori TM sequences is shown in Figure 1. The peptide, KIVELEEELR, is shared between all *B. mori* TM sequences and could therefore arise from one, all, or some TM isoforms. The peptide is does not result from a trypsin (the enzyme used for MS sample preparation) cleavage at both ends. Were this peptide cleaved by trypsin, we would expect removal of the N-terminal lysine (K) residue, as trypsin cuts after K or R except where P is the next residue. In the vast majority of cases, the most abundant peptides and most reliable identification result from perfect trypsin cleavages. This further suggests that the identification of this peptide may not be genuine.

Figure 1. Occurrence of the identified peptide (KIVELEEELR) in an alignment of8 B. mori TM sequences. Uniprot ID of each sequence is indicated at the left of each sequence. The alignment was generated using PEAKS 8.5. The peptide identified is shown within a red box. Capital letters and shading (dark = high conservation, light = lower conservation) indicate conservation of residues throughout sequences. A dash indicates absence of residues in a given sequence.

VI. Conclusions

- TM, AK, TR, CN and PM were readily identifiable in pupae samples at high confidence (n=3).
- Using HUPO Standards, no Proteins of Allergenic Interest were detected in the cocoon sample (n=3).
- Using HUPO Standards, no Proteins of Allergenic Interest were detected in the degummed fibroin sample (n=1).
- Using HUPO Standards, no Proteins of Allergenic Interest were detected in the fibroin powder product samples (n=3).
- In sum, it is my expert opinion that the fibroin powder product does not contain Proteins of Allergenic Interest that are detectable using the method employed.

Author:  Date: 3/22/2020

Assistant Professor
University of Nebraska—Lincoln
Department of Food Science and Technology

APPENDIX G
MORI SILK SAFETY STUDIES

APPENDIX G1
MORI SILK: BACTERIAL REVERSE MUTATION TEST (AMES TEST)

STUDY TITLE

Silk Fibroin:
Bacterial Reverse Mutation Test (Ames Test)

DATA REQUIREMENT

US FDA Toxicological Principles for the Safety Assessment of Food Ingredients, Redbook 2000, IV.C. 1. a. (2007)

ICH S2 (R1) Guidance on Genotoxicity Testing and Data Interpretation for Pharmaceuticals Intended for Human Use (2012)

AUTHOR

Mithila Shitut, BVSc & AH, MS

STUDY COMPLETED ON

September 15, 2017

PERFORMING LABORATORY

Product Safety Labs

LABORATORY STUDY NUMBER

45996

SPONSOR

Tufts University
169 Holland St.
Somerville, MA 02144

Product Safety Labs
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GOOD LABORATORY PRACTICE COMPLIANCE STATEMENT

Silk Fibroin

This study meets the requirements of Good Laboratory Practices as stated in U.S. FDA GLP: 21 CFR Part 58, 1987, and with the following exception:

Characterization of the positive control substances and verification of concentration of the positive control substances in their carriers during this study were not determined analytically; however, the purity of the materials used were certified by a reputable supplier and all preparations were thoroughly documented.

Specific information related to the characterization of the test substance as received and tested is the responsibility of the study Sponsor (see Test Substance section).

Study Director: [redacted] Date: September 15, 2017

Name of Signer: [redacted] BVSc & AH, MS

Name of Company: Product Safety Labs

Sponsor: _____ Date: _____

Name of Signer: _____

Name of Company: Tufts University

Submitter: _____ Date: _____

Name of Signer: _____

Name of Company: Tufts University

QUALITY ASSURANCE STATEMENT

The Product Safety Labs' Quality Assurance Unit has reviewed this final study report to assure the report accurately describes the methods and standard operating procedures, and that the reported results accurately reflect the raw data of the study.

QA activities for this study:

QA Activity	Performed By	Date Conducted	Date Findings Reported To Study Director And Management
Protocol review	[redacted]	Aug 21, 2015[1]; Aug 25, 2017	Aug 21, 2015; Aug 25, 2017
In-process inspection: *Optical density check and plating*		Aug 10, 2017	Aug 10, 2017
Raw data audit		Aug 25, 2017	Aug 25, 2017
Draft report review		Aug 25, 2017	Aug 25, 2017

Final report reviewed by:

[redacted] RQAP-GLP
Quality Assurance Auditor
Product Safety Labs

Sept. 15, 2017
Date

[1] PSL's "generic" protocol used for this study was reviewed by the Quality Assurance group on this date.

TABLE OF CONTENTS

SILK FIBROIN:
BACTERIAL REVERSE MUTATION TEST (AMES TEST)

PROTOCOL NO.:	P600.AMES
STUDY NUMBER:	45996
SPONSOR:	Tufts University 169 Holland St. Somerville, MA 02144
TEST SUBSTANCE IDENTIFICATION:	Silk Fibroin Batch #: 2017_27_07
DATE RECEIVED:	August 2, 2017
PSL REFERENCE NO:	170802-1D
STUDY INITIATION DATE:	August 3, 2017
DATES OF TEST:	August 10 - August 14, 2017
NOTEBOOK NO.:	45996: pages 1-82

1. PURPOSE

To evaluate the potential for Silk Fibroin to induce gene mutations in bacteria using the Ames assay. Point mutations which involve substitution, addition or deletion of one or a few DNA base pairs are detected in amino acid-requiring strains of *Salmonella typhimurium* (*S. typhimurium*, ST) and *Escherichia coli* (*E. coli*, EC) by their ability to functionally reverse mutations. These reverse mutations result in revertant colonies of bacteria with restored capability to synthesize the essential amino acid.

2. SUMMARY

The Ames test was conducted with Silk Fibroin at levels of 31.6, 100, 316, 1000, 3160, 10,000, 31,600, and 100,000 µg/plate, with the high level being the standard limit for this test. The main test was conducted using the plate incorporation method in both the absence and presence of metabolic activation (chemically-induced rat liver S9 mix). The results of the test were confirmed using a similar study design but employing the pre-incubation modification of the Ames test.

The mean revertant colony counts for each strain treated with the vehicle were close to or within the expected range, considering the laboratory historical control range and/or published values (Mortelmans & Zeiger, 2000; Gatehouse, 2012). The positive control substances caused the expected substantial increases in revertant colony counts in both the absence and presence of S9 in each phase of the test confirming the sensitivity of the test and the activity of the S9 mix. Therefore, each phase of the test is considered valid.

No signs of precipitation or toxicity were noted in any of the strains. Contamination, which did not impact mutagenicity evaluation, was noted in individual plates for the E. coli, TA1535 and TA1537 strains.

For all strains, eight dose levels without precipitation, toxicity or plate contamination were evaluated; therefore, bacterial mutagenicity was adequately assessed.

In conclusion, based on these findings and on the evaluation system used, Silk Fibroin did not elicit evidence of bacterial mutagenicity in the Ames assay.

3. TEST SUBSTANCE

The test substance, identified as Silk Fibroin, Batch #: 2017_27_07, was received on August 2, 2017, and was further identified with PSL Reference Number 170802-1D. The test substance was stored refrigerated. Documentation of the methods of synthesis, fabrication, or derivation of the test substance is retained by Tufts University Science and Tech Center, 4 Colby Street, Medford, MA.

The following information related to the characterization of the test substance was provided by the Sponsor:

Composition: Silk fibroin - 5%
Water - 95%

Physical Description: Clear liquid

Stability: Test substance was expected to be stable for the duration of testing.

Expiration Date: September 27, 2017

No correction for purity was used in preparation of formulations, and all dose levels are expressed in terms of material as supplied.

4. POSITIVE CONTROL SUBSTANCES

The positive control substances (known mutagens) were received on the dates listed below and were further identified using Product Safety Labs' identification numbers. The substances were stored refrigerated. Documentation of the methods of synthesis, fabrication, or derivation of the positive controls is retained by the vendor (Molecular Toxicology, Inc.).

Positive Control Substance Identification	Lot No.	CAS No.	Date of Receipt	PSL ID No.	Expiration Date
Sodium Azide (NaN_3)	6356SA	26628-22-8	Jun 22, 2017	170622-6H	Jul 14, 2018
ICR 191 Acridine	6263ICR	17070-45-0	Jun 22, 2017	170622-5H	Mar 29, 2019
Daunomycin	2177DU	20830-81-3	Jun 22, 2017	170622-4H	Dec 1, 2018
Methyl methanesulfonate (MMS)	8210MS	66-27-3	Jun 27, 2017	170627-18H	Jun 20, 2019
2-Aminoanthracene (2-AA)	6441AA	613-13-8	Jun 22, 2017	170622-3H	May 2, 2019

5. VEHICLE CONTROL SUBSTANCE

The test substance was found to be soluble in sterile water that was used as the vehicle control.

6. GENERAL TEST SYSTEM PARAMETERS

A. Test System Identification

Each of the *S. typhimurium* and *E. coli* strains received for use on this study was accompanied by documentation that includes lot number, preparation and expiration dates, and confirmation of phenotype and response to specific mutagens. The following bacterial strains were purchased from Molecular Toxicology, Inc.:

Strain	Characteristics	Mutations Detected	Lot Number	Expiration Date
ST TA1535	his; rfa; uvrB	Base-pair substitution	5138D	Aug 25, 2018
ST TA1537	his; rfa; uvrB	Frameshift	5166D	Mar 02, 2019
ST TA98	his; rfa; uvrB; R-factor	Frameshift	5165D	Feb 23, 2019
ST TA100	his; rfa; uvrB; R-factor	Base-pair substitution	5185D	Apr 06, 2019
EC WP2 uvrA	trp; uvrA	Base-pair substitution	5161D	Jan 06, 2019

Legend:

his	histidine required as a growth factor
rfa	deep rough mutation involves loss of a major component of the cell coat increasing permeability to larger molecules; this deletion also involves the gene coding for biotin synthesis
uvrA/B	deletion of DNA nucleotide excision repair system
R-factor	contains the pKM101 plasmid which increases sensitivity by enhancing error-prone DNA repair systems
trp	tryptophan required as a growth factor

B. Justification for the Selection of the Test System

The referenced guidelines (Section 10) accept the combination of *S. typhimurium* (TA1535, TA1537, TA98, and TA100) and *E. coli* (WP2 uvrA) strains selected for use in this study.

7. ASSAY MATERIALS

A. Growth Media and Plates

Overlay agar (supplemented with biotin and limited amounts of histidine and tryptophan) and minimal glucose agar plates were purchased from Molecular Toxicology, Inc.

B. Metabolic Activation System (S9 Mix) and Substitution Buffer

S9 mix (cofactor supplemented post-mitochondrial fraction) was included in the Ames test to simulate mammalian metabolism since some test substances only become mutagenic following metabolic activation. S9 liver fraction was purchased from Molecular Toxicology, Inc., and sourced from male Sprague-Dawley rats induced with phenobarbital and benzoflavone.

The S9 mix, freshly prepared on the day of use, was maintained on ice prior to and during use and contained 5% v/v S9 fraction. The prepared S9 mix contained the following sterile cofactors (Maron & Ames, 1983): 8 mM $MgCl_2$, 33 mM KCl, 100 mM sodium phosphate buffer pH 7.4, 5 mM glucose-6-phosphate and 4 mM NADP.

Sodium phosphate buffer was used as the substitution buffer for plates treated in the absence of S9.

C. Bacteria (Test Systems)

Fresh bacterial suspension cultures in nutrient broth were prepared so that they were in the late exponential phase of growth at the time of use (approximately 1 x 10^9 bacteria/mL). Bacterial growth was evaluated by spectrophotometric optical density measurement.

D. Test Substance Preparation

The test substance was formulated as a solution in Sterile water (0.316, 1, 3.16, 10, 31.6, 100, 316, and 1000 mg/mL) to provide corresponding dose levels of up to 100,000 µg/plate. The test substance was mixed with the vehicle by gently pipetting up and down. The entire tube was placed on a stir plate with a sterile stir bar and mixed at 125 RPM for approximately 5 to 10 minutes to make a homogenous solution. This procedure was followed before making every dilution.

E. Positive Control Substances

The performance of this test was evaluated with positive controls for each tester strain used, with and without metabolic activation (S9). Appropriate dilutions were prepared using the solvents listed below prior to testing.

Positive Control Substance (Concentration)	Solvent	Tester Strain	Metabolic Activation (S9)
Sodium Azide (15 µg/mL)	Sterile water	*S. typhimurium* TA100, TA1535	Absent
ICR 191 Acridine (10 µg/mL)	Sterile water	*S. typhimurium* TA1537	Absent
Daunomycin (60 µg/mL)	Sterile water	*S. typhimurium* TA98	Absent
Methyl methanesulfonate (25 µL/mL)	Sterile water	*E. coli* WP2 uvrA	Absent
2-Aminoanthracene (100 µg/mL)	DMSO	All	Present

8. EXPERIMENTAL DESIGN

A. Main Test (see Section 12)

The initial experiment followed the plate incorporation method, in which the following materials were mixed and poured over the surface of a minimal agar plate:

- Standard volume[1] of vehicle control, test substance solution, or positive control
- 500 µL S9 mix or substitution buffer
- 100 µL bacterial preparation (ST or EC)
- 2.0 mL overlay agar maintained at approximately 45°C

Plates were prepared in triplicate and uniquely identified. For each of the bacterial strains, plates were prepared at each experimental point as follows:

Treatment	Dose No.	Active Ingredient dose (µg/plate)	Final Test Substance Dose (µg/plate)[C]	Number of Replicates		Number of Strains
				-S9	+S9	
Vehicle control	0	0	0	3	3	5
Test substance	1	1.58	31.6	3	3	5
	2	5.0	100	3	3	5
	3	15.8	316	3	3	5
	4	50	1000	3	3	5
	5	158	3160	3	3	5
	6	500	10,000	3	3	5
	7	1580	31,600	3	3	5
	8	5000	100,000[A]	3	3	5
Positive control	*[B]		*[B]	3	3	5

[A] The OECD standard limit dose
[B] Dose depends on the test organism and the positive control
[C] Active ingredient composition in test substance is 5%

Appropriate sterility control check plates (treated with critical components in the absence of bacteria) were included as a standard procedural check. After pouring, plates were placed on a level surface until the agar was gelled then incubated at approximately 37°C until growth was adequate for enumeration (approximately 65 hours). Note that the loss of an individual plate (e.g., due to microbial contamination) will not affect the validity of the study.

B. Confirmatory Test

The confirmatory test employed the pre-incubation modification of the plate incorporation test. The test or control substances, bacteria suspension, and S9/substitution buffer were incubated under agitation for approximately 30 minutes at approximately 37°C prior to mixing with the overlay agar and pouring onto the minimal agar plates before proceeding as described for the

[1] Standard dose volume is 100 µL per plate for the positive controls, but this may be adjusted for the vehicle and test substance to achieve the required dose per plate depending on the nature of vehicle.

initial test. The study design for the confirmatory test, including strains, dose levels etc. was as described above for the initial (main) test.

C. Control of Bias

General procedures associated with the balanced design and conduct of this study were employed to control bias.

D. Results

After incubation, the number of colonies per plate was counted manually and/or with the aid of a plate counter (Colony Plate Reader: Model Colony-Doc-It™). The mean and standard deviation were calculated for each set of triplicate plates.

E. Criteria for Validity

The background lawn for vehicle control plates should appear normal (i.e., slightly hazy with abundant microscopic non-revertant bacterial colonies). The mean revertant colony counts for each strain treated with the vehicle should lie close to or within the expected range taking into account the laboratory historical control range and/or published values (Mortelmans & Zeiger, 2000; Gatehouse, 2012). The positive controls (with S9 where required) should produce substantial increases in revertant colony numbers with the appropriate bacterial strain as specified in the Evaluation of Mutagenicity Section below.

In the case where part of the study is invalid based on these criteria (e.g., the positive control does not induce an appropriate response with an individual strain or generally poor growth of the background lawn with that strain), detailed results for that part of the study will not be reported and the affected part of the study would normally be subjected to an automatic repeat as described in an amendment, if appropriate.

F. Evaluation of Toxicity

Toxic effects of the test substance are indicated by the partial or complete absence of a background lawn of non-revertant bacteria (colony counts, if any, should not be reported) or a substantial dose-related reduction in revertant colony counts compared with lower dose levels and concurrent vehicle control taking into account the laboratory historical control range. Where precipitation obscures observations on the condition of the background lawn, the lawn can be considered normal and intact if the revertant colony counts are within the expected range based on results for lower dose levels and historical control counts for that strain.

G. Evaluation of Mutagenicity

For each experimental point, the Mutation Factor (MF) was calculated by dividing the mean revertant colony count by the mean revertant colony count for the corresponding concurrent vehicle control group. The mutagenic activity of the test item was assessed by applying the following criteria:

The results were considered positive (i.e., indicative of mutagenic potential) if:

- The results for the test item showed a substantial increase in revertant colony counts, i.e., response MF $\geq$ 2 for strains TA98, TA100, and WP2 uvrA or MF $\geq$ 3 for strains TA1535 and TA1537, with mean value(s) outside the laboratory historical control range. Otherwise, results were considered negative.

- The above increase must be dose related and/or reproducible, i.e., increases must be

obtained at more than one experimental point (at least one strain, more than one dose level, more than one occasion or with different methodologies).

If the second criterion is not met, the results may be classified as equivocal, and further testing may be appropriate.

A test substance that produces neither a concentration related increase in the number of revertant colonies nor a reproducible substantial increase in revertant colonies is considered to be non-mutagenic in this test system.

9. STATISTICAL ANALYSIS

Product Safety Labs calculated means and standard deviations for all quantitative data collected.

10. STUDY CONDUCT

This study was conducted at Product Safety Labs' (PSL) test facility at 2394 US Highway 130, Dayton, New Jersey 08810. The Study Director for this study was Mithila Shitut, BVSc & AH, MS. The primary scientist for this study was Anupama Dubey, BS, with contributions from Monika Abraham, BA, Lisa Broske-Godin, BS, RLATG, Janet Dell John, BA, RLATG, and Katherine Sibley, BS. This study was conducted to comply with the Good Laboratory Practice (GLP) regulations as defined in:

- US FDA GLP: 21 CFR Part 58, 1987

The procedures as described in this protocol are based on the most recent version of the following testing guidelines:

- US FDA Toxicological Principles for the Safety Assessment of Food Ingredients, Redbook 2000, IV.C. 1. a. (2007)
- ICH S2 (R1) Guidance on Genotoxicity Testing and Data Interpretation for Pharmaceuticals Intended for Human Use (2012)

11. QUALITY ASSURANCE

The final report was audited for agreement with the raw data records and for compliance with the protocol, Product Safety Labs Standard Operating Procedures and appropriate Good Laboratory Practice Standards. Dates of inspections and audits performed during the study and the dates of reporting of the inspection and audit findings to the Study Director and Facility Management are presented in the Quality Assurance Statement.

12. AMENDMENT TO THE PROTOCOL

At the request of the Sponsor, Section 7A. Main Test of the protocol was changed to the following:

The initial experiment followed the plate incorporation method, in which the following materials were mixed and poured over the surface of a minimal agar plate:

- Standard volume[1] of vehicle control, test substance solution, or positive control

[1] Standard dose volume is 100 µL per plate for the positive controls, but this may be adjusted for the vehicle and test substance to achieve the required dose per plate depending on the nature of vehicle.

- 500 µL S9 mix or substitution buffer
- 100 µL bacterial preparation (ST or EC)
- 2.0 mL overlay agar maintained at approximately 45°C

Plates were prepared in triplicate and uniquely identified. For each of the bacterial strains, plates were prepared at each experimental point as follows:

Treatment	Dose No.	Active Ingredient dose (µg/plate)	Final Test Substance Dose (µg/plate)[C]	Number of Replicates		Number of Strains
				-S9	+S9	
Vehicle control	0	0	0	3	3	5
Test substance	1	1.58	31.6	3	3	5
	2	5.0	100	3	3	5
	3	15.8	316	3	3	5
	4	50	1000	3	3	5
	5	158	3160	3	3	5
	6	500	10,000	3	3	5
	7	1580	31,600	3	3	5
	8	5000	100,000[A]	3	3	5
Positive control	*[B]		*[B]	3	3	5

[A] The OECD standard limit dose
[B] Dose depends on the test organism and the positive control
[C] Active ingredient composition in test substance is 5%

Appropriate sterility control check plates (treated with critical components in the absence of bacteria) were included as a standard procedural check. After pouring, plates were placed on a level surface until the agar was gelled then incubated at approximately 37°C until growth was adequate for enumeration (approximately 65 hours). Note that the loss of an individual plate (e.g., due to microbial contamination) will not affect the validity of the study.

13. DEVIATIONS FROM THE PROTOCOL

None.

14. FINAL REPORT AND RECORDS TO BE MAINTAINED

Information on equipment maintenance and calibration, storage, usage, and disposition of the test substance, and all other records that would demonstrate adherence to the protocol will be maintained. Facility records which are not specific to the subject study will be maintained by the testing facility and archived according to PSL SOP.

The original, final report will be sent to the Sponsor. A copy of the signed report, together with the protocol, associated amendments and/or deviations if applicable, and all raw data generated at PSL will be maintained in the PSL Archives. PSL will maintain these records for a period of at least five years. After this time, the Sponsor of the study will be offered the opportunity to take possession of the records or request continued archiving by PSL.

15. RESULTS

Revertant colony counts for each strain are presented in Tables 1-5. Historical Control Data is presented in Appendix A.

The mean revertant colony counts for each strain treated with the vehicle were close to or within the expected range, considering the laboratory historical control range and/or published values (Mortelmans & Zeiger, 2000; Gatehouse, 2012). The positive control substances caused the expected substantial increases in revertant colony counts in both the absence and presence of S9 in each phase of the test confirming the sensitivity of the test and the activity of the S9 mix. Therefore, each phase of the test is considered valid.

No signs of precipitation or toxicity were noted in any of the strains. Contamination, which did not obscure the counts, was noted in an individual plate in the vehicle control plate for the E. coli strain in the plate incorporation method. Contamination, which obscured the counts, was noted for strains TA1535 and TA1537 in individual plates at doses 3160 µg/plate and 1000 µg/plate for the plate incorporation method with S9 and in the pre-incubation method with S9, respectively. Individual plate contamination did not impact mutagenicity evaluation.

For all strains, eight dose levels without precipitation, toxicity or plate contamination were evaluated; therefore, bacterial mutagenicity was adequately assessed.

There was no concentration-related or substantial test substance related increases in the number of revertant colonies observed with strains TA1535, TA1537, TA98, TA100 or E. Coli WP2 uvrA in both the absence and presence of S9 using either the plate incorporation or the pre-incubation method.

16. CONCLUSION

Based on these findings and on the evaluation system used, Silk Fibroin did not elicit evidence of bacterial mutagenicity in the Ames assay.

17. REFERENCES

Ames, B. N., Durston, W. E., Lee, F. D., & Yamasaki, E. (1973). Carcinogens are mutagens: a simple test system combining liver homogenates for activation and bacteria for detection. *Proceedings of the National Academy of Sciences, Vol. 70* (No. 8), 2281-2285.

Gatehouse D (2012). Bacterial mutagenicity assays: test methods. *Methods in Molecular Biology, Vol. 817*: 21-34.

Maron, D. M., & Ames, B. N. (1983). Revised methods for the Salmonella mutagenicity test. *Mutation Research, 113,* 173-215.

Mortelmans, K., & Zeiger, E. (2000). The Ames *Salmonella*/microsome mutagenicity assay. *Mutation Research, 455,* 29–60.

U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention & National Institutes of Health. (2009). Biosafety in Microbiological and Biomedical Laboratories (5th ed.). HHS Publication No. (CDC) 21-1112.

SIGNATURE

Silk Fibroin

I, the undersigned, declare that the methods, results and data contained in this report faithfully reflect the procedures used and raw data collected during the study.

[redacted] BVSc & AH, MS
Study Director
Product Safety Labs

September 15, 2017
Date

TABLE 1A: REVERTANT COLONY COUNTS – TA 1535

Plate Incorporation Method - Main Test									
TA1535		Revertant Colonies per Plate						Mutation Factor	
		Without Activation (-S9)			With Activation (+S9)				
Treatment	Dose (µg/plate)	Counts	Mean	SD	Counts	Mean	SD	-S9	+S9
Sterile Water	N/A	5 17 13	12	6.1	12 8 8	9	2.3	1.00	1.00
Test Substance	31.6	12 12 14	13	1.2	15 7 16	13	4.9	1.08	1.44
Test Substance	100	11 13 15	13	2.0	6 5 15	9	5.5	1.08	1.00
Test Substance	316	11 14 12	12	1.5	12 13 14	13	1.0	1.00	1.44
Test Substance	1000	16 13 15	15	1.5	10 9 15	11	3.2	1.25	1.22
Test Substance	3160	12 12 13	12	0.6	U 9 15	12	4.2	1.00	1.33
Test Substance	10000	10 12 23	15	7.0	14 9 8	10	3.2	1.25	1.11
Test Substance	31600	11 11 9	10	1.2	14 18 15	16	2.1	0.83	1.78
Test Substance	1000000	12 21 17	17	4.5	15 10 6	10	4.5	1.42	1.11
Sodium Azide	1.5	796 841 783	807	30.4	-			67.25	-
2-AA	10	-			374 461 401	412	44.5	-	45.78

N/A = Not applicable; U = Contamination, plate unreadable

TABLE 1B: REVERTANT COLONY COUNTS – TA 1535

Pre-Incubation Method - Confirmatory Test									
TA1535		Revertant Colonies per Plate						Mutation Factor	
		Without Activation (-S9)			With Activation (+S9)				
Treatment	Dose (µg/plate)	Counts	Mean	SD	Counts	Mean	SD	-S9	+S9
Sterile Water	N/A	18 8 10	12	5.3	16 15 9	13	3.8	1.00	1.00
Test Substance	31.6	11 16 15	14	2.6	9 8 13	10	2.6	1.17	0.77
Test Substance	100	5 9 12	9	3.5	9 8 9	9	0.6	0.75	0.69
Test Substance	316	13 9 10	11	2.1	12 11 12	12	0.6	0.92	0.92
Test Substance	1000	15 10 12	12	2.5	14 14 9	12	2.9	1.00	0.92
Test Substance	3160	14 14 19	16	2.9	8 9 8	8	0.6	1.33	0.62
Test Substance	10000	15 12 13	13	1.5	14 14 9	12	2.9	1.08	0.92
Test Substance	31600	24 11 10	15	7.8	17 8 8	11	5.2	1.25	0.85
Test Substance	1000000	12 13 9	11	2.1	19 14 13	15	3.2	0.92	1.15
Sodium Azide	1.5	792 807 815	805	11.7	-			67.08	-
2-AA	10	-			364 326 350	347	19.2	-	26.69

N/A = Not applicable

TABLE 2A: REVERTANT COLONY COUNTS – TA 1537

Plate Incorporation Method - Main Test									
TA1537		Revertant Colonies per Plate						Mutation Factor	
		Without Activation (-S9)			With Activation (+S9)				
Treatment	Dose (µg/plate)	Counts	Mean	SD	Counts	Mean	SD	-S9	+S9
Sterile Water	N/A	11 10 14	12	2.1	14 10 17	14	3.5	1.00	1.00
Test Substance	31.6	18 16 11	15	3.6	17 17 13	16	2.3	1.25	1.14
Test Substance	100	9 12 19	13	5.1	14 17 10	14	3.5	1.08	1.00
Test Substance	316	15 11 11	12	2.3	14 14 19	16	2.9	1.00	1.14
Test Substance	1000	6 10 6	7	2.3	14 11 11	12	1.7	0.58	0.86
Test Substance	3160	5 14 12	10	4.7	14 13 16	14	1.5	0.83	1.00
Test Substance	10000	14 18 13	15	2.6	17 13 9	13	4.0	1.25	0.93
Test Substance	31600	16 19 13	16	3.0	17 11 10	13	3.8	1.33	0.93
Test Substance	1000000	22 17 22	20	2.9	17 25 20	21	4.0	1.67	1.50
ICR 191 Acridine	1	326 227 308	287	52.7	-			23.92	-
2-AA	10	-			162 234 333	243	85.9	-	17.36

N/A = Not applicable

TABLE 2B: REVERTANT COLONY COUNTS – TA 1537

Pre-Incubation Method - Confirmatory Test									
TA1537		Revertant Colonies per Plate						Mutation Factor	
		Without Activation (-S9)			With Activation (+S9)				
Treatment	Dose (µg/plate)	Counts	Mean	SD	Counts	Mean	SD	-S9	+S9
Sterile Water	N/A	19 16 12	16	3.5	11 11 19	14	4.6	1.00	1.00
Test Substance	31.6	17 17 10	15	4.0	8 12 12	11	2.3	0.94	0.79
Test Substance	100	12 10 10	11	1.2	11 10 14	12	2.1	0.69	0.86
Test Substance	316	17 10 16	14	3.8	15 13 18	15	2.5	0.88	1.07
Test Substance	1000	14 14 27	18	7.5	U 18 16	17	1.4	1.13	1.21
Test Substance	3160	13 12 12	12	0.6	22 14 16	17	4.2	0.75	1.21
Test Substance	10000	16 16 20	17	2.3	22 17 16	18	3.2	1.06	1.29
Test Substance	31600	13 20 22	18	4.7	14 11 21	15	5.1	1.13	1.07
Test Substance	1000000	22 18 14	18	4.0	12 17 14	14	2.5	1.13	1.00
ICR 191 Acridine	1	5509 6162 6172	5948	379.9	-			371.75	-
2-AA	10	-			274 202 222	233	37.2	-	16.64

N/A = Not applicable; U = Contamination, plate unreadable

TABLE 3A: REVERTANT COLONY COUNTS – TA 98

Plate Incorporation Method - Main Test									
TA98		Revertant Colonies per Plate						Mutation Factor	
		Without Activation (-S9)			With Activation (+S9)				
Treatment	Dose (µg/plate)	Counts	Mean	SD	Counts	Mean	SD	-S9	+S9
Sterile Water	N/A	23 25 25	24	1.2	31 30 22	28	4.9	1.00	1.00
Test Substance	31.6	23 21 26	23	2.5	24 24 22	23	1.2	0.96	0.82
Test Substance	100	21 26 18	22	4.0	22 26 33	27	5.6	0.92	0.96
Test Substance	316	19 24 23	22	2.6	32 33 23	29	5.5	0.92	1.04
Test Substance	1000	20 35 16	24	10.0	28 33 25	29	4.0	1.00	1.04
Test Substance	3160	22 27 29	26	3.6	19 30 27	25	5.7	1.08	0.89
Test Substance	10000	16 20 25	20	4.5	29 25 31	28	3.1	0.83	1.00
Test Substance	31600	22 16 24	21	4.2	22 22 26	23	2.3	0.88	0.82
Test Substance	1000000	22 25 30	26	4.0	33 31 22	29	5.9	1.08	1.04
Daunomycin	6	1328 1416 1293	1346	63.4	-			56.08	-
2-AA	10	-			3408 2859 3347	3205	300.9	-	114.46

N/A = Not applicable

TABLE 3B: REVERTANT COLONY COUNTS – TA 98

Pre-Incubation Method - Confirmatory Test									
TA98		Revertant Colonies per Plate						Mutation Factor	
		Without Activation (-S9)			With Activation (+S9)				
Treatment	Dose (µg/plate)	Counts	Mean	SD	Counts	Mean	SD	-S9	+S9
Sterile Water	N/A	22 20 22	21	1.2	30 21 29	27	4.9	1.00	1.00
Test Substance	31.6	20 21 27	23	3.8	25 24 27	25	1.5	1.10	0.93
Test Substance	100	26 16 19	20	5.1	23 25 29	26	3.1	0.95	0.96
Test Substance	316	26 22 22	23	2.3	20 26 22	23	3.1	1.10	0.85
Test Substance	1000	25 22 18	22	3.5	18 26 29	24	5.7	1.05	0.89
Test Substance	3160	35 29 28	31	3.8	28 29 24	27	2.6	1.48	1.00
Test Substance	10000	17 29 17	21	6.9	34 37 30	34	3.5	1.00	1.26
Test Substance	31600	23 22 25	23	1.5	26 22 23	24	2.1	1.10	0.89
Test Substance	1000000	22 19 21	21	1.5	25 29 21	25	4.0	1.00	0.93
Daunomycin	6	892 864 871	876	14.6	-			41.71	-
2-AA	10	-			3868 3508 3160	3512	354.0	-	130.07

N/A = Not applicable

TABLE 4A: REVERTANT COLONY COUNTS – TA 100

Plate Incorporation Method - Main Test									
TA100		Revertant Colonies per Plate						Mutation Factor	
		Without Activation (-S9)			With Activation (+S9)				
Treatment	Dose (µg/plate)	Counts	Mean	SD	Counts	Mean	SD	-S9	+S9
Sterile Water	N/A	96 90 80	89	8.1	104 111 115	110	5.6	1.00	1.00
Test Substance	31.6	126 112 127	122	8.4	120 122 98	113	13.3	1.37	1.03
Test Substance	100	89 94 120	101	16.6	112 125 114	117	7.0	1.13	1.06
Test Substance	316	112 118 105	112	6.5	108 116 94	106	11.1	1.26	0.96
Test Substance	1000	84 105 96	95	10.5	115 128 108	117	10.1	1.07	1.06
Test Substance	3160	103 108 110	107	3.6	98 110 97	102	7.2	1.20	0.93
Test Substance	10000	122 99 115	112	11.8	118 140 108	122	16.4	1.26	1.11
Test Substance	31600	122 107 92	107	15.0	133 118 100	117	16.5	1.20	1.06
Test Substance	1000000	105 95 115	105	10.0	116 143 113	124	16.5	1.18	1.13
Sodium Azide	1.5	704 657 728	696	36.1	-			7.82	-
2-AA	10	-			3983 3837 3617	3812	184.2	-	34.65

N/A = Not applicable

TABLE 4B: REVERTANT COLONY COUNTS – TA 100

Pre-Incubation Method - Confirmatory Test									
TA100		Revertant Colonies per Plate						Mutation Factor	
		Without Activation (-S9)			With Activation (+S9)				
Treatment	Dose (µg/plate)	Counts	Mean	SD	Counts	Mean	SD	-S9	+S9
Sterile Water	N/A	84 135 126	115	27.2	92 127 145	121	27.0	1.00	1.00
Test Substance	31.6	97 73 102	91	15.5	114 118 133	122	10.0	0.79	1.01
Test Substance	100	103 100 94	99	4.6	132 117 129	126	7.9	0.86	1.04
Test Substance	316	105 126 91	107	17.6	118 143 137	133	13.1	0.93	1.10
Test Substance	1000	125 122 126	124	2.1	96 115 129	113	16.6	1.08	0.93
Test Substance	3160	98 108 123	110	12.6	113 109 111	111	2.0	0.96	0.92
Test Substance	10000	127 113 109	116	9.5	118 112 115	115	3.0	1.01	0.95
Test Substance	31600	92 106 110	103	9.5	112 109 90	104	11.9	0.90	0.86
Test Substance	1000000	112 107 95	105	8.7	113 117 93	108	12.9	0.91	0.89
Sodium Azide	1.5	501 433 493	476	37.2	-			4.14	-
2-AA	10	-			2464 2707 2954	2708	245.0	-	22.38

N/A = Not applicable

TABLE 5A: REVERTANT COLONY COUNTS – EC WP2 uvrA

Plate Incorporation Method - Main Test									
E. Coli WP2 uvrA		Revertant Colonies per Plate						Mutation Factor	
		Without Activation (-S9)			With Activation (+S9)				
Treatment	Dose (µg/plate)	Counts	Mean	SD	Counts	Mean	SD	-S9	+S9
Sterile Water	N/A	41 35/C 39	38	3.1	43 52 41	45	5.9	1.00	1.00
Test Substance	31.6	42 36 36	38	3.5	45 44 39	43	3.2	1.00	0.96
Test Substance	100	40 31 33	35	4.7	44 43 30	39	7.8	0.92	0.87
Test Substance	316	46 39 38	41	4.4	40 44 45	43	2.6	1.08	0.96
Test Substance	1000	45 36 51	44	7.5	43 36 49	43	6.5	1.16	0.96
Test Substance	3160	36 31 44	37	6.6	35 44 31	37	6.7	0.97	0.82
Test Substance	10000	43 30 33	35	6.8	50 44 57	50	6.5	0.92	1.11
Test Substance	31600	32 47 26	35	10.8	43 42 38	41	2.6	0.92	0.91
Test Substance	1000000	34 46 42	41	6.1	45 48 51	48	3.0	1.08	1.07
MMS	2.5	896 817 930	881	58.0	-			23.18	-
2-AA	10	-			115 120 117	117	2.5	-	2.60

N/A = Not applicable; C = Contamination, did not obscure count

TABLE 5B: REVERTANT COLONY COUNTS – EC WP2 uvrA

Pre-Incubation Method - Confirmatory Test									
E. Coli WP2 uvrA		Revertant Colonies per Plate						Mutation Factor	
		Without Activation (-S9)			With Activation (+S9)				
Treatment	Dose (µg/plate)	Counts	Mean	SD	Counts	Mean	SD	-S9	+S9
Sterile Water	N/A	34 42 38	38	4.0	40 44 43	42	2.1	1.00	1.00
Test Substance	31.6	47 42 42	44	2.9	51 49 46	49	2.5	1.16	1.17
Test Substance	100	37 36 40	38	2.1	48 49 40	46	4.9	1.00	1.10
Test Substance	316	29 40 33	34	5.6	42 54 38	45	8.3	0.89	1.07
Test Substance	1000	27 34 36	32	4.7	37 41 41	40	2.3	0.84	0.95
Test Substance	3160	32 40 38	37	4.2	41 43 33	39	5.3	0.97	0.93
Test Substance	10000	30 35 40	35	5.0	53 57 45	52	6.1	0.92	1.24
Test Substance	31600	38 44 30	37	7.0	46 43 33	41	6.8	0.97	0.98
Test Substance	1000000	34 38 35	36	2.1	46 44 41	44	2.5	0.95	1.05
MMS	2.5	457 460 453	457	3.5	-			12.03	-
2-AA	10	-			108 104 121	111	8.9	-	2.64

N/A = Not applicable

APPENDIX A: HISTORICAL CONTROL DATA[1]

Plate Incorporation Method - Revertants Per Plate							
Strain	**Treatment**	**Dose (µg/plate)**	**S9**	**Mean**	**SD**	**Min**	**Max**
TA1535	Sodium Azide	1.5	-	618	91	359	1192
TA1537	ICR 191 Acridine	1	-	1136	1437	119	6388
TA98	Daunomycin	6	-	938	343	350	1500
TA100	Sodium Azide	1.5	-	600	126	394	1003
E. Coli	MMS	2.5	-	634	101	386	846
TA1535	2-AA	10	+	267	86	85	636
TA1537	2-AA	10	+	280	99	42	542
TA98	2-AA	10	+	2321	971	83	3915
TA100	2-AA	10	+	2377	806	976	4169
E. Coli	2-AA	10	+	125	30	63	196
TA1535	Sterile Water	N/A	-	13	2	7	21
TA1537	Sterile Water	N/A	-	12	4	6	25
TA98	Sterile Water	N/A	-	28	8	16	49
TA100	Sterile Water	N/A	-	130	16	104	155
E. Coli	Sterile Water	N/A	-	45	7	29	57
TA1535	Sterile Water	N/A	+	13	1	9	20
TA1537	Sterile Water	N/A	+	15	3	8	28
TA98	Sterile Water	N/A	+	29	5	18	40
TA100	Sterile Water	N/A	+	145	14	116	170
E. Coli	Sterile Water	N/A	+	59	13	31	81

[1] Historical Data maintained by PSL from 2015.

APPENDIX A (cont.): HISTORICAL CONTROL DATA[1]

Pre-Incubation Method - Revertants Per Plate							
Strain	**Treatment**	Dose (µg/plate)	S9	Mean	SD	Min	Max
TA1535	Sodium Azide	1.5	-	622	71	478	831
TA1537	ICR 191 Acridine	1	-	3227	1227	875	5700
TA98	Daunomycin	6	-	602	345	146	1227
TA100	Sodium Azide	1.5	-	539	166	138	904
E. Coli	MMS	2.5	-	509	143	313	808
TA1535	2-AA	10	+	293	64	64	391
TA1537	2-AA	10	+	260	107	112	541
TA98	2-AA	10	+	2384	938	506	3530
TA100	2-AA	10	+	2388	583	1308	3620
E. Coli	2-AA	10	+	128	29	60	188
TA1535	Sterile Water	N/A	-	16	3	8	23
TA1537	Sterile Water	N/A	-	14	5	5	23
TA98	Sterile Water	N/A	-	29	7	14	46
TA100	Sterile Water	N/A	-	118	18	83	143
E. Coli	Sterile Water	N/A	-	46	10	30	67
TA1535	Sterile Water	N/A	+	12	2	8	19
TA1537	Sterile Water	N/A	+	14	5	6	26
TA98	Sterile Water	N/A	+	35	7	23	50
TA100	Sterile Water	N/A	+	125	16	88	147
E. Coli	Sterile Water	N/A	+	53	9	36	76

[1] Historical Data maintained by PSL from 2015.

APPENDIX G2
MORI SILK MAMMALIAN ERYTHROCYTE MICRONUCLEUS TEST

STUDY TITLE

Silk Fibroin:
Mammalian Erythrocyte Micronucleus Test
(Peripheral Blood, Flow Cytometry - Mouse)

DATA REQUIREMENT

US FDA Toxicological Principles for the Safety Assessment of Food Ingredients, Redbook 2000, IV.C.1.d. Mammalian Erythrocyte Micronucleus Test (2000)

AUTHOR

[redacted]

STUDY COMPLETED ON

October 11, 2017

PERFORMING LABORATORY

Product Safety Labs
2394 US Highway 130
Dayton, New Jersey 08810

Participating Laboratory:

Litron Laboratories
3500 Winton Pl.
Rochester, NY 14623

LABORATORY STUDY NUMBER

45997

SPONSOR

Tufts University
169 Holland St
Somerville, MA 02144

GOOD LABORATORY PRACTICE COMPLIANCE STATEMENT

Silk Fibroin

This study meets the requirements of U.S. FDA GLP: 21 CFR Part 58, 1987, with the following exception:

Characterization of the positive control substance and verification of concentration of the positive control substance in their carriers during this study were not determined analytically; however, the purity of the material used was certified by the supplier and all preparations were thoroughly documented.

Specific information related to the characterization of the test substance as received and tested is the responsibility of the Study Sponsor (see Test Substance section).

Study Director: [redacted] Date: Oct 11, 2017

Name of Signer: [redacted] PhD

Name of Company: Product Safety Labs

Sponsor: _____ Date: _____

Name of Signer: _____

Name of Company: Tufts University

Submitter: _____ Date: _____

Name of Signer: _____

Name of Company: Tufts University

QUALITY ASSURANCE STATEMENT

The Product Safety Labs' Quality Assurance Unit has reviewed this final study report to assure the report accurately describes the methods and standard operating procedures, and that the reported results accurately reflect the raw data of the study. QA activities for this study:

QA Activity	Performed By	Date Conducted	Date Findings Reported To Study Director And Management
Protocol review	[redacted];	Aug 3, 2017[1]; Sep 21, 2017	Aug 3, 2017; Sep 22, 2017
In-process inspection: *Day 2-Initiation of dosing*	[redacted]	Aug 16, 2017	Aug 16, 2017
Raw data audit	[redacted]	Sep 21 and 22, 2017	Sep 22, 2017
Draft report review	[redacted]	Sep 21 and 22, 2017	Sep 22, 2017

The QA Statement for the micronucleus analysis phase of the study is in Appendix A.

Final report reviewed by:

[redacted]
Quality Assurance Auditor
Product Safety Labs

October 11, 2017
Date

[1] PSL's "generic" protocol used for this study was reviewed by the Quality Assurance group on this date.

TABLE OF CONTENTS

SILK FIBROIN: MAMMALIAN ERYTHROCYTE MICRONUCLEUS TEST (PERIPHERAL BLOOD, FLOW CYTOMETRY - MOUSE)

PROTOCOL NO.:	P603.PBF-M
PSL STUDY NUMBER:	45997
SPONSOR:	Tufts University 169 Holland St Somerville, MA 02144
TEST SUBSTANCE IDENTIFICATION:	Silk Fibroin Batch #: 2017_27_07
DATE RECEIVED:	August 2, 2017
PSL REFERENCE NO.:	170802-1D
STUDY INITIATION DATE:	August 4, 2017
IN-LIFE DATES OF TEST:	August 15 – August 18, 2017
NOTEBOOK NO.:	45997: pages 1-157

1. PURPOSE

The objective of this study was to evaluate the potential of Silk Fibroin to cause damage to the chromosomes or mitotic spindle apparatus of erythroblasts, observed as an increase in micronucleated immature erythrocytes (MIE) in mouse peripheral blood.

2. SUMMARY

The *in vivo* mouse erythrocyte micronucleus test was performed to investigate the potential of Silk Fibroin to induce a statistically significant increase in MIE in mouse peripheral blood, which is the genotoxicity endpoint for this study type.

Silk Fibroin was dosed by oral gavage to mice (5 per sex) at 1000 mg/kg/day. Distilled water was used as the negative (vehicle) control and cyclophosphamide monohydrate was used as the positive control. The volume administered was 10 mL/kg *bis in die* (20 mL/kg total) for test substance/ negative control and 5 mL/kg for positive control. Animals were weighed prior to test initiation on Day 1. Animals were dosed with test substance or negative control on Days 1 and 2. The positive control was administered on Day 2 only. Blood samples were collected from all groups for analysis 44-48 hours after treatment. For all groups, a minimum target of 4000 polychromatic erythrocytes per animal was scored for incidence of micronucleated immature erythrocytes.

There were no mortalities in the study. There were no clinical observations noted in any animal during the study.

Silk Fibroin did not induce a statistically significant increase in frequency of micronucleated reticulocytes (%MN-RET or MIE) in male or female mice.

Frequency of reticulocyte (%RET) and micronucleated normochromatic erythrocytes (%MN-NCE) did not differ significantly after treatment with the test substance.

The negative control group animals show MIE values consistent with existing data. The positive control caused a clear, statistically significant increase in MIE with individual and mean values consistent with existing data and outside the historical control range for negative control animals.

Under the conditions of this study, Silk Fibroin at 1000 mg/kg/day did not induce micronucleus formation in the immature erythrocytes of the mouse. In conclusion, Silk Fibroin is not considered to be genotoxic with respect to micronucleus induction in the *In Vivo* Mouse Erythrocyte Micronucleus Test (Flow Cytometry).

3. MATERIALS

A. Test Substance

The test substance, identified as Silk Fibroin, Batch #: 2017_27_07, was received on August 2, 2017 and was further identified with PSL Reference Number 170802-1D. The test substance was stored refrigerated. Documentation of the methods of synthesis, fabrication, or derivation of the test substance is retained by Tufts University Science & Tech Ctr, 4 Colby St, Medford, MA.

The following information related to the characterization of the test substance was provided by the Sponsor:

Composition: Silk fibroin, 5%
Water, 95%

Physical Description: Clear Liquid

Stability: Test substance was expected to be stable for the duration of testing.

Expiration Date: September 27, 2017

B. Positive Control

The positive control substance, identified as cyclophosphamide monohydrate (Batch #: MKBX1822V), was received on August 16, 2016, and was further identified with PSL Reference Number 160816-11H. The positive control substance was stored refrigerated. Documentation of the methods of synthesis, fabrication, or derivation of the test substance is retained by Sigma-Aldrich, 3050 Spruce Street, St. Louis, MO 63103.

Composition: Cyclophosphamide monohydrate – 100.0%, CAS #6055-19-2

Physical Description: White powder

Stability: Test substance was expected to be stable for the duration of testing.

Expiration Date: December 2018

4. GENERAL TEST SYSTEM PARAMETERS

A. Animal Requirements

4.A.1 Number of Animals: 30

4.A.2 Number of Groups and Animals per Group:
Test: (1 group): 5 animals per sex per group

Negative (Vehicle) Control (1 group): 5 animals per sex per group
Positive Control (1 group): 5 animals per sex per group

4.A.3 Sex: Male and female; females were nulliparous and non-pregnant.

4.A.4 Species/Strain: Mouse/Swiss albino (ICR)

4.A.5 Age/Body weight: Young adult (approximately 8 weeks old)/males were 35-38 grams and females were 24-28 grams at experimental start.

4.A.6 Supplier: Received from Envigo Laboratories, Inc. on August 9, 2017.

B. Test System Justification

The rodent erythrocyte micronucleus test is the best-validated and most widely used *in vivo* model for investigating genotoxic potential of test agents. Damage to the chromosomes or the spindle apparatus in dividing erythroblasts in the bone marrow results in acentric fragments or lagging chromosomes which condense in the cytoplasm to form micronuclei. As erythrocytes mature, the main nucleus is expelled but micronuclei tend to remain behind. The newly formed (immature) micronucleated erythrocytes migrate to peripheral blood where they are easy to identify and readily quantifiable. Unlike many other species, micronucleated erythrocytes are not efficiently removed from the circulating blood in mice, making mouse peripheral blood suitable for analysis.

C. Husbandry

4.C.1 Housing: The animals were group-housed in solid bottom cages, which conforms to the size recommendations in the latest *Guide for the Care and Use of Laboratory Animals* (Natl. Res. Council, 2011). Bedding (bed-o'-cobs®) was used and changed at least once per week.

4.C.2 Animal Room Temperature and Relative Humidity Ranges: 19-22°C and 50-58%, respectively.

4.C.3 Animal Room Air Changes/Hour: 13. Airflow measurements are evaluated regularly and the records are kept on file at Product Safety Labs.

4.C.4 Photoperiod: 12-hour light/dark cycle

4.C.5 Acclimation Period: The animals were conditioned to the housing facilities for 6 days prior to testing.

4.C.6 Food: Envigo Teklad Global 16% Protein Rodent Diet® #2016. The diet was available *ad libitum*.

4.C.7 Water: Filtered tap water was supplied *ad libitum*.

4.C.8 Contaminants: There were no known contaminants reasonably expected to be found in the food or water at levels which would have interfered with the results of this study. Analyses of the food and water are conducted regularly and the records are kept on file at Product Safety Labs.

D. Identification

4.D.1 Cage: Each cage was identified by a cage card indicating the study number, dose level, group assignment, individual animal identifications, and sex of the animals.

4.D.2 Animal: Each animal was given a sequential animal number in addition to being uniquely identified (e.g., ear tag or color marking). This number, together with a sequential animal number assigned to study 45997, constituted unique identification. Only the sequential animal number is presented in this report.

5. EXPERIMENTAL DESIGN

A. Route of Administration

The test, negative (vehicle) control, and positive control substances were administered by oral gavage (PO).

B. Justification of Route of Administration

The oral route of administration was used because it is a common route of human exposure and is widely used in the micronucleus and other safety assessment tests, as noted in the referenced guidelines (Section 10.C).

C. Control of Bias

General procedures associated with the balanced design and conduct of this study were employed to control bias (see Section 6.A).

D. Dose Levels (Main Test)

Five male and five female test animals were assigned to each of the following test groups.

Group	No. Animals/ Group M/F	Dose Level *(mg/kg body weight)*	Dose Volume (mL/kg)[a]	Sampling time (hr) after final treatment
1	5/5	Negative (Vehicle) Control *0*	10 b.i.d.[b]	44-48
2	5/5	Test substance (high dose) *1000*		
3	5/5	Positive Control (Cyclophosphamide monohydrate) *40*	5	

[a] An alternative dose volume was selected due to the stability of the test substance.
[b] *Bis in die.*

E. Justification of Dose Level Selection

The Sponsor, in consultation with the Study Director, selected a limit dose of 1000 mg/kg/day, the maximum achievable dose level of the test substance formulation in this test system. A dose volume of 10 mL/kg *bis in die* (b.i.d.) was selected to reach 20 mL/kg, the maximum dose volume recommended in the referenced guidelines (Section 10.C), without causing potential negative health effects to the study animals. The positive control dose is based on existing data.

6. PROCEDURES

A. Selection of Animals

For all testing, mice were indiscriminately allocated to cages/groups so that there was no statistically significant difference among group body weight means within a sex. Animals were

selected for study on the basis of freedom from clinical signs of disease or injury and a body weight within 20% of the mean within a sex.

B. Dosing and Preparation Procedures

6.B.1 Preparation: The vehicle was distilled water. The test substance was a liquid and was administrated as received (undiluted) at 50 mg/mL. The positive control substance was prepared in distilled water at 8 mg/mL.

6.B.2 Dose Calculation: Individual animal doses were calculated based on the initial body weight to achieve the targeted dose for all animals (i.e., mg/kg/day). All doses for the test substance and negative control groups on the main test were administered at a constant volume of 10 mL/kg b.i.d (20 mL/kg total). The negative control group received distilled water only. The positive control group was treated at 5 mL/kg.

6.B.3 Dosing: The positive control substance was administered via oral gavage on Day 2 only. The negative control and test substance were administered by oral gavage on Days 1 and 2 in divided doses. Oral gavage was conducted using a stainless steel ball-tipped gavage needle attached to an appropriate syringe. The dosing formulations were maintained at room temperature. The first day of administration was considered Day 1 of the study. Dosing was at approximately the same time each day ± 2 hours.

C. Clinical Observations

All animals were observed at least twice daily for viability. Cage-side observations of all animals were performed daily during the study. All findings were recorded.

Observations of the test system were conducted at intervals appropriate to assess the onset and termination of adverse effects (if any were observed). The first observation was made approximately 30 minutes following administration. Animals were also observed during the first several hours post-dosing on Day 1 for the negative control and test substance-treated groups.

D. Terminal Sacrifice and Blood Collection

At terminal sacrifice, all animals were anesthetized with carbon dioxide. Timing followed the table in Section 5.D. Whole blood was collected by cardiac puncture while the animals were anesthetized. Mice were then euthanized by exsanguination and discarded without further examination.

E. Sample Processing and Analysis

6.E.1 Blood Fixation and Shipment: Blood was processed according to the instructions in the Litron *In Vivo* Micronucleus Kit (MicroFlow^{BASIC} (Rodent Fixed Blood), Rochester, NY). The sampling target was 100 µL per sample. Duplicate samples were prepared from each mouse.

An additional sample of blood (200-500 µL) was collected for potential toxicokinetic analysis. The additional samples were placed in a tube containing K_2EDTA and mixed by inversion. Plasma was separated by centrifugation, transferred to a separate, labeled tube, and stored frozen (approximately -70°C) until the completion of the study.

Blood for micronucleus analysis was fixed and permeabilized by rapid pipetting in chilled methanol (e.g., using a dry ice box); samples were stored for at least three

days in methanol (storage followed kit instructions). Samples were then centrifuged; the methanol was removed, and the cells were resuspended in shipping buffer provided with the kit. One set of samples was shipped to Litron Laboratories (Section 10.A); shipping conditions followed kit instructions. The other set was held in reserve by PSL, stored in accordance with kit instructions. Retained fixed blood samples were perishable and discarded after study completion.

6.E.2 Staining and Analysis: Cells were stained with dyes to identify immature vs. mature erythrocytes (fluorescent labeled anti-CD71 antibody), platelets (fluorescent labeled anti-CD61 antibody) and DNA (propidium iodide, following RNAse treatment). Stained cells were analyzed by flow cytometry (cf. Section 10.A). The analysis target was a minimum of 4000 immature erythrocytes per animal. Analyses measured DNA content (i.e., propidium iodide staining) in both immature erythrocytes (i.e., CD71+/CD61- cells) and mature erythrocytes (i.e., CD71-/CD61- cells).

7. STATISTICAL ANALYSIS

The data generated (the proportions of immature among total erythrocytes and micronucleated erythrocytes) were analyzed by analysis of variance followed by Bonferroni-corrected multiple comparison test using GraphPad Prism (version 5.03), GraphPad Software, San Diego, CA.

8. ASSAY VALIDITY

The test was considered valid if negative control group animals showed micronucleated immature erythrocyte (MIE) values close to or within the expected range based on published values for this method and laboratory control data. Additionally, the positive control should have caused a clear increase in MIE with individual and mean values outside the historical control range for negative control animals.

9. POSITIVE RESULT EVALUATION

A positive result was defined as a statistically significant increase in MIE compared with the negative control group in the absence of cytotoxicity (reticulocyte fraction less than 5% of vehicle control).

10. STUDY CONDUCT

A. Testing Facility

This in-life portion of this study was conducted at Product Safety Labs' (PSL) test facility at 2394 U.S. Highway 130, Dayton, NJ 08810. The Study Director for this study was Jayson Chen, PhD. The primary scientist was Colleen Wojenski, BS, LATG, with contributions by Aubrey Blue, Lisa Broske-Godin, BS, RLATG, Janet Dell John BA, RLATG, and Katherine Sibly, BS. Flow cytometry procedures were conducted at Litron Laboratories, 3500 Winton Pl, Rochester, NY 14623 (PI: Dorothea Torous).

B. GLP Compliance

This study was conducted in compliance with the following Good Laboratory Practice (GLP) regulations:

- US FDA GLP: 21 CFR 58, 1987.

C. Test Procedure Guideline

The procedures described in this report are based on the following testing guideline:

- US FDA Toxicological Principles for the Safety Assessment of Food Ingredients, Redbook 2000, IV.C.1.d. Mammalian Erythrocyte Micronucleus Test (2000).

11. QUALITY ASSURANCE

The final report was audited for agreement with the raw data records and for compliance with the protocol, Product Safety Labs Standard Operating Procedures and appropriate Good Laboratory Practice Standards.

In addition, PSL QAU functioned as lead QA for this study and monitored QA activities at Litron Laboratories. For portions of the study conducted by a subcontractor, the QAU for that facility conducted necessary critical phase inspections and audited respective results and reported for the study phase according to the SOPs of that facility.

The QA Units from Litron Laboratories sent all GLP audit reports to the Study Director, Study Director's management, and PSL QAU as soon as they were issued.

12. AMENDMENTS TO THE PROTOCOL

At the request of the Sponsor, Protocol Sections 6.E Dose Levels (Main Test) and 6.F Justification of Dose Level Selection were updated to run the main test as a limit test with the following changes:

6.E Dose Levels (Main Test)

Group	No. Animals/ Group M/F	Dose Level *(mg/kg body weight)*	Dose Volume (mL/kg body weight)[a]	Sampling time (hr) after final treatment
1	5/5	Negative (Vehicle) Control *0*	10 b.i.d.[b]	44-48
2	5/5	Test substance (high dose) *1000*		
3	5/5	Positive Control (Cyclophosphamide monohydrate) *40*	5	

[a] An alternative dose volume was selected due to the stability of the test substance.
[b] *Bis in die*

E.F Justification of Dose Level Selection

The Sponsor, in consultation with the Study Director, selected a limit dose of 1000 mg/kg/day, the maximum achievable dose level of the test substance formulation in this test system. Dose volume of 10 mL/kg *bis in die* (b.i.d.) was selected to reach 20 mL/kg, the maximum dose volume recommended in the referenced guidelines (Section 10.C), without causing potential negative health effects to the study animals. The positive control dose is based on existing data.

13. DEVIATIONS FROM THE PROTOCOL

None.

14. FINAL REPORT AND RECORDS TO BE MAINTAINED

Information on care of the test system, equipment maintenance and calibration, storage, usage, and disposition of the positive control and all other records that would demonstrate adherence to the protocol will be maintained. Facility records which are not specific to the subject study will be maintained by the testing facility and archived according to PSL SOP.

The original, final report will be sent to the Sponsor. A copy of the signed report, together with the protocol, associated amendments and/or deviations, if applicable, and all raw data generated at PSL and raw data from Litron Laboratories will be maintained in the PSL Archives. PSL will maintain these records for a period of at least five years. After this time, the Sponsor of the study will be offered the opportunity to take possession of the records or will be charged an archiving fee for continued archiving by PSL.

Any electronic raw data generated by the Test Site will be maintained in accordance to the Test Site SOPs.

15. RESULTS

A summary of average % micronucleated reticulocytes, % of reticulocytes, and % micronucleated normochromatic erythrocytes are presented in Table 1. Individual animal bodyweights and cage-side observations are presented in Tables 2 and 3, respectively. The Microflow® Mouse Micronucleus Analysis Report from Litron and PSL's historical control data are presented in Appendices A and B, respectively.

Five male and five female mice per group received oral administration of distilled water (negative/vehicle control, Group 1) or 1000 mg/kg/day of Silk Fibroin (test substance, Group 2) for two days, or 40 mg/kg/day of cyclophosphamide monohydrate (positive control, Group 3) for a single dose.

All animals survived administration of the negative control, test substance, or positive control.

A. Body Weight (Tables 2)

The initial body weights of all animals were within ± 20% of the mean within a sex.

B. Clinical Observations (Tables 3)

There were no clinical observations noted in any animal during the study.

C. Cytotoxicity and Micronucleus Induction (Tables 1, Appendix A)

Silk Fibroin did not induce a statistically significant increase in frequency of micronucleated reticulocytes (%MN-RET or MIE) in male or female mice.

Frequency of reticulocyte (%RET) and micronucleated normochromatic erythrocytes (%MN-NCE) did not differ significantly after treatment with the test substance.

The negative control group animals show MIE values consistent with existing data (Appendix B). The positive control caused a clear, statistically significant increase in MIE with individual and mean values consistent with existing data and outside the historical control range for negative control animals.

16. CONCLUSION

Under the conditions of this study, Silk Fibroin at 1000 mg/kg/day did not induce micronucleus formation in the immature erythrocytes of the mouse. In conclusion, Silk Fibroin is not considered to be genotoxic with respect to micronucleus induction in the In Vivo Mouse Erythrocyte Micronucleus Test (Flow Cytometry).

SIGNATURE

Silk Fibroin

I, the undersigned, declare that the methods, results, and data contained in this report faithfully reflect the procedures used and raw data collected during the study.

[redacted] Oct. 11, 2017

Study Director
Product Safety Labs

Date

TABLE 1: FLOW CYTOMETRY RESULT SUMMARY

% MN-RET

Group	Dose (mg/kg/day)	Mean ± SEM		*p*-value[1]	
		Male	Female	Male	Female
Negative (Vehicle) Control	0	0.12 ± 0.01	0.11 ± 0.01	-	-
Test Substance	1000	0.12 ± 0.02	0.14 ± 0.01	ns	ns
Positive Control	40	2.06 ± 0.35	1.41 ± 0.15	$p < 0.001$	$p < 0.001$

% RET

Group	Dose (mg/kg/day)	Mean ± SEM		*p*-value[1]	
		Male	Female	Male	Female
Negative (Vehicle) Control	0	1.88 ± 0.12	1.52 ± 0.10	-	-
Test Substance	1000	1.55 ± 0.14	1.42 ± 0.21	ns	ns
Positive Control	40	0.62 ± 0.08	0.42 ± 0.08	$p < 0.001$	$p < 0.001$

% MN-NCE

Group	Dose (mg/kg/day)	Mean ± SEM		*p*-value[1]	
		Male	Female	Male	Female
Negative (Vehicle) Control	0	0.11 ± 0.01	0.09 ± 0.01	-	-
Test Substance	1000	0.11 ± 0.01	0.13 ± 0.01	ns	ns
Positive Control	40	0.14 ± 0.02	0.13 ± 0.01	ns	ns

ns = not significant ($p > 0.05$)
% MN-RET = frequency (%) of positive CD71 micronucleated reticulocytes (i.e., micronucleated immature erythrocytes [MIEs])
% RET = frequency (%) of CD71 positive reticulocytes
% MN-NCE = frequency (%) of micronucleated normochromatic erythrocytes

[1] Bonferroni-corrected multiple comparison test.

TABLE 2: INDIVIDUAL ANIMAL BODY WEIGHTS

Individual Animal Body Weights
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Male Bodyweight (g)

0 mg/kg/day Group 1	Day(s) Relative to Start
	1
5201	37
5202	38
5203	38
5204	36
5205	36
Mean	37.0
SD	1.0
N	5

Individual Animal Body Weights
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Male Bodyweight (g)

1000 mg/kg/day Group 2	Day(s) Relative to Start
	1
5211	37
5212	38
5213	36
5214	37
5215	37
Mean	37.0
SD	0.7
N	5

Individual Animal Body Weights
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Male Bodyweight (g)

40 mg/kg/day Group 3	Day(s) Relative to Start
	1
5221	35
5222	36
5223	37
5224	37
5225	35
Mean	36.0
SD	1.0
N	5

Individual Animal Body Weights
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Female Bodyweight (g)

0 mg/kg/day Group 1	Day(s) Relative to Start
	1
5206	26
5207	26
5208	25
5209	27
5210	26
Mean	26.0
SD	0.7
N	5

Individual Animal Body Weights
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Female Bodyweight (g)

1000 mg/kg/day Group 2	Day(s) Relative to Start
	1
5216	27
5217	26
5218	28
5219	26
5220	28
Mean	27.0
SD	1.0
N	5

Individual Animal Body Weights
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Female Bodyweight (g)

40 mg/kg/day Group 3	Day(s) Relative to Start
	1
5226	28
5227	27
5228	26
5229	26
5230	24
Mean	26.2
SD	1.5
N	5

TABLE 3: INDIVIDUAL ANIMAL CAGE-SIDE OBSERVATIONS

Individual Animal Clinical Observations
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Male	Animal	Observation Type: All Types	From Day -9999 (Start Date) to 9999 (Start Date)
Control	5201	Normal	1 to 3
	5202	Normal	1 to 3
	5203	Normal	1 to 3
	5204	Normal	1 to 3
	5205	Normal	1 to 3

Values = Clin Obs Range

Individual Animal Clinical Observations
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Male	Animal	Observation Type: All Types	From Day -9999 (Start Date) to 9999 (Start Date)
High dose-1000	5211	Normal	1 to 3
	5212	Normal	1 to 3
	5213	Normal	1 to 3
	5214	Normal	1 to 3
	5215	Normal	1 to 3

Values = Clin Obs Range

Individual Animal Clinical Observations
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Male	Animal	Observation Type: All Types	From Day -9999 (Start Date) to 9999 (Start Date)
Cyclophosphamide	5221	Normal	1 to 3
	5222	Normal	1 to 3
	5223	Normal	1 to 3
	5224	Normal	1 to 3
	5225	Normal	1 to 3

Values = Clin Obs Range

Individual Animal Clinical Observations
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Female	Animal	Observation Type: All Types	From Day -9999 (Start Date) to 9999 (Start Date)
Control	5206	Normal	1 to 3
	5207	Normal	1 to 3
	5208	Normal	1 to 3
	5209	Normal	1 to 3
	5210	Normal	1 to 3

Values = Clin Obs Range

Individual Animal Clinical Observations
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Female	Animal	Observation Type: All Types	From Day -9999 (Start Date) to 9999 (Start Date)
High dose-1000	5216	Normal	1 to 3
	5217	Normal	1 to 3
	5218	Normal	1 to 3
	5219	Normal	1 to 3
	5220	Normal	1 to 3

Values = Clin Obs Range

Individual Animal Clinical Observations
PSL Study Number 45997
Mammalian Erythrocyte Micronucleus Test (Peripheral Blood, Flow Cytometry-Mouse)

Sex: Female	Animal	Observation Type: All Types	From Day -9999 (Start Date) to 9999 (Start Date)
Cyclophosphamide	5226	Normal	1 to 3
	5227	Normal	1 to 3
	5228	Normal	1 to 3
	5229	Normal	1 to 3
	5230	Normal	1 to 3

APPENDIX A: MICROFLOW® MOUSE MICRONUCLEUS ANALYSIS REPORT

MicroFlow® Mouse Micronucleus Analysis Report

Study Identification:	45997
Good Laboratory Practice Number:	GLP-2017-45997PSL
Date Samples Received:	August 25, 2017
Experimental Start Date:	August 28, 2017
Experimental End Date:	August 29, 2017
Date of Report:	October 6, 2017
Study Phase Plan:	M51MFv15
Principal Investigator:	[redacted]
Test Site:	Litron Laboratories 3500 Winton Place Suite 1B Rochester, New York 14623
Study Director:	[redacted] Study Director
Test Facility:	Product Safety Labs 2394 US Highway 130, Suite E Dayton, New Jersey 08810

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Table of Contents

Lilrpn Laboratories

1. List of Figures and Tables

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2. Good Laboratory Practice Compliance Statement

This phase of the study was conducted in compliance with Good Laboratory Practice (GLP) regulations for non-clinical laboratory studies by the FDA (21 CFR 58), current version as of April 2016.

The study phase data have been reviewed by the Principal Investigator, who certifies that the information contained in this report accurately reflects and is supported by the study phase raw data and represents an appropriate conclusion within the context of the study phase design and evaluation criteria. Methods relating to the receipt and flow cytometric analysis of blood samples specified in the test facility's protocol and the MicroFlow Study Phase Plan were followed.

Principal Investigator [redacted] Date 20/Jul/2017

3. Other Scientists Involved in the Study

Not applicable.

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4. Quality Assurance Statement

This study has been subjected to inspection and the report has been audited by the Quality Assurance (QA) Unit of Litron Laboratories in accordance with GLP regulations for non-clinical laboratory studies by the FDA (21 CFR 58), current version as of April 2016. The report describes the methods and procedures used in the study phase and the reported results accurately reflect the raw data of this study phase.

The following inspections were performed by [redacted] B.S., RQAP-GLP:

Date	Phase Inspected	Date Reported to PI and Test Site Management	Date Reported to Test Facility SD, QA and Management*
August 25, 2017	Sample Receipt	August 28, 2017	August 29, 2017
August 28, 2017	Sample Washing	August 28, 2017	August 29, 2017
August 28, 2017	Sample Staining	August 28, 2017	August 29, 2017
August 28, 2017	Flow Cytometer Calibration	August 28, 2017	August 29, 2017
August 28, 2017	Sample Analysis	August 28, 2017	August 29, 2017
August 30, 2017	Check Training	August 31, 2017	September 5, 2017
August 30, 2017	Check Data Sheets for Completion	August 31, 2017	September 5, 2017
August 30, 2017	Raw Data versus Report	August 31, 2017	September 5, 2017
August 30, 2017	Draft Report Check	August 31, 2017	September 5, 2017
October 5, 2017	MicroFlow Report Check	October 5, 2017	October 6, 2017

Quality Assurance Auditor [redacted] Date 06 Oct 2017

* Indicates the date that the inspection reports were sent to the Test Facility.

5. Summary

On August 25, 2017, 30 fixed mouse blood samples were received from the test facility for this study. Flow cytometric analysis was performed on all samples according to Litron's Standard Operating Procedures.

The frequency of reticulocytes (% RET) was determined and used to provide an indication of bone marrow toxicity (i.e., a decrease in the % RET for a treatment group as compared to the Negative Control group). The frequency of micronucleated reticulocytes (% MN-RET) was determined to provide an indication of genotoxicity. Statistical tests will be performed by the test facility.

Dose Level (mg/kg body weight)	Sex	Average % RET	% RET Decrease*	% MN-RET
Negative (Vehicle) Control 0	Male	1.88	N/A	0.12
Test Substance (high dose) 1000	Male	1.55	18%	0.12
Negative (Vehicle) Control 0	Female	1.52	N/A	0.11
Test Substance (high dose) 1000	Female	1.42	7%	0.14
Negative (Vehicle) Control 0	Male	1.88	N/A	0.12
Positive Control (CP) 40	Male	0.62	67%	2.08
Negative (Vehicle) Control 0	Female	1.52	N/A	0.11
Positive Control (CP) 40	Female	0.42	72%	1.41

* Comparisons of each treatment group with the corresponding negative control. A negative value indicates increases in the % RET.
N/A = Not applicable. CP = Cyclophosphamide monohydrate.

6. Objective

The objective of this analysis was to evaluate test facility prepared mouse peripheral blood samples for the presence of micronuclei (MN) using the MicroFlow procedure. Micronuclei were analyzed in both the reticulocyte and normochromatic erythrocyte (NCE) populations. Micronucleus measurements made in the RET population provide an indication of genotoxicity associated with an acute dosing regimen, while those made in the NCE population are appropriate when subchronic or chronic exposure regimens have been utilized. The frequency of RETs among total red blood cells was measured to provide an indication of bone marrow toxicity.

7. Materials and Methods

7.1. Experimental Procedures (performed by Test Facility)

The test facility was responsible for following the procedures detailed in the MicroFlow kit manual supplied to the test facility. The supplies and reagents were provided as a MicroFlow kit by the test site. No deviations from the manual were noted.

7.2. Blood Cell Receipt

On August 25, 2017, Litron Laboratories received 30 fixed mouse blood samples from Study 45997. All fixed blood samples were stored in a freezer (–90 °C to –60 °C) until analysis.

7.3. Blood Cell Preparation

The fixed blood samples were thawed and then washed by adding each aliquot to tubes containing 5 ± 1 ml of cold Hank's Balanced Salt Solution (HBSS) + 1% fetal bovine serum. Cells were isolated by centrifugation, and the cell pellets were stored on ice until staining and then at 2 °C to 10 °C. After analysis of each stained sample, the remaining cell pellets were discarded.

7.4. Staining for Identification of Cell Populations

An aliquot (20 µl) of each washed blood sample was added to 80 µl of a solution containing RNase (to degrade RNA, 1 mg/ml), a fluorescently labeled (fluorescein isothiocyanate; FITC) antibody to the transferrin receptor to label RETs (anti-CD71-FITC, 10 µl/ml), and a fluorescently labeled antibody (phycoerythrin; PE) to label platelets (anti-CD61-PE, 5 µl/ml) in a base of HBSS. The samples were incubated in the labeling solution for 30 ± 10 minutes at 2 °C to 10 °C and 30 ± 10 minutes at room temperature. After incubation, the cells were kept at 2 °C to 10 °C until analysis. A propidium iodide (PI) solution (2 ml ± 0.5 ml) was added to each sample immediately before flow cytometric analysis to stain all DNA, including MN in the cells.

7.5. Flow Cytometer Calibration

Methanol-fixed blood from mice infected with *Plasmodium berghei* and methanol-fixed blood from uninfected rats were used to configure the flow cytometer before analysis. Whereas MN are relatively rare and exhibit a heterogeneous DNA content, parasitized cells are prevalent and have a homogenous DNA content. These characteristics make them ideal for calibrating the flow cytometer for the micronucleus scoring application.

7.6. Analysis of Blood Samples

Each blood sample was analyzed by high-speed flow cytometry using CellQuest software, version 5.2 (Becton Dickinson, San Jose, CA). The stained cells were moved at a high velocity past an argon laser set to provide 488 nm excitation. Photomultiplier tubes collected the fluorescence emitted by each cell. Using the previously described staining procedure, the PI-stained DNA of the MN emitted a red fluorescence, the anti-CD71-FITC antibody emitted a high green fluorescent signal, and platelets were excluded based on their anti-CD61-PE fluorescence. Upon successful analysis of the stained samples, each was discarded.

7.7. Number of Cells Analyzed

For test facility samples, at least 5,000 RETs (CD71+) were evaluated for the presence of MN.

7.8. Data Provided

The number of NCEs, MN-NCEs, RETs and MN-RETs are provided for each sample analyzed. The frequency of MN-RETs and MN-NCEs were calculated as an indication of genotoxic potential. The % RET was determined to provide an indication of bone marrow toxicity. For each group, the average and standard deviations for % RET, % MN-RET and % MN-NCE are provided for males and females separately.

7.9. Criteria for a Valid Assay

The test facility will establish if the criteria for determining whether an analysis is valid were met.

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7.10. Statistical Analysis of the Data

The test facility provided the following information regarding test article treatment groups.

Male Animal Numbers	Female Animal Numbers	Group Dose Level *(mg/kg body weight)*	Sampling Time (hr) after Final Treatment
5201, 5202, 5203, 5204 and 5205	5206, 5207, 5208, 5209 and 5210	1 Negative (Vehicle) Control *0*	44-48
5211, 5212, 5213, 5214 and 5215	5216, 5217, 5218, 5219 and 5220	2 Test Substance (high dose) *1000*	44-48
5221, 5222, 5223, 5224 and 5225	5226, 5227, 5228, 5229 and 5230	3 Positive Control (Cyclophosphamide monohydrate) *40*	44-48

Five samples/sex/group were submitted (see table, above) for all groups. No statistical analyses were performed on the data, other than the calculations indicated in this report. The test facility is responsible for the evaluation and interpretation of results.

7.11. Determining a Positive Response

A test article is considered genotoxic if the average % MN-RET for the treated animals is significantly higher than the average % MN-RET values for the negative (vehicle) control animals ($p < 0.05$). A test article is considered negative if statistical significance is not demonstrated ($p \geq 0.05$). Biological relevance of results is also considered in the final determination of genotoxicity. Although most experiments will give clearly positive or negative results, in rare cases the data set will preclude making a definite judgment about the activity of the test article. These results are considered equivocal and are very rare. Equivocal results should be clarified by further testing preferably using a modification of experimental conditions.

8. Discussion of Results

All statistical evaluations will be performed by Product Safety Labs.

9. Conclusions

The genotoxic potential of the test article will be evaluated by Product Safety Labs.

10. Historical Data

None available at time of analysis, but a historical control database is being developed.

11. Records Maintained

The study phase plan, MicroFlow report, and study-specific records (copies, if applicable) will be transferred to the test facility at the completion of the study phase. Litron will maintain copies of the report, protocol, study phase plan, and other study-specific records for two years following completion of the study. After the retention period, Litron will contact the Test facility and study-specific records will either be discarded or sent to a location designated by the Test facility. Electronic copies of some records will be stored off-site (ESL Federal Credit Union, Brighton Henrietta Branch, Rochester, NY) in addition to storage at Litron Laboratories.

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- Section 4 of the OECD Guidelines for the Testing of Chemicals: Mammalian Erythrocyte Micronucleus Test, Guideline 474 (Adopted 26th September 2014).
- Where applicable, GLP regulations for non-clinical laboratory studies as developed by the FDA (21 CFR 58). Please note that the computerized systems utilized for data acquisition, data analysis and report generation have undergone an internal validation guided by FDA GLP regulations. Litron is working towards 21 CFR part 11 compliance.
- Where applicable, ISO 10993-3: Biological evaluation of medical devices – Part 3: Tests for genotoxicity, carcinogenicity and reproductive toxicology (2009-10-15).
- Where applicable, ICH Harmonised Tripartite Guideline: Guidance on Genotoxicity Testing and Data Interpretation for Pharmaceuticals Intended for Human Use, S2(R1), current Step 4 version dated 9 November 2011.

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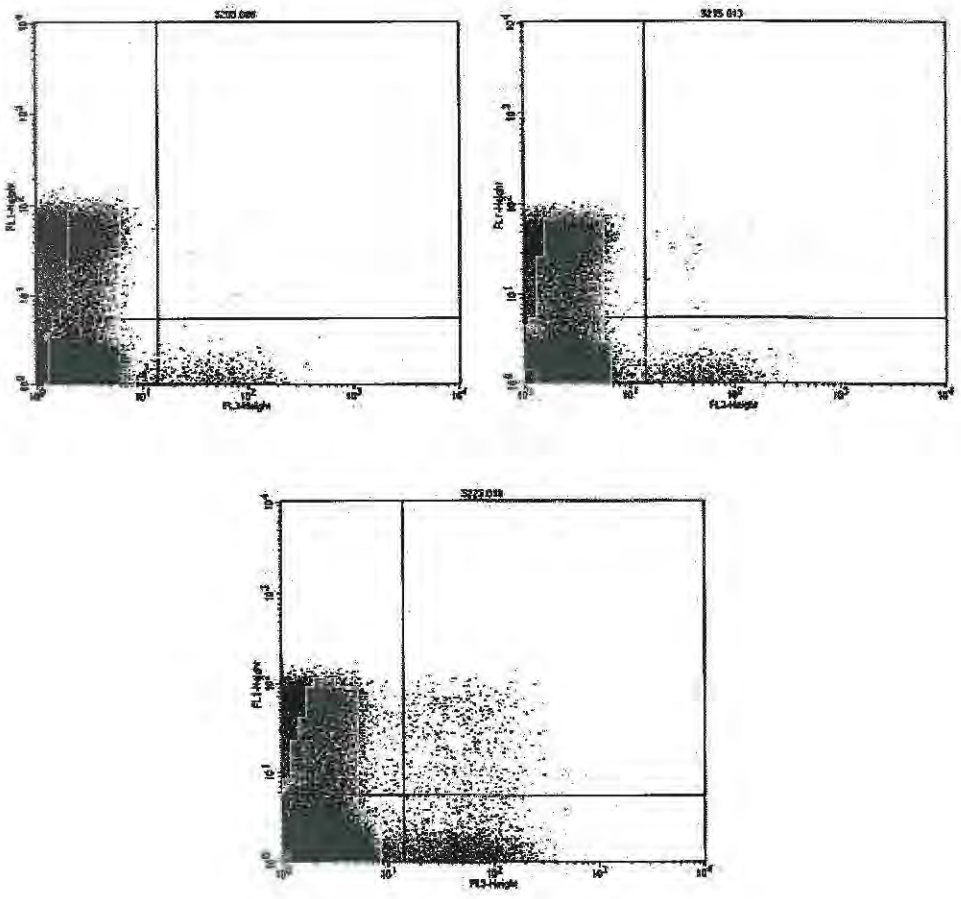
Figures 1-3: Representative Bivariates - Males

These representative bivariates of test facility submitted Samples 5205, 5215 and 5225 illustrate the resolution of the various erythrocyte populations in mouse peripheral blood: Lower Left quadrant = NCE [cells which are low in green and red fluorescence]; Lower Right = MN-NCE [cells high in red (PI) fluorescence]; Upper Left = CD71 positive RET [cells with green (CD71) fluorescence]; Upper Right = CD71 positive MN-RET [cells with both red and green fluorescence; the population of primary interest for this analysis].



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Figures 4-6: Representative Bivariates - Females

These representative bivariates of test facility submitted Samples 5206, 5216 and 5226 illustrate the resolution of the various erythrocyte populations in mouse peripheral blood: Lower Left quadrant = NCE [cells which are low in green and red fluorescence]; Lower Right = MN-NCE [cells high in red (PI) fluorescence]; Upper Left = CD71 positive RET [cells with green (CD71) fluorescence]; Upper Right = CD71 positive MN-RET [cells with both red and green fluorescence; the population of primary interest for this analysis].

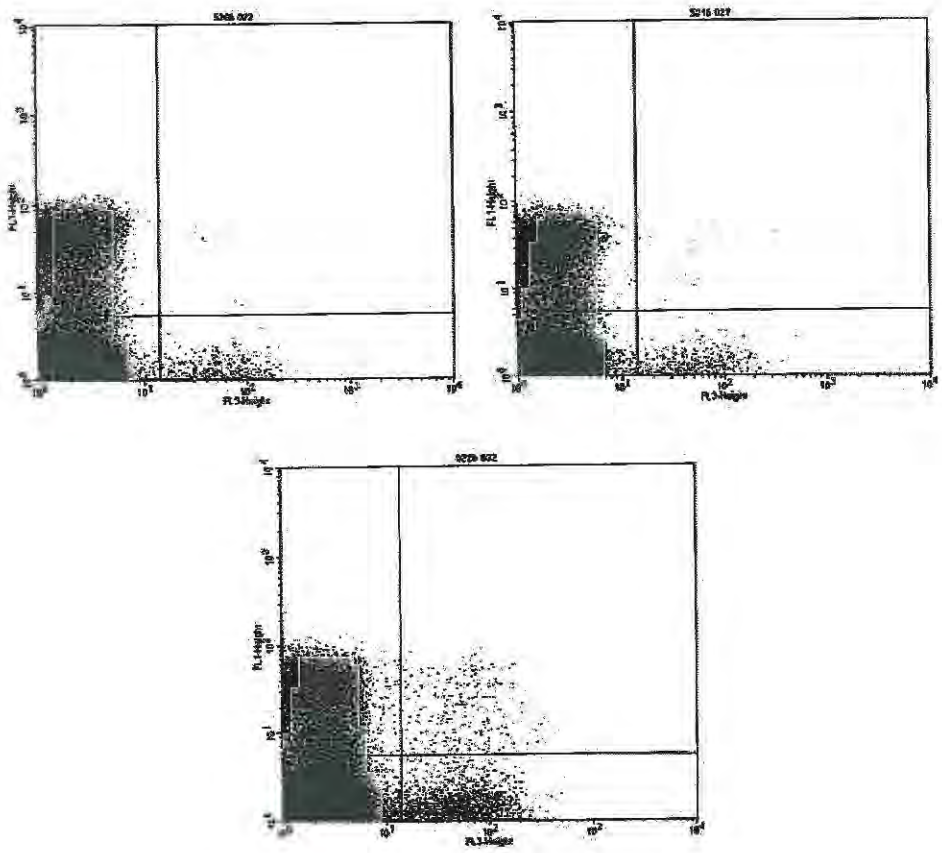

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Table 1: Individual Animal Data – Raw Data

Animal No.	Group	Sex	Dose Level *(mg/kg body weight)*	No. NCE[1]	No. MN-NCE[2]	No. RET[3]	No. MN-RET[4]
5201	1	Male	Negative (Vehicle) Control *0*	1123789	1374	19970	30
5202	1	Male	Negative (Vehicle) Control *0*	1051210	1275	19972	28
5203	1	Male	Negative (Vehicle) Control *0*	1003595	1271	19976	24
5204	1	Male	Negative (Vehicle) Control *0*	847800	675	19983	17
5205	1	Male	Negative (Vehicle) Control *0*	1271744	1086	19985	15
5206	1	Female	Negative (Vehicle) Control *0*	1496832	1190	19972	28
5207	1	Female	Negative (Vehicle) Control *0*	1065645	1107	19979	21
5208	1	Female	Negative (Vehicle) Control *0*	1220816	902	19980	19
5209	1	Female	Negative (Vehicle) Control *0*	1488874	1681	19975	25
5210	1	Female	Negative (Vehicle) Control *0*	1283611	1048	19982	18
5211	2	Male	Test Substance (high dose) *1000*	1103763	1289	19980	20
5212	2	Male	Test Substance (high dose) *1000*	1095103	1202	19980	20
5213	2	Male	Test Substance (high dose) *1000*	1233241	1038	19978	22
5214	2	Male	Test Substance (high dose) *1000*	1984335	1674	19981	19
5215	2	Male	Test Substance (high dose) *1000*	1241507	1921	19964	36
5216	2	Female	Test Substance (high dose) *1000*	994214	1286	19963	36
5217	2	Female	Test Substance (high dose) *1000*	1145942	1304	19976	24
5218	2	Female	Test Substance (high dose) *1000*	1347030	1489	19979	21
5219	2	Female	Test Substance (high dose) *1000*	2525995	4087	19969	31
5220	2	Female	Test Substance (high dose) *1000*	1679145	1946	19973	27
5221	3	Male	Positive Control (CP) *40*	2606393	1887	9890	110
5222	3	Male	Positive Control (CP) *40*	2639660	3469	19499	501
5223	3	Male	Positive Control (CP) *40*	3966214	5408	19669	331
5224	3	Male	Positive Control (CP) *40*	3165193	5722	19619	381
5225	3	Male	Positive Control (CP) *40*	2392784	4613	19378	622
5226	3	Female	Positive Control (CP) *40*	3493568	4108	19637	363
5227	3	Female	Positive Control (CP) *40*	4675952	5807	19754	246
5228	3	Female	Positive Control (CP) *40*	4849524	7320	9840	160
5229	3	Female	Positive Control (CP) *40*	3482604	4962	9856	144
5230	3	Female	Positive Control (CP) *40*	3266788	3186	19807	193

[1] NCE = normochromatic erythrocytes; [2] MN-NCE = micronucleated normochromatic erythrocytes;
[3] RET = CD71 positive reticulocytes; [4] MN-RET = CD71 positive micronucleated reticulocytes;
CP = Cyclophosphamide monohydrate

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Table 2: Individual Animal Data – Calculated Data

Animal No.	Group	Sex	Dose Level *(mg/kg body weight)*	%RET[a]	%MN-NCE[b]	%MN-RET[c]
5201	1	Male	Negative (Vehicle) Control 0	1.75	0.12	0.15
5202	1	Male	Negative (Vehicle) Control 0	1.86	0.12	0.14
5203	1	Male	Negative (Vehicle) Control 0	1.95	0.13	0.12
5204	1	Male	Negative (Vehicle) Control 0	2.30	0.08	0.09
5205	1	Male	Negative (Vehicle) Control 0	1.55	0.09	0.08
			Average	**1.88**	**0.11**	**0.12**
			StDev	**0.28**	**0.02**	**0.03**
5206	1	Female	Negative (Vehicle) Control 0	1.32	0.08	0.14
5207	1	Female	Negative (Vehicle) Control 0	1.84	0.10	0.11
5208	1	Female	Negative (Vehicle) Control 0	1.61	0.07	0.10
5209	1	Female	Negative (Vehicle) Control 0	1.32	0.11	0.13
5210	1	Female	Negative (Vehicle) Control 0	1.53	0.08	0.09
			Average	**1.52**	**0.09**	**0.11**
			StDev	**0.22**	**0.02**	**0.02**
5211	2	Male	Test Substance (high dose) 1000	1.78	0.12	0.10
5212	2	Male	Test Substance (high dose) 1000	1.79	0.11	0.10
5213	2	Male	Test Substance (high dose) 1000	1.59	0.08	0.11
5214	2	Male	Test Substance (high dose) 1000	1.00	0.08	0.10
5215	2	Male	Test Substance (high dose) 1000	1.58	0.15	0.18
			Average	**1.55**	**0.11**	**0.12**
			StDev	**0.32**	**0.03**	**0.03**
5216	2	Female	Test Substance (high dose) 1000	1.97	0.13	0.18
5217	2	Female	Test Substance (high dose) 1000	1.71	0.11	0.12
5218	2	Female	Test Substance (high dose) 1000	1.46	0.11	0.11
5219	2	Female	Test Substance (high dose) 1000	0.78	0.16	0.16
5220	2	Female	Test Substance (high dose) 1000	1.18	0.12	0.14
			Average	**1.42**	**0.13**	**0.14**
			StDev	**0.46**	**0.02**	**0.03**
5221	3	Male	Positive Control (CP) 40	0.38	0.07	1.10
5222	3	Male	Positive Control (CP) 40	0.75	0.13	2.51
5223	3	Male	Positive Control (CP) 40	0.50	0.14	1.66
5224	3	Male	Positive Control (CP) 40	0.63	0.18	1.91
5225	3	Male	Positive Control (CP) 40	0.89	0.19	3.11
			Average	**0.62**	**0.14**	**2.06**
			StDev	**0.18**	**0.05**	**0.78**
5226	3	Female	Positive Control (CP) 40	0.57	0.12	1.82
5227	3	Female	Positive Control (CP) 40	0.43	0.12	1.23
5228	3	Female	Positive Control (CP) 40	0.21	0.15	1.60
5229	3	Female	Positive Control (CP) 40	0.29	0.14	1.44
5230	3	Female	Positive Control (CP) 40	0.61	0.10	0.97
			Average	**0.42**	**0.13**	**1.41**
			StDev	**0.17**	**0.02**	**0.33**

[a] % RET = frequency (%) of CD71 positive reticulocytes
[b] % MN-NCE = frequency (%) of micronucleated normochromatic erythrocytes
[c] % MN-RET = frequency (%) of CD71 positive micronucleated reticulocytes
CP = Cyclophosphamide monohydrate

APPENDIX B: PSL's HISTORICAL CONTROL DATA

Validation data: cyclophosphamide

		%MN-RET		%RET		%MN-NCE	
Sex	Treatment	Result	Significance	Result	Significance	Result	Significance
Male	Vehicle	0.17 ± 0.02	n/a (ref.)	1.74 ± 0.10	n/a (ref.)	0.12 ± 0.01	n/a (ref.)
Male	1.5 mg/kg	0.23 ± 0.03	ns	2.36 ± 0.37	ns	0.11 ± 0.02	ns
Male	5 mg/kg	0.28 ± 0.03	$p < 0.05$	1.39 ± 0.15	ns	0.10 ± 0.01	ns
Male	15 mg/kg	0.57 ± 0.03	$p < 0.001$	1.48 ± 0.15	ns	0.15 ± 0.00	ns
Male	40 mg/kg	1.33 ± 0.07	$p < 0.001$	0.81 ± 0.18	$p < 0.05$	0.12 ± 0.01	ns
Female	Vehicle	0.17 ± 0.02	n/a (ref.)	1.79 ± 0.17	n/a (ref.)	0.11 ± 0.01	n/a (ref.)
Female	1.5 mg/kg	0.22 ± 0.04	ns	1.83 ± 0.23	ns	0.11 ± 0.01	ns
Female	5 mg/kg	0.29 ± 0.02	$p < 0.05$	1.77 ± 0.13	ns	0.10 ± 0.01	ns
Female	15 mg/kg	0.46 ± 0.05	$p < 0.001$	1.15 ± 0.14	ns	0.11 ± 0.01	ns
Female	40 mg/kg	1.36 ± 0.29	$p < 0.001$	1.15 ± 0.36	ns	0.14 ± 0.02	ns

Cylcophosphamide reference publications: De Boeck, M. et al. (2005) Flow cytometric analysis of micronucleated reticulocytes: Time- and dose-dependent response of known mutagens in mice, using multiple blood sampling. Environmental and Molecular Mutagenesis (46) 30-42. LeBaron, M. J. et al. (2012) Influence of counting methodology on erythrocyte ratios in the mouse micronucleus test. Environmental and Molecular Mutagenesis (54) 222-8. Witt, K. L. et al. (2008) Comparison of flow cytometry- and microscopy-based methods for measuring micronucleated reticulocyte frequencies in rodents treated with nongenotoxic and genotoxic chemicals. Mutation Research (649) 101-13.

Historical control data

		%MN-RET		%RET		%MN-NCE	
Sex	Treatment	Mean ± SEM	Control lim.	Mean ± SEM	Control lim.	Mean ± SEM	Control lim.
Male	Vehicle	0.16 ± 0.01	-0.01 to 0.34	2.21 ± 0.15	-0.80 to 5.22	0.12 ± 0.00	0.03 to 0.22
Male	CP 40	1.56 ± 0.08	-0.12 to 3.24	0.69 ± 0.05	-0.29 to 1.68	0.12 ± 0.00	0.02 to 0.23
Female	Vehicle	0.17 ± 0.01	-0.07 to 0.41	1.90 ± 0.08	0.27 to 3.54	0.11 ± 0.01	-0.04 to 0.26
Female	CP 40	1.49 ± 0.12	-1.04 to 4.02	0.81 ± 0.06	-0.54 to 2.17	0.13 ± 0.00	0.04 to 0.22

APPENDIX G3
MORI SILK 14-DAY REPEATED DOSE ORAL GAVAGE RANGE-FINDING STUDY IN RATS

STUDY TITLE

Silk Fibroin:
A 14-Day Repeat Dose Oral Gavage
Range-Finding Study in Rats

PRODUCT IDENTIFICATION

Silk Fibroin

TESTING GUIDELINES

OECD Guidelines for Testing of Chemicals, Section 4, Test No. 407: Health Effects, *Repeated Dose 28-Day Oral Toxicity Study in Rodents* (adopted 1995; updated October 2008)

US EPA Health Effects Test Guidelines: OPPTS 870.3050 Repeated Dose 28-day Oral Toxicity Study in Rodents (2000)

US FDA Toxicological Principles for the Safety Assessment of Food Ingredients, Redbook 2000, Revised 2007, IV.C. 4. a. *Subchronic Toxicity Studies with Rodents* (2003)

STUDY NUMBER

50725

PERFORMING LABORATORY

Product Safety Labs
2394 US Highway 130
Dayton, New Jersey 08810

STUDY COMPLETION DATE

January 24, 2020

STUDY DIRECTOR

[redacted]

SPONSOR

Cambridge Crops Inc
444 Somerville Ave
Somerville, MA 02143

CERTIFICATIONS

We, the undersigned, declare that the methods, results and data contained in this report faithfully reflect the procedures used and raw data collected during the study.

[redacted]
Study Director
Product Safety Labs

01|24|2020
Date

[redacted]
President
Product Safety Labs

01/24/2020
Date

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

STUDY INFORMATION

Protocol No.:	P710.01 CMR
Test Substance:	Silk Fibroin Batch #: 128
Physical Description:	Slightly yellow liquid
Date Test Substances Received:	1) June 14, 2019 2) June 28, 2019
PSL IDs:	1) 190614-1D 2) 190628-1D
PSL Study Number:	50725
Sponsor:	Cambridge Crops Inc 444 Somerville Ave Somerville, MA 02143
Study Initiated-Completed:	June 20, 2019 – (see report cover page)
In-Life Study Initiated-Completed:	June 26 – July 8, 2019

KEY PERSONNEL

Product Safety Labs:

President:

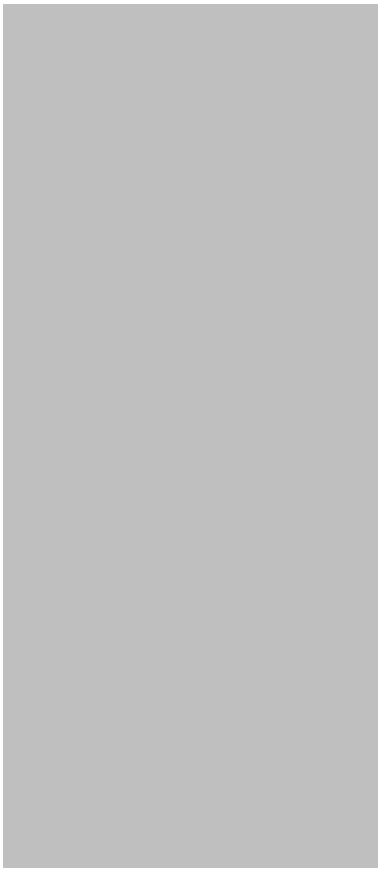
Laboratory Director:

Study Director:

Primary Scientist:

Contributing Personnel:

Technical Writing Supervisor:



1. OBJECTIVE

The objective of this study was to evaluate the potential subchronic toxicity of Silk Fibroin in male and female rats that is likely to arise from repeated exposure via oral gavage over a test period of 14 days. These data will be used, along with existing data, to select dose levels for a subsequent longer toxicity study in rats.

2. SUMMARY

Forty adult Crl: Sprague-Dawley CD® IGS rats (20 males, 20 females) were equally distributed into four dose groups (5/sex/group). Dose levels of 0, 125, 250, and 500 mg/kg/day (Groups 1-4, respectively) were selected for the study.

An appropriate amount of the test substance or vehicle control (distilled water) was administered daily via oral intubation to each rat for 14 days. The test substance was prepared at concentrations of 12.5 (low dose), 25 (intermediate dose), and 50 (high dose) mg/mL, w/v in the vehicle (distilled water). The test substance preparations were administered at a dose volume of 10 mL/kg/day.

The animals were observed at least once daily for viability, signs of gross toxicity, and behavioral changes, and weekly for a battery of detailed observations. Body weights were recorded two times during the acclimation period (including prior to initial dose administration on Day 1), on Days 8 and 15, and immediately prior to sacrifice. Individual food consumption was also recorded in conjunction with scheduled body weights. Food efficiency was calculated. All animals were subjected to a gross necropsy at study termination on Day 15.

There were no mortalities, clinical observations, body weight, body weight gain, food consumption, or food efficiency changes attributable to Silk Fibroin administration. There were no macroscopic findings at necropsy.

Under the conditions of the study and based on the toxicological endpoints evaluated, male and female Sprague Dawley rats are expected to tolerate dose levels of 500 mg/kg/day Silk Fibroin in a study of longer duration.

3. TEST SUBSTANCE

A. Source

The test substance was received from the Sponsor.

B. Identification

The test substance was received on June 14, 2019, and identified using the following information provided by the Sponsor and PSL identification number.

Test Substance (Amendment 2): Silk Fibroin
Batch #: 128; Batch #: 136 (Amendment 1)
PSL IDs: 190614-1D; 190628-1D (Amendment 1)
Physical Description: Slightly yellow liquid
Composition (Amendment 3): 5.0 % Silk Fibroin (CAS# 9007-76-5) & 95 % Water
Storage Conditions: -20^{0}C (thawed on ice before use at ambient temp)
Expiration Date: 07/20/2019

Documentation of the methods of synthesis, fabrication, or derivation of the test substance is retained by the Sponsor.

C. Analysis

The test substance, as received, was expected to be stable for the duration of the study.

D. Hazards

Appropriate routine safety precautions were exercised in the handling of the test substance.

4. GENERAL TEST SYSTEM PARAMETERS

A. Animal Requirements

4.A.1 Number of Animals: 40

4.A.2 Number of Groups: 4 (3 dose levels per sex + 1 control group per sex)

4.A.3 Number of Animals per Group: 10 (5 males, 5 females)

4.A.4 Sex: Male and female. Females were nulliparous and non-pregnant.

4.A.5 Species/Strain: CRL Sprague-Dawley CD® IGS rats

4.A.6 Age/Weight: Seven to eight weeks at initiation; the weight variation did not exceed ± 20% of the mean weight for each sex.

4.A.7 Supplier: Charles River Laboratories, Inc. Rats were shipped in filtered cartons by truck.

On June 18, 2019, forty-four (44) CRL Sprague-Dawley CD® IGS rats (22/sex) arrived from Charles River Laboratories, Raleigh, NC, with an assigned birth date of May 3, 2019. The rats were designated by the supplier to be six to seven weeks of age upon arrival.

B. Test System Justification

The Sprague-Dawley® rat was the system of choice because, historically, it has been a preferred and commonly used species for oral toxicity tests. The current state of scientific knowledge does not provide acceptable alternatives to the use of live animals to accomplish the objective of this study.

C. Animal Husbandry

4.C.1 Housing

The animals were housed in regularly cleaned cages which conform to the size recommendations in the most recent *Guide for the Care and Use of Laboratory Animals* (Natl. Res. Council, 2011). The animal room had a 12-hour light/dark cycle and was kept clean and vermin free.

4.C.2 Animal Room Temperature and Relative Humidity Ranges

Temperature and humidity was 19-22°C and 50-67%, respectively.

4.C.3 Acclimation

The animals were conditioned to the housing facilities for six days prior to testing. Body weights and clinical observations were recorded at least two times prior to study start.

4.C.4 Feed

2016 Certified Envigo Teklad Global Rodent Diet® was stored in a dedicated temperature and humidity monitored feed storage site and available *ad libitum* during acclimation and throughout the study, except when animals were fasted for terminal sacrifice.

4.C.5 Water

Filtered tap water was available ad libitum from individual bottles attached to the cages or from an automatic watering access system. Water analysis is conducted by Precision Analytical Services, Inc., Toms River, NJ, and South Brunswick Municipal Water Supply, South Brunswick, NJ.

4.C.6 Contaminants

There are no known contaminants reasonably expected to be found in the food or water that would interfere with the results of this study. Results of routine analysis consisting of each lot of feed used in this study were received from Envigo Teklad, Madison, WI. Water analysis was conducted periodically and the records are kept on file at Product Safety Labs. The date of the most recent analysis is reported in the final report (Appendix B).

D. Identification

4.D.1 Cage

Each cage was identified by a cage card indicating at least the study number, dose level, group assignment, individual animal identification and sex of the animal.

4.D.2 Animal

Each animal was given a sequential number in addition to being uniquely identified with a Monel® self-piercing stainless steel ear tag. Only the sequential animal number is presented in the report.

5. EXPERIMENTAL DESIGN

A. Route of Administration

The test substance was administered by oral gavage.

B. Justification of Route of Administration

The oral route of administration was selected by the Sponsor. This route of administration is recommended in the referenced guidelines (Section 8.C) and a potential route of human exposure.

C. Control of Bias

Animals were randomly assigned, stratified by body weight, to test groups.

E. Dose Levels

Five male and five female rats were randomly assigned to each of the following test groups:

Group	No. Animals/Group (M/F)	Target Dose Level (mg/kg/day)	Dose Volume (mL/kg/day)	Dose Concentration[a] (mg/mL)
1	5/5	Vehicle Control[b] / 0	10	0
2	5/5	Low Dose / 125		12.5
3	5/5	Intermediate Dose / 250		25
4	5/5	High Dose / 500		50

[a] Appropriate concentrations of the test substance in vehicle to achieve the target dose level.
[b] Distilled water, Fox Ledge; Lot #: 19000510, Exp. Date: 05/10/21.

F. Justification of Dose Level Selection

The dose levels of 0 (vehicle control), 125, 250, and 500 mg/kg/day of Silk Fibroin were selected by the Sponsor in consultation with the Study Director. As provided by the Sponsor, the highest achievable level of a visually homogenous solution was 50 mg/mL. The high dose is a tolerable dose and is not expected to cause marked toxicity. The intermediate and low dose levels are selected to derive a dose-response for any effects observed. These data will be used to select dose levels for a subsequent longer toxicity study.

6. GENERAL PROCEDURES

A. Selection of Animals

After acclimating to the laboratory environment for six days, the rats were examined for general health and weighed. Only those rats free of clinical signs of disease or injury and having a body weight range within ±20% of the mean were selected for test. Forty (40) healthy rats (20 males; 20 females) were selected for test. The animals weighed 210-264 grams (males) and 130-172 grams (females) and were approximately seven to eight weeks of age at initiation of dosing. The rats that were used on test were randomly distributed, stratified by body weight, among the groups on the day of study start.

B. Dose Preparation and Procedures

6.B.1 Test Substance Preparation

The test substance was mixed weight to volume (w/v) in distilled water. Group 1 received distilled water alone, as a vehicle control. Fresh formulations containing 12.5 (low dose), 25 (intermediate dose), and 50 (high dose) mg/mL concentrations of the test substance were prepared once a week. The formulations were vortexed, if necessary, at ambient temperature until a visually homogeneous mixture was achieved. Preparations of the test substance were documented in the raw data.

6.B.2 Dose Calculations

Individual doses were calculated based on the most recent weekly body weights and were adjusted each week to maintain the targeted dose level for all rats (i.e., mg/kg/day). All doses

were administered volumetrically at 10 mL/kg. The control group received the vehicle only, at the same dose volume as the test animals.

6.B.3 Dosing

Each animal was dosed by oral intubation using a stainless steel ball-tipped gavage needle attached to an appropriate syringe. Dose administration was daily (7 days/week) for a period of at least 14 days. The dose mixtures were maintained on a magnetic stir plate during dose administration. The first day of administration was considered Day 1 of the study. Dosing was at approximately the same time each day (±2 hours). Residual dose mixtures were properly discarded following daily administration and sampling (as required).

C. Sampling of Test Substance and Dose Preparations

6.C.1 Sample Collections

The neat test substance and dose preparations were sampled in duplicate.

6.C.2 Test Substance and Dose Preparation Stability

The test substance was expected to be stable over the course of the study under the conditions of storage at Product Safety Labs. Given that the dose preparations were prepared daily, maintained on a stir plate during dose administration, and used within approximately two hours, the test substance in the preparations were considered to be stable. A sample of the test substance (neat) was collected at the beginning and end of the in-life phase.

6.C.3 Dose Preparation Homogeneity

At the beginning of the study, formulation of each concentration was prepared according to the procedures as were used on test (Section 6.B.1). Samples from these preparations were collected from the top, middle, and bottom of each concentration of test substance that was prepared in the vehicle. Sample of the vehicle control was collected from the middle of the container only.

6.C.4 Dose Preparation Concentration Verification

Samples for concentration verification were collected from dose preparations at the beginning of the study (as part of the homogeneity assessment, Section 6.C.3).

6.C.5 Sample Preservation

Upon sampling, dose preparations and neat test substance were stored frozen. Samples were considered stable from the point at which they are frozen. All samples were retained until finalization of the study and discarded following the issuance of the final report.

6.C.6 Sample Analysis

Samples collected above were not analyzed. Samples are kept for possible future analysis of dose preparations (i.e., high and low doses) and/or neat test substance. If necessary, the concentration verifications can be identified via BCA assay with Silk Fibroin as the standard. Alternatively, gravimetrical methods are also applicable (i.e., TGA, moisture analyzer).

D. Clinical Observations

All animals were observed at least twice daily for viability. Cage-side observations of all animals were performed daily during the study. All findings were recorded.

Prior to the first treatment with the test substance on Day 1, and approximately a week after, a detailed clinical observation was conducted while handling the animal, generally occurring on days that the animals were weighed and food consumption measurements were taken. Potential signs noted included, but were not limited to: changes in skin, fur, eyes, and mucous membranes, occurrence of secretions and excretions and autonomic activity (e.g., lacrimation, piloerection, pupil size, unusual respiratory pattern). Likewise, changes in gait, posture, and response to handling, as well as the presence of clonic or tonic movements, stereotypies (e.g., excessive grooming, repetitive circling), or bizarre behavior (e.g., self-mutilation, walking backwards) were also recorded. The date and clock time of all observations and/or mortality checks were recorded.

E. Body Weight and Body Weight Gain

Individual body weights were recorded at least two times during acclimation. All animals were weighed on Day 1 (prior to study start) and weekly thereafter (intervals of 7 days ±1). The animals were also weighed prior to sacrifice. Body weight gain was calculated for selected intervals and for the study overall.

F. Food Consumption and Food Efficiency

Individual food consumption was measured and recorded to coincide with body weight measurements. Food efficiency was also calculated and reported. Due to a system error, the food consumption and food efficiency for males and females is not reported for Days 1-8.

G. Terminal Sacrifice

At terminal sacrifice, all animals were euthanized by exsanguination from the abdominal aorta under isoflurane anesthesia. All animals in the study were subjected to a gross necropsy, which included examination of the external surface of the body, all orifices, musculoskeletal system, and the cranial, thoracic, abdominal, and pelvic cavities with their associated organs and tissues. All gross lesions were recorded.

7. STATISTICAL ANALYSIS

In-Life Data

Product Safety Labs performed statistical analysis of all quantitative data collected during the in-life phase of the study. The use of the word “significant” or “significantly” indicates a statistically significant difference between the control and the experimental groups. Significance was judged at a probability value of $p < 0.05$. Mean and standard deviations were calculated for all quantitative data. Male and female rats were evaluated separately.

Statistical analysis was conducted by Provantis® version 9, Tables and Statistics, Instem LSS, Staffordshire UK; INSTAT.

7.A Statistical Methods

In-Life Data

For all in-life endpoints that are identified as multiple measurements of continuous data over time (e.g. body weight parameters, food consumption, and food efficiency), treatment and control groups were compared using a two-way analysis of variance (ANOVA), testing the effects of both time and treatment, with methods accounting for repeated measures in one independent variable (time) (Motulsky, 2014). Significant interactions observed between treatment and time as well as main effects and non-significant findings were further analyzed

by a *post hoc* multiple comparisons test (e.g. Dunnett's test [Dunnett 1964 and 1980]) of the individual treated groups to control.

8. STUDY CONDUCT

A. Laboratories

Testing Facility

In-life	Product Safety Labs 2394 US Highway 130 Dayton, NJ 08810

B. GLP Compliance

This study was not performed in full compliance with Good Laboratory Practice (GLP) standards, but was conducted in a GLP-compliant facility.

C. Test Procedure Guidelines

This study design conformed to the following guidelines:

- OECD Guidelines for Testing of Chemicals, Section 4, Test No. 407: Health Effects, *Repeated Dose 28-Day Oral Toxicity Study in Rodents* (adopted 1995; updated October 2008).
- US EPA Health Effects Test Guidelines: OPPTS 870.3050 Repeated Dose 28-day Oral Toxicity Study in Rodents (2000).
- US FDA Toxicological Principles for the Safety Assessment of Food Ingredients, Redbook 2000, Revised 2007, IV.C. 4. a. *Subchronic Toxicity Studies with Rodents* (2003).

9. FINAL REPORT AND RECORDS TO BE MAINTAINED

The original, signed final report and all paper raw data will be sent to the Sponsor. A copy of the signed report, together with copy of the protocol and all raw data generated at Product Safety Labs, are maintained in the Product Safety Labs' Archives.

The following records are maintained:

A. Information on test substance includes but was not limited to the following:

Storage	Disposition
Usage	

B. Information on animals includes but was not limited to the following:

Receipt, date of birth	Food consumption
Initial health assessment	Clinical observations
Dosing	Individual necropsy records
Body weights	Histopathology data

All other records that would demonstrate adherence to the protocol. Any electronic raw data generated by the Test Site are maintained in accordance to the Test Site's procedures.

10. PROTOCOL, PROTOCOL AMENDMENTS, AND PROTOCOL DEVIATION

See Appendix A for the Protocol, Protocol Amendments, and Protocol Deviation.

11. RESULTS

A. Mortality and Clinical Observations (Tables 1-2; Appendices C-E and J)

All animals survived test substance administration. There were no clinical signs considered related to test substance administration.

The fate of all animals is presented in Appendix J.

Males

Incidental clinical signs included: superficial eschar on the face of 1/5 Group 2 males and a lesion on the tail of 1/5 Group 4 males which correspond to the following detailed clinical observations: eschar on the face of 1/5 Group 2 males and a lesion on the tail of 1/5 Group 4 males. Neither of these findings was deemed to be test substance-related.

Females

All females appeared active and healthy throughout the entire study.

B. Body Weight and Body Weight Gain (Tables 3-4; Appendices F-G)

Overall and mean weekly body weights and mean daily body weight gain for treated male and female rats in Groups 2-4 were comparable to their respective control Group 1 values throughout the study.

C. Food Consumption and Food Efficiency (Tables 5-6; Appendices H-I)

Due to a recording error, the food consumption for Days 1-8 could not be determined. Mean daily food consumption and mean food efficiency for treated male and female rats in Groups 2-4 were comparable to control Group 1 values on Days 8-15.

D. Necropsy Observations (Appendices J-K)

There were no macroscopic findings at necropsy.

12. CONCLUSION

Under the conditions of the study and based on the toxicological endpoints evaluated, male and female Sprague Dawley rats are expected to well tolerate dose levels of 500 mg/kg/day of Silk Fibroin in a study of longer duration.

13. REFERENCES

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National Research Council of the National Academies. (2011). *Guide for the Care and Use of Laboratory Animals. Institute of Laboratory Animal Research, Division of Earth and Life Studies*. National Academy Press, Washington, D.C.