March 11, 2022

Lowell Marshall
Electronic Submissions Gateway
U.S. Food and Drug Administration
3WFN, Room 7C34
12225 Wilkins Avenue
Rockville, MD 20852

Re: Authorization Letter

To whom it may concern:

Pursuant to Section 11.100 of Title 21 of the Code of Federal Regulations, please accept this Authorization Letter. This letter is to certify that Cargill, Inc. authorizes Trinity Consultants Inc. dba SafeBridge Regulatory & Life Sciences Group to submit in the Electronic Submissions Gateway on behalf of Cargill, Inc.

Sincerely yours,

Susan Blum
Senior Food Lawyer
Cargill, Inc.

Safety Evaluation Dossier Supporting a Generally Recognized As Safe (GRAS) Conclusion for Corn Protein

SUBMITTED BY:

Cargill, Incorporated
15407 McGinty Road West/MS-163
Wayzata, MN 55391

SUBMITTED TO:

U.S. Food and Drug Administration
Center for Food Safety and Applied Nutrition
Office of Food Additive Safety (HFS-200)
5001 Campus Drive
College Park, MD 20740

CONTACT FOR TECHNICAL OR OTHER INFORMATION:

Trinity Consultants, Inc. dba SafeBridge® Regulatory & Life Sciences Group
154 Hansen Road, Suite 201
Charlottesville, VA 22911

March 16, 2022

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§ 170.225 Part 1, GRAS Notice: Signed Statements and Certification

GRAS Notice Submission

The current GRAS Notice is hereby submitted in accordance with Title 21 of the U.S. Code of Federal Regulations (CFR), Chapter I, Subchapter B, Part 170, Subpart E to inform the Agency that the proposed uses of corn protein described herein have been determined to be generally recognized as safe (GRAS) through scientific procedures, and are therefore exempt from the pre-market approval requirements of the Federal Food, Drug, and Cosmetic Act.

March 16, 2022

G. Craig Llewellyn, Ph.D.
Principal Toxicologist and Scientific Director
Trinity Consultants, Inc. dba
SafeBridge® Regulatory & Life Sciences Group
Agent for Cargill

Date

Name and Address of Notifier

Cargill, Incorporated
15407 McGinty Road
Wayzata, MN 55391

Name of Notified Substance

The name of the substance that is the subject of this GRAS conclusion is corn protein.

Intended Use in Food

Corn protein is intended for use as a source of protein in a variety of food categories. It is also intended for such functional effects as thickening, water absorption, fat/oil absorption, gelation, and solid fat emulsification.

Basis for GRAS Conclusion

The basis for the GRAS conclusion for corn protein is through scientific procedures in accordance with 21 CFR §170.30(a) and (b). These criteria are applied herein in an analysis of whether the use of corn protein is GRAS for the intended conditions of use, *i.e.,* as a source of protein, and for functional uses such as thickening, water absorption, fat/oil absorption, and gelation in a variety of food categories, and solid fat emulsification.

The members of an Expert Panel (the Panel) were convened to evaluate corn protein and its general recognition of safety. The Panel's Opinion is provided as Exhibit I of this Notice. The Panel critically evaluated the information summarized herein (less the recent minor updates to estimated corn protein intake) and other information they deemed appropriate and relevant. The Panel unanimously concluded that the totality of the evidence satisfies the safety standard of reasonable certainty of no harm for the intended conditions of uses of corn protein. In addition, because the information supporting safety is publicly available, widely known and accepted by qualified experts, the Panel concluded that corn protein is not only safe, but generally recognized as safe (GRAS) for the intended condition of use described herein. Considering that the current corn protein intake estimates are only minimally increased compared to the estimates reviewed previously by the Panel (i.e., worst-case 90th percentile total population intake of 29.0 g/day versus 24.3 g/day for all proposed uses), the previous conclusions regarding the safety of corn protein for its intended use remain valid as reflected in the Panel's original Opinion.

Based upon our findings and knowledge of the information compiled in this Notice, supported by the Expert Panel, we conclude that corn protein is GRAS for the intended conditions of use described herein.

To the best of our knowledge, the current GRAS Notice is a complete, representative, and balanced submission that includes unfavorable information, as well as favorable

information, known to us and pertinent to the evaluation of the safety and GRAS status of the use of corn protein.

Availability of Information

The data and information that serve as the basis for this GRAS conclusion, as well any information that has become available since the GRAS conclusion, will be sent to the FDA on request, or are available for the FDA's review and copying during customary business hours from Trinity Consultants, Inc. dba SafeBridge® Regulatory & Life Sciences Group, 154 Hansen Road, Suite 201, Charlottesville, VA 22911 [contact: G. Craig Llewellyn, Ph.D.; telephone: (434) 977-5957; email: craig.llewellyn@safebridge.com].

None of the data and information in Parts 2 through 7 of the current GRAS Notice are considered exempt from disclosure under the Freedom of Information Act (FOIA), 5 U.S.C. 552.

Additionally, the U.S. Food and Drug Administration (FDA) is authorized to send this Notice (including any trade secrets) to the U.S. Department of Agriculture (USDA) Food Safety and Inspection Service (FSIS).

§ 170.230 Part 2, Identity, Method of Manufacture, Specifications, and Physical or Technical Effect

Identity and Characterization

The subject of this GRAS Notification is corn protein that is composed of at least 65% protein; the remainder being carbohydrates, fat/oil, ash, organic acid, and water. It typically appears as a pale yellow to light tan powder.

Corn Protein Method of Manufacture

Cargill's corn protein is manufactured from corn gluten meal, which is obtained through wet milling of maize, in accordance with current good manufacturing practices (cGMP) for food (21 CFR Part 110). Corn gluten meal may be obtained from corn (maize) sourced from inside and outside the US. All raw materials and processing aids used in the manufacture of corn protein are considered safe and appropriate for use in foods. Figure 1 provides a flow diagram of the manufacturing process.

The main steps in corn milling are steeping, grinding, germ separation, fiber separation, starch separation, and protein concentration. Corn gluten meal (slurry) is the product of this final protein concentration after the prior steps have been completed. The corn gluten meal (slurry) is pH adjusted using food grade buffers, processed by jet cooking the slurry, mixed with a heat-resistant food grade enzyme, such as alpha-amylase[1], followed by incubation at approximately 75-85°C until the solubilized starch can be removed from the insoluble protein. During the wet milling of maize, antimicrobial preservation is completed by liberated sulfur dioxide (SO_2), derived from sodium bisulfite (food grade), ammonium bisulfite (food grade) or a sulfur burner. Sulfur dioxide weakens the glutelin matrix by breaking inter- and intramolecular disulfide bonds and ensures that sulfurous acid is present to suppress wild yeasts and bacteria. The bisulfite is also added in the

[1] The alpha-amylase used as a processing aid in corn protein production is sourced from a nonpathogenic and nontoxigenic strain of *Bacillus licheniformis*, and meets FCC (2016) and JECFA (FAO, 2016) specifications for food enzymes.

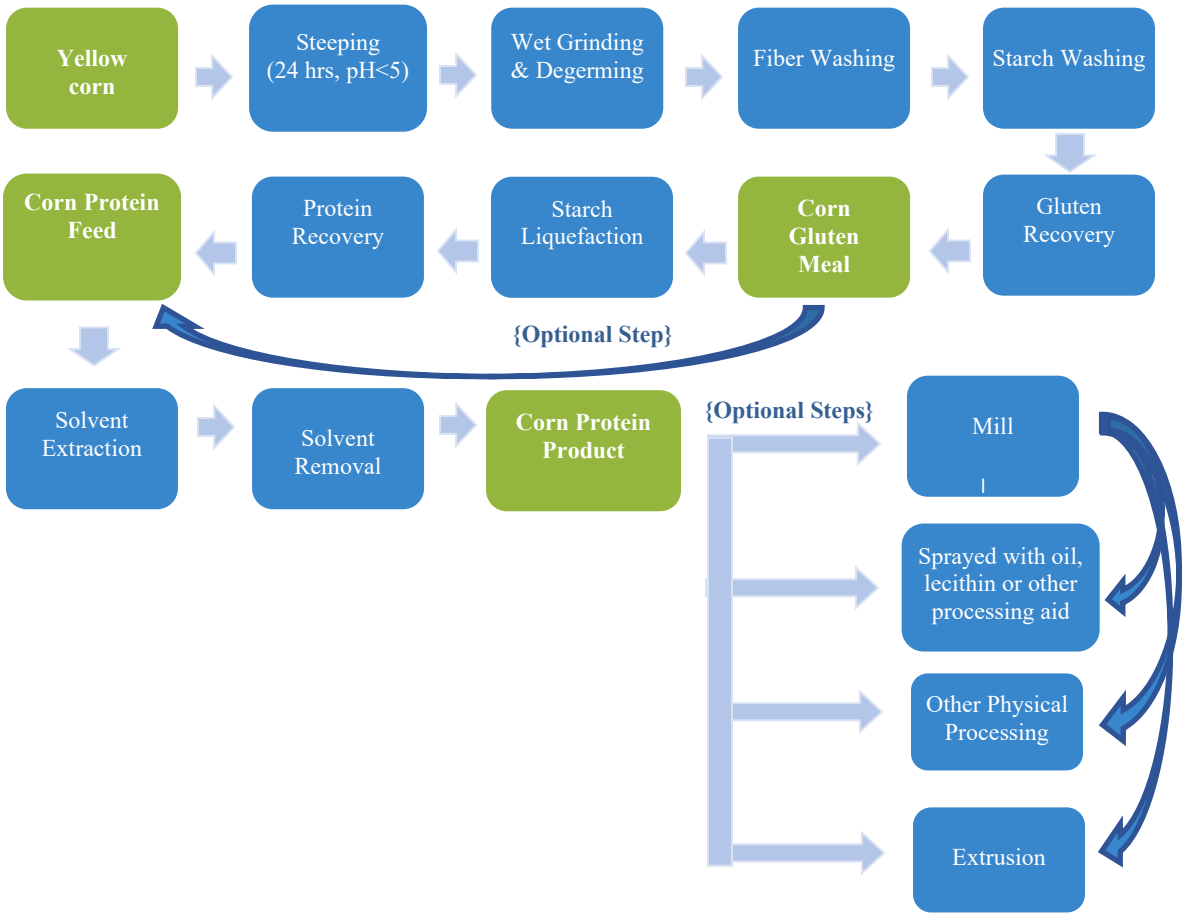
heavy gluten tank to maintain microbial loading. The vast majority of the sulfite does not partition with the heavy gluten wet solids. Most sulfur dioxide is consumed or returned to steeping, while some goes with the separated fiber. Levels of free sulfites are limited in the corn protein ingredient to no more than 100 ppm.

The insoluble protein may be pH adjusted using food grade buffers and then recovered on a filter with a rinse of fresh water and up to 2% oxidizing agent (hydrogen peroxide)[2] to yield the wet destarched corn protein. Alternatively, corn gluten slurry is collected directly on a filter without destarching in a similar process.

Destarched corn protein or corn gluten, as a wet cake containing about 40-55% solids, is then fed into a dryer to raise the dry solids content as needed and subsequently deposited in an immersion extractor. Solids are washed in a counter-current fashion with food grade ethyl alcohol to remove ethyl alcohol-soluble non-protein components, and the ethyl alcohol is removed by evaporation. A safe and suitable oxidizing agent (hydrogen peroxide)[2] is added at no more than 2% to diminish the levels of sulfur dioxide to below 100 ppm. After a final drainage, the solids are dropped into a desolventizer which removes the solvent to levels in Table 1. The resulting powder, which consists of at least 88% solids, may be milled, physically processed or sprayed with food grade oil, lecithin or other safe and suitable processing aid prior to bulk packaging.

[2] An effective Food Contact Notification (FCN 2165) for Cargill's use of hydrogen peroxide as a processing aid in the manufacture of corn protein is on file with US FDA.

Figure 1. Corn Protein Process Flow Diagram



Specifications for Food Grade Corn Protein

The food grade specifications for corn protein are summarized in Table 1. Conformance to specifications and consistency in the manufacturing process of corn protein is demonstrated by the analyses of multiple non-consecutive batches of commercially representative corn protein (Table 2). In addition, appropriate food safety and quality controls are in place to ensure that potential contaminants (*e.g.*, mycotoxins and pesticides) are absent from the product or below levels of safety concern (Table 3) (see additional discussion of potential contaminants and impurities in § 170.250 Part 6, GRAS Narrative).

All analytical methods used to analyze corn protein batches for conformance with the stated parameters in Tables 1, 2 and 3 have been validated for that particular purpose.

Table 1. Food Grade Specifications for Corn Protein

Item	Corn Protein Specifications (acceptable range)	Method
Loss on drying (%)	≤ 12	CRA Method MOIST.04
Protein (% dry basis)	minimum 65	CRA PROTE.03
Ethyl alcohol (g/kg)	< 10	CRA SACCH.03
SO_2 (mg/kg)	< 100	AOAC 990.28
Aerobic Plate Count (cfu/g)	< 10,000	AOAC 990.12
Enterobacteriaceae (cfu/g)	< 10	AOAC 2003.01
Salmonella (cfu/25g)	Absent	AOAC 2004.03
Yeast and Mold (cfu/g)	< 5,000	FDA-BAM 7th Ed.
Heavy Metals Cadmium (ppm) Arsenic (ppm) Lead (ppm)	 < 0.1 < 0.1 < 0.2	 J. AOAC vol 90 (2007) 844-856 J. AOAC vol 90 (2007) 844-856 J. AOAC vol 90 (2007) 844-856

AOAC = Association of Official Analytical Chemists; CRA = Corn Refiners Association

Table 2. Analytical Results for Multiple Non-Consecutive Batches of Corn Protein

Parameter	Specifications	Corn Protein Batch No.									
		CPC1207 20F	**CPC1209 20F**	**CPC1211 20F**	**CPC1215 20F**	**CPC1221 20F**	**CP1203 20F**	**CP1208 20F**	**CP1210 20F**	**CP1214 20F**	**CP1216 20F**
Loss on drying (%)	≤ 12	5.16	5.18	5.09	4.84	5.34	4.42	4.97	4.46	4.54	3.86
Protein (% dry basis)	≥ 65	69.25	68.30	67.85	68.73	69.78	90.65	89.65	90.55	90.05	91.40
Ethyl alcohol (g/kg)	< 10	0.06	0.25	0.70	0.00	0.00	0.28	0.01	0.04	0.00	0.00
Sulfur dioxide (mg/kg)	< 100	26.3	19.7	20.8	23	29.6	51.0	49.4	44.4	52.7	53.8
Aerobic plate count (cfu/g)	< 10,000	180	90	260	< 10	80	3,700	110	80	50	< 10
Enterobacteriaceae (cfu/g)	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Salmonella spp. (cfu/25g)	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Yeast (cfu/g)	< 5000	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mold (cfu/g)	< 5000	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Heavy Metals											
Lead (ppm)	< 0.2	0.026	0.024	0.023	0.037	0.021	0.030	0.026	0.021	0.019	0.021
Cadmium (ppm)	< 1	0.018	0.016	0.02	0.024	0.021	0.031	0.027	0.028	0.028	0.029
Arsenic (ppm)	< 1	0.015	0.011	0.014	0.013	0.015	0.019	0.018	0.016	0.018	0.018

Table 3. Additional Analytical Results for Multiple Non-Consecutive Batches of Corn Protein

Parameter	Limits	Method	Corn Protein Batch No.									
			CPC12 0720F	**CPC12 0920F**	**CPC12 1120F**	**CPC121 520F**	**CPC12 2120F**	**CP1203 20F**	**CP1208 20F**	**CP1210 20F**	**CP1214 20F**	**CP1216 20F**
Fat (%)	-	CRA FATCR.01	0.04	0.04	0	0	0.03	0.02	0.07	0.05	0.04	0.06
Soluble Carbohydrates (%)	-	CRA SACCH.03	0.05	0.15	0.12	0.16	0.14	0.24	0.37	0.21	0.42	0.30
Heavy Metals												
Mercury (ppm)	-	J. AOAC vol 90(2007) 844-856	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Mycotoxins*												
Aflatoxin B1 (ppb)	< 2	Trilogy Internal SOP based on AOAC 994.08, 999.07 or 2000.08	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*
Aflatoxin B2 (ppb)	-		*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*
Aflatoxin G1 (ppb)	-		*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*
Aflatoxin G2 (ppb)			*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*
SUM aflatoxins B1+B2+G1+G2 (ppb)	< 4[a,b]	-	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*
Deoxynivalenol (ppb)	< 800[c]	Trilogy Internal SOP based on JAOAC Vol. 88 #4, 2005	*< 100*	*< 100*	*< 100*	*< 100*	*< 100*	*< 100*	*< 100*	*< 100*	*< 100*	*< 100*
Fumonisin B1 (ppb)	-	Trilogy Internal SOP based on AOAC 2001.04 or 995.15	300	200	200	200	200	*< 100*	100	200	200	100
Fumonisin B2 (ppb)	-		300	300	300	300	300	100	200	200	200	200
Sum of Fum B1+B2 (ppb)	<1,500[d,e,f]	-	600	500	500	500	500	100	300	400	400	300
HT-2 toxin (ppb)	-	Trilogy Internal SOP based on J Ag Food Chem Vol.42 #4, 1994	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*
T-2 (ppb)	-		*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*
SUM HT-2 + T-2 (ppb)	< 40[g]	-	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*
Ochratoxin A (ppb)	< 6[h]	Trilogy Internal SOP based on AOAC 2000.03	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*
Zearalenone (ppb)	< 200[i]	Trilogy Internal SOP based on JAOAC Vol. 88 #6, 2005	*< 12.5*	*< 12.5*	*< 12.5*	*< 12.5*	*< 12.5*	*< 12.5*	*< 12.5*	*< 12.5*	*< 12.5*	*< 12.5*

Parameter	Limits	Method	Corn Protein Batch No.									
			CPC12 0720F	CPC12 0920F	CPC12 1120F	CPC121 520F	CPC12 2120F	CP1203 20F	CP1208 20F	CP1210 20F	CP1214 20F	CP1216 20F
Other substances												
Phytic acid (%)	-	Analytical Biochemistry 77:536-539 (1977)	1.34	1.28	1.31	1.28	1.3	0.78	0.77	0.84	0.76	0.81
Total polyphenols (ppm)	-	Miletic et al (2012) Phenolic content of plum AJCS 9(4) 681-7	*< 491*	*< 491*	*< 491*	*< 491*	*< 491*	*< 491*	*< 491*	*< 491*	*< 491*	*< 491*
Pesticides (ppm)**	-	AOAC 2007.01	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*
Hydrogen peroxide (mg/L)	-	Chin, H.S. andCortes	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*	*< 0.01*

* Acceptance Criteria for mycotoxins in corn protein product are based on available US FDA and/or EU Maximum Contaminant Levels (MCLs), Maximum Levels (MLs), Guidance Levels, or Action Levels for mycotoxins in foods and ingredients as well as consumer exposure thresholds determined for safety assessment. See additional discussion below in § 170.250 Part 6 (GRAS Narrative).

** See Appendix 2 for listing of analytes (n=488) included in the screening analysis. Limit of quantification varies depending on the pesticide.

Italized font indicates analyte was Non-Detected at the noted Limit of Detection

ppm = parts per million (mg/kg); ppb=parts per billion (µg/kg); cfu=colony forming units; AOAC = Association of Official Analytical Chemists; CRA = Corn Refiners Association

[a] FDA Action Level = 20 ppb for foods adulterated with aflatoxin (FDA, 2005).

[b] EU MCLs = 5-10 ppb for maize to be subjected to sorting or other physical treatment before human consumption or use as an ingredient in foodstuffs [5 ppb for Aflatoxin B1; 10 ppb for Total Aflatoxins B1, B2, G1, G2] (EC, 2006).

[c] FDA Advisory Level = 1 ppm on finished wheat products, e.g. flour, bran, and germ, that may potentially be consumed by humans (FDA, 2010).

[d] FDA Guidance Levels = 2-4 ppm for whole, degermed, or partially degermed dry milled corn products for human consumption (FDA, 2001).

[e] Codex MLs = 4 ppm for raw maize grain; 2 ppm for maize flour and maize meal (CAC, 2016).

[f] EU MCLs = 0.2-1.0 ppm for maize flour, maize meal, maize grits, maize germ and refined maize oil (1.0 ppm); maize based foods for direct human consumption (0.4 ppm); processed maize-based foods and baby foods for infants and young children (0.2 ppm) (EC, 2006).

[g] EU Indicative Levels from which onwards/above which investigations should be performed = 200 ppb for unprocessed maize, 100 ppb for maize for direct human consumption, 100 ppb for maize milling products, 75 ppb for breakfast cereals, 15 ppb for cereal-based foods for infants and young children (EC, 2013).

[h] EU MCLs = 0.5-5 ppb for unprocessed cereals (5 ppb); products derived from unprocessed cereals, including processed cereal products and cereals intended for direct human consumption (3 ppb); processed cereal-based foods and baby foods for infants and young children (0.5 ppb) (EC, 2006).

[i] MCLs for maize intended for direct human consumption, maize flour, maize meal, maize grits, maize germ and refined maize oil (200 ppb); maize snacks and maize based breakfast cereals (50 ppb); processed maize-based foods for infants and young children (20 ppb) (EC, 2006).

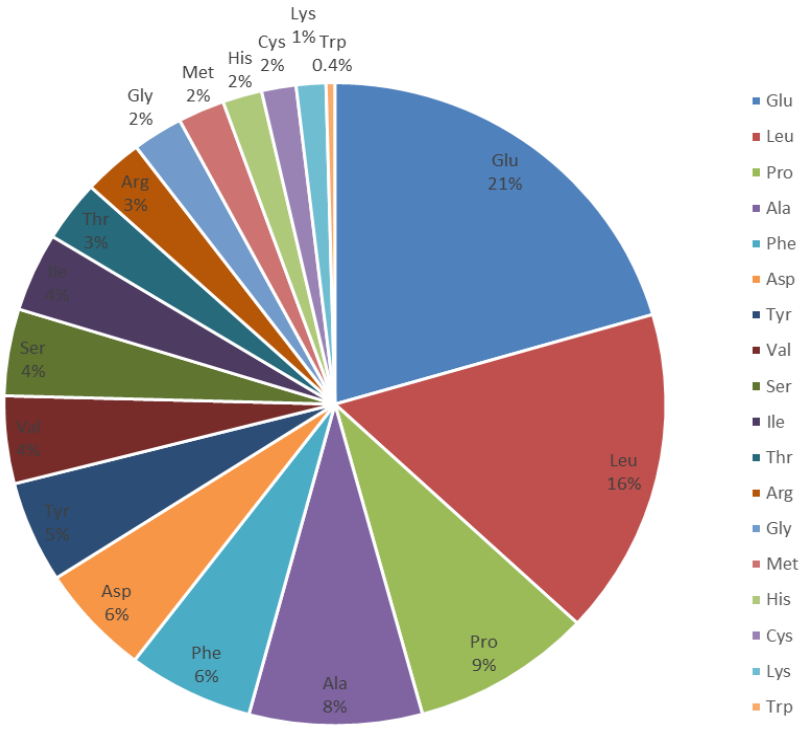
Composition of Food Grade Corn Protein

The typical composition and detailed nutritional analysis data for corn protein are presented below in Table 4. All analytical methods used to analyze the batches for conformance with the stated parameters in Table 4 have been validated for that particular purpose. The amino acid profile for corn protein raw material is presented in Figure 2. Table 5 summarizes the amino acid profile of Cargill's corn protein ingredient. Corn protein contains a high level of leucine, which is a critical amino acid for muscle protein synthesis (Pasiakos *et al*., 2011; Casperson *et al*., 2012; Dillon, 2013), and glutamine, which is essential under conditions of stress (Roth, 2008; Stehle and Kuhn, 2015). As shown in Figure 3, the amino acid profile of corn protein is qualitatively similar to other commonly consumed plant-derived proteins, with lower amounts of lysine, but much higher levels of leucine.

Table 4. Compositional and Nutritional Profiles of Corn Protein

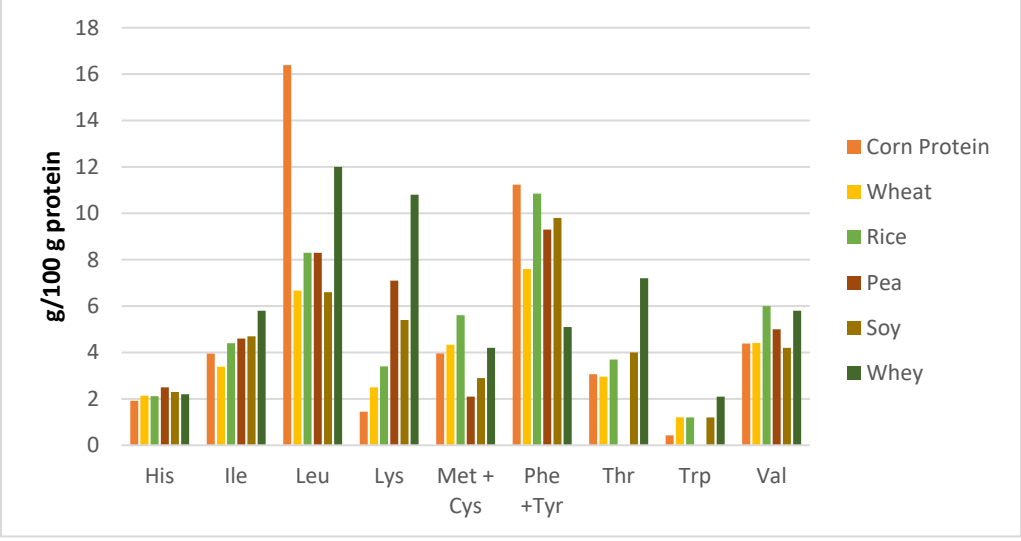
Parameter	Corn Protein Batch No.									
	CPC1207 20F	**CPC1209 20F**	**CPC1211 20F**	**CPC1215 20F**	**CPC1221 20F**	**CP1203 20F**	**CP1208 20F**	**CP1210 20F**	**CP1214 20F**	**CP1216 20F**
Total Fat (as triglycerides) (%)	0.14	0.17	0.14	0.18	0.12	0.09	0.08	0.08	0.06	0.07
Monounsaturated fatty acids (%)	0.05	0.06	0.05	0.06	0.05	0.03	0.02	0.02	0.02	0.02
Polyunsaturated fatty acids (%)	0.06	0.07	0.06	0.07	0.05	0.04	0.04	0.04	0.03	0.03
Trans fatty acids (%)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cholesterol (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Starch (%)	22.1	22.8	22.8	23.6	22.2	1.7	2.1	2.2	2.9	2.6
Dietary Fiber (%)	3	4.5	3.1	4.3	4.1	3.6	4	4.2	5.5	5.2
Insoluble fiber (%)	3	3.3	3.1	3	2.9	3.6	4	4.2	5.5	5.2
Soluble fiber (%)	<0.2	1.2	<0.2	1.3	1.2	<0.2	<0.2	<0.2	<0.2	<0.2
Protein (%)	69.25	68.3	67.85	68.73	69.78	90.65	89.65	90.55	90.05	91.4
Ash (%)	1.521	1.533	1.533	1.515	1.552	1.087	1.098	1.125	1.074	1.133
Calcium (mg/kg)	3,230	3,230	3,140	3,270	3,380	2,990	2,710	2,820	2,720	2,960
Iron (mg/kg)	118	111	112	126	125	64.2	51.5	57.8	52.6	61.8
Potassium (mg/kg)	206	217	213	217	188	230	232	175	219	220
Sodium (mg/kg)	486	701	541	488	432	346	478	234	269	318
Vitamin B_3 (mg/kg)	40.16	38.73	35.11	37.45	34.29	30.18	40.72	37.65	38.82	35.54
Vitamin D (µg/kg)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Anthocyanin (mg/kg)	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	25	<3.8	<3.8	<3.8
Total carotene (µg/kg)	<0.25	<0.25	<0.25	<0.25	<0.25	12.2	12.7	13.4	<0.25	<0.25

Figure 2. Amino Acid Profile for Corn Protein Raw Material



Glutamic Acid (Glu); Leucine (Leu); Proline (Pro); Alanine (Ala); Phenylalanine (Phe); Aspartic Acid (Asp); Tyrosine (Tyr); Valine (Val); Serine (Ser); Isoleucine (Ile); Threonine (Thr); Arginine (Arg); Glycine (Gly); Methionine (Met); Histidine (His); Cysteine (Cys); Lysine (Lys); Tryptophan (Trp)

Figure 3. Comparison of Amino Acid Profile for Corn Protein Raw Material to Common Food Proteins*



* Source for data other than corn protein: GRN 575 (Oat Protein), p. 000019.

Table 5. **Amino Acid Profile of Corn Protein (w/w%)**

Amino Acids	Corn Protein Batch No.[#]					
	CP120320	**CP121020**	**CP121620**	**CPC120720**	**CPC120920**	**CPC122120**
Taurine*	0.00	0.00	0.00	0.07	0.07	0.07
Hydroxyproline	0.01	0.02	0.02	0.00	0.00	0.00
Aspartic Acid	5.10	4.95	5.01	4.03	3.90	3.86
Threonine	2.82	2.66	2.70	2.14	2.09	2.10
Serine	3.97	3.51	3.63	2.73	2.70	2.76
Glutamic Acid	19.07	18.56	18.81	14.71	14.58	14.47
Proline	7.39	7.16	7.29	5.51	5.51	5.35
Lanthionine*	0.00	0.00	0.00	0.00	0.00	0.00
Glycine	2.33	2.26	2.29	1.85	1.81	1.77
Alanine	7.63	7.43	7.53	5.90	5.84	5.79
Cysteine	1.58	1.54	1.55	1.23	1.19	1.18
Valine	4.05	4.04	4.08	3.19	3.14	3.13
Methionine	2.27	2.23	2.25	1.86	1.80	1.74
Isoleucine	3.67	3.72	3.75	2.93	2.90	2.89
Leucine	14.40	14.08	14.26	11.05	10.98	10.99
Tyrosine	4.21	3.97	4.07	2.95	2.94	2.94
Phenylalanine	5.47	5.37	5.48	4.19	4.16	4.17
Hydroxylysine	0.00	0.01	0.01	0.00	0.00	0.00
Ornithine*	0.07	0.07	0.07	0.06	0.05	0.05
Lysine	1.48	1.43	1.46	1.20	1.17	1.17
Histidine	1.71	1.69	1.71	1.35	1.31	1.31
Arginine	2.71	2.61	2.65	2.08	2.05	2.03
Tryptophan	0.34	0.38	0.38	0.34	0.33	0.32
Total	90.28	87.69	89.00	69.37	68.52	68.09
Crude Protein**	91.08	91.48	92.14	70.46	69.56	70.27

w/w% = grams per 100 grams of sample; [#]Results are expressed on an "as is" basis unless otherwise indicated; *Non-proteinogenic amino acids; Crude Protein** = %N x 6.25

Physical or Technical Effect

Corn protein is proposed for use as a source of protein and for functional uses such as thickening, water absorption, fat/oil absorption, gelation and solid fat emulsification in a variety of food categories. These proposed uses are consistent with those previously recognized in GRNs for other plant-based protein sources such as soy (GRN No. 134, p.000010), canola (GRN No. 386, p. 000008; GRN No. 693, p. 7), pea (GRN No. 581, p.16; GRN No. 608, p. 000013; GRN No. 788, Agency Response Letter [FDA, 2018]; GRN No. 803, p. 1-2; GRN No. 804, p. 024; GRN No. 851, p. 1-2), wheat (GRN No. 26; p. 000018), rice (GRN No. 609, pp. 000080-000081), oat (GRN No. 575, p. 000014), potato (GRN No. 447, p. 5), mung bean (GRN No. 684, p.5), and fava bean (GRN 879, p. 15). Corn protein is proposed for use in bakery products, cooked pasta (from fresh or dry), ready-to-eat (RTE) cereals, meat analogs and vegetarian products, processed meats, snack foods, nutrition bars, mixed dishes with sauce, nut butters (excluding full-fat peanut butter), dairy analog products, cream-based sauces, protein and nutritional powders, ready-to-drink (RTD) protein beverages, non-dairy beverages, and batter/breading/coating for frying at levels ranging from 0.08% to 40% in the finished products.

Stability

Cargill's corn protein product is considered stable for 24 months when stored under recommended storage conditions, *i.e.*, in a cool (20-30°C), dry location and in the original sealed package away from odorous material. Similar shelf-lives have been determined for other plant-based proteins previously concluded to be GRAS, e.g. pea protein was stable for 24 months at 25°C (GRN Nos. 608, p. 000013), oat protein was stable for 18 months at room temperature (GRN No. 575, p. 000024), potato protein was stable for 36 months at 40°C (GRN No. 447, pp. 13-15), mung bean protein was stable at room temperature for 6 months (interim results from 24-month stability study) (GRN No. 684, pp. 21-22), canola protein isolate was stable for 16 weeks at 40°C (data supporting shelf-life declaration of 15 months at 25°C) (GRN No. 683, p. 18), and fava bean protein was stable for 24 months at <100°F (GRN 879, p. 13-14). Corn protein also has low water activity and low fat/oil content which limits the possibility of microbial

growth and contamination of the product. There are no known degradation products of safety concern associated with corn protein.

To verify the stability and shelf-life determination for corn protein, samples from five independent batches of corn protein produced in May 2018 or May/June 2019 were reanalyzed in March or July 2021 following storage in closed plastic or Mylar bags in spaces that were cool (20-25°C), dry (relative humidity 20-40%), and away from light. Samples were evaluated for bacterial contamination, microbial contamination, or basic proximate measures. Additional method details are provided in Exhibit II. Results are summarized in Table 6 below and demonstrate that there were no meaningful changes in the parameters assessed. These stability data generated for corn protein samples with >88% protein are considered to be representative of corn protein with a lower protein fraction (*i.e.,* ≥65%) and higher amount of carbohydrates as the low water activity and low fat/oil content limits the possibility of microbial growth and contamination of the product.

Table 6. Stability Data for 5 Batches of Corn Protein

Lot number	Sample Analysis Date	APC (cfu/g)	Ebac (cfu/g)	Salmonella (cfu/25g)	Yeast (cfu/g)	Mold (cfu/g)	LoD (%)	Protein (%, db)	Fat (%, db)
Baseline (Time 0) Analysis									
190522-CP-P-350	May 2019	<10	<10	Absent	*	<10	1.9	88.9	0.2
190612-CP-P-359	June 2019	1,702	<10	Absent	*	*	1.8	88.3	0.3
18052901CP	May 2018	350	<10	Absent	<10	<10	-	-	-
18052903CP	May 2018	3,100	<10	Absent	<10	<10	-	-	-
18052904CP	May 2018	3,900	<10	Absent	<10	<10	-	-	-
Reanalysis									
190522-CP-P-350	March 2021	<10	<10	Absent	<10	<10	2.15	87.2	0.3
190612-CP-P-359	March 2021	<10	<10	Absent	<10	<10	3.29	87.3	0.1
18052901CP	July 2021	130	<10	Absent	<10	<10	-	-	-
18052903CP	July 2021	3,200	<10	Absent	<10	<10	-	-	-
18052904CP	July 2021	960	<10	Absent	<10	<10	-	-	-

Note: APC = Aerobic Plate Count; Ebac = *Enterobacteriaceae*; LoD = Loss on Drying, db = dry basis; cfu = colony forming units
*Yeast and/or mold were not analyzed in these two samples.

§ 170.235 Part 3, Dietary Exposure

Intended Uses of Corn Protein

Corn protein is proposed for use as a source of protein and for functional uses such as thickening, water absorption, fat/oil absorption, solid fat emulsification, and gelation of bakery products, cooked pasta (from fresh or dry), ready-to-eat (RTE) cereals, meat analogs and vegetarian products, snack foods, nutrition bars, mixed dishes with sauce, nut butters (excluding full-fat peanut butter), dairy analog products, cream-based sauces, protein and nutritional powders, ready-to-drink (RTD) protein beverages, non-dairy beverages, batter/breading/coating for frying, and processed meats at the levels presented in Table 7. These food categories and use levels are consistent with those uses previously recognized as GRAS for other plant-derived proteins (e.g., p. 000010 of GRN No. 134 for soy, p. 000035 of GRN No. 386 for canola, p. 000026 of GRN 575 for oat protein, p. 19 of GRN No. 581 for pea protein, pp. 000014-15 of GRN 608 for pea protein concentrate, pp. 000019-20 of GRN No. 26 for wheat protein, pp. 000081-82 GRN No. 609 for rice protein, p. 4 of GRN No. 447 for potato protein, pp. 5-6 of GRN 684 for mung bean protein, pp. 7-8 of GRN 683 for canola protein isolate, the Agency Response Letter to GRN 788 for pea protein concentrate [FDA, 2018], pp. 24-25 of GRN 804 for pea protein, pp. 18-19 of GRN 851 for pea protein, and p. 15 of GRN 879 for fava bean protein). Corn protein is not intended to be used as a color additive.

Suitability data for the use of corn protein in processed meats are provided in Exhibit III.

Table 7. Proposed Food Uses and Levels of Corn Protein

Food Category	Examples	Maximum Use Level (%) Corn Protein, As Consumed
Bakery products	Bakery products including flatbread and pizza crust (all types including gluten-free), gluten-free biscuits, bread, English muffins, and muffins	8
Batter/breading/coating for frying	Batter/breading/coating for frying	2
Cereal, Ready-to-Eat (RTE)	RTE cereal, all types	30
Dairy analog products	All types of dairy analog products including imitation cheese and sour cream, cream substitute, non-dairy topping, margarine and margarine-like spreads, tofu frozen dessert, rice dessert bar, ices and sorbet	10
Meat analogs and vegetarian food products	Meat analogs and vegetarian food products including vegetable protein, vegetarian meat loaf, vegetarian stew, meatless bacon, chicken analogs, breakfast link, fish stick, vegetarian frankfurter, luncheon meat, meatball, vegetarian burger or patty, vegetarian dishes (*i.e.*, pot pie, chili, stew, stroganoff)	40
Mixed dishes with sauce	Prepackaged products with sauce including frozen meals; canned products such as Chef Boyardee products and creamed vegetables; box mixes such as Hamburger Helper, Rice-A-Roni, Easy Mac, and scalloped and mashed potato; pot pie	0.08
Non-dairy beverages	Milk substitutes including soy milk, almond milk, rice milk, coconut milk, and other imitation milks	5
Nut butters (except full-fat peanut butter)	Nut butters including almond, cashew, and peanut (excluding full-fat peanut butter)	10
Nutritional bars	Nutrition and meal replacement bars including Zone Perfect, CLIF bar, South Beach Living bars, Kashi bars, PowerBar, SlimFast bar, Snickers Marathon energy, protein bars	25
Pasta, cooked	Cooked pastas including macaroni, spaghetti noodles, lasagna noodles, ravioli, other pasta noodles	5

Food Category	Examples	Maximum Use Level (%) Corn Protein, As Consumed
Processed meats	Processed meats including sausage, luncheon meats, frankfurter, cured ham, pastrami, pate, pepperoni, salami, chicken nuggets, patties	7
Protein and nutritional powders*	Non-reconstituted powder mix including Carnation Instant Breakfast, Muscle Milk, Slim Fast, protein powder/mix, milkshake mix	5
Protein beverages, Ready-to-Drink (RTD)	RTD nutritional drink or meal replacement beverage high in protein	5
Sauces, cream-based	Cream-based sauces including cheese sauce, cream sauce, milk sauce, lemon-butter sauce, hollandaise sauce, horseradish sauce	1.5
Snack foods	Snack foods including cereal and granola bars, crackers, extruded potato chips, pretzel/snack mix, tortilla chips, corn chips, other veggie/puff chips	15

* Use level corresponds to the prepared/reconstituted beverage
RTE: Ready-to-eat
RTD: Ready-to-drink

Estimated Daily Intake of Corn Protein

Available Data and Methods

The estimated daily intake (EDI) of corn protein from the proposed uses was estimated based on the proposed maximum use levels in Table 7, using Exponent Inc.'s Foods and Residue Evaluation Program (FARE™ version 14.06) software and data from the most recent National Health and Nutrition Examination Survey (NHANES 2015-2018). Individual food codes selected for inclusion in each proposed use category are provided in Appendix 3.

The NHANES 2015-2016 and 2017-2018 (NCHS, 2018, 2020) is a complex multistage probability sample designed to be representative of the civilian US population. The survey collects two days of food intake data, in addition to nutrition, demographic, and health information. Exponent Inc. used the statistically weighted values from the survey in the analyses. The statistical weights compensate for variable probabilities of selection,

adjust for non-response, and provide intake estimates that are representative of the US population and the selected age subgroups.

Exponent Inc. estimated the daily intake on a "*per capita*" and "per user" basis. *Per capita* estimates refer to the consumption based on the entire population of interest, whereas per user estimates refer to those who reported consuming any of the foods within a given food product category on either of the survey days. In this analysis, a "user" is anyone who reported consuming at least one category of food in which it is proposed to use corn protein (corn protein food category) on either of the survey days, *i.e.*, United States Department of Agriculture's (USDA's) "user" definition. Each individual who reported consuming a proposed food on either of the survey days was identified, and that individual's responses for both survey days was used. Because corn protein is likely to be consumed over a lifetime, it is appropriate to average exposures over a longer period than one day. Therefore, Exponent Inc. used each respondent's food consumption averaged over the two days of the NHANES 2015-2016 and 2017-2018 surveys. A 2-day average typically overestimates lifetime average daily intake especially for foods consumed infrequently; however, only two non-consecutive days' worth of food consumption data are available in the most recent NHANES 2015-2016 and 2017-2018 surveys database. It is well known that food consumption data collected over longer periods of time, *e.g.*, 14 days as in Market Research Corporation of America (MRCA) consumer surveys, yield estimates of daily intake that may be significantly lower than 2-day averages (Lambe *et al.*, 2000). Therefore, actual consumer exposures to corn protein are anticipated to be lower than the estimates reported herein.

Estimated Daily Intake

The EDI of corn protein was calculated by multiplying each NHANES respondents' 2-day average food intake by the use levels described in Table 7, above. Each individual's intake of corn protein was divided by his/her body weight to provide the *per capita* and per user intakes on a body weight basis. Mean and 90th percentile daily intakes on a *per capita* and per user basis, as g corn protein/day and g corn protein/kg bw/day, were estimated for the proposed uses of corn protein for the US population (Table 8).

Table 8. Two-day Average Estimated Daily Intake of Corn Protein from Proposed Uses at Maximum Use Levels (Total US Population)

Food Category	N[1]	% Users	*Per Capita* Intake of Corn Protein (g/day)		Per User Intake of Corn Protein (g/day)		*Per Capita* Intake of Corn Protein (g/kg bw/day)		Per User Intake of Corn Protein (g/kg bw/day)	
			Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile
Bakery products	4,791	37	1.9	6.2	5.1	9.9	0.03	0.10	0.09	0.18
Batter/breading/coating for frying	3,195	22	0.1	0.3	0.3	0.7	<0.005	<0.005	0.01	0.01
Cereal, RTE	4,557	33	3.6	12.5	10.9	20.6	0.07	0.23	0.20	0.41
Dairy analog products	8,067	61	0.6	1.5	1.0	2.6	0.01	0.02	0.01	0.03
Meat analogs and vegetarian food products	228	2	0.4	0	15.8	41.6	0.01	0	0.22	0.81
Mixed dishes with sauce	1,920	14	<0.05	0.1	0.1	0.2	<0.005	<0.005	<0.005	<0.005
Non-dairy beverages	710	6	0.5	0	7.9	15.0	0.01	0	0.15	0.26
Nut butters (except full-fat peanut butter)*	121	1	<0.05	0	1.4	3.2	<0.005	0	0.02	0.05
Nutritional bars	291	4	0.4	0	9.5	18.0	0.01	0	0.14	0.28
Pasta, cooked	4,290	32	1.4	4.8	4.3	8.8	0.02	0.08	0.07	0.16
Processed meats	9,211	70	2.6	7.0	3.8	8.1	0.04	0.12	0.06	0.15
Protein and nutritional powders	402	4	0.5	0	11.9	26.4	0.01	0	0.16	0.33
Protein beverages, RTD*	165	2	0.2	0	13.4	22.0	<0.005	0	0.20	0.35

Food Category	N[1]	% Users	*Per Capita* Intake of Corn Protein (g/day)		Per User Intake of Corn Protein (g/day)		*Per Capita* Intake of Corn Protein (g/kg bw/day)		Per User Intake of Corn Protein (g/kg bw/day)	
			Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile
Sauces, cream-based	1,040	9	0.1	0	0.7	1.5	<0.005	0	0.01	0.03
Snack foods	6,825	54	2.2	6.3	4.1	8.5	0.04	0.11	0.08	0.17
Total (all proposed foods)	**13,093**	**98**	**14.5**	**28.8**	**14.7**	**29.0**	**0.25**	**0.56**	**0.25**	**0.57**

[1] Unweighted number of users; %user, per user estimates for NHANES derived using the statistical weights provided by the NCHS.

* Sample size inadequate to provide reliable estimates at the per user 90th percentile of intake.

Approximately 98% of the total US population surveyed was identified as potential consumers of corn protein from its proposed food uses (13,093 users identified). On a *per capita* basis, mean and 90th percentile intakes of corn protein from all proposed food uses by the total US population were estimated at 0.25 and 0.56 g/kg bw/day (equivalent to 14.5 and 28.8 g/day), respectively. On a per user basis, the total EDI for corn protein from all proposed uses assuming the maximum proposed use level for each food category is 0.25 g/kg bw/day at the mean and 0.57 g/kg bw/day at the 90th percentile (equivalent to 14.7 g/day and 29.0 g/day, respectively). A further breakout of estimated corn protein intakes by age subgroups is shown below in Table 9.

Table 9. Two-day Average Estimated Daily Intake of Corn Protein from All Proposed Uses (Maximum Use Levels) by Population Subgroup (Infants, Children, Teenagers, and Adults)

Population	Users[1]	% Users	*Per Capita* Intake of Corn Protein (g/day)		Per User Intake of Corn Protein (g/day)		*Per Capita* Intake of Corn Protein (g/kg bw/day)		Per User Intake of Corn Protein (g/kg bw/day)	
			Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile
Total US Population	**13,093**	**98**	**14.5**	**28.8**	**14.7**	**29.0**	**0.25**	**0.56**	**0.25**	**0.57**
Infants 0-11 months	205[2]	33	1.0	3.4	3.0	7.6	0.11	0.38	0.33	0.73
Children 1-6 years	1,566	100	12.2	23.0	12.3	23.0	0.73	1.31	0.73	1.31
Children 7-12 years	1,504	100	16.4	28.9	16.4	28.9	0.47	0.86	0.47	0.86
Adolescents (13-19 years)	1,613	99	16.4	32.4	16.5	32.5	0.26	0.51	0.26	0.51
Adults ≥ 20 years	8,205	99	14.5	29.2	14.6	29.3	0.18	0.38	0.18	0.38

[1] Unweighted number of users; % user, per user estimates for NHANES derived using the statistical weights provided by the NCHS.

[2] Note: Sample size is just slightly above the threshold (*i.e.,* 202) for flagging of statistically unreliable 90th percentile consumption values. See additional details in Appendix 3 (Exponent, 2022).

On a body weight basis, the highest per user mean and 90th percentile intake estimates for corn protein are among children 1-6 years at 0.73 g/kg bw/day and 1.31 g/kg bw/day, respectively. The next highest per user intake levels on a body weight basis are among children 7-12 years with mean and 90th percentile estimates of 0.47 g/kg bw/day and 0.86 g/kg bw/day, respectively, and infants 0-11 months with mean and 90th percentile estimates of 0.33 g/kg bw/day and 0.73 g/kg bw/day, respectively. However, it should be noted that the sample size of 205 for infants is just slightly above the threshold (*i.e.,* 202) for flagging of statistically unreliable 90th percentile consumption values (see additional details in Appendix 3 [Exponent, 2022]). The range of intake estimates among the remaining population subgroups (adults and adolescents) are similar to, or lower than the total population EDI, *e.g.,* 0.18 to 0.26 g/kg bw/day (mean) and 0.38 to 0.51 g/kg bw/day (90th percentile), respectively.

Discussion

As noted in the EDI report (Exponent, 2022; Appendix 3), the above estimates based on 2-day average intakes do not necessarily represent long-term intakes because (1) they may not capture infrequent consumers of foods proposed to contain corn protein, (2) they assume that subjects who consumed corn protein-containing products on both survey days actually consume these corn protein products every day of the year, and (3) they do not adjust for potential day-to-day variation in corn protein intake. A 2-day average typically overestimates long-term (chronic) daily intake and does not necessarily represent long-term intakes.

As discussed further below (§ 170.250 Part 6, GRAS Narrative), there are no safety concerns associated with these worst-case, conservative intake estimates for corn protein from proposed food categories and use levels.

Corn protein is intended to be an alternative source of protein for current uses in food and is not expected to result in an increase in the overall consumption of protein. The minimum daily protein intake values recommended by the FDA (Daily Reference Values, DRV) and Institute of Medicine (IOM) (Recommended Dietary Allowances, RDA) are

50 g/day or 56/46 g/day (males/females) for adults, respectively (FDA, 2016; IOM, 2002/2005; USDA, 2020a), while the 90th percentile intake of protein from food and beverages ranges from 68.3-139.1 g/day according to 2007-2010 NHANES dietary survey data (USDA, 2015). Therefore, even at the most conservative, upper range of estimated intake for the total US population (*i.e.,* 29 g/day at the 90th percentile per user intake estimate [Tables 8 and 9]), the proposed uses of corn protein would contribute only a small portion of the background protein consumption in the US, or the dietary protein recommendations of the FDA and IOM.

Therefore, as an alternative/replacement source of protein for current uses in food, the proposed uses of the corn protein will not result in an increase in the overall consumption of protein, but simply will provide an alternative source of well-characterized protein from corn for use in food. Therefore, cumulative intake analysis is not considered necessary.

§ 170.240 Part 4, Self-limiting Levels of Use

The use of corn protein as a food ingredient is limited by the level that can technically be added to a given food without compromising its quality and consumer acceptability.

§ 170.245 Part 5, Experience Based on Common Use in Food

General recognition of safety for the notified substance, corn protein, is established through scientific procedures; therefore, information regarding experience based on common use of the notified substance in food prior 1958 is not applicable. The historical consumption of corn and protein is discussed below in § 170.250 Part 6 (GRAS Narrative) as supporting information.

§ 170.250 Part 6, GRAS Narrative

Introduction

This section of the GRAS Notice fulfills the requirements of 21 CFR §170.250 by providing a narrative in regard to the generally available and accepted scientific data, information, methods, or principles that are relied on to establish safety.

Historical Consumption of Corn

Corn [also referred to as "maize" (*Zea mays*) and belonging to the grass family (*Gramineae*)], is one of the most important cereal grains in the world, providing nutrients for humans and animals and serving as a basic raw material for the production of starch, oil and protein, alcoholic beverages, and food sweeteners (FAO, 1992). As such, corn and its proteins have been part of the normal human diet for centuries, with the earliest recorded presence of the crop in Mexico reported as early as 8700 BP[3] (Piperno, 2011).

Modern food uses of corn (maize) include use of the whole grain, or processing of the maize by wet or dry milling techniques to obtain a variety of intermediary products (*e.g.*, maize grits/meal/flour *via* dry milling, maize starch and maize gluten *via* wet milling) (FAO, 1992). As described above, the corn protein that is the subject of this GRAS conclusion is obtained *via* wet milling of maize to yield corn gluten meal, from which protein is recovered. Protein content in the various parts of the corn (maize) kernel range from 3.7% in the pericarp to approximately 8% in the endosperm, and 18.4% in the germ (FAO, 1992).

[3] BP = "Before Present" (*i.e.,* before 1950 as the commencement of radiocarbon dating)

Nutritional and Safety Considerations for Protein Intake

The IOM (2002/2005) minimum RDA for protein is 0.8 g/kg bw/day for adults, which corresponds to RDAs of 56 g/day and 46 g/day for adult men and women (>19 years of age), respectively. IOM (2002/2005) also recommends that adults should get 10- 35% of their calories from protein. The FDA has established a protein DRV of 50 g/day for adults and children four years of age or older (FDA, 2016). However, neither the RDA nor DRV represent an upper limit of consumption. The World Health Organization (WHO) recommends body weight-based protein consumption rates for both genders, noting that individuals involved in bodybuilding ingest much higher levels of protein (WHO, 2007). For example, the safe protein consumption level for a 40-kg adult is 33 g/day, and that for an 80-kg adult is 66 g/day (equivalent to 0.83 g/kg per day for proteins with a protein digestibility-corrected amino acid score or PDCAAS value of 1.0) (WHO, 2007).

Safe protein consumption levels for children aged 1-6 years range from 11.6-17.1 g/day for boys (10.2-19.7 kg body weight) and 10.8-16.2 g/day for girls (9.5-18.6 kg body weight) based on maintenance and growth requirements for each age group (WHO, 2007). For children aged 7-12 years, safe protein consumption levels range from 25.9-40.5 g/day for boys (28.1-45.0 kg body weight) and 26.2-41.0 g/day for girls (28.5-46.1 kg body weight) (WHO, 2007). Estimated consumer intake levels for corn protein (§ 170.235 Part 3, Dietary Exposure) in these subpopulations (*i.e.,* conservative 90th percentile estimates of 23.0 g/day for children 1-6 years and 28.9 g/day for children 7-12 years) are similar to, or slightly above the range of safe protein consumption levels identified by WHO. However, while WHO stated that no safe upper limit had been identified, they also indicated that it is unlikely that intakes of twice the safe level are associated with any risk. Caution was advised to those contemplating the very high intakes of 3 to 4 times the safe level, since such intakes approach the tolerable upper limit and cannot be assumed to be risk-free (WHO, 2007). According to the USDA 2020-2025 Dietary Guidelines for Americans, intake of "protein foods" (including lean meats, poultry, and eggs; seafood; beans, peas, and lentils; and nuts, seeds, and soy products) are close to the target amounts, but many Americans do not meet recommendations for

specific protein subgroups, such as the seafood subgroup or the beans, peas, and lentils subgroup (USDA, 2020a). Based on NHANES 2007-2010 survey data, the USDA previously reported that the 90th percentile intake of protein from food and beverages ranged from 68.3-139.1 g/day for males and females ≥1 year (USDA, 2015). A more recent NHANES survey 2013-2016 indicates that 90th percentile intake of "total protein foods" was approximately 280 g/day (converted from 9.9 oz equivalents) for males and females ≥1 year (USDA, 2020b).

Safety Evaluation for the Non-Protein Fraction of Corn Protein

The non-protein fraction of corn protein is composed of carbohydrates (primarily starch and dietary fiber), fat, ash, vitamins, and minerals, all of which are common constituents of the human diet (see Table 4 above). In addition, per the specifications, there could be up to 12% loss on drying yielding even lower amounts of these constituents. Therefore, Cargill concludes that the non-protein constituents comprising up to 35% of the corn protein ingredient do not present a safety concern.

Regulatory and Safety Status of Similar Materials

Zein and Corn Gluten

Zein (CAS Reg. No. 9010–66–6) is a corn gluten extract with GRAS affirmed status as a direct food additive used as a "surface-finishing agent" at levels not to exceed current good manufacturing practice or cGMP (21CFR§184.1984). Corn gluten (CAS Reg. No. 66071-96-3), also known as corn gluten meal (CGM), is the principal protein component of corn endosperm, consisting mainly of zein and glutelin, and was also affirmed as GRAS for use as a nutrient supplement and a texturizer in food at levels not to exceed current good manufacturing practice (21CFR§184.1321). Therefore, the GRAS status of CGM for use in human foods supports its safety as the raw material used to produce corn protein.

CGM is more commonly utilized as an animal feed ingredient, with the Association of American Feed Control Officials (AAFCO) definition for CGM (international feed

number 48.15) originally adopted in 1936 and amended in 1960 (AAFCO Publication 2020). As such, the safety and suitability of CGM as animal feed has been extensively studied in several mammalian species. These studies (*e.g.,* De Gracia *et al.,* 1989; Holter *et al.,* 1992; Cozzi and Polan, 1994) demonstrated that dietary CGM administration did not cause adverse toxicological effects or changes in safety-related endpoints (*e.g.,* body weight gain). In its review of animal feeding studies, the FDA Select Committee of GRAS Substances (SCOGS) (FDA, 1981) noted that protein products such as corn gluten may not support adequate growth when used as the sole source of dietary protein (FDA, 1981). However, owing to the small contribution of these products to the *per capita* intake of protein from all sources, the poor performance of some animals studied was considered to have little relevance to the evaluation of the proteins as food ingredients in human diets (FDA, 1981). As discussed above in Part 3, the proposed uses of corn protein would contribute only a small portion of the background protein consumption in the US (*i.e.,* the conservative per user 90th percentile intake estimate for corn protein is 29 g/day compared to the 90th percentile intake of protein from food and beverages ranging from 68.3 to 139.1 g/day (USDA, 2015), with dietary protein derived from a range of sources (*e.g.,* meat and meat products, grains and grain-based products, and milk and dairy products).

In consideration of the information presented above, Cargill concludes that the available data and information corroborate the FDA GRAS affirmation for CGM as a human food ingredient and substantiate its safety and suitability as the raw material used to produce Cargill's corn protein.

Plant Protein Isolates and Concentrates

To date, FDA has reviewed extensive information and data as part of GRAS notifications for other plant protein isolates and concentrates and subsequently issued "no questions letters" (*e.g.,* GRN No. 26 (isolated wheat protein); GRN No. 134 (soy protein); GRN No. 609 (rice protein); GRN 386 (canola protein isolate and hydrolyzed canola protein isolate); GRN No. 447 (potato protein isolates); GRN No. 575 (oat protein), GRN Nos. 581, 803, 804, 851 (pea protein), GRN Nos. 608 and 788 (pea protein concentrate), GRN

No. 683 (canola protein isolate), GRN 684 (mung bean protein isolate), and GRN 879 (fava bean protein isolate). Cargill considers the data and information contained within these GRAS Notifications (including that which is published and that which is unpublished but corroborative) to be supportive of the current GRAS conclusion for corn protein. Specifically, these Notifications present data and information confirming that there is a history of safe consumption of the source plants and their proteins, there are no toxicologically or clinically relevant effects observed in studies where these plant proteins were fed to animals or humans, and estimated consumer intake levels for these plant proteins are consistent with established RDAs (IOM 2002/2005) or safe consumption values (WHO, 2007) for protein [pp. 000008-000009 of GRN No. 26 (isolated wheat protein); pp. 000015-000019 of GRN No. 134 (soy protein); pp. 000083-000092 of GRN No. 609 (rice protein); pp. 000028-000036 of GRN 386 (canola protein isolate and hydrolyzed canola protein isolate); pp. 17-20, 23-34 of GRN No. 447 (potato protein isolates); pp. 000029-000042 of GRN No. 575 (oat protein); pp. 23-31 of GRN No. 581 (pea protein); pp. 000017-18, 000021-24, 000025 of GRN No. 608 (pea protein concentrate); pp. 39-59 of GRN No. 683 (canola protein isolate); pp. 27-38 of GRN 684 (mung bean protein isolate); pp. 22-26 of GRN 879 (fava bean protein isolate); and the Agency Response Letter to GRN 788 for pea protein concentrate (FDA, 2018)].

Overview of Safety Database Supporting GRAS Conclusion for Corn Protein

Introduction and Literature Search Strategy

With the long history of safe human consumption of corn and its proteins, traditional toxicology and clinical safety studies on corn protein are not available in the published literature, but there are no known reports of adverse health effects related to corn or its proteins. A comprehensive literature search was conducted using National Library of Medicine (NLM) TOXNET sources (*e.g.,* PubMed, TOXLINE) as well as subscription-based literature database access (*i.e.*, ToxPlanet, Timberlake Ventures, Inc.) and included the terms “corn protein”, “maize protein”, “corn AND protein”, “maize AND protein” and “zein”. Results were screened to identify publications that were deemed relevant to the safety evaluation and GRAS assessment of corn protein for the proposed uses. The

initial search was performed in October 2015 and updated searches were performed in April 2019 and February 2022 for all relevant publications to date.

Published data and information relevant to the safety evaluation and GRAS assessment of corn protein for the proposed uses are summarized below. The literature search confirmed that there are no published data or information that would contradict a GRAS conclusion for proposed uses of corn protein. Corroborative studies demonstrating the lack of genetic toxicity potential for corn protein are also discussed below.

Non-Clinical Safety

A major corn protein, zein hydrolysate (ZeinH), has been studied for its potential to stimulate glucagon-like peptide-1 (GLP-1) secretion in experimental animals *via* ileal administration and oral administration, as a possible method for attenuating postprandial hyperglycemia in humans. Although safety endpoints were not monitored in these studies, no adverse effects were reported (Hira *et al*., 2009; Higuchi *et al*., 2013).

Absorption, Distribution, Metabolism, and Elimination (ADME)

The human metabolic pathway for protein and amino acids is well understood and would be similar for corn protein supporting its safety. Briefly, dietary proteins undergo acid-catalyzed or enzymatic hydrolysis to yield individual amino acids which are further broken down by deamination, yielding amino acid carbon skeletons (α-keto acids) that can be converted to common metabolic intermediates (Voet and Voet, 1995). Amino groups resulting from deamination are converted either to ammonia or to the amino group of aspartate which may be excreted in the urine unchanged or as urea (Voet and Voet, 1995).

He *et al.* (2018) report that hydrolyzed corn gluten meal may be more bioavailable than crude corn gluten meal, with associated improvements in growth and immunological parameters measured in rats. The findings of this study comparing hydrolyzed corn gluten meal and corn gluten meal, and lacking a concurrent negative

control group, are considered to have limited relevance to the safety evaluation and GRAS assessment of corn protein as a human food ingredient.

Digestibility

Protein digestibility-corrected amino acid score (PDCAAS) values for maize have been reported to range from 0.42 (Jin *et al.,* 2014) to 0.60 (Naves *et al.,* 2011). Mean protein digestibility values of maize, whole corn, and corn cereal in humans have been reported to be 85%, 87%, and 70%, respectively (FAO, 1991). It is expected that corn protein digestibility values in humans will be in a similar range; therefore, published studies on *in vivo* digestibility and nitrogen absorption/protein quality of corn/maize were not considered pivotal to the safety evaluation of Cargill's corn protein ingredient. This conclusion is supported by data demonstrating that the mean digestible indispensable amino acid scores (DIAAS) for corn (84-91% determined by three different methods) were similar to DIAAS values for corn gluten meal (84-93%), the raw material used to produce corn protein (Kim *et al.,* 2012).

As discussed above in Part 2, the amino acid profile of corn protein is qualitatively similar to other commonly consumed plant-derived proteins, with lower amounts of lysine but much higher levels of leucine and glutamine. Studies in children fed maize diets have reported lower nitrogen balance results compared to those fed milk and other vegetable proteins (FAO, 1992; Ch. 8), an effect which is attributed to the lower lysine content of maize protein (Mariscal-Landin *et al.,* 2014). Improvements to nitrogen absorption and retention in humans receiving maize diets have been observed following dietary supplementation with tryptophan and lysine, as well as adjusting the proportion of maize in the total diet (FAO, 1992; Ch. 8).

Tables 10 and 11 below summarize the essential amino acid scores of a number of plant- and animal-based protein sources based on recommendations for adults and young children, respectively (Berrazaga *et al.,* 2019). Essential amino acid scores for maize protein are generally similar to those of soy protein and pea protein, with the exception of

much lower lysine scores, but much higher methionine + cysteine scores. Maize protein also fares better than wheat protein in all essential amino acid scores.

Although the digestibility, protein value, and nitrogen absorption of maize by animals and humans is reportedly lower compared to some other protein sources (FAO, 1992; Sauer *et al.,* 2015; Asche *et al.,* 1989), the proposed uses of corn protein would contribute only a small portion of the background protein consumption in the US (*i.e.,* the conservative per user 90th percentile intake estimate for corn protein is 29 g/day compared to the 90th percentile intake of protein from food and beverages ranging from 68.3 to 139.1 g/day (USDA, 2015)), with the majority of dietary protein continuing to be derived from a range of other sources (*e.g.,* meat and meat products, grains and grain-based products, and milk and dairy products). Therefore, the digestibility, protein value, and nitrogen absorption specifically associated with corn protein do not present a safety or nutritional concern with regard to the proposed uses.

Based on the availability of *in vivo* digestibility data on corn/maize and corn gluten meal in animals and humans, *in vitro* digestibility data (*e.g.*, Nunes *et al.*, 2004) were not analyzed as part of the current assessment.

Table 10. Essential Amino Acid Scores of Animal- and Plant-Based Protein Sources in Adults[1]

	Plant-Based Proteins						Animal-Based Proteins			
	Wheat	**Maize**	**Soybean**	**Pea**	**Faba Bean**	**Lentil**	**Whey**	**Casein**	**Milk**	**Beef**
	Essential Amino Acid Scores (%)[2]									
Histidine	140	187	173	167	231	176	127	180	180	240
Isoleucine	137	127	157	153	112	154	213	167	170	167
Leucine	115	219	136	125	121	132	168	151	161	144
Lysine	31	62	147	182	158	160	204	169	153	207
Methionine + Cysteine	120	127	91	73	79	91	130	125	134	157
Phenylalanine + Tyrosine	290	300	277	267	247	263	227	343	313	280
Threonine	109	161	174	191	156	165	291	187	174	209
Valine	108	128	126	131	95	135	162	162	159	133

[1] Excerpted from Berrazaga *et al.* (2019)

[2] Scores are calculated based on recommended amino acid scoring pattern for adults (WHO/FAO/UNU, 2007)

Table 11. Essential Amino Acid Scores of Animal- and Plant-Based Protein Sources in Young Children[1]

	Plant-Based Proteins						Animal-Based Proteins			
	Wheat	**Maize**	**Soybean**	**Pea**	**Faba Bean**	**Lentil**	**Whey**	**Casein**	**Milk**	**Beef**
	Essential Amino Acid Scores (%)[2]									
Histidine	112	150	138	134	185	141	102	144	144	192
Isoleucine	128	119	147	143	105	144	200	157	159	157
Leucine	106	202	126	116	112	122	155	140	149	133
Lysine	26	52	124	153	133	135	172	142	129	174
Methionine + Cysteine	102	108	78	62	67	78	111	106	114	134
Phenylalanine + Tyrosine	229	237	218	211	195	207	179	270	247	221
Threonine	88	130	140	154	126	133	235	151	140	169
Valine	100	119	117	122	88	126	151	151	148	124

[1] Adapted from Berrazaga *et al.* (2019)

[2] Scores are calculated based on recommended amino acid scoring pattern for children 6 months to 3 years of age (FAO, 1991)

Genetic Toxicity

As a nutritive component of commonly consumed corn, corn protein is not expected to be genotoxic or mutagenic. Corroborative studies were performed to confirm that corn protein lacks genetic toxicity potential, including the *in vitro* bacterial reverse mutation (Ames) assay (OECD Guideline 471) and the *in vitro* mammalian cell micronucleus test (OECD Guideline 487). Two corn protein materials were tested in these assays, one containing ~68% protein (Anthem Biosciences 2021a,b) and the other containing ~91% protein (Anthem Biosciences 2021c,d). Complete study reports are on file with Cargill.

In the *in vitro* mammalian cell micronucleus tests (Anthem Biosciences 2021a,c), corn protein test concentrations of 25, 50, and 100 µg/mL in DMSO were evaluated after short and long-term treatment in the absence (~4 and ~24 h treatment) and presence (~4 h treatment) of metabolic activation via Aroclor 1254 induced male Sprague Dawley rat liver S9). Corn protein was non-cytotoxic at any of the tested concentrations. There were no significant increases in % micronuclei of the test article treated cells compared to controls. Significantly increased % micronuclei were observed in treated positive controls meeting the criteria for a valid test.

In the Ames test (Anthem Biosciences 2021b,d), corn protein test concentrations of 10, 31.65, 100, 316.50, and 1000 µg/plate (vehicle: DMSO) were evaluated in *Salmonella typhimurium* strains TA98, TA100, TA102, TA1535, and TA1537 in the plate incorporation and preincubation methods with and without S9 metabolic activation. There was no precipitation and no cytotoxicity at any of the tested concentrations. There were no statistically significant increases in the number of His+ revertants observed in any strain tested under any of the treatment conditions. The positive controls showed appropriate mutagenic responses meeting the criteria for a valid test.

Based on the results of these assays, corn protein was concluded to be non-mutagenic, non-clastogenic, and non-aneugenic in the *in vitro* test systems evaluated under the conditions of

the assays employed (Anthem Biosciences 2021a,b,c.d). Therefore, these studies provide corroborative evidence that corn protein lacks genetic toxicity potential.

Bioactive Constituents

Research has been performed on the potential bioactivity of specific corn protein-derived peptides for use in antioxidant, antihypertensive, hepatoprotective, alcohol metabolism-facilitating, anti-inflammatory, and anticancer therapies (Zhu *et al.,* 2019). However, investigative studies on these isolated and purified peptides, produced mainly *via* enzymatic hydrolysis of corn gluten meal, are not considered relevant to the corn protein ingredient that is subject of this GRAS conclusion.

Evaluation of Potential Anti-nutrients

The published literature reports that the presence of antinutritional factors associated with corn, including phytic acid, tannins and polyphenols, may be reduced by domestic processing such as cooking and fermenting (Awada *et al.,* 2005; Gemede, 2020; Pena Betancourt *et al.,* 2013; Roger *et al.,* 2015). Phytates, trypsin inhibitors and α-amylase inhibitors have also been detected as antinutrient factors in corn which have been shown to be reduced during traditional fermentation which includes soaking raw yellow corn seeds in distilled water for four days followed by subsequent milling, washing, sieving, decanting and drying (Ejigui *et al.,* 2005; Kalu *et al.,* 2019). Fermentation also decreased the concentration of phytate and polyphenol levels in 'high phytate' and 'low phytate' corn genotypes (Sokrab *et al.,* 2012). It was suggested that the loss of phytate during fermentation could be due to phytase activity naturally present in corn.

Phytic acid levels in analyzed batches of corn protein (Table 3) ranged from 0.76 to 1.34%. These values are within the range of phytic acid levels reported for other protein isolates, including canola protein, which ranged from <0.14% to 3.34% (GRN 683). Further, GRN 683 includes the following discussion of phytic acid consumption in the human diet which is considered relevant to the safety evaluation of corn protein:

"Phytic acid is ingested with many plant-derived foods. Soy protein isolate is reported to contain 1.6-2.0 % phytic acid (Honig, Wolf & Rackis 1984). Lower values (0.49-0.84 %) were reported more recently (Hurrell et al. 1992). In tofu, 1.46-2.90 % phytic acid was found (on a dry matter basis). Phytic acid/phytate is present in cereals such as maize 0.72-2.22 %, wheat 0.39-1.35 %, rice 0.06-1.08%, barley 0.38-1.16%, sorghum 0.57-3.35 %, oat 0.42-1.16%, rye 0.54-1.46 %, millet 0.18-1.67 %, triticale 0.50-1.89 % and wild rice 2.20% (on dry matter basis). The level of phytic acid/phytate has also been identified in several legumes such as kidney beans 0.61-2.3 %, broad beans 0.51-1.77 %, peas 0.22-1.22 % dry cowpeas 0.37-2.90 %, chickpeas 0.28-1.60 % and lentils 0.27-1.51 % (on dry matter basis). Several type of nuts contain Phytic acid/phytate ranging from 0.17-9.42 % (on dry matter basis) (Schlemmer, Frølich, Prieto & Grasesn 2009). [GRN 683, pp. 29-30]"

In consideration of the above information, Cargill concludes that the phytate levels in corn protein are consistent with those safely consumed as part of the normal human diet. Additional antinutritional factors associated with corn are not expected to become concentrated in the corn protein ingredient and are likely reduced during the manufacturing of corn protein and/or during subsequent processing of food products containing corn protein as an ingredient.

Allergenicity

Food allergy to maize, although relatively rare, has been reported in the literature (Scibilia *et al.*, 2008; Pastorello *et al.*, 2009; Goodman *et al.*, 2013; Krishnan and Chen, 2013). The primary maize allergen responsible for food-induced allergic reactions is a nonspecific lipid transfer protein (LTP), which is considered a pathogenesis-related protein that may be induced by stress (Goodman *et al*., 2013; Pastorello *et al.*, 2000; Pastorello *et al*., 2009). Maize LTP is reported to be produced and stored in the pericarp of the grain as well as throughout the embryo (germ) of the mature grain (Goodman *et al.,* 2013). Because the raw material used to produce corn protein is de-germed corn gluten meal (*i.e.,* derived from the corn endosperm, which is depleted of hull and

endosperm fiber components, with the protein comprising mainly of zein and glutelin), the finished corn protein ingredient lacks the lipid-rich fraction and is not expected to have concentrated levels of LTP. Pastorello *et al.* (2003) report that thermostable LTP is extractable in the water-soluble fraction as well as in total protein and glutelin fractions, but LTP was not identified in the total zein fraction by IgE immunoblotting.

In vitro evidence suggests that immune response to maize prolamins (zeins) identified as alpha-zeins may occur in some patients with celiac disease (Cabrera-Chavez *et al.,* 2012); however, the clinical significance of this finding has not been determined. Similarly, immunoblot analysis of plasma from young pigs fed a blended maize/soybean meal diet for nine days after weaning revealed an elevated immune response against the 27 kDA maize protein (γ-zein) (Krishnan *et al.,* 2010), but this isolated report is considered to have limited relevance to the safety evaluation of Cargill's corn protein ingredient. Further, there were no reports identified in the literature regarding allergenicity of corn gluten meal (corn protein raw material) when used as an animal feed ingredient.

Based on the information discussed above, Cargill does not anticipate potential corn allergens to become purified or concentrated in the corn protein ingredient. The potential for corn protein to elicit an allergic response is expected to be similar to, or perhaps lower than, that associated with normal consumption of corn.

Corn (maize) is not listed as one of eight major allergen groups by the FDA under the Food Allergen Labeling and Consumer Protection Act of 2004 (Public Law 108-282, Title II); however, formulated finished food product ingredient lists would state the presence of a corn protein ingredient and individuals who wish to avoid corn protein consumption for any reason would be able to identify the presence of a corn-derived ingredient.

Conclusion from Literature Review

In consideration of the relevant literature on corn/maize and its proteins, as well as the corn gluten meal raw material, there are no safety concerns regarding the proposed uses of corn protein as a human food ingredient, which is expected to replace only a small portion of the background intake of protein. Corroborative evidence of safety is also provided by the genetic toxicity studies performed with Cargill's corn protein ingredient.

Safety Evaluation of Potential Corn Protein Impurities and Contaminants

Current food-grade specifications and quality controls for corn protein (see Part 1) ensure that potential impurities and contaminants of safety concern (*e.g.*, sulfur dioxide, residual solvent ethyl alcohol, mycotoxins, heavy metals, and pesticides) are absent from the processed material or present at levels below applicable US and/or EU Maximum Contaminant Levels or Action Levels for foods, or at levels that do not present a safety concern based on relevant Acceptable Daily Intakes (ADIs), Tolerable Daily Intakes (TDIs), or Provisional Maximum Tolerable Daily Intakes (PMTDIs). The safety assessment for each of these impurities and contaminants at maximum potential exposure levels is discussed below.

Zearalenone

Cargill has set a maximum concentration limit for zearalenone in corn protein at ≤200 ppb; therefore, even the worst-case potential dietary intake of zearalenone through consumption of formulated food products containing corn protein (*e.g.*, conservative per user 90th percentile estimate for the Total US Population of 570 mg/kg bw/day corn protein ingested x 200 ppb zearalenone = 0.1 µg/kg bw/day) would be sufficiently below the TDI of 0.25 µg/kg bw/day for zearalenone established by the European Food Safety Authority (EFSA) (EFSA, 2011). Adequate margins of safety compared to this TDI also exist for conservative estimates of corn protein intake among population subgroups (*e.g.*, highest mean estimate for children ages 1-6 years of 730 mg/kg bw/day corn protein ingested x 200 ppb zearalenone = 0.15 µg/kg bw/day; highly conservative, unrealistic 90th percentile estimate for children ages 1-6 years of 1310 mg/kg bw/day corn protein ingested x 200 ppb zearalenone = 0.26 µg/kg bw/day). As previously mentioned, the EDI

values for corn protein consumption by the US population are considered overestimates and not expected to represent long-term intakes. Further, the EFSA TDI is considered an appropriate, but highly conservative benchmark value for safety assessment in the absence of an FDA-derived ADI or TDI for zearalenone.

As shown in Table 3, zearalenone was not detected (LOD: 12.5 ppb) in representative batches of corn protein.

Fumonisins

Cargill has a maximum concentration limit for fumonisins in corn protein of ≤1.5 ppm [Total Fumonisins (FB1 + FB2 + FB3)], which is below FDA Guidance Levels for fumonisins in whole, degermed, or partially degermed dry milled corn products for human consumption (FDA, 2001). Additionally, even the worst-case potential dietary intake of fumonisins through consumption of formulated food products containing corn protein (*e.g.*, conservative per user 90th percentile estimate for the Total US Population of 570 mg/kg bw/day corn protein ingested x 1.5 ppm fumonisins = 0.86 µg/kg bw/day) would be sufficiently below the Provisional Maximum Tolerable Daily Intake (PMTDI) of 2 µg/kg bw/day for fumonisins established by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) in 2001 and maintained at the JECFA re-evaluations completed in 2011 and 2016 re-evaluations (JECFA, 2001, 2011, 2016). Adequate margins of safety compared to this PMTDI also exist for worst-case estimates of corn protein intake among population subgroups, with the highest90th percentile per user estimate for children ages 1-6 years falling within the JECFA PMTDI (*i.e.,* 1310 mg/kg bw/day corn protein ingested x 1.5 ppm fumonisins = 1.97 µg/kg bw/day). As previously mentioned, the EDI values for corn protein consumption by the US population are considered overestimates and not expected to represent long-term intakes.

A variety of research areas were identified at the fifty-sixth meeting (JECFA, 2011) in order to investigate the biochemical and physiological mechanism(s) underlying fumonisin-induced renal and hepatic toxicity or carcinogenicity. At the seventy-fourth meeting (JECFA, 2011), the Committee used a short-term dose–response study of liver

toxicity in male transgenic mice fed diets containing purified fumonisin B1 (FB_1) to derive a group PMTDI for FB_1, FB_2 and fumonisin B_3 (FB_3), alone or in combination, of 2 µg/kg bw on the basis of a lower 95% confidence limit on the benchmark dose for a 10% response ($BMDL_{10}$) of 0.165 mg/kg bw per day and an uncertainty factor of 100. At the eighty-third meeting (JECFA, 2016, 2017), the Committee concluded that they would not change the overall toxicological assessment performed previously; thus, the previously established group PMTDI of 2 µg/kg bw for FB_1, FB_2 and FB_3, alone or in combination, was retained by the current Committee. The JECFA PMTDI is considered an appropriate benchmark value for safety assessment in the absence of an FDA-derived ADI or TDI for fumonisins. Although EFSA (2018) established a lower TDI of 1 µg/kg bw/day for fumonisins, this value is considered overly conservative for safety assessment of fumonisins as a potential contaminant of corn protein, where theoretical exposure to fumonisins has already been conservatively calculated at the upper end of the specification range and estimated consumer exposure to corn protein.

Based on the most recent global exposure estimates calculated by JECFA (2017), mean and high (90^{th} percentile) chronic exposures for total fumonisins in adults were 0.82-2.1 and 1.6-4.3 µg/kg bw/day, respectively. In children, mean and high (90^{th} percentile) chronic exposures for total fumonisins were 1.2-3.2 and 2.3-6.4 µg/kg bw/day, respectively. Therefore, theoretical exposure to fumonisins from proposed uses of corn protein (*e.g.,* 0.27-1.10 µg/kg bw/day at the mean and 0.57-1.97 µg/kg bw/day at the 90^{th} percentile, ranges for all population subgroups) are below, or within the lower range of international estimates of background dietary exposure to fumonisins.

Additionally, as shown in Table 3, the analyzed concentration of fumonisins (sum of B1+B2) ranged from 0.1-0.6 ppm in representative batches of corn protein.

Aflatoxins

Cargill's maximum concentration limit for aflatoxins in corn protein is ≤4 ppb (sum of aflatoxins B1+B2+G1+G2); therefore, the worst-case potential dietary intake of aflatoxins through consumption of formulated food products containing corn protein

(*e.g.*, highly conservative, unrealistic 90th percentile per user estimate for the Total US Population of 570 mg/kg bw/day corn protein ingested x 4 ppb aflatoxins) is 2.3 ng/kg bw/day. This intake level is within the range of international estimates of background dietary exposure to aflatoxins (*i.e.*, 0.4-3.7 ng/kg bw/day) as reported by JECFA (2007). Aflatoxins are considered genotoxic carcinogens that induce tumors in the liver of animals and humans; therefore, a tolerable intake level for aflatoxins has not been established. The JECFA committee has stated that the reduction of aflatoxins dietary exposure is an important public health goal, particularly in populations who consume high levels of any food that may potentially be contaminated with aflatoxins (JECFA, 2007). The FDA Action Level for aflatoxins in human food is 20 ppb (FDA, 2005), which is 5-fold higher than Cargill's limit for aflatoxins in corn protein (≤4 ppb). As indicated in Table 3, aflatoxins were not detected (LOD: 1 ppb) in representative batches of corn protein.

Most recently, JECFA evaluated co-exposure to fumonisins and aflatoxins considering that both mycotoxins are frequent contaminants in cereal (including maize), and co-exposure to both mycotoxins is likely in areas where these foods are consumed as part of the routine diet (JECFA, 2016). Although evidence in laboratory animals has suggested an additive or synergistic effect of fumonisin and aflatoxin co-exposure in the development of preneoplastic lesions or hepatocellular carcinoma, currently no data are available on such effects in humans (JECFA, 2016). The Committee concluded that there are few data available to support co-exposure as a contributing factor in human disease; however, the interaction between aflatoxin B_1, a compound with known genotoxic properties, and fumonisins, which have the potential to induce regenerative cell proliferation (particularly at exposures above the PMTDI), remains a concern (JECFA, 2016). Based on current specifications for corn protein, potential exposure to fumonisins and aflatoxins, based on highly conservative estimates of consumption of corn protein under the intended conditions of use, do not present a safety concern.

Other Mycotoxins

Cargill's limits for other potential mycotoxins in corn protein (*e.g.,* deoxynivalenol, HT-2 and T-2 toxin, and ochratoxin A) are based on applicable US and/or EU Maximum Contaminant Levels or Action Levels for foods which are considered appropriate to ensure safety of the corn protein ingredient for the proposed uses. As shown in Table 3, these mycotoxins were not detected in representative batches of corn protein.

Ethyl alcohol

Regarding the potential intake of ethyl alcohol (EtOH, residual solvent) by corn protein consumers, Cargill's specification for EtOH in corn protein is maximum 10 g/kg (or 1%). This would yield a calculated/theoretical maximum daily exposure level of 5.7 mg EtOH/kg bw/day (per user 90th percentile estimate for the Total US Population of 570 mg/kg bw/day corn protein ingested x 1% EtOH) or 342 mg EtOH/day for a 60 kg adult, assuming a worst-case upper estimate of intake for all proposed food categories at the maximum use level of corn protein. The worst-case calculated/theoretical maximum daily exposure level of EtOH among population subgroups is 13.1 mg EtOH/kg bw/day (per user 90th percentile estimate for children ages 1-6 years of 1310 mg/kg bw/day corn protein ingested x 1% EtOH) or 197 mg EtOH/day for a 15 kg child, assuming a worst-case upper estimate of intake for all proposed food categories at the maximum use level of corn protein. Spread throughout the course of a day, the amount of EtOH potentially present in corn protein containing foods would be substantially less than the average level of EtOH in a non-alcoholic beverage (defined as having an alcoholic content of less than 0.5% alcohol[4]), *i.e.*, 1.4 g EtOH, assuming 355 mL at 0.5%, specific gravity of 0.794 g/mL.

Additionally, residual EtOH levels in corn protein products for consumption are expected to be minimal due to evaporation, as most or all proposed products will be heated during processing and/or cooking prior to ingestion. The USDA Table of Nutrient Retention Factors (Release 6) demonstrates a steady decrease in EtOH content with heating (baking

[4] "Electronic Code of Federal Regulations". United States Government. Retrieved 29 April 2015. See 27 §7.71, paragraphs (e) and (f).

or simmering) of alcoholic beverages over time (*e.g.*, retention factor reduced from 40% after 15 minutes to 5% after 2.5 hours) (USDA, 2007).

Sulfur dioxide

With respect to potential sulfur dioxide (SO_2) intake by corn protein consumers, Cargill's specification for SO_2 in corn protein is maximum 100 mg/kg (or 0.01%), which could result in a maximum daily exposure level of 0.06 mg SO_2/kg bw/day (per user 90th percentile estimate for the Total US Population of 570 mg/kg bw/day corn protein ingested x 0.01% SO_2), assuming a conservative upper estimate of corn protein intake. JECFA (2000) established an ADI of 0.7 mg/kg bw for sulfites (used as antioxidants/preservatives) based on long-term studies in rats, including a 3-generation study of reproductive toxicity with a No-Observed-Effect-Level (NOEL) of 2.5 g/kg (0.25%) sodium metabisulfite in the diet, equivalent to 70 mg/kg bw/day of sulfur dioxide equivalents. Therefore, the conservatively estimated potential daily intake of SO_2 from proposed food uses of corn protein would be 11 times lower than the ADI for sulfites established by JECFA. An adequate margin of safety (5-fold lower) compared to the ADI also exists for worst-case estimates of corn protein intake among population subgroups (*e.g.*, conservative per user 90th percentile estimate for children ages 1-6 years of 1310 mg/kg bw/day corn protein ingested x 0.01% SO_2 = 0.13 mg/kg bw/day).

Discussion of Potential Safety Concerns Regarding High Protein Intake

Although the proposed food uses of corn protein are expected to result in consumption amounts well below the safe protein ingestion levels recommended by the WHO (2007) (*i.e.*, 33-66 g/day for adults depending on body weight, 10.8-17.1 g/day for children ages 1-6, and 25.9-41.0 g/day for children ages 7-12), potential adverse effects associated with consumption of extremely high levels of protein have been reported in the literature and are discussed herein for completeness.

Preterm infants who were fed high-protein formula (reported daily protein intakes of 6 to 7.2 g/kg bw) exhibited poor feeding, fever, lethargy, and low IQ scores and strabismus at

3- and 6-year evaluations (Goldman *et al*., 1971; 1974). In individuals consuming diets consisting of 45% of their dietary energy as protein (from rabbit meat), diarrhea and nausea occurred after 3 days, and death within a few weeks (Speth and Spielmann, 1983). As this study included a very unusual dietary situation, the results are not considered relevant to the safety assessment of corn protein. Cargill's corn protein product is not intended for use in infant formula.

Excess protein intake has been found to advance chronic kidney disease due to increased glomerular pressure and hyperfiltration (Martin *et al*., 2005; WHO, 2007). However, following a comprehensive review of the literature, Martin *et al*. (2005) concluded that the existing evidence does not indicate an adverse effect of high protein consumption on renal function in healthy individuals. Further, several studies indicate that hyperfiltration, the reported mechanism for kidney effects, is a normal adaptive response to increased demands for renal clearance due to higher nitrogen load. The authors defined a "high protein diet" as a daily intake of ≥1.5 g/kg-day, which is nearly double the current recommended intake level set by the IOM. Increased dietary consumption of animal protein has been found to accelerate this renal clearance disorder in patients with preexisting kidney disease, but the association did not occur in persons with healthy kidney function (Martin *et al*., 2005). The proposed uses of Cargill's corn protein product are not expected to result in high protein intake levels such as those associated with renal function decrements even in individuals with chronic kidney disease.

While excess protein intake may adversely impact the body's calcium balance and calcium concentration in bone, the existing evidence indicates that dietary protein, when consumed as part of a well-balanced diet, is likely beneficial for bone, potentially even at dietary levels exceeding the recommended consumption rates (WHO, 2007). A high-protein diet may also lead to increased incidence of kidney stone formation due to increased urinary calcium and oxalate levels; however, relevant clinical studies report a wide range of protein consumption rates (*e.g.*, 80-185 g/day) and were therefore considered inconclusive by WHO (2007). Additional research is also needed to determine potential differences between animal and plant protein intake relative to the

incidence of kidney stone formation. To allow for the present uncertainty, WHO (2007) recommends that in order to minimize the risk of kidney stones in patients who are at risk, the diet should ideally provide at least the safe level of protein (0.83 g/kg per day), but not excessive amounts (*i.e.*, less than 1.4 g/kg per day), preferably from vegetable sources.

High protein consumption is considered a risk factor for development of gout (Choi *et al*., 2004). In a large prospective cohort study, Choi and colleagues (2004) tracked 47,150 American men (ages 40-75 years old in 1986) during a 12-year period and observed 730 new cases of gout. While the consumption of meat and seafood was associated with an increased risk of gout (relative risk of 1.41 and 1.51, respectively), total protein intake was not associated with gout incidence.

As stated above, the proposed uses and consumption of corn protein in the specified foods is not expected to raise concerns regarding the above safety-related outcomes.

Safety Evaluation Summary and Discussion

Corn and its proteins have a long history of safe human consumption and there are no known reports of adverse health effects associated with dietary intake of corn, or its protein at the levels proposed herein.

The focus of this GRAS determination is a comprehensive assessment of the safety of corn protein as a source of protein for enrichment of processed foods, similar to that of other plant-based protein sources such as soy, canola, oats, lentils, wheat, rice, potato, peas, and whey. The Institute of Medicine (IOM, 2002/2005) recommends that adults consume a minimum of 0.8 g protein/kg and has set a range for acceptable protein intake of 10 - 35% of daily calories. In the US, the recommended daily allowance (RDA) of protein is 56 grams/day and 46 grams/day for adult men and women (>19 years of age), respectively (IOM, 2022/2005; USDA, 2020a). The FDA (2015) has established a protein daily reference value (DRV) of 50 g/day for adults and children four years of age or older. However, as the RDA represents the amount of protein that is recommended to

meet a person's basic nutritional requirements, it does not represent an upper limit of consumption.

Similar plant-derived protein products are currently available in the marketplace. To date, the FDA has reviewed data as part of GRAS notifications for a number of plant-based protein isolates and concentrates and subsequently issued "no questions letters" [*i.e.*, GRN No. 26 (isolated wheat protein); GRN No. 134 (soy protein); GRN 386 (canola protein isolate and hydrolyzed canola protein isolate); GRN No. 447 (potato protein isolates); GRN No. 575 (oat protein); GRN No. 581, 803, 804, 851 (unhydrolyzed and hydrolyzed pea protein); GRN Nos. 608 and 788 (pea protein concentrate); GRN No. 609 (rice protein); GRN No. 683 (canola protein isolate); GRN 684 (mung bean protein isolate); and GRN 879 (fava bean protein isolate)]. Cargill considers the data and information supporting the GRAS conclusions for these ingredients (including that which is published and that which is unpublished but corroborative) to corroborate the conclusion of GRAS for corn protein. Specifically, these Notifications present data and information confirming that there is a history of safe consumption of the source plants and their proteins, there are no toxicologically or clinically relevant effects observed in studies where these plant proteins were fed to animals or humans, and estimated consumer intake levels for these plant proteins are consistent with established RDAs (IOM, 2002/2005) or safe consumption values (WHO, 2007) for protein [pp. 000008-000009 of GRN No. 26 (isolated wheat protein); pp. 000015-000019 of GRN No. 134 (soy protein); pp. 000083-000092 of GRN No. 609 (rice protein); pp. 000028-000036 of GRN 386 (canola protein isolate and hydrolyzed canola protein isolate); pp. 17-20, 23-34 of GRN No. 447 (potato protein isolates); pp. 000029-000042 of GRN No. 575 (oat protein); pp. 23-31 of GRN No. 581 (pea protein); pp. 000017-18, 000021-24, 000025 of GRN No. 608 (pea protein concentrate); pp. 39-59 of GRN No. 683 (canola protein isolate); pp. 27-38 of GRN 684 (mung bean protein isolate); pp. 22-26 of GRN 879 (fava bean protein isolate); and the Agency Response Letter to GRN 788 for pea protein concentrate (FDA, 2018)].

Cargill's corn protein is proposed for use as a source of protein and for functional uses such as thickening, water absorption, fat/oil absorption, solid fat emulsification, and gelation in a variety of foods. The per user mean and 90th percentile intake estimates for corn protein are 14.7 and 29.0 g/day (0.25 and 0.57 g/kg bw/day), respectively, for the total US population, assuming a worst-case estimate of intake for all proposed food categories at the maximum proposed use level. The proposed uses of corn protein are not expected to result in an increase in the overall consumption of protein, but simply provide an alternative source of well-characterized protein from corn for use in food. Further, the proposed uses of corn protein would contribute only a small portion of the background protein consumption in the US, or the dietary protein recommendations of the FDA and IOM.

Although potential adverse effects associated with consumption of extremely high levels of protein have been reported in the literature, the proposed food uses of corn protein are expected to result in consumption amounts well below the safe or acceptable protein ingestion levels recommended by FDA (2016), IOM (2002/2005) and WHO (2007) (details discussed above).

Discussion of Information Inconsistent with GRAS Conclusion

Cargill is not aware of information that would be inconsistent with a finding that the proposed use of corn protein as a plant-derived source of protein is GRAS. The regulatory framework for determining whether a substance is GRAS is in 21 CFR §170.30, which states that GRAS status through scientific procedures shall ordinarily be based upon published studies, which may be corroborated by unpublished studies and other data and information. These criteria have been applied to the existing data for corn protein.

GRAS Conclusion

Consideration of the totality-of-the-evidence related to the safety evaluation of corn protein (including the historical consumption of corn and its proteins), provides a basis upon which to conclude that the uses of corn protein described in this dossier satisfy the

safety standard of Reasonable Certainty of No Harm. Additionally, these publicly available and widely accepted data and information are known and accepted by a consensus of qualified experts in the general scientific community [Exhibit I. *Expert Panel Report*], fulfilling the requirement for common knowledge that corn protein is generally recognized as safe (GRAS) under its intended conditions of use, when produced in accordance with current GMPs and meeting the food-grade/quality specifications described above.

§ 170.250 Part 7, Supporting Data and Information

The below-listed references are all generally available, unless otherwise noted. Appendix 1 (Certificates of Analysis for Corn Protein), Appendix 3 (Consumer Intake Assessment Report for Corn Protein), Exhibit I (signed Expert Panel report), Exhibit II (Corn Protein Stability Data), and Exhibit III (Suitability Data for USDA regulated uses of Corn Protein) are not generally available but are attached for reference.

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Anthem Biosciences Pvt. Ltd. 2021a. *In vitro* Mammalian Cell Micronucleus Test of Corn Protein Concentrate using Chinese Hamster Ovary (CHO-K1) cells. Study No. G21022. Study Director: Mohan C. U.

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Anthem Biosciences Pvt. Ltd. 2021c. *In vitro* Mammalian Cell Micronucleus Test of Corn Protein Isolate using Chinese Hamster Ovary (CHO-K1) cells. Study No. G21023. Study Director: Mohan C. U.

Anthem Biosciences Pvt. Ltd. 2021d. Evaluation of Mutagenic Potential of Corn Protein Isolate by Bacterial Reverse Mutation Test (Ames Test). Study No. G21025. Study Director: Sajeev Justin Dev. M.

Appendix 1. Certificates of Analysis for Corn Protein

Certificate of Analysis

Cargill - Plymouth MN
14800 28th Ave N

Plymouth MN
Attn:
P.O. Number: 4508584434
Client Sample ID: CP120320F
Description: Corn Protein
Notes:

Date Received: 1/25/2021
Date Reported: 1/27/2021
Client ID:

Certificate No: 2671325

Trilogy ID: S210251023

Analysis	Results	Units	Detection Limit	Method	Reference
Aflatoxin B1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin B2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Deoxynivalenol	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B1	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B2	0.1	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B3	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
HT-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Ochratoxin A	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
T-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Zearalenone	ND	ppb	12.5 ppb	LCMSMS	Internal SOP-14-168

ND = None Detected

Results Approved by:

Julie Brunkhorst Vice President of the Technical Division

Trilogy Analytical
870 Vossbrink
Washington, MO 63090

Toll Free 855-256-8244
Phone 636-239-1521
Fax: 636-239-1531

Certificate of Analysis

Cargill - Plymouth MN
14800 28th Ave N

Plymouth MN
Attn:
P.O. Number: 4508584434
Client Sample ID: CP120720F
Description: Corn Protein
Notes:

Date Received: 1/25/2021
Date Reported: 1/27/2021
Client ID:

Certificate No: 2671325

Trilogy ID: S210251026

Analysis	Results	Units	Detection Limit	Method	Reference
Aflatoxin B1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin B2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Deoxynivalenol	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B1	0.3	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B2	0.3	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B3	0.1	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
HT-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Ochratoxin A	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
T-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Zearalenone	ND	ppb	12.5 ppb	LCMSMS	Internal SOP-14-168

ND = None Detected

Results Approved by:

Julie Brunkhorst Vice President of the Technical Division

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 TESTING LABORATORY

Trilogy Analytical
870 Vossbrink
Washington, MO 63090

Toll Free 855-256-8244
Phone 636-239-1521
Fax: 636-239-1531

Certificate of Analysis

Cargill - Plymouth MN
14800 28th Ave N

Plymouth MN
Attn:
P.O. Number: 4508584434
Client Sample ID: CP120820F
Description: Corn Protein
Notes:

Date Received: 1/25/2021
Date Reported: 1/27/2021
Client ID:

Certificate No: 2671325

Trilogy ID: S210251027

Analysis	Results	Units	Detection Limit	Method	Reference
Aflatoxin B1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin B2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Deoxynivalenol	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B1	0.1	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B2	0.2	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B3	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
HT-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Ochratoxin A	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
T-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Zearalenone	ND	ppb	12.5 ppb	LCMSMS	Internal SOP-14-168

ND = None Detected

Results Approved by:

Julie Brunkhorst Vice President of the Technical Division

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 TESTING LABORATORY

Trilogy Analytical
870 Vossbrink
Washington, MO 63090

Toll Free 855-256-8244
Phone 636-239-1521
Fax: 636-239-1531

Certificate of Analysis

Cargill - Plymouth MN
14800 28th Ave N

Plymouth MN
Attn:
P.O. Number: 4508584434
Client Sample ID: CPC120920F
Description: Corn Protein
Notes:

Date Received: 1/25/2021
Date Reported: 1/27/2021
Client ID:

Certificate No: 2671325

Trilogy ID: S21025102B

Analysis	Results	Units	Detection Limit	Method	Reference
Aflatoxin B1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin B2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Deoxynivalenol	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B1	0.2	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B2	0.3	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B3	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
HT-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Ochratoxin A	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
T-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Zearalenone	ND	ppb	12.5 ppb	LCMSMS	Internal SOP-14-168

ND = None Detected

Results Approved by:

Julie Brunkhorst Vice President of the Technical Division

Trilogy Analytical
870 Vossbrink
Washington, MO 63090

Toll Free 855-256-8244
Phone 636-239-1521
Fax: 636-239-1531

Certificate of Analysis

Cargill - Plymouth MN
14800 28th Ave N

Plymouth MN
Attn:
P.O. Number: 4508584434
Client Sample ID: CP121020F
Description: Corn Protein
Notes:

Date Received: 1/25/2021
Date Reported: 1/27/2021
Client ID:

Certificate No: 2671325

Trilogy ID: S21025102C

Analysis	Results	Units	Detection Limit	Method	Reference
Aflatoxin B1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin B2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Deoxynivalenol	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B1	0.2	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B2	0.2	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B3	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
HT-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Ochratoxin A	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
T-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Zearalenone	ND	ppb	12.5 ppb	LCMSMS	Internal SOP-14-168

ND = None Detected

Results Approved by:

Julie Brunkhorst Vice President of the Technical Division

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870 Vossbrink
Washington, MO 63090

Toll Free 855-256-8244
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Fax: 636-239-1531

Certificate of Analysis

Cargill - Plymouth MN
14800 28th Ave N

Plymouth MN
Attn:
P.O. Number: 4508584434
Client Sample ID: CPC121120F
Description: Corn Protein
Notes:

Date Received: 1/25/2021
Date Reported: 1/27/2021
Client ID:

Certificate No: 2671325

Trilogy ID: S21025102D

Analysis	Results	Units	Detection Limit	Method	Reference
Aflatoxin B1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin B2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Deoxynivalenol	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B1	0.2	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B2	0.3	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B3	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
HT-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Ochratoxin A	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
T-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Zearalenone	ND	ppb	12.5 ppb	LCMSMS	Internal SOP-14-168

ND = None Detected

Results Approved by:

Julie Brunkhorst Vice President of the Technical Division

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Certificate of Analysis

Cargill - Plymouth MN
14800 28th Ave N

Plymouth MN
Attn:
P.O. Number: 4508584434
Client Sample ID: CP121420F
Description: Corn Protein
Notes:

Date Received: 1/25/2021
Date Reported: 1/27/2021
Client ID:

Certificate No: 2671325

Trilogy ID: S21025102E

Analysis	Results	Units	Detection Limit	Method	Reference
Aflatoxin B1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin B2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Deoxynivalenol	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B1	0.2	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B2	0.2	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B3	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
HT-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Ochratoxin A	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
T-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Zearalenone	ND	ppb	12.5 ppb	LCMSMS	Internal SOP-14-168

ND = None Detected

Results Approved by:

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Certificate of Analysis

Cargill - Plymouth MN
14800 28th Ave N

Plymouth MN

Attn:

P.O. Number: 4508584434

Client Sample ID: CPC121520

Description: Corn Protein

Notes:

Date Received: 1/25/2021
Date Reported: 1/27/2021
Client ID:

Certificate No: 2671325

Trilogy ID: S21025102F

Analysis	Results	Units	Detection Limit	Method	Reference
Aflatoxin B1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin B2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Deoxynivalenol	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B1	0.2	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B2	0.3	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B3	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
HT-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Ochratoxin A	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
T-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Zearalenone	ND	ppb	12.5 ppb	LCMSMS	Internal SOP-14-168

ND = None Detected

Results Approved by:

Julie Brunkhorst Vice President of the Technical Division

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Washington, MO 63090

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Phone 636-239-1521
Fax: 636-239-1531

Certificate of Analysis

Cargill - Plymouth MN
14800 28th Ave N

Plymouth MN
Attn:
P.O. Number: 4508584434
Client Sample ID: CP121620F
Description: Corn Protein
Notes:

Date Received: 1/25/2021
Date Reported: 1/27/2021
Client ID:

Certificate No: 2671325

Trilogy ID: S21025102G

Analysis	Results	Units	Detection Limit	Method	Reference
Aflatoxin B1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin B2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Deoxynivalenol	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B1	0.1	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B2	0.2	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B3	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
HT-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Ochratoxin A	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
T-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Zearalenone	ND	ppb	12.5 ppb	LCMSMS	Internal SOP-14-168

ND = None Detected

Results Approved by:

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Fax: 636-239-1531

Certificate of Analysis

Cargill - Plymouth MN
14800 28th Ave N

Plymouth MN
Attn:
P.O. Number: 4508584434
Client Sample ID: CPC122120F
Description: Corn Protein
Notes:

Date Received: 1/25/2021
Date Reported: 1/27/2021
Client ID:

Certificate No: 2671325

Trilogy ID: S21025102H

Analysis	Results	Units	Detection Limit	Method	Reference
Aflatoxin B1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin B2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G1	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Aflatoxin G2	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
Deoxynivalenol	ND	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B1	0.2	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B2	0.3	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
Fumonisin B3	0.1	ppm	0.1 ppm	LCMSMS	Internal SOP-14-168
HT-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Ochratoxin A	ND	ppb	1 ppb	LCMSMS	Internal SOP-14-168
T-2 Toxin	ND	ppb	5 ppb	LCMSMS	Internal SOP-14-168
Zearalenone	ND	ppb	12.5 ppb	LCMSMS	Internal SOP-14-168

ND = None Detected

Results Approved by:

Julie Brunkhorst Vice President of the Technical Division

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870 Vossbrink
Washington, MO 63090

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Fax: 636-239-1531

SILLIKER, Inc.
Minnesota Laboratory
11585 K-Tel Drive, Minnetonka, MN 55343
Tel. 1-844-938-5396 Fax. 952-932-0764
Email: getresults3@mxns.com

CERTIFICATE OF ANALYSIS

COA No:	MIN-44339153-3
Supersedes:	MIN-44339153-2
COA Date	1/17/21
Page 1 of 5	

TO:
Mr. Michael Porter
Title:Research Fellow
Cargill Health and Food Technologies
2500 Shadywood Road
Excelsior, MN 55331

Received From:	Excelsior, MN
Received Date:	1/12/21
P.O.# / ID:	4505884674

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Laboratory ID: 406861596 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 18
Desc. 1: CP120320F
Desc. 2: Corn Protein

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	3700	/g	AOAC 990.12	1/14/21	
* Enterobacteriaceae - Petrifilm	<10	/g	AOAC 2003.01	1/13/21	
* Salmonella - ELFA	Negative	/25g	AOAC 2004.03	1/14/21	
* Yeast and Mold			FDA-BAM, 7th ed.	1/17/21	
Yeast	<10	/g			
Mold	<10	/g			

Laboratory ID: 406861597 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 18
Desc. 1: CPC120720F
Desc. 2: Corn Protein

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	180	/g	AOAC 990.12	1/14/21	
* Enterobacteriaceae - Petrifilm	<10	/g	AOAC 2003.01	1/13/21	
* Salmonella - ELFA	Negative	/25g	AOAC 2004.03	1/14/21	
* Yeast and Mold			FDA-BAM, 7th ed.	1/17/21	
Yeast	<10	/g			
Mold	<10	/g			

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Minnesota Laboratory
11585 K-Tel Drive, Minnetonka, MN 55343
Tel. 1-844-938-5396 Fax. 952-932-0764
Email: getresults3@mxns.com

CERTIFICATE OF ANALYSIS

COA No:	MIN-44339153-3
Supersedes:	MIN-44339153-2
COA Date	1/17/21
Page 2 of 5	

TO:
Mr. Michael Porter
Title:Research Fellow
Cargill Health and Food Technologies
2500 Shadywood Road
Excelsior, MN 55331

Received From:	Excelsior, MN
Received Date:	1/12/21
P.O.# / ID:	4505884674

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Laboratory ID: 406861598 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 18
Desc. 1: CP120820F
Desc. 2: Corn Protein

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	110	/g	AOAC 990.12	1/14/21	
* Enterobacteriaceae - Petrifilm	<10	/g	AOAC 2003.01	1/13/21	
* Salmonella - ELFA	Negative	/25g	AOAC 2004.03	1/14/21	
* Yeast and Mold			FDA-BAM, 7th ed.	1/17/21	
Yeast	<10	/g			
Mold	<10	/g			

Laboratory ID: 406861601 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 18
Desc. 1: CPC120920F
Desc. 2: Corn Protein

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	90	/g	AOAC 990.12	1/14/21	
* Enterobacteriaceae - Petrifilm	<10	/g	AOAC 2003.01	1/13/21	
* Salmonella - ELFA	Negative	/25g	AOAC 2004.03	1/14/21	
* Yeast and Mold			FDA-BAM, 7th ed.	1/17/21	
Yeast	<10	/g			
Mold	<10	/g			

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Minnesota Laboratory
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Tel. 1-844-938-5396 Fax. 952-932-0764
Email: getresults3@mxns.com

CERTIFICATE OF ANALYSIS

COA No:	MIN-44339153-3
Supersedes:	MIN-44339153-2
COA Date	1/17/21
Page 3 of 5	

TO:
Mr. Michael Porter
Title:Research Fellow
Cargill Health and Food Technologies
2500 Shadywood Road
Excelsior, MN 55331

Received From:	Excelsior, MN
Received Date:	1/12/21
P.O.# / ID:	4505884674

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Laboratory ID: 406861604 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 18
Desc. 1: CP121020F
Desc. 2: Corn Protein

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	80	/g	AOAC 990.12	1/14/21	
* Enterobacteriaceae - Petrifilm	<10	/g	AOAC 2003.01	1/13/21	
* Salmonella - ELFA	Negative	/25g	AOAC 2004.03	1/14/21	
* Yeast and Mold			FDA-BAM, 7th ed.	1/17/21	
Yeast	<10	/g			
Mold	<10	/g			

Laboratory ID: 406861607 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 18
Desc. 1: CPC121120F
Desc. 2: Corn Protein

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	260	/g	AOAC 990.12	1/14/21	
* Enterobacteriaceae - Petrifilm	<10	/g	AOAC 2003.01	1/13/21	
* Salmonella - ELFA	Negative	/25g	AOAC 2004.03	1/14/21	
* Yeast and Mold			FDA-BAM, 7th ed.	1/17/21	
Yeast	<10	/g			
Mold	<10	/g			

SILLIKER, Inc.
Minnesota Laboratory
11585 K-Tel Drive, Minnetonka, MN 55343
Tel. 1-844-938-5396 Fax. 952-932-0764
Email: getresults3@mxns.com

CERTIFICATE OF ANALYSIS

COA No:	MIN-44339153-3
Supersedes:	MIN-44339153-2
COA Date	1/17/21
Page 4 of 5	

TO:
Mr. Michael Porter
Title:Research Fellow
Cargill Health and Food Technologies
2500 Shadywood Road
Excelsior, MN 55331

Received From:	Excelsior, MN
Received Date:	1/12/21
P.O.# / ID:	4505884674

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Laboratory ID: 406861614 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 18
Desc. 1: CP121420F
Desc. 2: Corn Protein

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	50	/g	AOAC 990.12	1/14/21	
* Enterobacteriaceae - Petrifilm	<10	/g	AOAC 2003.01	1/13/21	
* Salmonella - ELFA	Negative	/25g	AOAC 2004.03	1/14/21	
* Yeast and Mold			FDA-BAM, 7th ed.	1/17/21	
Yeast	<10	/g			
Mold	<10	/g			

Laboratory ID: 406861624 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 18
Desc. 1: CPC121520
Desc. 2: Corn Protein

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	<10	/g	AOAC 990.12	1/14/21	
* Enterobacteriaceae - Petrifilm	<10	/g	AOAC 2003.01	1/13/21	
* Salmonella - ELFA	Negative	/25g	AOAC 2004.03	1/14/21	
* Yeast and Mold			FDA-BAM, 7th ed.	1/17/21	
Yeast	<10	/g			
Mold	<10	/g			

SILLIKER, Inc.
Minnesota Laboratory
11585 K-Tel Drive, Minnetonka, MN 55343
Tel. 1-844-938-5396 Fax. 952-932-0764
Email: getresults3@mxns.com

CERTIFICATE OF ANALYSIS

COA No:	MIN-44339153-3
Supersedes:	MIN-44339153-2
COA Date	1/17/21
Page 5 of 5	

TO:
Mr. Michael Porter
Title:Research Fellow
Cargill Health and Food Technologies
2500 Shadywood Road
Excelsior, MN 55331

Received From:	Excelsior, MN
Received Date:	1/12/21
P.O.# / ID:	4505884674

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Laboratory ID: 406861631 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 18
Desc. 1: CP121620F
Desc. 2: Corn Protein

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	<10	/g	AOAC 990.12	1/14/21	
* Enterobacteriaceae - Petrifilm	<10	/g	AOAC 2003.01	1/13/21	
* Salmonella - ELFA	Negative	/25g	AOAC 2004.03	1/14/21	
* Yeast and Mold			FDA-BAM, 7th ed.	1/17/21	
Yeast	<10	/g			
Mold	<10	/g			

Laboratory ID: 406861640 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 18
Desc. 1: CPC122120F
Desc. 2: Corn Protein

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	80	/g	AOAC 990.12	1/14/21	
* Enterobacteriaceae - Petrifilm	<10	/g	AOAC 2003.01	1/13/21	
* Salmonella - ELFA	Negative	/25g	AOAC 2004.03	1/14/21	
* Yeast and Mold			FDA-BAM, 7th ed.	1/17/21	
Yeast	<10	/g			
Mold	<10	/g			

Jeff Lecy Laboratory Director

I Customer supplied information * ISO17025 Accredited Analysis † Indicates reason for COA amendent when applicable

SILLIKER, Inc.
Minnesota Laboratory
11585 K-Tel Drive, Minnetonka, MN 55343
Tel. 1-844-938-5396 Fax. 952-932-0764
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CERTIFICATE OF ANALYSIS

COA No:	MIN-44260812-1
Supersedes:	MIN-44260812-0
COA Date	12/16/20
Page 1 of 2	

TO:
Mr. Michael Porter
Title:Research Fellow
Cargill Health and Food Technologies
2500 Shadywood Road
Excelsior, MN 55331

Received From:	Excelsior, MN
Received Date:	12/14/20
P.O.# / ID:	4505884674

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Laboratory ID: 406188935 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 13
Desc. 1: CP120320

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	3500	/g	AOAC 990.12	12/16/20	

Laboratory ID: 406188937 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 13
Desc. 1: CPC120720

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	50	/g	AOAC 990.12	12/16/20	

Laboratory ID: 406188939 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 13
Desc. 1: CP120820

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	290	/g	AOAC 990.12	12/16/20	

Laboratory ID: 406188941 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 13
Desc. 1: CPC120820B

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	220	/g	AOAC 990.12	12/16/20	

SILLIKER, Inc.
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Tel. 1-844-938-5396 Fax. 952-932-0764
Email: getresults3@mxns.com

CERTIFICATE OF ANALYSIS

COA No:	MIN-44260812-1
Supersedes:	MIN-44260812-0
COA Date	12/16/20
Page 2 of 2	

TO:
Mr. Michael Porter
Title:Research Fellow
Cargill Health and Food Technologies
2500 Shadywood Road
Excelsior, MN 55331

Received From:	Excelsior, MN
Received Date:	12/14/20
P.O.# / ID:	4505884674

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Laboratory ID: 406188943 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 13
Desc. 1: CP121020

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	170	/g	AOAC 990.12	12/16/20	

Laboratory ID: 406188944 **Condition Rec'd:** NORMAL **Temp Rec'd (°C):** 13
Desc. 1: CPC121120

Analyte	Result	Units	Method Reference	Test Date	Loc.
* Aerobic Plate Count - Petrifilm	<10	/g	AOAC 990.12	12/16/20	

Jeff Lecy Laboratory Director

I Customer supplied information * ISO17025 Accredited Analysis † Indicates reason for COA amendent when applicable

University of Missouri

Experiment Station Chemical Laboratories
College of Agriculture
Food and Natural Resources

Agriculture Bldg., Room 4
Columbia, MO 65211

PHONE 573-882-2608
EMAIL umccafnrescl@missouri.edu
WEB AESCL.missouri.edu

March 11, 2021

US Lab Customer Service Team
Michael Porter
14800 28th Ave N.
Plymouth, MN 55447

Dear Michael:

Please find enclosed a completed report of analyses for the samples we received February 25, 2021.

We have assigned lab numbers 2546-2551 to your samples. Reference standards were performed.

A University of Missouri invoice will be sent to you by the Accounting Department for payment of these services once all analysis requested for this sample are completed.

The original results will be on file in our office and available to you upon request. We are glad that we have been able to work with you on this project and look forward to being of service to you again.

Please let us know if you have further questions.

Agriculture Experiment Station
Experiment Station Chemical Laboratories
University of Missouri-Columbia

Sincerely,

[redacted]

Dr. James K. Waters
Research Chemist

[redacted]

Dr. Thomas P. Mawhinney
Director

Enclosure

Experiment Station Chemical Laboratories

Analytical Services | Room 4 Agricultural Building | Columbia, Missouri 65211

Sender: **Michael Porter**
Address: **Cargill Minneapolis Research Center**
14800 28th Ave. N, Plymouth, MN 55447
Phone: **763-383-3808**
Purchase Order #: **4509603003**

Date Received: **February 25, 2021**
Date of Report: **March 11, 2021**

Description: **Corn**

ESCL #	**2546**	**2547**	**2548**	**2549**	**2550**
Units	**W/W%**	**W/W%**	**W/W%**	**W/W%**	**W/W%**
Cargill ID	CP120320	CP121020	CP121620	CPC120720	CPC120920
Taurine §	0.00	0.00	0.00	0.07	0.07
Hydroxyproline	0.01	0.02	0.02	0.00	0.00
Aspartic Acid	5.10	4.95	5.01	4.03	3.90
Threonine	2.82	2.66	2.70	2.14	2.09
Serine	3.97	3.51	3.63	2.73	2.70
Glutamic Acid	19.07	18.56	18.81	14.71	14.58
Proline	7.39	7.16	7.29	5.51	5.51
Lanthionine §	0.00	0.00	0.00	0.00	0.00
Glycine	2.33	2.26	2.29	1.85	1.81
Alanine	7.63	7.43	7.53	5.90	5.84
Cysteine	1.58	1.54	1.55	1.23	1.19
Valine	4.05	4.04	4.08	3.19	3.14
Methionine	2.27	2.23	2.25	1.86	1.80
Isoleucine	3.67	3.72	3.75	2.93	2.90
Leucine	14.40	14.08	14.26	11.05	10.98
Tyrosine	4.21	3.97	4.07	2.95	2.94
Phenylalanine	5.47	5.37	5.48	4.19	4.16
Hydroxylysine	0.00	0.01	0.01	0.00	0.00
Ornithine §	0.07	0.07	0.07	0.06	0.05
Lysine	1.48	1.43	1.46	1.20	1.17
Histidine	1.71	1.69	1.71	1.35	1.31
Arginine	2.71	2.61	2.65	2.08	2.05
Tryptophan	0.34	0.38	0.38	0.34	0.33
Total	90.28	87.69	89.00	69.37	68.52
Crude protein*	91.08	91.48	92.14	70.46	69.56

W/W%= grams per 100 grams of sample. Crude protein= %N x6.25. § Non-proteinogenic amino acids.*
Results are expressed on an "as is" basis unless otherwise indicated.

Experiment Station Chemical Laboratories

Analytical Services | Room 4 Agricultural Building | Columbia, Missouri 65211

Sender: **Michael Porter**
Address: **Cargill Minneapolis Research Center**
14800 28th Ave. N, Plymouth, MN 55447
Phone: **763-383-3808**
Purchase Order #: **4509603003**

Date Received: **February 25, 2021**
Date of Report: **March 11, 2021**

Description: **Corn**

ESCL #	**2551**
Units	**W/W%**
Cargill ID	CPC122120
Taurine §	0.07
Hydroxyproline	0.00
Aspartic Acid	3.86
Threonine	2.10
Serine	2.76
Glutamic Acid	14.47
Proline	5.35
Lanthionine §	0.00
Glycine	1.77
Alanine	5.79
Cysteine	1.18
Valine	3.13
Methionine	1.74
Isoleucine	2.89
Leucine	10.99
Tyrosine	2.94
Phenylalanine	4.17
Hydroxylysine	0.00
Ornithine §	0.05
Lysine	1.17
Histidine	1.31
Arginine	2.03
Tryptophan	0.32
Total	68.09
Crude protein*	70.27

W/W%= grams per 100 grams of sample. Crude protein= %N x6.25. § Non-proteinogenic amino acids.*
Results are expressed on an "as is" basis unless otherwise indicated.

Eurofins Scientific Inc. (Des Moines)

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Des Moines, IA 50321
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ENACClientServices@EurofinsUS.com

Cargill CTS R&D

Varathan Vamadevan
14800 28th Ave N.
Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-020659-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250599	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CP120820F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QD495 - Phytic Acid	**Reference**		**Completed**
	Analytical Biochemistry Vol. 77:536-539 (1977)		01Feb2021
Parameter	**Result**	**Theoretical**	
Phytic Acid	0.77 %		

QD06T - Cadmium (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Cadmium (Cd)	0.027 mg/kg		

QD06S - Lead (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Lead (Pb)	0.026 mg/kg		

QD06R - Mercury (Mwd-ICP-MS, Most Matrices)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Mercury (Hg)	<0.010 mg/kg		

QD06Q - Arsenic (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Arsenic (As)	0.018 mg/kg		

Cargill CTS R&D

Varathan Vamadevan
14800 28th Ave N.
Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-020659-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250599	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CP120820F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QA01P - Pesticides Quechers GC-MSMS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

QA01R - Pesticides Quechers-LC-MS/MS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

Subcontracting partners:
1 - Eurofins Central Analytical Laboratories, LA

Respectfully Submitted,

Loreen Jones
Support Services Coordinator

Eurofins Scientific Inc. (Des Moines)

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Des Moines, IA 50321
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Cargill CTS R&D

Varathan Vamadevan
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Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-026256-01

Client Code: QD0007539
PO Number: 4509200160

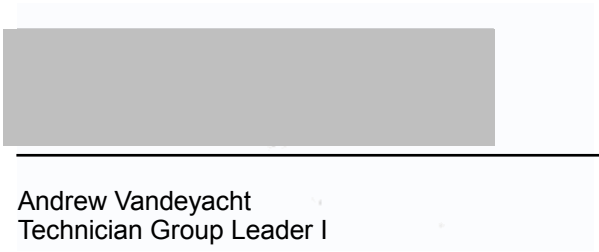
Received On: 04Feb2021
Reported On: 09Feb2021

Eurofins Sample Code:	464-2021-02040999	**Sample Registration Date:**	04Feb2021
Client Sample Code:	CP120820F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	corn protein	**Sample Reference:**	

QA902 - Sulfites (SO2) by Optimized Monier Williams Method	**Reference**	**Completed**
	AOAC 990.28	09Feb2021

Parameter	**Result**	**Theoretical**
Sulfites (SO2)	49.4 ppm	

Respectfully Submitted,



Andrew Vandeyacht
Technician Group Leader I

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Cargill CTS R&D

Varathan Vamadevan
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Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-020661-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250601	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CP121020F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QD495 - Phytic Acid	**Reference**		**Completed**
	Analytical Biochemistry Vol. 77:536-539 (1977)		01Feb2021
Parameter	**Result**	**Theoretical**	
Phytic Acid	0.84 %		

QD06T - Cadmium (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Cadmium (Cd)	0.028 mg/kg		

QD06S - Lead (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Lead (Pb)	0.021 mg/kg		

QD06R - Mercury (Mwd-ICP-MS, Most Matrices)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Mercury (Hg)	<0.010 mg/kg		

QD06Q - Arsenic (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Arsenic (As)	0.016 mg/kg		

Cargill CTS R&D

Varathan Vamadevan
14800 28th Ave N.
Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-020661-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250601	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CP121020F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QA01P - Pesticides Quechers GC-MSMS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

QA01R - Pesticides Quechers-LC-MS/MS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

Subcontracting partners:
1 - Eurofins Central Analytical Laboratories, LA

Respectfully Submitted,

Loreen Jones
Support Services Coordinator

Eurofins Scientific Inc. (Des Moines)

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Cargill CTS R&D

Varathan Vamadevan
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Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-026254-01

Client Code: QD0007539
PO Number: 4509200160

Received On: 04Feb2021
Reported On: 09Feb2021

Eurofins Sample Code:	464-2021-02041001	**Sample Registration Date:**	04Feb2021
Client Sample Code:	CP121020F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	corn protein	**Sample Reference:**	

QA902 - Sulfites (SO2) by Optimized Monier Williams Method	**Reference** AOAC 990.28	**Completed** 09Feb2021

Parameter	**Result**	**Theoretical**
Sulfites (SO2)	44.4 ppm	

Respectfully Submitted,

Andrew Vandeyacht
Technician Group Leader I

Eurofins Scientific Inc. (Des Moines)

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ENACClientServices@EurofinsUS.com

Cargill CTS R&D

Varathan Vamadevan
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Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-020663-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250603	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CP121420F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QD495 - Phytic Acid	**Reference**		**Completed**
	Analytical Biochemistry Vol. 77:536-539 (1977)		01Feb2021
Parameter	**Result**	**Theoretical**	
Phytic Acid	0.76 %		

QD06T - Cadmium (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Cadmium (Cd)	0.028 mg/kg		

QD06S - Lead (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Lead (Pb)	0.019 mg/kg		

QD06R - Mercury (Mwd-ICP-MS, Most Matrices)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Mercury (Hg)	<0.010 mg/kg		

QD06Q - Arsenic (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Arsenic (As)	0.018 mg/kg		

Cargill CTS R&D

Varathan Vamadevan
14800 28th Ave N.
Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-020663-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250603	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CP121420F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QA01P - Pesticides Quechers GC-MSMS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

QA01R - Pesticides Quechers-LC-MS/MS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

Subcontracting partners:
1 - Eurofins Central Analytical Laboratories, LA

Respectfully Submitted,

Loreen Jones
Support Services Coordinator

Eurofins Scientific Inc. (Des Moines)

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ENACClientServices@EurofinsUS.com

Cargill CTS R&D

Varathan Vamadevan
14800 28th Ave N.
Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-026252-01

Client Code: QD0007539
PO Number: 4509200160

Received On: 04Feb2021
Reported On: 09Feb2021

Eurofins Sample Code:	464-2021-02041003	**Sample Registration Date:**	04Feb2021
Client Sample Code:	CP121420F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	corn protein	**Sample Reference:**	

QA902 - Sulfites (SO2) by Optimized Monier Williams Method	**Reference** AOAC 990.28	**Completed** 09Feb2021

Parameter	**Result**	**Theoretical**
Sulfites (SO2)	52.7 ppm	

Respectfully Submitted,

Andrew Vandeyacht
Technician Group Leader I

Eurofins Scientific Inc. (Des Moines)

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ENACClientServices@EurofinsUS.com

Cargill CTS R&D

Varathan Vamadevan
14800 28th Ave N.
Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-020665-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250605	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CP121620F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QD495 - Phytic Acid	**Reference**		**Completed**
	Analytical Biochemistry Vol. 77:536-539 (1977)		01Feb2021
Parameter	**Result**	**Theoretical**	
Phytic Acid	0.81 %		

QD06T - Cadmium (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Cadmium (Cd)	0.029 mg/kg		

QD06S - Lead (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Lead (Pb)	0.021 mg/kg		

QD06R - Mercury (Mwd-ICP-MS, Most Matrices)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Mercury (Hg)	<0.010 mg/kg		

QD06Q - Arsenic (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Arsenic (As)	0.018 mg/kg		

Cargill CTS R&D

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ANALYTICAL REPORT

AR-21-QD-020665-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250605	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CP121620F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QA01P - Pesticides Quechers GC-MSMS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

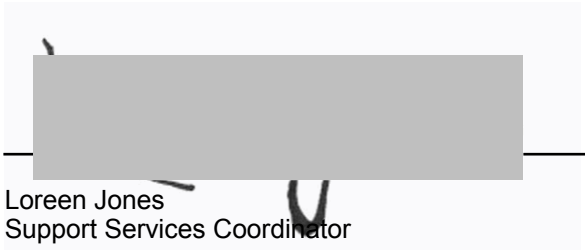
Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

QA01R - Pesticides Quechers-LC-MS/MS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

Subcontracting partners:
1 - Eurofins Central Analytical Laboratories, LA

Respectfully Submitted,



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Cargill CTS R&D

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ANALYTICAL REPORT

AR-21-QD-026250-01

Client Code: QD0007539
PO Number: 4509200160

Received On: 04Feb2021
Reported On: 09Feb2021

Eurofins Sample Code:	464-2021-02041005	**Sample Registration Date:**	04Feb2021
Client Sample Code:	CP121620F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	corn protein	**Sample Reference:**	

QA902 - Sulfites (SO2) by Optimized Monier Williams Method	**Reference** AOAC 990.28	**Completed** 09Feb2021

Parameter	**Result**	**Theoretical**
Sulfites (SO2)	53.8 ppm	

Respectfully Submitted,

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ANALYTICAL REPORT

AR-21-QD-020657-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250597	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CP120320F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QD495 - Phytic Acid	**Reference**		**Completed**
	Analytical Biochemistry Vol. 77:536-539 (1977)		01Feb2021
Parameter	**Result**	**Theoretical**	
Phytic Acid	0.78 %		

QD06T - Cadmium (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Cadmium (Cd)	0.031 mg/kg		

QD06S - Lead (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Lead (Pb)	0.030 mg/kg		

QD06R - Mercury (Mwd-ICP-MS, Most Matrices)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Mercury (Hg)	<0.010 mg/kg		

QD06Q - Arsenic (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Arsenic (As)	0.019 mg/kg		

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ANALYTICAL REPORT

AR-21-QD-020657-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250597	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CP120320F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QA01P - Pesticides Quechers GC-MSMS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

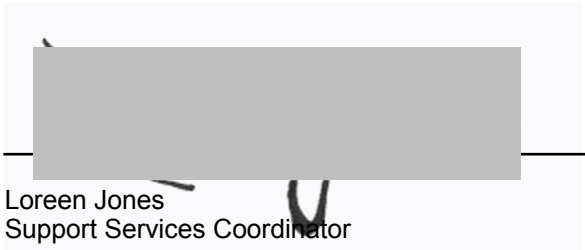
Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

QA01R - Pesticides Quechers-LC-MS/MS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

Subcontracting partners:
1 - Eurofins Central Analytical Laboratories, LA

Respectfully Submitted,



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ANALYTICAL REPORT

AR-21-QD-026258-01

Client Code: QD0007539
PO Number: 4509200160

Received On: 04Feb2021
Reported On: 09Feb2021

Eurofins Sample Code:	464-2021-02040977	**Sample Registration Date:**	04Feb2021
Client Sample Code:	CP120320F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	corn protein	**Sample Reference:**	

QA902 - Sulfites (SO2) by Optimized Monier Williams Method	**Reference** AOAC 990.28	**Completed** 09Feb2021

Parameter	**Result**	**Theoretical**
Sulfites (SO2)	51.0 ppm	

Respectfully Submitted,

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ANALYTICAL REPORT

AR-21-QD-020658-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250598	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CPC120720F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QD495 - Phytic Acid	**Reference**		**Completed**
	Analytical Biochemistry Vol. 77:536-539 (1977)		01Feb2021
Parameter	**Result**	**Theoretical**	
Phytic Acid	1.34 %		

QD06T - Cadmium (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Cadmium (Cd)	0.018 mg/kg		

QD06S - Lead (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Lead (Pb)	0.026 mg/kg		

QD06R - Mercury (Mwd-ICP-MS, Most Matrices)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Mercury (Hg)	<0.010 mg/kg		

QD06Q - Arsenic (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Arsenic (As)	0.015 mg/kg		

Cargill CTS R&D

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ANALYTICAL REPORT

AR-21-QD-020658-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250598	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CPC120720F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QA01P - Pesticides Quechers GC-MSMS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

QA01R - Pesticides Quechers-LC-MS/MS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

Subcontracting partners:
1 - Eurofins Central Analytical Laboratories, LA

Respectfully Submitted,

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ANALYTICAL REPORT

AR-21-QD-026257-01

Client Code: QD0007539
PO Number: 4509200160

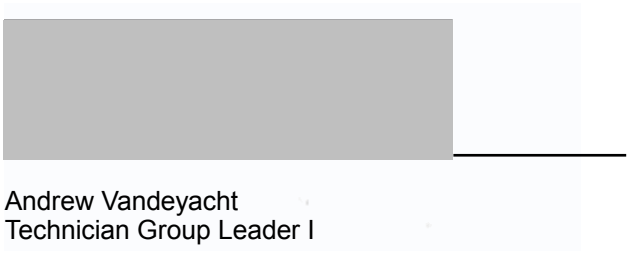
Received On: 04Feb2021
Reported On: 09Feb2021

Eurofins Sample Code:	464-2021-02040998	**Sample Registration Date:**	04Feb2021
Client Sample Code:	CPC120720F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	corn protein	**Sample Reference:**	

QA902 - Sulfites (SO2) by Optimized Monier Williams Method	**Reference** AOAC 990.28	**Completed** 09Feb2021

Parameter	**Result**	**Theoretical**
Sulfites (SO2)	26.3 ppm	

Respectfully Submitted,



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ANALYTICAL REPORT

AR-21-QD-020660-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250600	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CPC120920F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QD495 - Phytic Acid	**Reference**		**Completed**
	Analytical Biochemistry Vol. 77:536-539 (1977)		01Feb2021
Parameter	**Result**	**Theoretical**	
Phytic Acid	1.28 %		

QD06T - Cadmium (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Cadmium (Cd)	0.016 mg/kg		

QD06S - Lead (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Lead (Pb)	0.024 mg/kg		

QD06R - Mercury (Mwd-ICP-MS, Most Matrices)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Mercury (Hg)	<0.010 mg/kg		

QD06Q - Arsenic (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Arsenic (As)	0.011 mg/kg		

Cargill CTS R&D

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ANALYTICAL REPORT

AR-21-QD-020660-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250600	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CPC120920F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QA01P - Pesticides Quechers GC-MSMS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

QA01R - Pesticides Quechers-LC-MS/MS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

Subcontracting partners:
1 - Eurofins Central Analytical Laboratories, LA

Respectfully Submitted,

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ANALYTICAL REPORT

AR-21-QD-026255-01

Client Code: QD0007539
PO Number: 4509200160

Received On: 04Feb2021
Reported On: 09Feb2021

Eurofins Sample Code:	464-2021-02041000	**Sample Registration Date:**	04Feb2021
Client Sample Code:	CPC120920F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	corn protein	**Sample Reference:**	

QA902 - Sulfites (SO2) by Optimized Monier Williams Method	**Reference** AOAC 990.28	**Completed** 09Feb2021

Parameter	**Result**	**Theoretical**
Sulfites (SO2)	19.7 ppm	

Respectfully Submitted,

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Cargill CTS R&D

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ANALYTICAL REPORT

AR-21-QD-020662-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250602	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CPC121120F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QD495 - Phytic Acid	**Reference**		**Completed**
	Analytical Biochemistry Vol. 77:536-539 (1977)		01Feb2021
Parameter	**Result**	**Theoretical**	
Phytic Acid	1.31 %		

QD06T - Cadmium (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Cadmium (Cd)	0.020 mg/kg		

QD06S - Lead (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Lead (Pb)	0.023 mg/kg		

QD06R - Mercury (Mwd-ICP-MS, Most Matrices)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Mercury (Hg)	<0.010 mg/kg		

QD06Q - Arsenic (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Arsenic (As)	0.014 mg/kg		

Cargill CTS R&D

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ANALYTICAL REPORT

AR-21-QD-020662-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250602	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CPC121120F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QA01P - Pesticides Quechers GC-MSMS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

QA01R - Pesticides Quechers-LC-MS/MS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

Subcontracting partners:
1 - Eurofins Central Analytical Laboratories, LA

Respectfully Submitted,

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Cargill CTS R&D

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ANALYTICAL REPORT

AR-21-QD-026253-01

Client Code: QD0007539
PO Number: 4509200160

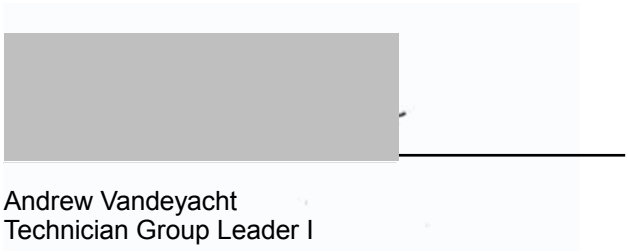
Received On: 04Feb2021
Reported On: 09Feb2021

Eurofins Sample Code:	464-2021-02041002	**Sample Registration Date:**	04Feb2021
Client Sample Code:	CPC121120F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	corn protein	**Sample Reference:**	

QA902 - Sulfites (SO2) by Optimized Monier Williams Method	**Reference** AOAC 990.28	**Completed** 09Feb2021

Parameter	**Result**	**Theoretical**
Sulfites (SO2)	20.8 ppm	

Respectfully Submitted,



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ANALYTICAL REPORT

AR-21-QD-020664-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250604	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CPC121520	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QD495 - Phytic Acid	**Reference**		**Completed**
	Analytical Biochemistry Vol. 77:536-539 (1977)		01Feb2021
Parameter	**Result**	**Theoretical**	
Phytic Acid	1.28 %		

QD06T - Cadmium (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Cadmium (Cd)	0.024 mg/kg		

QD06S - Lead (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Lead (Pb)	0.037 mg/kg		

QD06R - Mercury (Mwd-ICP-MS, Most Matrices)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Mercury (Hg)	<0.010 mg/kg		

QD06Q - Arsenic (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Arsenic (As)	0.013 mg/kg		

Cargill CTS R&D

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ANALYTICAL REPORT

AR-21-QD-020664-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250604	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CPC121520	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QA01P - Pesticides Quechers GC-MSMS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

QA01R - Pesticides Quechers-LC-MS/MS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

Subcontracting partners:
1 - Eurofins Central Analytical Laboratories, LA

Respectfully Submitted,

Loreen Jones
Support Services Coordinator

Eurofins Scientific Inc. (Des Moines)

Eurofins Scientific Inc. (Des Moines)

2200 Rittenhouse Street Suite 150
Des Moines, IA 50321
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ENACClientServices@EurofinsUS.com

Cargill CTS R&D

Varathan Vamadevan
14800 28th Ave N.
Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-026251-01

Client Code: QD0007539
PO Number: 4509200160

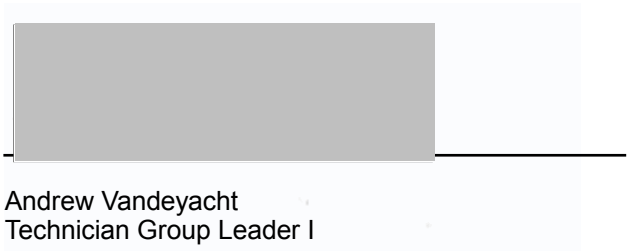
Received On: 04Feb2021
Reported On: 09Feb2021

Eurofins Sample Code:	464-2021-02041004	**Sample Registration Date:**	04Feb2021
Client Sample Code:	CPC121520F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	corn protein	**Sample Reference:**	

QA902 - Sulfites (SO2) by Optimized Monier Williams Method	**Reference** AOAC 990.28	**Completed** 09Feb2021

Parameter	**Result**	**Theoretical**
Sulfites (SO2)	23.0 ppm	

Respectfully Submitted,



Andrew Vandeyacht
Technician Group Leader I

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Cargill CTS R&D

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ANALYTICAL REPORT

AR-21-QD-020666-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250606	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CPC122120F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

495 - Phytic Acid	**Reference**		**Completed**
	Analytical Biochemistry Vol. 77:536-539 (1977)		01Feb2021
Parameter	**Result**	**Theoretical**	
Phytic Acid	1.30 %		

QD06T - Cadmium (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Cadmium (Cd)	0.021 mg/kg		

QD06S - Lead (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Lead (Pb)	0.021 mg/kg		

QD06R - Mercury (Mwd-ICP-MS, Most Matrices)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Mercury (Hg)	<0.010 mg/kg		

QD06Q - Arsenic (Mwd-ICP-MS)	**Reference**	**Accreditation**	**Completed**
	J. AOAC vol. 90 (2007) 844-856 (Mod)	ISO/IEC 17025:2017 A2LA 2927.01	02Feb2021
Parameter	**Result**	**Theoretical**	
Arsenic (As)	0.015 mg/kg		

Cargill CTS R&D

Varathan Vamadevan
14800 28th Ave N.
Plymouth, MN 55447

ANALYTICAL REPORT

AR-21-QD-020666-01

Client Code: QD0007539
PO Number: PO 4509200160

Received On: 25Jan2021
Reported On: 02Feb2021

Eurofins Sample Code:	464-2021-01250606	**Sample Registration Date:**	25Jan2021
Client Sample Code:	CPC122120F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	Corn Protein	**Sample Reference:**	

QA01P - Pesticides Quechers GC-MSMS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

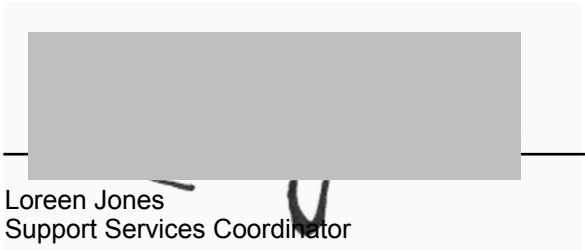
Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

QA01R - Pesticides Quechers-LC-MS/MS	**Reference**	**Accreditation**	**Completed**	**Sub**
	AOAC 2007.01	ISO/IEC 17025:2017 A2LA 2993.01	01Feb2021	1

Parameter	**Result**	**Theoretical**
Screened pesticides	Not Detected at LOQ	

Subcontracting partners:
1 - Eurofins Central Analytical Laboratories, LA

Respectfully Submitted,



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Cargill CTS R&D

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ANALYTICAL REPORT

AR-21-QD-026906-01

Client Code: QD0007539
PO Number: 4509200160

Received On: 04Feb2021
Reported On: 10Feb2021

Eurofins Sample Code:	464-2021-02041006	**Sample Registration Date:**	04Feb2021
Client Sample Code:	CPC122120F	**Condition Upon Receipt:**	acceptable, non-perishable
Sample Description:	corn protein	**Sample Reference:**	

QA902 - Sulfites (SO2) by Optimized Monier Williams Method	**Reference** AOAC 990.28	**Completed** 10Feb2021

Parameter	**Result**	**Theoretical**
Sulfites (SO2)	29.6 ppm	

Respectfully Submitted,

David Gross
Support Services Manager

Medallion Labs
www.medallionlabs.com 800-245-5615 info@medlabs.com

Order Number: **2021-000845**

Completed Date: 16-Feb-2021

Submitted Date: 27-Jan-2021

Submitter: Michael Porter

Company: Cargill

Company Address: 14800 28th Ave N
Plymouth, MN 55447

Results Email: michael_porter@cargill.com

Invoice Email: michael_porter@cargill.com

Purchase Order: 4509418367

Medallion Labs
www.medallionlabs.com 800-245-5615 info@medlabs.com

Order # Sample ID: 2021-000845-01 **Company:** Cargill

Customer Sample ID: CP120320F

Sample Description: corn protein

Analytical Testing

Method:	Component:	Result:	Test Date:
² Anthocyanin	Cyanidin-3-glucoside equivalents	<3.8 mg/kg	10-Feb-2021
Ash	Ash	1.087 %	04-Feb-2021
² Carotene	Source	Dietary	01-Feb-2021
	alpha carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	trans beta carotene (mcg RAE)	1.22 mcg/100 g	01-Feb-2021
	cis beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total beta Carotene (mcg RAE)	1.22 mcg/100 g	01-Feb-2021
	Total Carotene (mcg RAE)	1.22 mcg/100 g	01-Feb-2021
Cholesterol	Total Cholesterol	<1.0 mg/100g	03-Feb-2021
Fat (Gas Chromatography)	Total Fat	0.09 %	03-Feb-2021
	Saturated Fat	0.03 %	03-Feb-2021
	Monounsaturated Fat	0.02 %	03-Feb-2021
	cis-cis Polyunsaturated Fat	0.04 %	03-Feb-2021
	trans Fat	<LOQ %	03-Feb-2021
² Fiber (AOAC 2001.03 & AOAC 991.43)	Insoluble Dietary Fiber	3.6 %	11-Feb-2021
	Soluble Dietary Fiber Gravimetric	<0.2 %	11-Feb-2021
	Soluble Dietary Fiber HPLC	0.0 %	11-Feb-2021
	Soluble Dietary Fiber Total	<0.2 %	11-Feb-2021
	Total Dietary Fiber	3.6 %	11-Feb-2021
Metals (ICP-OES)	Calcium	299 mg/100g	02-Feb-2021
Metals (ICP-OES)	Iron	6.42 mg/100g	02-Feb-2021
Metals (ICP-OES)	Potassium	23.0 mg/100g	02-Feb-2021

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² This test is not considered in-scope of our current A2LA accreditation. For a listing of in-scope tests, please visit www.medallionlabs.com.

Medallion Labs
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Order # Sample ID:	2021-000845-01	**Company:**	Cargill
Customer Sample ID:	CP120320F		
Sample Description:	corn protein		

Analytical Testing

Method:	Component:	Result:	Test Date:
Metals (ICP-OES)	Sodium	34.6 mg/100g	02-Feb-2021
[2] Total Polyphenols	Total Polyphenols	<491 mg/kg	10-Feb-2021
[2] Total Starch	Total Starch	1.7 %	04-Feb-2021
Vitamin B3 (Niacin)	Vitamin B3 (Niacin)	3.018 mg/100g	05-Feb-2021
Vitamin D	Vitamin D3	<0.500 mcg/100 g	09-Feb-2021

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Order # Sample ID: 2021-000845-02 **Company:** Cargill
Customer Sample ID: CPC120720F
Sample Description: corn protein

Analytical Testing

Method:	Component:	Result:	Test Date:
² Anthocyanin	Cyanidin-3-glucoside equivalents	<3.8 mg/kg	10-Feb-2021
Ash	Ash	1.521 %	04-Feb-2021
² Carotene	Source	Dietary	01-Feb-2021
	alpha carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	trans beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	cis beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total beta Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
Cholesterol	Total Cholesterol	<1.0 mg/100g	03-Feb-2021
Fat (Gas Chromatography)	Total Fat	0.14 %	03-Feb-2021
	Saturated Fat	0.05 %	03-Feb-2021
	Monounsaturated Fat	0.03 %	03-Feb-2021
	cis-cis Polyunsaturated Fat	0.06 %	03-Feb-2021
	trans Fat	<LOQ %	03-Feb-2021
² Fiber (AOAC 2001.03 & AOAC 991.43)	Insoluble Dietary Fiber	3.0 %	11-Feb-2021
	Soluble Dietary Fiber Gravimetric	<0.2 %	11-Feb-2021
	Soluble Dietary Fiber HPLC	0.1 %	11-Feb-2021
	Soluble Dietary Fiber Total	<0.2 %	11-Feb-2021
	Total Dietary Fiber	3.0 %	11-Feb-2021
Metals (ICP-OES)	Calcium	323 mg/100g	02-Feb-2021
Metals (ICP-OES)	Iron	11.8 mg/100g	02-Feb-2021
Metals (ICP-OES)	Potassium	20.6 mg/100g	02-Feb-2021

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Order # Sample ID:	2021-000845-02	**Company:**	Cargill
Customer Sample ID:	CPC120720F		
Sample Description:	corn protein		

Analytical Testing

Method:	Component:	Result:	Test Date:
Metals (ICP-OES)	Sodium	48.6 mg/100g	02-Feb-2021
[2] Total Polyphenols	Total Polyphenols	<491 mg/kg	10-Feb-2021
[2] Total Starch	Total Starch	22.1 %	04-Feb-2021
Vitamin B3 (Niacin)	Vitamin B3 (Niacin)	4.016 mg/100g	05-Feb-2021
Vitamin D	Vitamin D3	<0.500 mcg/100 g	09-Feb-2021

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Order # Sample ID: 2021-000845-03 **Company:** Cargill

Customer Sample ID: CP120820F

Sample Description: corn protein

Analytical Testing

Method:	Component:	Result:	Test Date:
² Anthocyanin	Cyanidin-3-glucoside equivalents	25.0 mg/kg	10-Feb-2021
Ash	Ash	1.098 %	04-Feb-2021
² Carotene	Source	Dietary	01-Feb-2021
	alpha carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	trans beta carotene (mcg RAE)	1.27 mcg/100 g	01-Feb-2021
	cis beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total beta Carotene (mcg RAE)	1.27 mcg/100 g	01-Feb-2021
	Total Carotene (mcg RAE)	1.27 mcg/100 g	01-Feb-2021
Cholesterol	Total Cholesterol	<1.0 mg/100g	03-Feb-2021
Fat (Gas Chromatography)	Total Fat	0.08 %	03-Feb-2021
	Saturated Fat	0.02 %	03-Feb-2021
	Monounsaturated Fat	0.02 %	03-Feb-2021
	cis-cis Polyunsaturated Fat	0.04 %	03-Feb-2021
	trans Fat	<LOQ %	03-Feb-2021
² Fiber (AOAC 2001.03 & AOAC 991.43)	Insoluble Dietary Fiber	4.0 %	11-Feb-2021
	Soluble Dietary Fiber Gravimetric	<0.2 %	11-Feb-2021
	Soluble Dietary Fiber HPLC	0.0 %	11-Feb-2021
	Soluble Dietary Fiber Total	<0.2 %	11-Feb-2021
	Total Dietary Fiber	4.0 %	11-Feb-2021
Metals (ICP-OES)	Calcium	271 mg/100g	02-Feb-2021
Metals (ICP-OES)	Iron	5.15 mg/100g	02-Feb-2021
Metals (ICP-OES)	Potassium	23.2 mg/100g	02-Feb-2021

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Order # Sample ID:	2021-000845-03	**Company:**	Cargill
Customer Sample ID:	CP120820F		
Sample Description:	corn protein		

Analytical Testing

Method:	Component:	Result:	Test Date:
Metals (ICP-OES)	Sodium	47.8 mg/100g	02-Feb-2021
[2] Total Polyphenols	Total Polyphenols	<491 mg/kg	10-Feb-2021
[2] Total Starch	Total Starch	2.1 %	04-Feb-2021
Vitamin B3 (Niacin)	Vitamin B3 (Niacin)	4.072 mg/100g	05-Feb-2021
Vitamin D	Vitamin D3	<0.500 mcg/100 g	09-Feb-2021

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Order # Sample ID: 2021-000845-04 **Company:** Cargill
Customer Sample ID: CPC120920F
Sample Description: corn protein

Analytical Testing

Method:	Component:	Result:	Test Date:
² Anthocyanin	Cyanidin-3-glucoside equivalents	<3.8 mg/kg	10-Feb-2021
Ash	Ash	1.533 %	04-Feb-2021
² Carotene	Source	Dietary	01-Feb-2021
	alpha carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	trans beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	cis beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total beta Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
Cholesterol	Total Cholesterol	<1.0 mg/100g	03-Feb-2021
Fat (Gas Chromatography)	Total Fat	0.17 %	03-Feb-2021
	Saturated Fat	0.06 %	03-Feb-2021
	Monounsaturated Fat	0.04 %	03-Feb-2021
	cis-cis Polyunsaturated Fat	0.07 %	03-Feb-2021
	trans Fat	<LOQ %	03-Feb-2021
² Fiber (AOAC 2001.03 & AOAC 991.43)	Insoluble Dietary Fiber	3.3 %	16-Feb-2021
	Soluble Dietary Fiber Gravimetric	1.1 %	16-Feb-2021
	Soluble Dietary Fiber HPLC	0.1 %	16-Feb-2021
	Soluble Dietary Fiber Total	1.2 %	16-Feb-2021
	Total Dietary Fiber	4.5 %	16-Feb-2021
Metals (ICP-OES)	Calcium	323 mg/100g	02-Feb-2021
Metals (ICP-OES)	Iron	11.1 mg/100g	02-Feb-2021
Metals (ICP-OES)	Potassium	21.7 mg/100g	02-Feb-2021

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Order # Sample ID:	2021-000845-04	**Company:**	Cargill
Customer Sample ID:	CPC120920F		
Sample Description:	corn protein		

Analytical Testing

Method:	Component:	Result:	Test Date:
Metals (ICP-OES)	Sodium	70.1 mg/100g	02-Feb-2021
[2] Total Polyphenols	Total Polyphenols	<491 mg/kg	10-Feb-2021
[2] Total Starch	Total Starch	22.8 %	04-Feb-2021
Vitamin B3 (Niacin)	Vitamin B3 (Niacin)	3.873 mg/100g	05-Feb-2021
Vitamin D	Vitamin D3	<0.500 mcg/100 g	09-Feb-2021

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Order # Sample ID: 2021-000845-05 **Company:** Cargill
Customer Sample ID: CP121020F
Sample Description: corn protein

Analytical Testing

Method:	Component:	Result:	Test Date:
² Anthocyanin	Cyanidin-3-glucoside equivalents	<3.8 mg/kg	10-Feb-2021
Ash	Ash	1.125 %	04-Feb-2021
² Carotene	Source	Dietary	01-Feb-2021
	alpha carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	trans beta carotene (mcg RAE)	1.34 mcg/100 g	01-Feb-2021
	cis beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total beta Carotene (mcg RAE)	1.34 mcg/100 g	01-Feb-2021
	Total Carotene (mcg RAE)	1.34 mcg/100 g	01-Feb-2021
Cholesterol	Total Cholesterol	<1.0 mg/100g	03-Feb-2021
Fat (Gas Chromatography)	Total Fat	0.08 %	03-Feb-2021
	Saturated Fat	0.02 %	03-Feb-2021
	Monounsaturated Fat	0.02 %	03-Feb-2021
	cis-cis Polyunsaturated Fat	0.04 %	03-Feb-2021
	trans Fat	<LOQ %	03-Feb-2021
² Fiber (AOAC 2001.03 & AOAC 991.43)	Insoluble Dietary Fiber	4.2 %	11-Feb-2021
	Soluble Dietary Fiber Gravimetric	<0.2 %	11-Feb-2021
	Soluble Dietary Fiber HPLC	0.0 %	11-Feb-2021
	Soluble Dietary Fiber Total	<0.2 %	11-Feb-2021
	Total Dietary Fiber	4.2 %	11-Feb-2021
Metals (ICP-OES)	Calcium	283 mg/100g	02-Feb-2021
Metals (ICP-OES)	Iron	5.78 mg/100g	02-Feb-2021
Metals (ICP-OES)	Potassium	17.5 mg/100g	02-Feb-2021

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Medallion Labs
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Order # Sample ID:	2021-000845-05	**Company:**	Cargill
Customer Sample ID:	CP121020F		
Sample Description:	corn protein		

Analytical Testing

Method:	Component:	Result:	Test Date:
Metals (ICP-OES)	Sodium	23.4 mg/100g	02-Feb-2021
[2] Total Polyphenols	Total Polyphenols	<491 mg/kg	10-Feb-2021
[2] Total Starch	Total Starch	2.2 %	04-Feb-2021
Vitamin B3 (Niacin)	Vitamin B3 (Niacin)	3.765 mg/100g	05-Feb-2021
Vitamin D	Vitamin D3	<0.500 mcg/100 g	09-Feb-2021

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Order # Sample ID: 2021-000845-06 **Company:** Cargill

Customer Sample ID: CPC121120F

Sample Description: corn protein

Analytical Testing

Method:	Component:	Result:	Test Date:
² Anthocyanin	Cyanidin-3-glucoside equivalents	<3.8 mg/kg	10-Feb-2021
Ash	Ash	1.553 %	04-Feb-2021
² Carotene	Source	Dietary	01-Feb-2021
	alpha carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	trans beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	cis beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total beta Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
Cholesterol	Total Cholesterol	<1.0 mg/100g	03-Feb-2021
Fat (Gas Chromatography)	Total Fat	0.14 %	03-Feb-2021
	Saturated Fat	0.05 %	03-Feb-2021
	Monounsaturated Fat	0.03 %	03-Feb-2021
	cis-cis Polyunsaturated Fat	0.06 %	03-Feb-2021
	trans Fat	<LOQ %	03-Feb-2021
² Fiber (AOAC 2001.03 & AOAC 991.43)	Insoluble Dietary Fiber	3.1 %	11-Feb-2021
	Soluble Dietary Fiber Gravimetric	<0.2 %	11-Feb-2021
	Soluble Dietary Fiber HPLC	0.1 %	11-Feb-2021
	Soluble Dietary Fiber Total	<0.2 %	11-Feb-2021
	Total Dietary Fiber	3.1 %	11-Feb-2021
Metals (ICP-OES)	Calcium	314 mg/100g	02-Feb-2021
Metals (ICP-OES)	Iron	12.2 mg/100g	02-Feb-2021
Metals (ICP-OES)	Potassium	21.3 mg/100g	02-Feb-2021

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Order # Sample ID:	2021-000845-06	**Company:**	Cargill
Customer Sample ID:	CPC121120F		
Sample Description:	corn protein		

Analytical Testing

Method:	Component:	Result:	Test Date:
Metals (ICP-OES)	Sodium	54.1 mg/100g	02-Feb-2021
[2] Total Polyphenols	Total Polyphenols	<491 mg/kg	10-Feb-2021
[2] Total Starch	Total Starch	22.8 %	04-Feb-2021
Vitamin B3 (Niacin)	Vitamin B3 (Niacin)	3.511 mg/100g	05-Feb-2021
Vitamin D	Vitamin D3	<0.500 mcg/100 g	09-Feb-2021

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Order # Sample ID: 2021-000845-07 **Company:** Cargill

Customer Sample ID: CP121420F

Sample Description: corn protein

Analytical Testing

Method:	Component:	Result:	Test Date:
² Anthocyanin	Cyanidin-3-glucoside equivalents	<3.8 mg/kg	10-Feb-2021
Ash	Ash	1.074 %	04-Feb-2021
² Carotene	Source	Dietary	01-Feb-2021
	alpha carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	trans beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	cis beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total beta Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
Cholesterol	Total Cholesterol	<1.0 mg/100g	03-Feb-2021
Fat (Gas Chromatography)	Total Fat	0.06 %	03-Feb-2021
	Saturated Fat	0.02 %	03-Feb-2021
	Monounsaturated Fat	0.01 %	03-Feb-2021
	cis-cis Polyunsaturated Fat	0.03 %	03-Feb-2021
	trans Fat	<LOQ %	03-Feb-2021
² Fiber (AOAC 2001.03 & AOAC 991.43)	Insoluble Dietary Fiber	5.5 %	11-Feb-2021
	Soluble Dietary Fiber Gravimetric	<0.2 %	11-Feb-2021
	Soluble Dietary Fiber HPLC	0.0 %	11-Feb-2021
	Soluble Dietary Fiber Total	<0.2 %	11-Feb-2021
	Total Dietary Fiber	5.5 %	11-Feb-2021
Metals (ICP-OES)	Calcium	272 mg/100g	02-Feb-2021
Metals (ICP-OES)	Iron	5.26 mg/100g	02-Feb-2021
Metals (ICP-OES)	Potassium	21.9 mg/100g	02-Feb-2021

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Order # Sample ID:	2021-000845-07	**Company:**	Cargill
Customer Sample ID:	CP121420F		
Sample Description:	corn protein		

Analytical Testing

Method:	Component:	Result:	Test Date:
Metals (ICP-OES)	Sodium	26.9 mg/100g	02-Feb-2021
[2] Total Polyphenols	Total Polyphenols	<491 mg/kg	10-Feb-2021
[2] Total Starch	Total Starch	2.9 %	04-Feb-2021
Vitamin B3 (Niacin)	Vitamin B3 (Niacin)	3.882 mg/100g	05-Feb-2021
Vitamin D	Vitamin D3	<0.500 mcg/100 g	09-Feb-2021

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Order # Sample ID: 2021-000845-08 **Company:** Cargill

Customer Sample ID: CPC121520

Sample Description: corn protein

Analytical Testing

Method:	Component:	Result:	Test Date:
² Anthocyanin	Cyanidin-3-glucoside equivalents	<3.8 mg/kg	10-Feb-2021
Ash	Ash	1.515 %	04-Feb-2021
² Carotene	Source	Dietary	01-Feb-2021
	alpha carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	trans beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	cis beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total beta Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
Cholesterol	Total Cholesterol	<1.0 mg/100g	03-Feb-2021
Fat (Gas Chromatography)	Total Fat	0.18 %	03-Feb-2021
	Saturated Fat	0.06 %	03-Feb-2021
	Monounsaturated Fat	0.03 %	03-Feb-2021
	cis-cis Polyunsaturated Fat	0.07 %	03-Feb-2021
	trans Fat	<LOQ %	03-Feb-2021
² Fiber (AOAC 2001.03 & AOAC 991.43)	Insoluble Dietary Fiber	3.0 %	16-Feb-2021
	Soluble Dietary Fiber Gravimetric	1.1 %	16-Feb-2021
	Soluble Dietary Fiber HPLC	0.2 %	16-Feb-2021
	Soluble Dietary Fiber Total	1.3 %	16-Feb-2021
	Total Dietary Fiber	4.3 %	16-Feb-2021
Metals (ICP-OES)	Calcium	327 mg/100g	02-Feb-2021
Metals (ICP-OES)	Iron	12.6 mg/100g	02-Feb-2021
Metals (ICP-OES)	Potassium	21.7 mg/100g	02-Feb-2021

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Order # Sample ID:	2021-000845-08	**Company:**	Cargill
Customer Sample ID:	CPC121520		
Sample Description:	corn protein		

Analytical Testing

Method:	Component:	Result:	Test Date:
Metals (ICP-OES)	Sodium	48.8 mg/100g	02-Feb-2021
[2] Total Polyphenols	Total Polyphenols	<491 mg/kg	10-Feb-2021
[2] Total Starch	Total Starch	23.6 %	04-Feb-2021
Vitamin B3 (Niacin)	Vitamin B3 (Niacin)	3.745 mg/100g	05-Feb-2021
Vitamin D	Vitamin D3	<0.500 mcg/100 g	09-Feb-2021

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Order # Sample ID: 2021-000845-09 **Company:** Cargill

Customer Sample ID: CP121620F

Sample Description: corn protein

Analytical Testing

Method:	Component:	Result:	Test Date:
² Anthocyanin	Cyanidin-3-glucoside equivalents	<3.8 mg/kg	10-Feb-2021
Ash	Ash	1.133 %	04-Feb-2021
² Carotene	Source	Dietary	01-Feb-2021
	alpha carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	trans beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	cis beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total beta Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
Cholesterol	Total Cholesterol	<1.0 mg/100g	03-Feb-2021
Fat (Gas Chromatography)	Total Fat	0.07 %	03-Feb-2021
	Saturated Fat	0.02 %	03-Feb-2021
	Monounsaturated Fat	0.02 %	03-Feb-2021
	cis-cis Polyunsaturated Fat	0.03 %	03-Feb-2021
	trans Fat	<LOQ %	03-Feb-2021
² Fiber (AOAC 2001.03 & AOAC 991.43)	Insoluble Dietary Fiber	5.2 %	11-Feb-2021
	Soluble Dietary Fiber Gravimetric	<0.2 %	11-Feb-2021
	Soluble Dietary Fiber HPLC	0.0 %	11-Feb-2021
	Soluble Dietary Fiber Total	<0.2 %	11-Feb-2021
	Total Dietary Fiber	5.2 %	11-Feb-2021
Metals (ICP-OES)	Calcium	296 mg/100g	02-Feb-2021
Metals (ICP-OES)	Iron	6.18 mg/100g	02-Feb-2021
Metals (ICP-OES)	Potassium	22.0 mg/100g	02-Feb-2021

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Order # Sample ID:	2021-000845-09	**Company:**	Cargill
Customer Sample ID:	CP121620F		
Sample Description:	corn protein		

Analytical Testing

Method:	Component:	Result:	Test Date:
Metals (ICP-OES)	Sodium	31.8 mg/100g	02-Feb-2021
[2] Total Polyphenols	Total Polyphenols	<491 mg/kg	10-Feb-2021
[2] Total Starch	Total Starch	2.6 %	04-Feb-2021
Vitamin B3 (Niacin)	Vitamin B3 (Niacin)	3.554 mg/100g	05-Feb-2021
Vitamin D	Vitamin D3	<0.500 mcg/100 g	09-Feb-2021

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Order # Sample ID: 2021-000845-10 **Company:** Cargill

Customer Sample ID: CPC122120F

Sample Description: corn protein

Analytical Testing

Method:	Component:	Result:	Test Date:
² Anthocyanin	Cyanidin-3-glucoside equivalents	<3.8 mg/kg	10-Feb-2021
Ash	Ash	1.552 %	04-Feb-2021
² Carotene	Source	Dietary	01-Feb-2021
	alpha carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	trans beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	cis beta carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total beta Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
	Total Carotene (mcg RAE)	<0.0250 mcg/100 g	01-Feb-2021
Cholesterol	Total Cholesterol	<1.0 mg/100g	03-Feb-2021
Fat (Gas Chromatography)	Total Fat	0.12 %	03-Feb-2021
	Saturated Fat	0.05 %	03-Feb-2021
	Monounsaturated Fat	0.02 %	03-Feb-2021
	cis-cis Polyunsaturated Fat	0.05 %	03-Feb-2021
	trans Fat	<LOQ %	03-Feb-2021
² Fiber (AOAC 2001.03 & AOAC 991.43)	Insoluble Dietary Fiber	2.9 %	16-Feb-2021
	Soluble Dietary Fiber Gravimetric	1.0 %	16-Feb-2021
	Soluble Dietary Fiber HPLC	0.2 %	16-Feb-2021
	Soluble Dietary Fiber Total	1.2 %	16-Feb-2021
	Total Dietary Fiber	4.1 %	16-Feb-2021
Metals (ICP-OES)	Calcium	338 mg/100g	02-Feb-2021
Metals (ICP-OES)	Iron	12.5 mg/100g	02-Feb-2021
Metals (ICP-OES)	Potassium	18.8 mg/100g	02-Feb-2021

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Order # Sample ID: 2021-000845-10 **Company:** Cargill

Customer Sample ID: CPC122120F

Sample Description: corn protein

Analytical Testing

Method:	Component:	Result:	Test Date:
Metals (ICP-OES)	Sodium	43.2 mg/100g	02-Feb-2021
[2] Total Polyphenols	Total Polyphenols	<491 mg/kg	10-Feb-2021
[2] Total Starch	Total Starch	22.2 %	04-Feb-2021
Vitamin B3 (Niacin)	Vitamin B3 (Niacin)	3.429 mg/100g	05-Feb-2021
Vitamin D	Vitamin D3	<0.500 mcg/100 g	09-Feb-2021

Results Approved By: Steven Murray
(Authorized Reviewer)

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Analytical Method References:

Method Name	Method Reference
Anthocyanin	AOAC 2005.02*
Ash	AOAC: 923.03*
Carotene	AOAC 2005.07*
Cholesterol	AOAC: 976.26*
Fat (Gas Chromatography)	AOAC: 996.06*
Fiber (AOAC 2001.03 & AOAC 991.43)	AOAC 2001.03*, 991.43*
Metals (ICP-OES)	AOAC: 975.03*, 985.01*, 984.27*, 2011.14*
Total Polyphenols	Miletic et al (2012) Phenolic Content of Plum AJCS 6 (4) 681-687*
Total Starch	AOAC 979.10*, AACC 76-11*
Vitamin B3 (Niacin)	AOAC: 944.13*, 960.46*
Vitamin D	AOAC 995.05*, 992.26*, 2002.05*, Journal of AOAC Int vol 95, No. 3, 2012

* This method has been modified.

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Proximate analysis conducted internally at Cargill

	LOD	Carbohydrates (g/kg)						Carbohydrates (g/kg) on d.b.					
Sample ID	Loss on drying (%) (<=8%)	DP4+	DP3	MT	Dx	Fx	Total	DP3+	DP3	MT	Dx	Fx	Total
CP120320F	4.42	1.6	0.3	0.2	0.2	0.2	2.4	1.6	0.3	0.2	0.2	0.2	2.5
CPC120720F	5.16	0.3	0.1	0.0	0.0	0.0	0.5	0.3	0.1	0.0	0.0	0.0	0.5
CP120820F	4.97	2.6	0.3	0.2	0.2	0.2	3.7	2.7	0.4	0.2	0.3	0.3	3.8
CPC120920F	5.18		1.0	0.1	0.2	0.2	1.5	0.0	1.1	0.1	0.2	0.2	1.6
CP121020F	4.46	1.3	0.3	0.2	0.2	0.2	2.1	1.3	0.3	0.2	0.2	0.2	2.2
CPC121120F	5.09		0.7	0.1	0.2	0.2	1.2	0.0	0.7	0.1	0.2	0.2	1.2
CP121420F	4.54	3.0	0.5	0.2	0.2	0.3	4.2	3.2	0.5	0.3	0.3	0.3	4.4
CPC121520F	4.84		0.9	0.2	0.2	0.2	1.6	0.0	1.0	0.2	0.2	0.2	1.6
CP121620F	3.86	2.0	0.3	0.2	0.2	0.3	3.0	2.2	0.3	0.2	0.2	0.3	3.2
CPC122120F	5.34	0.4	0.4	0.1	0.2	0.2	1.4	0.4	0.4	0.2	0.2	0.2	1.5

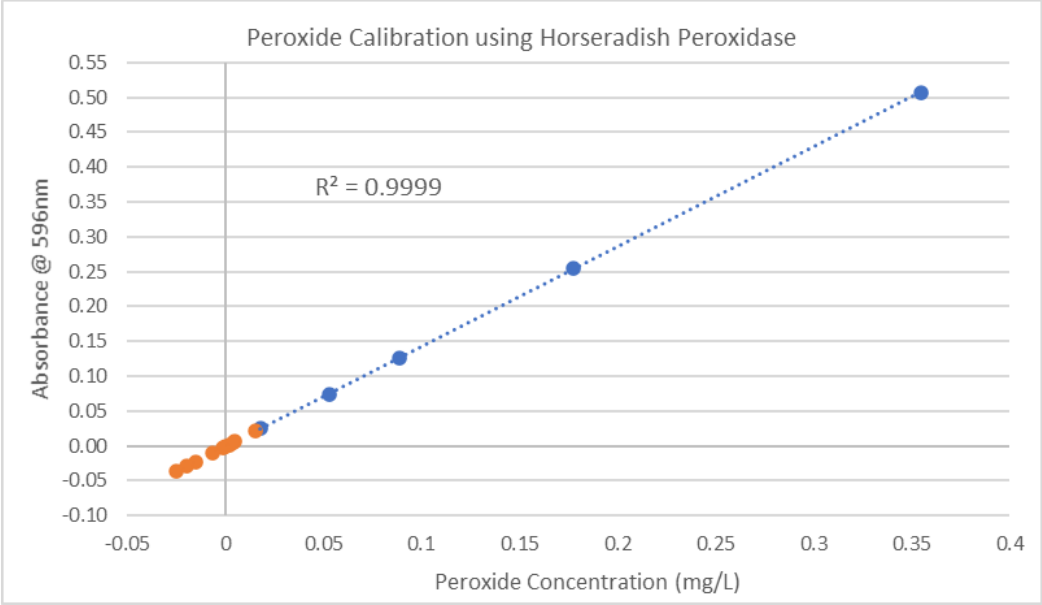
Organic Acids (g/Kg)								Organic Acids (g/Kg) on d.b.						
Citric	Succinic	Lactate	Glycerol	Acetate	Propionic	Total	EtOH (<60)	Citric	Succinic	Lactate	Glycerol	Acetate	Propionic*	Total
0.2	0.0	0.7	0.0	0.0	0.0	0.9	2.8	0.2	0.0	0.7	0.0	0.0	0.0	1.0
0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.6	0.0	0.0	0.1	0.0	0.0	0.0	0.2
0.3	0.1	0.5	0.1	0.0	0.0	1.0	0.1	0.3	0.2	0.6	0.1	0.0	0.0	1.1
0.2	0.1	0.2	0.1	0.0	0.0	0.7	2.5	0.2	0.1	0.3	0.1	0.0	0.0	0.7
0.2	0.1	0.4	0.1	0.0	0.0	0.8	0.4	0.2	0.1	0.4	0.1	0.0	0.0	0.9
0.2	0.1	0.3	0.1	0.0	0.0	0.6	7.0	0.2	0.1	0.3	0.1	0.0	0.0	0.7
0.3	0.2	0.6	0.1	0.0	0.1	1.2	0.0	0.3	0.2	0.6	0.1	0.0	0.1	1.3
0.2	0.1	0.3	0.1	0.0	0.1	0.7	0.0	0.3	0.1	0.3	0.1	0.0	0.1	0.8
0.3	0.2	0.6	0.1	0.0	0.0	1.1	0.0	0.3	0.2	0.6	0.1	0.0	0.0	1.2
0.2	0.1	0.3	0.1	0.0	0.1	0.7	0.0	0.2	0.1	0.3	0.1	0.0	0.1	0.8

	Ground				
CPI ID	%M.C.	Protein a	Protein d	%oil asis	%oil db
CP120320F	4.42	90.65	94.8	0.02	0.02
CPC120720F	5.16	69.25	73.0	0.04	0.04
CP120820F	4.97	89.65	94.3	0.07	0.07
CPC120920F	5.18	68.30	72.0	0.04	0.05
CP121020F	4.46	90.55	94.8	0.05	0.06
CPC121120F	5.09	67.85	71.5	0.00	0.00
CP121420F	4.54	90.05	94.3	0.04	0.04
CPC121520F	4.84	68.73	72.2	0.00	0.00
CP121620F	3.86	91.40	95.1	0.06	0.06
CPC122120F	5.34	69.78	73.7	0.03	0.03

Residual hydrogen peroxide

This method of analysis involved use of horseradish peroxidase to oxidize leuco-crystal violet in the presence of peroxide (Chin, H.S. and Cortes, A., Determination of Hydrogen Peroxide: A Comparison Between the Potentiometric Titration Method and an Enzyme Catalyzed Procedure", Unpublished Draft, National Food Processors Assn., 1950 Sixth Street, Berkeley, CA 94710, 1982, a s described in https://www.h2o2.com/technical-library/analytical-methods/default.aspx?pid=73&name=Peroxidase-Enzyme). A standard curve of peroxidase was linear down to 0.01 mg/L (see Figure 1).

Figure 1: Calibration of hydrogen peroxide standards as analyzed using horseradish peroxidase and leuco crystal violet. Calibration standard values are shown in blue and sample absorbances are shown in orange



Sample results using this method were all below the LOQ of 0.01mg/L (see Table 1). When hydrogen peroxide was spiked into the corn protein assay, approximately 80% of the added peroxide was detected (see Table 2) implying that, again, a component in the protein was capable of reducing some residual peroxide.

Table 1: Peroxide results for CP and CPC samples using horseradish peroxidase and leuco crystal violet

Sample	Abs @596nm	Sample Conc (mg/kg)
CP120820F	-0.023	<LOQ
CP121420F	-0.01	<LOQ
CP121020F	0.002	<LOQ
CP121620F	-0.029	<LOQ
CP120320F	-0.001	<LOQ
CPC122120F	0.021	<LOQ
CPC121520F	-0.003	<LOQ
CPC120920F	0.006	<LOQ
CPC120720F	-0.037	<LOQ
CPC121120F	0.005	<LOQ

Table 2: Recovery of spiked peroxide in sample matrix using horseradish peroxidase and leuco crystal violet

Replicate	Spike conc. (mg/L)	Measured Conc. (mg/L)	Recovery (%)
1	0.0899	0.0710	78.9
2	0.0899	0.0741	82.3

The enzymatic method is both more sensitive and more selective. In order to demonstrate the very low concentration (or absence) of residual hydrogen peroxide, we suspended corn protein in a volume of water just sufficient to leave a “free water” fraction after protein swelling. Thus, the extract is at the practical upper limit of concentration before entering analysis. The combination of high extraction ratio extracts, selectivity of the enzyme assay, and general marginal detection of peroxide in either method leads us to conclude that the residual peroxide concentration is generally below the limit of quantitation and often below the limit of detection.

Appendix 2. Pesticide Screening Methodology and Analytes

Tests and packages

PQA0E-1 Pesticides- Quechers for Fruits and Vegetables

Applied on Most fruits and vegetables

Time 8 days

Quantity of sample Optimal 1000 g Minimal 200 g

Content - Pesticides Quechers GC-MSMS [QA01P-1*] AOAC 2007.01

Acephate(LOQ 0.01mg/kg); Acetochlor(LOQ 0.01mg/kg); Aclonifen(LOQ 0.01mg/kg); Acrinathrin(LOQ 0.01mg/kg); Aldrin(LOQ 0.01mg/kg); Allethrin(LOQ 0.05mg/kg); Ametryn(LOQ 0.01mg/kg); Atrazine(LOQ 0.01mg/kg); Azaconazole(LOQ 0.01mg/kg); Captan(LOQ 0.02mg/kg); Azinphos-ethyl (Ethyl Guthion)(LOQ 0.01mg/kg); Azinphos-methyl(LOQ 0.01mg/kg); Benalaxyl(LOQ 0.01mg/kg); Benfluralin(LOQ 0.01mg/kg); Bifenox(LOQ 0.01mg/kg); Bifenthrin(LOQ 0.01mg/kg); Bromacil(LOQ 0.01mg/kg); Bromocyclen(LOQ 0.01mg/kg); Bromophos(LOQ 0.01mg/kg); Bromophos-ethyl(LOQ 0.01mg/kg); Bromopropylate(LOQ 0.01mg/kg); Butachlor(LOQ 0.01mg/kg); Butafenacil(LOQ 0.01mg/kg); Butylate(LOQ 0.01mg/kg); Cadusaphos(LOQ 0.01mg/kg); Captafol(LOQ 0.02mg/kg); Carbetamide(LOQ 0.01mg/kg); Carbophenothion(LOQ 0.01mg/kg); Carbophenothion-methyl(LOQ 0.01mg/kg); Chlordane, cis-(LOQ 0.01mg/kg); Chlordane, oxy-(LOQ 0.01mg/kg); Chlordane, trans-(LOQ 0.01mg/kg); Chlordene, beta(LOQ 0.01mg/kg); Chlordene, gamma-(LOQ 0.01mg/kg); Chlordimeform(LOQ 0.01mg/kg); Chlorethoxyfos(LOQ 0.01mg/kg); Chlorfenapyr(LOQ 0.01mg/kg); Chlorfenson(LOQ 0.01mg/kg); Chlorobenzilate(LOQ 0.01mg/kg); Chloroneb(LOQ 0.01mg/kg); Chloropropylate(LOQ 0.01mg/kg); Chlorothalonil(LOQ 0.01mg/kg); Chlorpropham (CIPC)(LOQ 0.01mg/kg); Chlorpyrifos(LOQ 0.01mg/kg); Chlorpyrifos-methyl(LOQ 0.01mg/kg); Chlorthal-dimethyl(LOQ 0.01mg/kg); Chlorthiofos(LOQ 0.01mg/kg); Chlorthion(LOQ 0.01mg/kg); Chlozolinate(LOQ 0.01mg/kg); Coumaphos(LOQ 0.01mg/kg); Cloquintocet-mexyl(LOQ 0.01mg/kg); Crimidine(LOQ 0.01mg/kg); Crotoxyphos(LOQ 0.01mg/kg); Cyanazine(LOQ 0.05mg/kg); Cyanofenphos(LOQ 0.01mg/kg); Cyanophos(LOQ 0.05mg/kg); Cyfluthrin(LOQ 0.01mg/kg); Cyhalofop-butyl(LOQ 0.01mg/kg); Endrin(LOQ 0.01mg/kg); Cyhalothrin lambda-(LOQ 0.01mg/kg); Cypermethrin(LOQ 0.01mg/kg); Dacthal (DCPA)(LOQ 0.01mg/kg); DDD, o,p'-(LOQ 0.01mg/kg); DDD, p,p'-(LOQ 0.01mg/kg); DDE, o,p'-(LOQ 0.01mg/kg); DDE, p,p'-(LOQ 0.01mg/kg); DDT, o,p'-(LOQ 0.01mg/kg); EPN(LOQ 0.01mg/kg); DDT, p,p'-(LOQ 0.01mg/kg); DEF (Butifos)(LOQ 0.01mg/kg); Deltamethrin(LOQ 0.01mg/kg); Demeton-O(LOQ 0.01mg/kg); Demeton-S(LOQ 0.01mg/kg); Demeton-S-methyl(LOQ 0.01mg/kg); Dialifos(LOQ 0.01mg/kg); Diallate(LOQ 0.01mg/kg); Dichlobenil(LOQ 0.01mg/kg); Diazinon (O Analog)(LOQ 0.01mg/kg); Dichlofenthion(LOQ 0.01mg/kg); Dichlofluanid(LOQ 0.01mg/kg); Dichlone(LOQ 0.05mg/kg); Dichlorvos(LOQ 0.01mg/kg); Diclobutrazol(LOQ 0.01mg/kg); Dicloran(LOQ 0.01mg/kg); Dicofol, p,p-(LOQ 0.01mg/kg); Dicrotophos(LOQ 0.01mg/kg); Dieldrin(LOQ 0.01mg/kg); Diflufenican(LOQ 0.01mg/kg); Dimethachlor(LOQ 0.01mg/kg); Dimethenamid(LOQ 0.01mg/kg); Dimoxystrobin(LOQ 0.01mg/kg); Dioxathion(LOQ 0.01mg/kg); Diphenamid(LOQ 0.01mg/kg); Diphenyl(LOQ 0.01mg/kg); Diphenylamine(LOQ 0.01mg/kg); Dipropetryn(LOQ 0.01mg/kg); Disulfoton(LOQ 0.01mg/kg); Disulfoton-PS-sulfone(LOQ 0.01mg/kg); Endosulfan I (alpha-endosulfan)(LOQ 0.01mg/kg); Endosulfan II (beta-Endosulfan)(LOQ 0.01mg/kg); Endrin ketone(LOQ 0.01mg/kg); Endosulfan sulphate(LOQ 0.01mg/kg); Endrin-aldehyde(LOQ 0.01mg/kg); EPTC(LOQ 0.01mg/kg); Esfenvalerate(LOQ 0.01mg/kg); Ethalfluralin(LOQ 0.01mg/kg); Ethion(LOQ 0.01mg/kg); Ethoprophos(LOQ 0.01mg/kg); Ethoxyquin(LOQ 0.01mg/kg); Etoxazole(LOQ 0.01mg/kg); Etridiazole(LOQ 0.01mg/kg); Etrimfos(LOQ 0.01mg/kg); Famophos(LOQ 0.01mg/kg); Famoxadone(LOQ 0.01mg/kg); Fenamidone(LOQ 0.01mg/kg); Fenchlorphos(LOQ 0.01mg/kg); Fenfluthrin(LOQ 0.01mg/kg); Fenitrothion(LOQ 0.01mg/kg); Fenoxaprop-p-ethyl(LOQ 0.01mg/kg); Fenpropathrin(LOQ 0.01mg/kg); Fenson(LOQ 0.01mg/kg); Fensulfothion(LOQ 0.01mg/kg); Fenthion(LOQ 0.01mg/kg); Fenvalerate(LOQ 0.01mg/kg); Fluazifop-P-butyl(LOQ 0.01mg/kg); Fluchloralin(LOQ 0.01mg/kg); Flucythrinate(LOQ 0.01mg/kg); Folpet(LOQ 0.01mg/kg); Fluensulfone(LOQ 0.01mg/kg); Flumioxazin(LOQ 0.01mg/kg); Fluotrimazole(LOQ 0.01mg/kg); Fluquinconazole(LOQ 0.01mg/kg); Flutolanil(LOQ 0.01mg/kg); Flutriafol(LOQ 0.01mg/kg); Fluvalinate(LOQ 0.01mg/kg);

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Fonofos(LOQ 0.01mg/kg); Halfenprox(LOQ 0.01mg/kg); Gamma-cyhalothrin(LOQ 0.01mg/kg); gamma-HCH (Lindane)(LOQ 0.01mg/kg); HCH, alpha-(LOQ 0.01mg/kg); HCH, beta-(LOQ 0.01mg/kg); HCH, delta-(LOQ 0.01mg/kg); Heptachlor(LOQ 0.01mg/kg); Heptachlor Epoxide (cis, trans)(LOQ 0.01mg/kg); Isodrin(LOQ 0.01mg/kg); Hexachlorobenzene (HCB)(LOQ 0.01mg/kg); Hexazinone(LOQ 0.01mg/kg); Iprobenfos(LOQ 0.01mg/kg); Iprodione(LOQ 0.01mg/kg); Isazophos(LOQ 0.01mg/kg); Isocarbamid(LOQ 0.01mg/kg); Isocarbofos(LOQ 0.01mg/kg); Isofenphos-methyl(LOQ 0.01mg/kg); Isopropalin(LOQ 0.01mg/kg); Isoprothiolane(LOQ 0.01mg/kg); Isoxadifen-ethyl(LOQ 0.01mg/kg); Lenacil(LOQ 0.01mg/kg); Leptophos(LOQ 0.01mg/kg); Malathion(LOQ 0.01mg/kg); Mefenpyr-diethyl(LOQ 0.01mg/kg); Mepronil(LOQ 0.01mg/kg); Mevinphos(LOQ 0.01mg/kg); Metazachlor(LOQ 0.01mg/kg); Methacriphos(LOQ 0.01mg/kg); Methamidophos(LOQ 0.01mg/kg); Methoprothryn(LOQ 0.01mg/kg); Methoxychlor, o,o'(LOQ 0.01mg/kg); Methoxychlor, p,p'(LOQ 0.01mg/kg); Mexacarbate(LOQ 0.01mg/kg); MGK-264(LOQ 0.01mg/kg); Mirex(LOQ 0.01mg/kg); Monocrotophos(LOQ 0.01mg/kg); Naproanilide(LOQ 0.01mg/kg); Napropamide(LOQ 0.01mg/kg); Nitralin(LOQ 0.01mg/kg); Nitrapyrin(LOQ 0.01mg/kg); Nitrofen(LOQ 0.01mg/kg); Nitrothal-isopropyl(LOQ 0.01mg/kg); Norea(LOQ 0.01mg/kg); Nonachlor, cis-(LOQ 0.01mg/kg); Nonachlor, trans-(LOQ 0.01mg/kg); Norflurazon(LOQ 0.01mg/kg); Ofurace(LOQ 0.01mg/kg); Omethoate(LOQ 0.01mg/kg); o-Phenylphenol(LOQ 0.01mg/kg); Oxyfluorfen(LOQ 0.01mg/kg); Paclobutrazol(LOQ 0.01mg/kg); Parathion(LOQ 0.01mg/kg); Parathion oxygen analog(LOQ 0.01mg/kg); Parathion-methyl(LOQ 0.01mg/kg); Parathion-methyl oxygen analog(LOQ 0.01mg/kg); PCB 101(LOQ 0.01mg/kg); PCB 138(LOQ 0.01mg/kg); PCB 153(LOQ 0.01mg/kg); PCB 180(LOQ 0.01mg/kg); PCB 28(LOQ 0.01mg/kg); PCB 52(LOQ 0.01mg/kg); Pebulate(LOQ 0.01mg/kg); Pentachloranisole(LOQ 0.01mg/kg); Pentachloroaniline(LOQ 0.01mg/kg); Pentachlorobenzene(LOQ 0.01mg/kg); Pentachlorobenzonitrile(LOQ 0.01mg/kg); Penthiopyrad(LOQ 0.01mg/kg); Pentachlorothioanisole(LOQ 0.01mg/kg); Permethrin(LOQ 0.01mg/kg); Perthane(LOQ 0.01mg/kg); Phenothrin(LOQ 0.01mg/kg); Phenthoate(LOQ 0.01mg/kg); Phorate(LOQ 0.01mg/kg); Phorate-O-analogue(LOQ 0.01mg/kg); Phorate-sulfone(LOQ 0.01mg/kg); Phosmet(LOQ 0.01mg/kg); Phosphamidon(LOQ 0.01mg/kg); Picolinafen(LOQ 0.01mg/kg); Picoxystrobin(LOQ 0.01mg/kg); Procymidone(LOQ 0.01mg/kg); Profenofos(LOQ 0.01mg/kg); Profluralin(LOQ 0.01mg/kg); Prometryn(LOQ 0.01mg/kg); Propachlor(LOQ 0.01mg/kg)
; Propamocarb(LOQ 0.01mg/kg); Propazine(LOQ 0.01mg/kg); Propetamphos(LOQ 0.01mg/kg); Propyzamide(LOQ 0.01mg/kg); Prothiofos(LOQ 0.01mg/kg); Pyrazophos(LOQ 0.01mg/kg); Pyridalyl(LOQ 0.01mg/kg); Pyrifenox(LOQ 0.01mg/kg); Quinalphos(LOQ 0.01mg/kg); Quinomethionate (Morestan)(LOQ 0.01mg/kg); Quintozene(LOQ 0.01mg/kg); Quizalofop-P-ethyl(LOQ 0.01mg/kg); S 421 (Octachlordipropylether)(LOQ 0.01mg/kg); Secbumeton(LOQ 0.01mg/kg); Silaneophan(LOQ 0.01mg/kg); Silthiofam(LOQ 0.01mg/kg); Simazine(LOQ 0.01mg/kg); Tebupirimfos(LOQ 0.01mg/kg); Tecnazene(LOQ 0.01mg/kg); Tefluthrin(LOQ 0.01mg/kg); Terbacil(LOQ 0.01mg/kg); Terbuthylazine(LOQ 0.01mg/kg); Tetradifon(LOQ 0.01mg/kg); Tetrahydrophthalimide (THPI)(LOQ 0.01mg/kg); Tetramethrin(LOQ 0.01mg/kg); Tetrasul(LOQ 0.01mg/kg); Thiometon(LOQ 0.01mg/kg); Thionazin(LOQ 0.01mg/kg); Tolclofos-methyl(LOQ 0.01mg/kg); Tolylfluanid(LOQ 0.01mg/kg); Tralomethrin(LOQ 0.01mg/kg); Transfluthrin(LOQ 0.01mg/kg); Screened pesticides; Triazophos(LOQ 0.01mg/kg); Trichlorfon(LOQ 0.01mg/kg); Trichloronat(LOQ 0.01mg/kg); Trifluralin(LOQ 0.01mg/kg); Triticonazole(LOQ 0.01mg/kg); Vinclozolin(LOQ 0.01mg/kg); Tetrachloroaniline, 2,3,4,6-(LOQ 0.01mg/kg); Other screened pesticides

- Pesticides Quechers-LC-MS/MS [QA01R-1*] AOAC 2007.01

1-Naphthol(LOQ 0.01mg/kg); 2,4-D(LOQ 0.01mg/kg); 3-Hydroxycarbofuran(LOQ 0.01mg/kg); 3-ketocarbofuran(LOQ 0.01mg/kg); Abamectin(LOQ 0.01mg/kg); Acetamiprid(LOQ 0.01mg/kg); Acibenzolar-s-methyl(LOQ 0.01mg/kg); Alachlor(LOQ 0.01mg/kg); Screened pesticides; Aldicarb(LOQ 0.01mg/kg); Aldicarb-sulfone(LOQ 0.01mg/kg); Aldicarb-sulfoxide(LOQ 0.01mg/kg); Aminocarb(LOQ 0.01mg/kg); Amitraz(LOQ 0.01mg/kg); Azadirachtin(LOQ 0.01mg/kg); Azinphos-methyl oxon(LOQ 0.01mg/kg); Azoxystrobin(LOQ 0.01mg/kg); Bendiocarb(LOQ 0.01mg/kg); Benfuracarb(LOQ 0.01mg/kg); Bensulide(LOQ 0.01mg/kg); Bifenazate(LOQ 0.01mg/kg); Bitertanol(LOQ 0.01mg/kg); Boscalid(LOQ 0.01mg/kg); Bromuconazole(LOQ 0.01mg/kg); Bupirimate(LOQ 0.01mg/kg); Buprofezin(LOQ 0.01mg/kg); Butocarboxim-sulfoxide(LOQ 0.05mg/kg); Carbaryl(LOQ 0.01mg/kg); Carbendazim(LOQ 0.01mg/kg); Carbofuran(LOQ 0.01mg/kg); Carbofuran (Phenol)(LOQ 0.01mg/kg); Carbosulfan(LOQ 0.01mg/kg); Carboxin(LOQ 0.01mg/kg); Carfentrazone-ethyl(LOQ 0.01mg/kg); Chlorantraniliprole(LOQ 0.01mg/kg); Chlorfenvinphos(LOQ 0.01mg/kg); Chloridazone(LOQ 0.01mg/kg); Chloroxuron(LOQ 0.01mg/kg); Clethodim(LOQ 0.01mg/kg); Climbazole(LOQ 0.01mg/kg); Clodinafop-propargyl(LOQ 0.01mg/kg); Clofentezine(LOQ 0.01mg/kg); Clomazone(LOQ 0.01mg/kg); Clothianidin(LOQ 0.01mg/kg); Cyantraniliprole(LOQ 0.01mg/kg); Cyazofamid(LOQ 0.01mg/kg); Cycloate(LOQ 0.01mg/kg); Cycloxydim(LOQ 0.01mg/kg); Cymoxanil(LOQ 0.01mg/kg); Cyproconazole(LOQ 0.01mg/kg); Cyprodinil(LOQ 0.01mg/kg);

Cyromazine(LOQ 0.05mg/kg); Demeton-S-methyl-sulfone(LOQ 0.01mg/kg); Demeton-S-sulfone(LOQ 0.01mg/kg); Desmedipham(LOQ 0.01mg/kg); Desmetryn(LOQ 0.01mg/kg); Diafenthiuron(LOQ 0.01mg/kg); Diazinon(LOQ 0.01mg/kg); Diethofencarb(LOQ 0.01mg/kg); Difenoconazole(LOQ 0.01mg/kg); Diflubenzuron(LOQ 0.01mg/kg); Dimethametryn(LOQ 0.01mg/kg); Dimethoate(LOQ 0.01mg/kg); Dimethomorph(LOQ 0.01mg/kg); Dimethylvinphos(LOQ 0.01mg/kg); Diniconazole(LOQ 0.01mg/kg); Dioxacarb(LOQ 0.01mg/kg); Diuron(LOQ 0.01mg/kg); Dodine(LOQ 0.01mg/kg); Edifenphos(LOQ 0.01mg/kg); Epoxiconazole(LOQ 0.01mg/kg); Etaconazole(LOQ 0.01mg/kg); Ethiofencarb(LOQ 0.01mg/kg); Ethiofencarb-sulfone(LOQ 0.01mg/kg); Ethiofencarb-sulfoxide(LOQ 0.01mg/kg); Ethofumesate(LOQ 0.01mg/kg); Etobenzanid(LOQ 0.01mg/kg); Etofenprox(LOQ 0.01mg/kg); Fenamiphos(LOQ 0.01mg/kg); Fenarimol(LOQ 0.02mg/kg); Fenazaquin(LOQ 0.01mg/kg); Fenbuconazole(LOQ 0.01mg/kg); Fenhexamid(LOQ 0.01mg/kg); Fenobucarb(LOQ 0.01mg/kg); Fenoxycarb(LOQ 0.01mg/kg); Fenpropimorph(LOQ 0.01mg/kg); Fenpyroximate(LOQ 0.01mg/kg); Fipronil(LOQ 0.005mg/kg); Flonicamid(LOQ 0.01mg/kg); Fludioxonil(LOQ 0.01mg/kg); Flufenacet(LOQ 0.01mg/kg); Flufenoxuron(LOQ 0.01mg/kg); Fluopicolide(LOQ 0.01mg/kg); Fluopyram(LOQ 0.01mg/kg); Flupyradifurone(LOQ 0.01mg/kg); Flusilazole(LOQ 0.01mg/kg); Fluthiacet-methyl(LOQ 0.01mg/kg); Fluxapyroxad(LOQ 0.01mg/kg); Forchlorfenuron(LOQ 0.01mg/kg); Fosthiazate(LOQ 0.01mg/kg); Furalaxyl(LOQ 0.01mg/kg); Furathiocarb(LOQ 0.01mg/kg); Heptenophos(LOQ 0.01mg/kg); Hexaconazole(LOQ 0.01mg/kg); Hexaflumuron(LOQ 0.01mg/kg); Hexythiazox(LOQ 0.01mg/kg); Imazalil(LOQ 0.01mg/kg); Imidacloprid(LOQ 0.01mg/kg); Indoxacarb(LOQ 0.01mg/kg); Iprovalicarb(LOQ 0.01mg/kg); Isofenphos(LOQ 0.01mg/kg); Isoprocarb(LOQ 0.01mg/kg); Isoproturon(LOQ 0.01mg/kg); Isoxaben(LOQ 0.01mg/kg); Isoxaflutole(LOQ 0.01mg/kg); Kresoxim-methyl(LOQ 0.01mg/kg); Linuron(LOQ 0.01mg/kg); Lufenuron(LOQ 0.01mg/kg); Malaoxon(LOQ 0.01mg/kg); Mecarbam(LOQ 0.01mg/kg); Mepanipyrim(LOQ 0.01mg/kg); Metalaxyl and Metalaxyl-M (sum)(LOQ 0.01mg/kg); Metamitron(LOQ 0.05mg/kg); Methabenztiazuron(LOQ 0.01mg/kg); Methidathion(LOQ 0.01mg/kg); Methiocarb(LOQ 0.01mg/kg); Methiocarb-sulfone(LOQ 0.01mg/kg); Methiocarb sulfoxide(LOQ 0.01mg/kg); Methomyl(LOQ 0.01mg/kg); Methoxyfenozide(LOQ 0.01mg/kg); Metolachlor(LOQ 0.01mg/kg); Metolcarb(LOQ 0.01mg/kg); Metoxuron(LOQ 0.01mg/kg); Metribuzin(LOQ 0.01mg/kg); Molinate(LOQ 0.01mg/kg); Naled(LOQ 0.01mg/kg); Monolinuron(LOQ 0.01mg/kg); Myclobutanil(LOQ 0.01mg/kg); Naphthalene Acetamide(LOQ 0.01mg/kg); Neburon(LOQ 0.01mg/kg); Nitenpyram(LOQ 0.05mg/kg); Novaluron(LOQ 0.01mg/kg); Nuarimol(LOQ 0.01mg/kg); Oxadiazon(LOQ 0.01mg/kg); Oxadixyl(LOQ 0.01mg/kg); Oxamyl(LOQ 0.01mg/kg); Oxydemeton-methyl(LOQ 0.01mg/kg); Penconazole(LOQ 0.01mg/kg); Pencycuron(LOQ 0.01mg/kg); Pendimethalin(LOQ 0.01mg/kg); Phenkapton(LOQ 0.01mg/kg); Phenmedipham(LOQ 0.01mg/kg); Phorate-sulfoxide(LOQ 0.01mg/kg); Phosalone(LOQ 0.01mg/kg); Piperonyl butoxide (PBO)(LOQ 0.01mg/kg); Pirimicarb(LOQ 0.01mg/kg); Pirimicarb, desmethyl-(LOQ 0.01mg/kg); Pirimicarb, desmethyl-formamido-(LOQ 0.01mg/kg); Pirimiphos-ethyl(LOQ 0.01mg/kg); Pirimiphos-methyl(LOQ 0.01mg/kg); Prochloraz(LOQ 0.01mg/kg); Profoxydim(LOQ 0.01mg/kg); Promecarb(LOQ 0.01mg/kg); Prometon(LOQ 0.01mg/kg); Propanil(LOQ 0.01mg/kg); Propaquizafop(LOQ 0.01mg/kg); Propargite(LOQ 0.02mg/kg); Propham(LOQ 0.05mg/kg); Propiconazole(LOQ 0.01mg/kg); Propoxur(LOQ 0.01mg/kg); Proquinazid(LOQ 0.01mg/kg); Prosulfocarb(LOQ 0.01mg/kg); Pymetrozine(LOQ 0.02mg/kg); Pyraclostrobin(LOQ 0.01mg/kg); Pyridaben(LOQ 0.01mg/kg); Pyridaphenthion(LOQ 0.01mg/kg); Pyridate(LOQ 0.01mg/kg); Pyrimethanil(LOQ 0.01mg/kg); Pyriproxyfen(LOQ 0.01mg/kg); Quinoxyfen(LOQ 0.01mg/kg); Rimsulfuron(LOQ 0.01mg/kg); Rotenone(LOQ 0.01mg/kg); Sethoxydim(LOQ 0.01mg/kg); Simetryn(LOQ 0.01mg/kg); Spinetoram(LOQ 0.01mg/kg); Spinosad(LOQ 0.01mg/kg); Spirodiclofen(LOQ 0.01mg/kg); Spiromesifen(LOQ 0.01mg/kg); Spirotetramat(LOQ 0.01mg/kg); Spiroxamine(LOQ 0.01mg/kg); Sulfotep(LOQ 0.01mg/kg); Sulprofos(LOQ 0.01mg/kg); Tebuconazole(LOQ 0.01mg/kg); Tebufenozide(LOQ 0.01mg/kg); Tebufenpyrad(LOQ 0.01mg/kg); Tebuthiuron(LOQ 0.01mg/kg); Teflubenzuron(LOQ 0.01mg/kg); Tepraloxydim(LOQ 0.01mg/kg); Terbufos(LOQ 0.01mg/kg); Terbumeton(LOQ 0.01mg/kg); Terbutryn(LOQ 0.01mg/kg); Tetrachlorvinphos(LOQ 0.01mg/kg); Tetraconazole(LOQ 0.01mg/kg); Thiabendazole(LOQ 0.01mg/kg); Thiacloprid(LOQ 0.01mg/kg); Thiamethoxam(LOQ 0.01mg/kg); Thiobencarb(LOQ 0.01mg/kg); Thiodicarb(LOQ 0.01mg/kg); Thiofanox-sulfoxide(LOQ 0.01mg/kg); Thiophanate-methyl(LOQ 0.01mg/kg); Tolfenpyrad(LOQ 0.01mg/kg); Tralkoxydim(LOQ 0.01mg/kg); Triadimefon(LOQ 0.01mg/kg); Triadimenol(LOQ 0.01mg/kg); Triallate(LOQ 0.01mg/kg); Triazamate(LOQ 0.01mg/kg); Tricyclazole(LOQ 0.01mg/kg); Tridemorph(LOQ 0.01mg/kg); Trifloxystrobin(LOQ 0.01mg/kg); Triflumizole(LOQ 0.01mg/kg); Triforine(LOQ 0.01mg/kg)

; Triflumuron(LOQ 0.01mg/kg); Trimethacarb 2.3.5-(LOQ 0.01mg/kg); Trimethycarb, 3,4,5-(LOQ 0.01mg/kg); Uniconazole-P(LOQ 0.01mg/kg); Other screened pesticides

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LOQ: Limit of Quantification *LOD: Limit of detection*

(The * sign indicates the test is accredited) (¤:The accreditation status of the test depends on the type of sample.)(∞:The accreditation status of the test depends on the regulation area.) (The § sign indicates the test is not accredited for all parameters)

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Package Test Code	Package Name	Test Code	Pesticide Parameter	LOQ	Numerator	Denominator	Method Reference
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Cadusaphos	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Acrinathrin	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Tralomethrin	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chloropropylate	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	S 421 (Octachlordipropylether)	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Endrin-aldehyde	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Endrin ketone	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Nonachlor, trans-	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Acetochlor	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dimethenamid	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Carbetamide	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Secbumeton	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Pentachlorothioanisole	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlorethoxyfos	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Cyhalofop-butyl	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Naproanilide	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Phorate-O-analogue	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Nonachlor, cis-	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	PCB 28	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	PCB 52	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	PCB 153	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlordane, oxy-	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fenfluthrin	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Flucythrinate	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Carbophenothion-methyl	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Famophos	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Iprobenfos	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Prometryn	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Propachlor	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Propazine	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Propetamphos	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Prothiofos	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Pyrazophos	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Quinalphos	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Quintozene	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fluvalinate	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Tecnazene	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Terbuthylazine	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Tetradifon	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Tetramethrin	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Tetrasul	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Thiometon	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Tolclofos-methyl	0.01	kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Tolylfluanid	0.01	kg	mg	AOAC 2007.01

PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Triazophos		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Trichlorfon		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Trichloronat		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Trifluralin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Vinclozolin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Allethrin		0.05 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Carbophenothion		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlorobenzilate		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlorthiofos		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dialifos		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dimethachlor		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dioxathion		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Endosulfan sulphate		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	DDD, o,p'-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	DDE, o,p'-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	DDT, o,p'-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	DDD, p,p'-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	DDE, p,p'-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	DDT, p,p'-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Perthane		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Clethodim		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Profoxydim		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Desmedipham		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Propaquizafop		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Methoxyfenozide		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Tepraloxydim		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Thiofanox-sulfoxide		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Spinetoram		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Flonicamid		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Naphthalene Acetamide		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Etobenzanid		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Azinphos-methyl oxon		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Carbofuran (Phenol)		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	1-Naphthol		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Nitenpyram		0.05 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Cyazofamid		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fluopyram		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fluxapyroxad		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Cyantraniliprole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Flupyradifurone		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Screened pesticides	-1	No unit	No unit	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pirimicarb, desmethyl-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Etofenprox		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Dodine		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Rotenone		0.01 kg	mg	AOAC 2007.01

PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fenpyroximate		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Bromuconazole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Clodinafop-propargyl		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pyriproxyfen		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Quinoxyfen		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Terbumeton		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Indoxacarb		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Hexaflumuron		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Flufenoxuron		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Lufenuron		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Thiobencarb		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Other screened pesticides	-1	No unit	No unit	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Spirotetramat		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Chlorantraniliprole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Azoxystrobin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Buprofezin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Carbosulfan		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Chloridazone		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Climbazole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Clomazone		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Cycloate		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Diazinon		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Diethofencarb		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Etaconazole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fenazaquin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Furathiocarb		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Iprovalicarb		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Isoprocarb		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Metribuzin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Myclobutanil		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pirimiphos-methyl		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Prochloraz		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Prosulfocarb		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pyridaben		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pyrimethanil		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Tebufenpyrad		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Thiabendazole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Triflumizole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fenhexamid		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Azaconazole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Isoprothiolane		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Butachlor		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Isocarbofos		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Picolinafen		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Halfenprox		0.01 kg	mg	AOAC 2007.01

PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Transfluthrin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Butafenacil	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dimoxystrobin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Flumioxazin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Isoxadifen-ethyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Pyridalyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Silaneophan	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Silthiofam	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Mepronil	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Penthiopyrad	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Hexachlorobenzene (HCB)	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	gamma-HCH (Lindane)	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dieldrin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Mirex	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Parathion-methyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Parathion	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlorpyrifos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Acephate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	HCH, alpha-	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Azinphos-ethyl (Ethyl Guthion)	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Benfluralin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	HCH, beta-	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Bromocyclen	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Bromophos-ethyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Bromophos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Bromopropylate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Captafol	0.02 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Captan	0.02 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlordimeform	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlorfenson	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chloroneb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Quizalofop-P-ethyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlorothalonil	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Acetamiprid	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Spinosad	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Thiamethoxam	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Rimsulfuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Prometon	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Diflubenzuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Dimethomorph	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Benfuracarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Tridemorph	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	3-Hydroxycarbofuran	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Aldicarb-sulfone	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Aldicarb-sulfoxide	0.01 kg	mg	AOAC 2007.01

PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Methiocarb-sulfone	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Methiocarb sulfoxide	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Oxamyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Thiodicarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Isoxaben	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Imidacloprid	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Demeton-S-sulfone	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Tebuthiuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Uniconazole-P	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Nuarimol	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Cyprodinil	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Diniconazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Epoxiconazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fludioxonil	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Hexythiazox	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Tetraconazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Azadirachtin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Dimethylvinphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fluopicolide	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pirimicarb, desmethyl-formamido-	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fluthiacet-methyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Forchlorfenuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Metolcarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Proquinazid	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Spirodiclofen	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Tralkoxydim	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Ethiofencarb-sulfone	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Ethiofencarb-sulfoxide	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Tolfenpyrad	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Teflubenzuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Triflumuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Cyromazine	0.05 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Chloroxuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Metamitron	0.05 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pyridaphenthion	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Oxydemeton-methyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Ethofumesate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Oxadixyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Penconazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pendimethalin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Phosalone	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Piperonyl butoxide (PBO)	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pirimicarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pirimiphos-ethyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Promecarb	0.01 kg	mg	AOAC 2007.01

PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Propham	0.05 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Propiconazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Propoxur	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Sulfotep	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Sulprofos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Tebuconazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Tebufenozide	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Terbutryn	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Triadimefon	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Triadimenol	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Triallate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Triforine	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Cycloxydim	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Furalaxyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fenamiphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Desmetryn	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Clofentezine	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fenpropimorph	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Dimethametryn	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Isoproturon	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Kresoxim-methyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Malaoxon	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Metoxuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Naled	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Neburon	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Phenkapton	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pyridate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Terbufos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fenbuconazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fenoxycarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Propargite	0.02 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Tetrachlorvinphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Alachlor	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Bitertanol	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Carboxin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Edifenphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Demeton-S-methyl-sulfone	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Simetryn	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Molinate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Phenmedipham	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	3-ketocarbofuran	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fenobucarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Triazamate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Boscalid	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Spiromesifen	0.01 kg	mg	AOAC 2007.01

PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Tricyclazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Imazalil	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Novaluron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Clothianidin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fipronil	0.005 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Acibenzolar-s-methyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pyraclostrobin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Carbendazim	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Diafenthiuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Bifenazate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Sethoxydim	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	2,4-D	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Abamectin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Aldicarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Aminocarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Amitraz	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Bendiocarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Bupirimate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Carbaryl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Carbofuran	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Chlorfenvinphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Cymoxanil	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Cyproconazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Difenoconazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Dimethoate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Dioxacarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Diuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Ethiofencarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fenarimol	0.02 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Flusilazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Heptenophos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Hexaconazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Isofenphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Linuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Mecarbam	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Methabenztiazuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Metalaxyl and Metalaxyl-M (sum)	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Methidathion	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Methiocarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Methomyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Metolachlor	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Monolinuron	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Oxadiazon	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Permethrin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Procymidone	0.01 kg	mg	AOAC 2007.01

PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Pyrifenox		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Terbacil		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Crimidine		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fenamidone		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Tetrachloroaniline, 2,3,4,6-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Methoxychlor, o,o'		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Methoxychlor, p,p'		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Mexacarbate		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Gamma-cyhalothrin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Norea		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Pentachlorobenzonitrile		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlordene, beta		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlordene, gamma-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dacthal (DCPA)		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	DEF (Butifos)		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Diazinon (O Analog)		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Quinomethionate (Morestan)		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Heptachlor Epoxide (cis, trans)		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	MGK-264		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Tebupirimfos		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Phenothrin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Isofenphos-methyl		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Screened pesticides	-1	No unit	No unit	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fluensulfone		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pencycuron		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Thiophanate-methyl		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Flufenacet		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Isoxaflutole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Propanil		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Pymetrozine		0.02 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Trifloxystrobin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Bensulide		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Spiroxamine		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Phorate-sulfoxide		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Trimethacarb 2.3.5-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Trimethycarb, 3,4,5-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Butocarboxim-sulfoxide		0.05 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Fosthiazate		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Thiacloprid		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Mepanipyrim		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01R-1	Carfentrazone-ethyl		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Disulfoton-PS-sulfone		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Phorate-sulfone		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlordane, cis-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlordane, trans-		0.01 kg	mg	AOAC 2007.01

PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Diphenyl		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dichlone		0.05 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlorfenapyr		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Diflufenican		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Cyhalothrin lambda-		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Famoxadone		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Heptachlor		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Flutolanil		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Other screened pesticides	-1	No unit	No unit	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	PCB 101		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	PCB 138		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	PCB 180		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Ofurace		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Aclonifen		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Aldrin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Ametryn		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Atrazine		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Azinphos-methyl		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Benalaxyl		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Bifenox		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Bifenthrin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Bromacil		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Cyfluthrin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Cypermethrin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Tetrahydrophthalimide (THPI)		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Diphenylamine		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dipropetryn		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Endrin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	EPN		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Ethion		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Etoxazole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fenpropathrin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fluazifop-P-butyl		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fluotrimazole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fluquinconazole		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Folpet		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Isazophos		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Malathion		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Metazachlor		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Methoprothryn		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Nitrapyrin		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	o-Phenylphenol		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Oxyfluorfen		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Paclobutrazol		0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dicrotophos		0.01 kg	mg	AOAC 2007.01

PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Diphenamid	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	EPTC	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Ethalfluralin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Etridiazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Hexazinone	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Demeton-O	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Monocrotophos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Nitralin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Norflurazon	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Isocarbamid	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Napropamide	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Pebulate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Phenthoate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Phosphamidon	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Isopropalin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Propamocarb	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Esfenvalerate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Tefluthrin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Flutriafol	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Propyzamide	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Thionazin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlorthal-dimethyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Endosulfan I (alpha-endosulfan)	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Endosulfan II (beta-Endosulfan)	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Butylate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Crotoxyphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Demeton-S-methyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Demeton-S	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Diallate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlorpropham (CIPC)	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlorpyrifos-methyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlorthion	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Chlozolinate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Coumaphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Cyanazine	0.05 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Cyanofenphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Cyanophos	0.05 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	HCH, delta-	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Deltamethrin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dichlobenil	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dichlofenthion	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dichlofluanid	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dicloran	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dichlorvos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Diclobutrazol	0.01 kg	mg	AOAC 2007.01

PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Dicofol, p,p-	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Disulfoton	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Ethoprophos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Ethoxyquin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Etrimfos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fenchlorphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fenitrothion	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fenson	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fensulfothion	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fenthion	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fenvalerate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fluchloralin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fonofos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Iprodione	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Isodrin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Lenacil	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Leptophos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Methamidophos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Methacriphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Mevinphos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Nitrofen	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Omethoate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Parathion oxygen analog	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Parathion-methyl oxygen analog	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Pentachloranisole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Pentachlorobenzene	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Pentachloroaniline	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Phorate	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Phosmet	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Profenofos	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Profluralin	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Mefenpyr-diethyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Simazine	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Nitrothal-isopropyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Triticonazole	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Cloquintocet-mexyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Fenoxaprop-p-ethyl	0.01 kg	mg	AOAC 2007.01
PQA0E-1	Pesticides- Quechers for Fruits and Vegetables	QA01P-1	Picoxystrobin	0.01 kg	mg	AOAC 2007.01

Appendix 3. Estimated Daily Intake of Corn Protein Proposed for Use in Select Foods among the U.S. Population (Exponent, 2022)

Exponent®

Center for Chemical Regulation and Food Safety

Estimated Daily Intake of Corn Protein Proposed for Use in Select Foods Among the U.S. Population

Estimated Daily Intake of Corn Protein Proposed for Use in Select Foods Among the U.S. Population

Prepared for

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March 4, 2022

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Contents

List of Tables

List of Acronyms

bw	Bodyweight
DHHS	U.S. Department of Health and Human Services
EDI	Estimated Daily Intake
FARE®	Foods Analysis and Residues Evaluation Program
FDA	U.S. Food and Drug Administration
FNDDS	Food and Nutrient Database for Dietary Studies
FPED	Food Pattern Equivalents Database
FPID	Food Patterns Equivalents Ingredients Database
g	Gram
kg	Kilogram
mo	Month
NCHS	National Center for Health Statistics
NHANES	National Health and Nutrition Examination Survey
RTD	Ready-to-drink
RTE	Ready-to-eat
SR	Standard Reference
U.S.	United States
USDA	U.S. Department of Agriculture
VIF	Variance Inflation Factor
WWEIA	What We Eat in America
y	Years

Introduction

At the request of Cargill, Inc. (Cargill), Exponent, Inc. (Exponent) conducted an intake assessment to estimate the total daily intake of corn protein proposed for use in 15 food categories. The estimated daily intake (EDI) of corn protein was based on foods reported consumed in the *What We Eat in America* (WWEIA) dietary component of the National Health and Nutrition Examination Survey (NHANES) 2015-2018. Corn protein estimates were provided for the total U.S. population and sub-populations of infants, children, adolescents, and adults. The data and methods used to conduct the intake assessment and results are summarized in this report.

Data and Methods

Proposed Use and Levels

Corn protein is proposed for use in 15 food categories including bakery products, batter/breading/coating for frying, ready-to-eat (RTE) cereals, dairy analog products, meat analogs and vegetarian products, mixed dishes with sauce, non-dairy beverages, nut butters (excluding full-fat peanut butter), nutritional bars, cooked pasta, processed meats, protein and nutritional powders, ready-to-drink (RTD) protein beverages, cream-based sauces, and snack foods. The proposed use level of corn protein ranges from 0.08% to 40% in the finished product (i.e., the food as consumed). Table 1 lists the proposed food uses as well as the corresponding use level of corn protein for each food use.

Table 1. Proposed Food Uses and Levels of Corn Protein

Food Category		Proposed Food Uses	Corn Protein Use Level (%) As Consumed
1	Bakery products	Bakery products including flatbread and pizza crust (all types including gluten-free); gluten-free biscuits, bread/rolls, English muffins, muffins, pancakes, and waffles	8
2	Batter/breading/coating for frying	Batter/breading/coating for frying	2
3	Cereal, RTE	RTE cereal, all types	30
4	Dairy analog products	All types of dairy analog products including imitation cheese, cream substitute, non-dairy topping, margarine and margarine-like spreads, rice dessert bar, yogurt	10
5	Meat analogs and vegetarian food products	Meat analogs & vegetarian food products including vegetable protein, vegetarian meat loaf, vegetarian stew, meatless bacon, chicken analogs, breakfast link, fish stick, vegetarian frankfurter, luncheon meat, meatball, vegetarian burger or patty, vegetarian dishes (i.e., pot pie, chili, stew, stroganoff)	40
6	Mixed dishes with sauce	Prepackaged products with sauce including frozen meals; canned products such as Chef Boyardee products and creamed vegetables; box mixes such as Hamburger Helper, Rice-A-Roni, Easy Mac, and scalloped and mashed potato; pot pie	0.08
7	Non-dairy beverages	Milk substitutes including soy milk, almond milk, rice milk, coconut milk, and other imitation milks	5
8	Nut butters (except full-fat peanut butter)	Nut butters including almond, cashew, and peanut (excluding full-fat peanut butter)	10
9	Nutritional bars	Nutrition and meal replacement bars including Zone Perfect, Clif bar, South Beach Living bars, Kashi bars, PowerBar, SlimFast bar, Snickers Marathon energy, and protein bars	25
10	Pasta, cooked	Cooked pastas including macaroni, spaghetti noodles, lasagna noodles, ravioli, other pasta noodles	5
11	Processed meats	Processed meats including sausage, luncheon meats, frankfurter, cured ham, pastrami, pate, pepperoni, salami, chicken nuggets, patties	7
12	Protein and nutritional powders[1]	Non-reconstituted powder mix including Carnation Instant Breakfast, Muscle Milk, Slim Fast, protein powder/mix, milkshake mix	5
13	Protein beverages, RTD	RTD nutritional drink or meal replacement beverage high in protein	5
14	Sauces, cream-based	Cream-based sauces including cheese sauce, cream sauce, milk sauce, lemon-butter sauce, hollandaise sauce, horseradish sauce	1.5
15	Snack foods	Snack foods including cereal and granola bars, crackers, extruded potato chips, pretzel/snack mix, tortilla chips, corn chips, other veggie/puff chips	15

RTE: Ready-to-eat; RTD: Ready-to-drink.

[1] Use level corresponds to the prepared/reconstituted beverage.

Consumption Data

Corn protein intakes from proposed foods were based on food consumption records collected in the WWEIA component of NHANES conducted in 2015-2016 and 2017-2018 cycles (NHANES 2015-2018). This continuous survey is a complex, multistage, probability sample designed to be representative of the civilian US population (CDC 2018, 2020). The NHANES datasets provide nationally representative nutrition and health data and prevalence estimates for nutrition and health status measures in the United States. Statistical weights are provided by the National Center for Health Statistics (NCHS) to adjust for the differential probabilities of selection. As part of the examination, trained dietary interviewers collected detailed information on all foods and beverages consumed by respondents in the previous 24 hour time period (midnight to midnight). A second dietary recall was administered by telephone three to ten days after the first dietary interview, but not on the same day of the week as the first interview. The dietary component of the survey is conducted as a partnership between the U.S. Department of Agriculture (USDA) and the U.S. Department of Health and Human Services (DHHS). DHHS is responsible for the sample design and data collection, and USDA is responsible for the survey's dietary data collection methodology, maintenance of the databases used to code and process the data, and data review and processing. A total of 13,666 individuals in the 2015-2018 survey period provided two complete days of dietary recalls.

Food and Nutrient Database for Dietary Studies (FNDDS)

For each food reported in NHANES, the USDA Food and Nutrient Database for Dietary Studies (FNDDS) databases translates foods as reported consumed into one or more ingredients (and gram amounts) or recipes. The FNDDS also provides information on the amount of energy and approximately 60 nutrients or food constituents per 100 g of each food based on the National Nutrient Database for Standard Reference (SR). Exponent applied FNDDS version 2017-2018 food recipes (USDA 2018a) to process dietary recall data reported in NHANES 2015-2018 and FNDDS version 2015-2016 recipes (USDA 2018b) for foods that were only reported consumed in NHANES 2015-2016.

Food Patterns Equivalents Database (FPED)

The Food Pattern Equivalents Database (FPED) is developed by the USDA and translates each food reported consumed in the NHANES into 37 dietary components (e.g., fruits, vegetables, grains, protein foods, etc.) per 100 grams of each NHANES food. In addition, the FPED includes the Food Patterns Equivalents Ingredients Database (FPID) for ingredients of the foods in FNDDS. Exponent applied FPID 2017-2018 (USDA 2020) to process dietary recall data reported in NHANES 2015-2018 and FPID 2015-2016 (USDA 2018c) for foods that were only reported consumed in NHANES 2015-2016.

NHANES Food Selection

Consumption data in the NHANES survey are reported on an "as consumed basis". That is, if a survey participant consumed a roast beef sandwich, the consumption amount reported in the survey for that subject would be for the total amount of the whole sandwich consumed, and not for the ingredients (bread, meat, lettuce, tomato, and mayonnaise) used to make that sandwich. Exponent utilized the USDA's FNDDS recipes for many of the food uses of corn protein; however, when the recipes did not have a complete breakdown of ingredients for a given food, an alternate approach was taken to identify food components with proposed uses of corn protein. The alternate approaches were applied to identify food uses of corn protein within food mixtures as described below:

- Bakery products – FNDDS recipes were applied to identify the biscuit, English muffin, flatbread, and pizza crust components in food mixtures such as sandwiches and pizzas. Pizza crust contribution of a pizza was assumed to be 50% based on the average pizza crust content for those with recipe breakdowns.
- Batter/breading/coating for frying – All coated, battered, and breaded foods were identified by its corresponding dry or soft bread crumb component, if available, using the FNDDS recipe database. Due to inconsistent and incomplete recipes for many of these foods, the maximum bread crumb proportion of 24% among meats, 10% among mixed dishes, 13% among sandwiches, 7% among fried ham, and 5% among fried vegetables with recipes was assumed for all identified foods belonging within these respective food categories.

- Pasta, cooked – All pasta ingredients with proposed uses of corn protein (including pasta-containing ingredients) were identified based on the FNDDS recipes which included both cooked and uncooked forms. Using both the FPID and SR (USDA 2016) databases, all pastas of interest were converted to the cooked form to identify cooked pastas reported consumed as is or as part of a mixed dish.
- Processed meats – All processed meat ingredients with proposed uses of corn protein (including processed meat-containing ingredients) were identified based on the FNDDS recipes in combination with the FPID.
- Sauces, cream-based – All cream-based sauce ingredients with proposed uses of corn protein were identified based on the FNDDS recipes. Foods with descriptions containing "cream" or "cheese" and "sauce" that were not identified as containing a cream-based sauce ingredient within the FNDDS recipes were given the average sauce component among similar foods with recipes within the same WWEIA category designation.

Identification of the weight of ingredients in foods allowed for the estimation of the select foods with corn protein proposed uses that can be consumed as is or as a component in a food (i.e., deli meat in sandwiches and corn chips in Mexican casseroles or taco salads). NHANES foods corresponding to all other food categories were identified based on the food description of the food reported as consumed or on the USDA recipe database. The list of all NHANES food codes (and their descriptions) included in the analysis can be found in Appendix I.

Analysis

Using the NHANES consumption data, Exponent estimated the 2-day average daily intake on a *per capita* and *per user* basis. *Per capita* estimates refer to the consumption based on the entire population of interest whereas *per user* estimates refer to the consumption among those who reported consuming the food(s) of interest on either of the survey days. We identified each participant who reported consuming a proposed food on either of the survey days, and we used that individual's responses for both survey days. Zero consumption days are included in calculating that individual's average daily intake. For example, if someone reported consuming 30 grams (g) of crackers on day 1 and 50 g of crackers on day 2, his/her 2-day average cracker consumption would be 40 g ([30 + 50]/2). The analysis was limited to individuals who provided

two complete and reliable dietary recalls as determined by NCHS. The 2-day average intakes by each individual were estimated using Exponent's Foods Analysis and Residues Evaluation Program (FARE® version 14.06) software. Exponent used the statistically weighted values from the survey in its analyses. The statistical weights compensate for variable probabilities of participant selection, adjusted for non-response, and provide intake estimates that are representative of the U.S. population.

In the analysis, the 2-day average intake of corn protein was estimated by multiplying the reported intake of foods from the 24-hr recall with the proposed use level (see Table 1) and the cumulative sum over the two 24-hr recalls was divided by two.

Two-day average estimates were derived for each proposed food use category as well as from all food uses combined. Estimates were also derived on a body weight (bw) basis based on each participant's measured body weight and derived for the total U.S. population and the following age sub-populations:

- Infants, ages 0 to 11 mo;
- Children, ages 1 to 6 y;
- Children, ages 7 to 12 y;
- Adolescents, ages 13 to 19 y; and
- Adults, ages 20 y and older.

Flagging of Statistically Unreliable Estimates

Intake estimates that may be less statistically reliable are flagged in the summary tables provided in the results section below. The flagging of statistically unreliable estimates was based on guidance from NCHS (CDC 1996). Specifically, estimates of mean consumption are flagged when based on a sample size of less than 30 times the variance inflation factor (VIF) and estimates of 90th percentiles of consumption are flagged when based on a sample size of less than 8 times the VIF and divided by 0.10. A VIF estimate of 2.52 was estimated by USDA for NHANES 2015-2018 (USDA 2021), and using this VIF, the estimated mean consumption is flagged when based on a sample size of less than 76 (30 x 2.52). Similarly, using a VIF of 2.52,

estimated 90th percentile (and higher) of consumption is flagged when based on a sample size of less than 202 (8 x 2.52/0.10).

Results

Two-day average corn protein intake estimates from the proposed use in 15 food categories were calculated based on food consumption data collected in NHANES 2015-2018. Both the *per capita* and *per user* mean and 90th percentile intake estimates for the U.S. population and sub-populations of infants age 0-11 mo; children 1-6 y and 7-12 y; adolescents 13-19 y; and adults 20+ y from all proposed food uses are provided in Table 2. Table 3 summarizes the estimated intake of corn protein by population group and food category. Corn protein intake estimates are expressed in grams per day (g/day) and grams per kilogram bodyweight (g/kg-bw/day).

Table 2. Two-day average estimated daily intake (EDI) of corn protein from all proposed food uses among the total U.S. population and sub-populations

			Per Capita		Per User		Per Capita		Per User	
			Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile
Population	N[1]	% User	- - - - g/day - - - -				- - - - g/kg-bw/day - - - -			
Total U.S.	13,093	98	14.5	28.8	14.7	29.0	0.25	0.56	0.25	0.57
Infants 0-11 mo	205	33	1.0	3.4	3.0	7.6	0.11	0.38	0.33	0.73
Children 1-6 y	1,566	100	12.2	23.0	12.3	23.0	0.73	1.31	0.73	1.31
Children 7-12 y	1,504	100	16.4	28.9	16.4	28.9	0.47	0.86	0.47	0.86
Adolescents 13-19 y	1,613	99	16.4	32.4	16.5	32.5	0.26	0.51	0.26	0.51
Adults 20+ y	8,205	99	14.5	29.2	14.6	29.3	0.18	0.38	0.18	0.38

[1] Un-weighted number of users; %user, *per capita* and *per user* estimates were based on NHANES 2015-2018 using the statistical weights provided by the NCHS.

Table 3. Two-day average estimated daily intake (EDI) of corn protein by proposed food use categories among the total U.S. population and sub-populations

				Per Capita		Per User		Per Capita		Per User	
					90th		90th		90th		90th
			%	Mean	Percentile	Mean	Percentile	Mean	Percentile	Mean	Percentile
Population and Food Category		N	User	- - - - g/day - - - -				- - - - g/kg-bw/day - - - -			
Total U.S.											
1	Bakery products	4,791	37	1.9	6.2	5.1	9.9	0.03	0.10	0.09	0.18
2	Batter/breading/coating for frying	3,195	22	0.1	0.3	0.3	0.7	<0.005	<0.005	0.01	0.01
3	Cereal, RTE	4,557	33	3.6	12.5	10.9	20.6	0.07	0.23	0.20	0.41
4	Dairy analog products	8,067	61	0.6	1.5	1.0	2.6	0.01	0.02	0.01	0.03
5	Meat analogs & vegetarian food products	228	2	0.4	0	15.8	41.6	0.01	0	0.22	0.81
6	Mixed dishes with sauce	1,920	14	<0.05	0.1	0.1	0.2	<0.005	<0.005	<0.005	<0.005
7	Non-dairy beverages	710	6	0.5	0	7.9	15.0	0.01	0	0.15	0.26
8	Nut butters (except full-fat peanut butter)**	121	1	<0.05	0	1.4	3.2	<0.005	0	0.02	0.05
9	Nutritional bars	291	4	0.4	0	9.5	18.0	0.01	0	0.14	0.28
10	Pasta, cooked	4,290	32	1.4	4.8	4.3	8.8	0.02	0.08	0.07	0.16
11	Processed meats	9,211	70	2.6	7.0	3.8	8.1	0.04	0.12	0.06	0.15
12	Protein and nutritional powders	402	4	0.5	0	11.9	26.4	0.01	0	0.16	0.33
13	Protein beverages, RTD**	165	2	0.2	0	13.4	22.0	<0.005	0	0.20	0.35
14	Sauces, cream-based	1,040	9	0.1	0	0.7	1.5	<0.005	0	0.01	0.03
15	Snack foods	6,825	54	2.2	6.3	4.1	8.5	0.04	0.11	0.08	0.17
Infants 0-11 mo											
1	Bakery products*	31	5	0.1	0	1.4	3.5	0.01	0	0.14	0.36
2	Batter/breading/coating for frying*	6	0.9	<0.05	0	<0.05	NA	<0.005	0	<0.005	NA
3	Cereal, RTE*	49	8	0.2	0	2.2	4.4	0.02	0	0.25	0.46
4	Dairy analog products**	110	19	<0.05	<0.05	0.2	0.2	<0.005	<0.005	0.02	0.02
5	Meat analogs & vegetarian food products*	1	0.1	<0.05	0	25.9	NA	<0.005	0	2.35	NA
6	Mixed dishes with sauce*	27	4	<0.05	0	0.1	0.3	<0.005	0	0.01	0.03
7	Non-dairy beverages*	7	1	0.2	0	13.0	NA	0.02	0	1.43	NA
8	Nut butters (except full-fat peanut butter)*	0	0	NA	NA	NA	NA	NA	NA	NA	NA
9	Nutritional bars*	0	0	NA	NA	NA	NA	NA	NA	NA	NA
10	Pasta, cooked *	50	7	0.1	0	1.4	3.5	0.01	0	0.15	0.33
11	Processed meats*	61	11	0.2	0.1	2.0	4.4	0.02	0.01	0.23	0.49
12	Protein and nutritional powders*	0	0	NA	NA	NA	NA	NA	NA	NA	NA

				Per Capita		Per User		Per Capita		Per User	
					90th		90th		90th		90th
			%	Mean	Percentile	Mean	Percentile	Mean	Percentile	Mean	Percentile
Population and Food Category		N	User	- - - - g/day - - - -				- - - - g/kg-bw/day - - - -			
13	Protein beverages, RTD*	0	0	NA	NA	NA	NA	NA	NA	NA	NA
14	Sauces, cream-based*	9	1	<0.05	0	0.3	NA	<0.005	0	0.03	NA
15	Snack foods**	82	13	0.2	0.5	1.5	3.3	0.02	0.05	0.17	0.43
Children 1-6 y											
1	Bakery products	646	43	1.5	5.0	3.4	6.8	0.08	0.28	0.19	0.36
2	Batter/breading/coating for frying	251	14	<0.05	0.1	0.2	0.4	<0.005	0.01	0.01	0.02
3	Cereal, RTE	914	57	3.8	10.5	6.6	13.8	0.22	0.60	0.39	0.76
4	Dairy analog products	843	50	0.1	0.2	0.2	0.4	0.01	0.01	0.01	0.02
5	Meat analogs & vegetarian food products*	17	2	0.1	0	7.3	17.1	0.01	0	0.42	0.81
6	Mixed dishes with sauce	377	24	<0.05	0.1	0.1	0.2	<0.005	0.01	0.01	0.01
7	Non-dairy beverages**	88	6	0.5	0	9.1	27.1	0.04	0	0.68	2.13
8	Nut butters (except full-fat peanut butter)*	14	0.8	<0.05	0	1.1	1.6	<0.005	0	0.07	0.12
9	Nutritional bars*	17	1	0.1	0	6.0	10.0	<0.005	0	0.33	0.50
10	Pasta, cooked	638	38	1.0	3.4	2.6	5.2	0.06	0.20	0.16	0.31
11	Processed meats	1,191	77	2.5	6.2	3.3	6.5	0.15	0.35	0.19	0.38
12	Protein and nutritional powders*	20	1	<0.05	0	2.7	6.0	<0.005	0	0.16	0.30
13	Protein beverages, RTD*	7	0.5	<0.05	0	7.5	NA	<0.005	0	0.42	NA
14	Sauces, cream-based**	132	8	<0.05	0	0.5	1.0	<0.005	0	0.03	0.05
15	Snack foods	1,048	69	2.5	6.5	3.7	7.6	0.15	0.40	0.23	0.48
Children 7-12 y											
1	Bakery products	727	48	2.2	6.3	4.6	8.7	0.06	0.18	0.13	0.24
2	Batter/breading/coating for frying	319	20	0.1	0.2	0.3	0.6	<0.005	0.01	0.01	0.02
3	Cereal, RTE	835	54	5.3	15.0	9.8	18.8	0.15	0.45	0.28	0.57
4	Dairy analog products	773	53	0.1	0.4	0.3	0.7	<0.005	0.01	0.01	0.02
5	Meat analogs & vegetarian food products*	21	2	0.1	0	4.8	12.2	<0.005	0	0.16	0.42
6	Mixed dishes with sauce	266	20	<0.05	0.1	0.1	0.2	<0.005	<0.005	<0.005	0.01
7	Non-dairy beverages*	40	3	0.2	0	7.8	13.0	0.01	0	0.24	0.48
8	Nut butters (except full-fat peanut butter)*	5	0.6	<0.05	0	1.8	NA	<0.005	0	0.05	NA
9	Nutritional bars*	21	3	0.2	0	7.1	12.4	0.01	0	0.21	0.38
10	Pasta, cooked	581	39	1.5	4.8	3.8	7.2	0.04	0.13	0.11	0.22
11	Processed meats	1,233	83	3.0	6.9	3.6	7.6	0.08	0.20	0.10	0.22

				Per Capita		Per User		Per Capita		Per User	
					90th		90th		90th		90th
			%	Mean	Percentile	Mean	Percentile	Mean	Percentile	Mean	Percentile
Population and Food Category		N	User	- - - - g/day - - - -				- - - - g/kg-bw/day - - - -			
12	Protein and nutritional powders*	10	0.9	<0.05	0	3.7	NA	<0.005	0	0.12	NA
13	Protein beverages, RTD*	6	0.6	<0.05	0	8.0	NA	<0.005	0	0.18	NA
14	Sauces, cream-based**	122	9	0.1	0	0.8	1.8	<0.005	0	0.02	0.05
15	Snack foods	1,007	69	3.5	8.9	5.1	11.0	0.10	0.26	0.15	0.32
Adolescents 13-19 y											
1	Bakery products	745	45	2.6	8.2	5.7	10.5	0.04	0.13	0.09	0.17
2	Batter/breading/coating for frying	341	19	0.1	0.3	0.4	0.8	<0.005	<0.005	0.01	0.01
3	Cereal, RTE	647	41	4.8	15.9	11.7	23.1	0.08	0.25	0.18	0.35
4	Dairy analog products	708	46	0.3	0.6	0.6	1.1	<0.005	0.01	0.01	0.02
5	Meat analogs & vegetarian food products*	23	2	0.2	0	10.2	37.0	<0.005	0	0.14	0.41
6	Mixed dishes with sauce	215	15	<0.05	0.1	0.1	0.2	<0.005	<0.005	<0.005	<0.005
7	Non-dairy beverages*	61	5	0.5	0	9.2	13.4	0.01	0	0.15	0.23
8	Nut butters (except full-fat peanut butter)*	6	0.3	<0.05	0	1.0	NA	<0.005	0	0.02	NA
9	Nutritional bars*	37	2	0.2	0	8.1	13.1	<0.005	0	0.13	0.19
10	Pasta, cooked	535	32	1.6	5.9	4.8	10.1	0.03	0.08	0.08	0.16
11	Processed meats	1,212	76	3.2	7.9	4.2	8.7	0.05	0.12	0.06	0.14
12	Protein and nutritional powders*	47	3	0.4	0	10.7	22.0	0.01	0	0.16	0.34
13	Protein beverages, RTD*	13	0.8	0.1	0	14.1	52.6	<0.005	0	0.22	0.86
14	Sauces, cream-based**	105	6	0.1	0	0.9	1.6	<0.005	0	0.01	0.03
15	Snack foods	909	59	2.5	6.4	4.2	8.5	0.04	0.10	0.07	0.14
Adults 20+ y											
1	Bakery products	2,642	34	1.8	6.1	5.3	10.3	0.02	0.07	0.07	0.13
2	Batter/breading/coating for frying	2,278	23	0.1	0.3	0.4	0.7	<0.005	<0.005	<0.005	0.01
3	Cereal, RTE	2,112	28	3.3	12.1	11.9	22.8	0.04	0.15	0.15	0.29
4	Dairy analog products	5,633	66	0.8	2.1	1.2	3.0	0.01	0.03	0.01	0.04
5	Meat analogs & vegetarian food products**	166	3	0.5	0	17.6	45.4	0.01	0	0.22	0.87
6	Mixed dishes with sauce	1,035	13	<0.05	0.1	0.1	0.2	<0.005	<0.005	<0.005	<0.005
7	Non-dairy beverages	514	7	0.5	0	7.7	15.0	0.01	0	0.10	0.21
8	Nut butters (except full-fat peanut butter)**	96	1	<0.05	0	1.5	3.2	<0.005	0	0.02	0.04
9	Nutritional bars	216	5	0.5	0	9.8	18.5	0.01	0	0.13	0.25
10	Pasta, cooked	2,486	31	1.4	4.8	4.5	9.7	0.02	0.06	0.06	0.12

				Per Capita		Per User		Per Capita		Per User	
					90th		90th		90th		90th
			%	Mean	Percentile	Mean	Percentile	Mean	Percentile	Mean	Percentile
Population and Food Category		N	User	- - - - g/day - - - -				- - - - g/kg-bw/day - - - -			
11	Processed meats	5,514	68	2.5	7.0	3.8	8.3	0.03	0.08	0.05	0.10
12	Protein and nutritional powders	325	5	0.7	0	12.4	26.8	0.01	0	0.16	0.33
13	Protein beverages, RTD**	139	2	0.3	0	13.7	22.0	<0.005	0	0.19	0.35
14	Sauces, cream-based	672	9	0.1	0	0.8	1.5	<0.005	0	0.01	0.02
15	Snack foods	3,779	51	2.1	6.1	4.0	8.5	0.03	0.07	0.05	0.10

[1] Un-weighted number of users; % user, *per capita*, and *per user* estimates were based on NHANES 2015-2018 using the statistical weights provided by the NCHS.

* The estimated per user mean and 90th percentile daily intakes are likely not statistically reliable due to an inadequate number of users.

** The estimated per user 90th percentile daily intake is likely not statistically reliable due to an inadequate number of users.

NA = Not available; estimate not reported when the unweighted number of users ≤10.

Conclusions

Consumption data and information pertaining to the proposed food use of corn protein were used to estimate the *per capita* and *per user* intakes of corn protein for the total U.S. population and select age subpopulations. The methodology in this study relied on the dietary recall component of the NHANES survey which consists of two non-consecutive 24-hour recalls. The estimates based on 2-day average intakes do not necessarily represent long-term intakes, since (1) they may not capture infrequent consumers of foods proposed to contain corn protein, (2) assume that subjects who consumed corn protein-containing products on both survey days actually consume these corn protein products every day of the year, and (3) do not adjust for potential day-to-day variation in corn protein intake.

In summary, on a *per capita* basis, the mean intake of corn protein by the total U.S. population from all proposed food uses was estimated to be 14.5 g/day or 0.25 g/kg bw/day. At the *per user* 90th percentile (i.e., heavy users), intake of corn protein by the total U.S. population from all proposed food uses was estimated to be 29.0 g/day or 0.57 g/kg bw/day.

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Appendix I: NHANES Food Codes Used in Analysis

Food code	Food description
Bakery products	
27515080	Steak sandwich, plain, on biscuit*
27516010	Gyro sandwich (pita bread, beef, lamb, onion, condiments), with tomato and spread*
27520170	Bacon on biscuit*
27520250	Ham on biscuit*
27540145	Chicken fillet biscuit, from fast food*
27540180	Chicken patty sandwich or biscuit*
27540200	Fajita-style chicken sandwich with cheese, on pita bread, with lettuce and tomato*
27560650	Sausage on biscuit*
27560670	Sausage and cheese on English muffin*
27560705	Sausage balls, made with biscuit mix and cheese*
32101500	Egg, Benedict*
32202010	Egg, cheese, and ham on English muffin*
32202030	Egg, cheese, and sausage on English muffin*
32202050	Egg, cheese, and sausage on biscuit*
32202060	Egg and sausage on biscuit*
32202070	Egg, cheese, and bacon on biscuit*
32202080	Egg, cheese, and bacon on English muffin*
32202090	Egg and bacon on biscuit*
32202110	Egg and ham on biscuit*
32202130	Egg and steak on biscuit*
32202200	Egg and cheese on biscuit*
51108010	Focaccia, Italian flatbread, plain
51108100	Naan, Indian flatbread
51109100	Bread, pita
51109150	Bread, pita with fruit
51186010	Muffin, English
51186100	Muffin, English, with raisins
51186160	Muffin, English, with fruit other than raisins
51300175	Bread, chappatti or roti, wheat
51300185	Bread, paratha, wheat
51301600	Bread, pita, whole wheat
51301620	Bread, pita, wheat or cracked wheat
51302500	Muffin, English, wheat bran
51303010	Muffin, English, wheat or cracked wheat
51303030	Muffin, English, whole wheat
51303050	Muffin, English, wheat or cracked wheat, with raisins
51303070	Muffin, English, whole wheat, with raisins
51303100	Muffin, English, whole grain white
51404550	Muffin, English, pumpernickel
51630200	Muffin, English, multigrain
51808000	Bread, gluten free
51808010	Bread, gluten free, toasted
51808100	Roll, gluten free
52101000	Biscuit, NFS
52101030	Biscuit dough, fried
52101100	Biscuit, baking powder or buttermilk type, made from mix
52102040	Biscuit, from refrigerated dough
52103000	Biscuit, from fast food / restaurant
52104010	Biscuit, home recipe
52104040	Biscuit, wheat

Food code	Food description
52104100	Biscuit, cheese
52104200	Biscuit with fruit
52206010	Cornbread muffin, stick, round
52206060	Cornbread muffin, stick, round, made from home recipe
52301000	Muffin, NFS
52302010	Muffin, fruit
52302020	Muffin, fruit, low fat
52302500	Muffin, chocolate chip
52302600	Muffin, chocolate
52303010	Muffin, whole wheat
52303500	Muffin, wheat
52304000	Muffin, whole grain
52304010	Muffin, wheat bran
52304040	Muffin, bran with fruit, lowfat
52304100	Muffin, oatmeal
52304150	Muffin, oat bran
52306010	Muffin, plain
52306500	Muffin, pumpkin
52306550	Muffin, zucchini
52306700	Muffin, carrot
54408485	Pretzels, soft, gluten free
54408487	Pretzels, soft, gluten free, coated or flavored
55100040	Pancakes, gluten free, from frozen
55106000	Pancakes, gluten free
55200090	Waffle, gluten free, from frozen
55208000	Waffle, gluten free
55301025	French toast, gluten free*
58106200	Pizza, cheese, from frozen, thin crust*
58106205	Pizza, cheese, from frozen, thick crust*
58106210	Pizza, cheese, from restaurant or fast food, NS as to type of crust*
58106220	Pizza, cheese, from restaurant or fast food, thin crust*
58106225	Pizza, cheese, from restaurant or fast food, medium crust*
58106230	Pizza, cheese, from restaurant or fast food, thick crust*
58106233	Pizza, cheese, stuffed crust*
58106234	Pizza, cheese, from school lunch, medium crust*
58106235	Pizza, cheese, from school lunch, thin crust*
58106236	Pizza, cheese, from school lunch, thick crust*
58106250	Pizza, extra cheese, thin crust*
58106260	Pizza, extra cheese, thick crust*
58106300	Pizza, cheese, with vegetables, from frozen, thin crust*
58106305	Pizza, cheese with vegetables, from frozen, thick crust*
58106320	Pizza, cheese, with vegetables, from restaurant or fast food, thin crust*
58106325	Pizza, cheese, with vegetables, from restaurant or fast food, medium crust*
58106330	Pizza, cheese, with vegetables, from restaurant or fast food, thick crust*
58106345	Pizza with cheese and extra vegetables, thin crust*
58106347	Pizza with cheese and extra vegetables, medium crust*
58106358	Pizza, cheese, with fruit, thin crust*
58106359	Pizza, cheese, with fruit, medium crust*
58106360	Pizza, cheese, with fruit, thick crust*
58106512	Pizza with pepperoni, from frozen, thin crust*
58106514	Pizza with pepperoni, from frozen, medium crust*
58106516	Pizza with pepperoni, from frozen, thick crust*
58106540	Pizza with pepperoni, from restaurant or fast food, NS as to type of crust*
58106550	Pizza with pepperoni, from restaurant or fast food, thin crust*
58106555	Pizza with pepperoni, from restaurant or fast food, medium crust*

Food code	Food description
58106560	Pizza with pepperoni, from restaurant or fast food, thick crust*
58106565	Pizza with pepperoni, stuffed crust*
58106570	Pizza with pepperoni, from school lunch, thin crust*
58106578	Pizza, with pepperoni, from school lunch, medium crust*
58106580	Pizza with pepperoni, from school lunch, thick crust*
58106602	Pizza with meat other than pepperoni, from frozen, thin crust*
58106604	Pizza with meat other than pepperoni, from frozen, medium crust*
58106606	Pizza with meat other than pepperoni, from frozen, thick crust*
58106610	Pizza with meat other than pepperoni, from restaurant or fast food, NS as to type of crust*
58106620	Pizza with meat other than pepperoni, from restaurant or fast food, thin crust*
58106625	Pizza with meat other than pepperoni, from restaurant or fast food, medium crust*
58106630	Pizza with meat other than pepperoni, from restaurant or fast food, thick crust*
58106633	Pizza, with meat other than pepperoni, stuffed crust*
58106634	Pizza, with meat other than pepperoni, from school lunch, medium crust*
58106635	Pizza, with meat other than pepperoni, from school lunch, thin crust*
58106636	Pizza, with meat other than pepperoni, from school lunch, thick crust*
58106650	Pizza with extra meat, thin crust*
58106655	Pizza with extra meat, medium crust*
58106660	Pizza with extra meat, thick crust*
58106700	Pizza with meat and vegetables, from frozen, thin crust*
58106702	Pizza with meat and vegetables, from frozen, medium crust*
58106705	Pizza with meat and vegetables, from frozen, thick crust*
58106720	Pizza with meat and vegetables, from restaurant or fast food, thin crust*
58106725	Pizza with meat and vegetables, from restaurant or fast food, medium crust*
58106730	Pizza with meat and vegetables, from restaurant or fast food, thick crust*
58106736	Pizza with extra meat and extra vegetables, thin crust*
58106737	Pizza with extra meat and extra vegetables, thick crust*
58106738	Pizza with extra meat and extra vegetables, medium crust*
58106750	Pizza with meat and fruit, thin crust*
58106755	Pizza with meat and fruit, medium crust*
58106760	Pizza with meat and fruit, thick crust*
58106830	Pizza with beans and vegetables, thick crust*
58107050	Pizza, no cheese, thin crust*
58107205	White pizza, cheese, thin crust*
58107212	White pizza, cheese, with vegetables, thin crust*
58107222	White pizza, cheese, with meat, thin crust*
58107224	White pizza, cheese, with meat, thick crust*
58107232	White pizza, cheese, with meat and vegetables, thin crust*
58108000	Calzone, with cheese, meatless*
58108010	Calzone, with meat and cheese*
58108050	Pizza rolls*
58109015	Pizza, cheese, whole wheat thin crust*
58109020	Pizza, cheese, whole wheat thick crust*
58109030	Pizza, with meat, whole wheat thin crust*
58109040	Pizza, with meat, whole wheat thick crust*
58109050	Pizza, cheese and vegetables, whole wheat thin crust*
58109060	Pizza, cheese and vegetables, whole wheat thick crust*
58109100	Pizza, cheese, gluten-free thin crust*
58109120	Pizza, with meat, gluten-free thin crust*
58109130	Pizza, with meat, gluten-free thick crust*
58109140	Pizza, cheese and vegetables, gluten-free thin crust*
58109150	Pizza, cheese and vegetables, gluten-free thick crust*
58109210	Breakfast pizza with egg*
58128000	Biscuit with gravy
Batter/breading/coating for frying	

Food code	Food description
14660200	Mozzarella sticks, breaded, baked, or fried*
21003000	Beef, NS as to cut, fried, NS to fat eaten*
21102110	Beef steak, fried, NS as to fat eaten*
21102120	Beef steak, fried, lean and fat eaten*
21102130	Beef steak, fried, lean only eaten*
21103110	Beef steak, breaded or floured, baked or fried, NS as to fat eaten*
21103120	Beef steak, breaded or floured, baked or fried, lean and fat eaten*
21103130	Beef steak, breaded or floured, baked or fried, lean only eaten*
21104110	Beef steak, battered, fried, NS as to fat eaten*
21104130	Beef steak, battered, fried, lean only eaten*
22000200	Pork, NS as to cut, fried, NS as to fat eaten*
22000210	Pork, NS as to cut, fried, lean and fat eaten*
22000220	Pork, NS as to cut, fried, lean only eaten*
22000300	Pork, NS as to cut, breaded or floured, fried, NS as to fat eaten*
22000320	Pork, NS as to cut, breaded or floured, fried, lean only eaten*
22101140	Pork chop, breaded or floured, broiled or baked, lean and fat eaten*
22101150	Pork chop, breaded or floured, broiled or baked, lean only eaten*
22101200	Pork chop, fried, NS as to fat eaten*
22101210	Pork chop, fried, lean and fat eaten*
22101220	Pork chop, fried, lean only eaten*
22101300	Pork chop, breaded or floured, fried, NS as to fat eaten*
22101310	Pork chop, breaded or floured, fried, lean and fat eaten*
22101320	Pork chop, breaded or floured, fried, lean only eaten*
22101410	Pork chop, battered, fried, lean and fat eaten*
22101420	Pork chop, battered, fried, lean only eaten*
22201050	Pork steak or cutlet, battered, fried, NS as to fat eaten*
22201060	Pork steak or cutlet, battered, fried, lean and fat eaten*
22201070	Pork steak or cutlet, battered, fried, lean only eaten*
22201210	Pork steak or cutlet, fried, lean and fat eaten*
22201220	Pork steak or cutlet, fried, lean only eaten*
22201320	Pork steak or cutlet, breaded or floured, broiled or baked, lean only eaten*
22201410	Pork steak or cutlet, breaded or floured, fried, lean and fat eaten*
22201420	Pork steak or cutlet, breaded or floured, fried, lean only eaten*
22210310	Pork, tenderloin, breaded, fried*
22300150	Ham, breaded or floured, fried, NS as to fat eaten*
22300160	Ham, breaded or floured, fried, lean and fat eaten*
23150200	Goat, fried*
23203030	Veal chop, fried, lean only eaten*
23205020	Veal cutlet or steak, fried, lean and fat eaten*
23205030	Veal cutlet or steak, fried, lean only eaten*
23220030	Veal patty, breaded, cooked*
23321250	Venison/deer steak, breaded or floured, cooked, NS as to cooking method*
24107070	Chicken, NS as to part, fried, coated, skin / coating eaten*
24107071	Chicken, NS as to part, fried, coated, skin / coating not eaten*
24127200	Chicken breast, fried, coated, skin / coating eaten, from raw*
24127201	Chicken breast, fried, coated, skin / coating not eaten, from raw*
24127202	Chicken breast, fried, coated, prepared skinless, coating eaten, from raw*
24127210	Chicken breast, fried, coated, skin / coating eaten, from pre-cooked*
24127211	Chicken breast, fried, coated, skin / coating not eaten, from pre-cooked*
24127220	Chicken breast, fried, coated, skin / coating eaten, from fast food / restaurant*
24127221	Chicken breast, fried, coated, skin / coating not eaten, from fast food / restaurant*
24127500	Chicken breast, baked, coated, skin / coating eaten*
24137300	Chicken leg, drumstick and thigh, fried, coated, skin / coating eaten*
24137301	Chicken leg, drumstick and thigh, fried, coated, skin / coating not eaten*
24137310	Chicken leg, drumstick and thigh, baked, coated, skin / coating eaten*

Food code	Food description
24147300	Chicken drumstick, fried, coated, skin / coating eaten, from raw*
24147301	Chicken drumstick, fried, coated, skin / coating not eaten, from raw*
24147302	Chicken drumstick, fried, coated, prepared skinless, coating eaten, from raw*
24147310	Chicken drumstick, fried, coated, skin / coating eaten, from pre-cooked*
24147311	Chicken drumstick, fried, coated, skin / coating not eaten, from pre-cooked*
24147320	Chicken drumstick, fried, coated, skin / coating eaten, from fast food / restaurant*
24147321	Chicken drumstick, fried, coated, skin / coating not eaten, from fast food / restaurant*
24147400	Chicken drumstick, baked, coated, skin / coating eaten*
24157300	Chicken thigh, fried, coated, skin / coating eaten, from raw*
24157301	Chicken thigh, fried, coated, skin / coating not eaten, from raw*
24157302	Chicken thigh, fried, coated, prepared skinless, coating eaten, from raw*
24157310	Chicken thigh, fried, coated, skin / coating eaten, from pre-cooked*
24157311	Chicken thigh, fried, coated, skin / coating not eaten, from pre-cooked*
24157320	Chicken thigh, fried, coated, skin / coating eaten, from fast food*
24157321	Chicken thigh, fried, coated, skin / coating not eaten, from fast food*
24157330	Chicken thigh, fried, coated, skin / coating eaten, from restaurant*
24157331	Chicken thigh, fried, coated, skin / coating not eaten, from restaurant*
24157400	Chicken thigh, baked, coated, skin / coating eaten*
24167200	Chicken wing, fried, coated, from raw*
24167210	Chicken wing, fried, coated, from pre-cooked*
24167220	Chicken wing, fried, coated, from fast food*
24167230	Chicken wing, fried, coated, from restaurant*
24167300	Chicken wing, baked, coated*
24168002	Chicken "wings", plain, from fast food / restaurant*
24168012	Chicken "wings", plain, from precooked*
24168022	Chicken "wings", plain, from other sources*
24168030	Chicken "wings", boneless, with hot sauce, from fast food / restaurant*
24168031	Chicken "wings", boneless, with hot sauce, from other sources*
24201060	Turkey, light meat, breaded, baked or fried, skin not eaten*
24201360	Turkey, light or dark meat, fried, coated, skin not eaten*
24201370	Turkey, light or dark meat, fried, coated, skin eaten*
24301210	Duck, coated, fried*
25110140	Beef liver, fried*
25110450	Chicken liver, fried*
26100130	Fish, NS as to type, coated, baked or broiled, made with oil*
26100133	Fish, NS as to type, coated, baked or broiled, no added fat*
26100140	Fish, NS as to type, coated, fried, made with oil*
26100142	Fish, NS as to type, coated, fried, made with margarine*
26105140	Carp, coated, fried*
26107110	Catfish, cooked, NS as to cooking method*
26107130	Catfish, coated, baked or broiled, made with oil*
26107131	Catfish, coated, baked or broiled, made with butter*
26107133	Catfish, coated, baked or broiled, no added fat*
26107140	Catfish, coated, fried, made with oil*
26107143	Catfish, coated, fried, no added fat*
26107144	Catfish, coated, fried, made with cooking spray*
26109130	Cod, coated, baked or broiled, made with oil*
26109133	Cod, coated, baked or broiled, no added fat*
26109134	Cod, coated, baked or broiled, made with cooking spray*
26109140	Cod, coated, fried, made with oil*
26109141	Cod, coated, fried, made with butter*
26109144	Cod, coated, fried, made with cooking spray*
26111140	Croaker, coated, fried*
26115130	Flounder, coated, baked or broiled, made with oil*
26115140	Flounder, coated, fried, made with oil*

Food code	Food description
26117130	Haddock, coated, baked or broiled, fat added*
26117131	Haddock, coated, baked or broiled, no added fat*
26117140	Haddock, coated, fried*
26118030	Halibut, coated, baked or broiled, made with oil*
26119130	Herring, coated, baked or broiled, fat added*
26119140	Herring, coated, fried*
26121140	Mackerel, coated, fried*
26127110	Perch, cooked, NS as to cooking method*
26127130	Perch, coated, baked or broiled, made with oil*
26127140	Perch, coated, fried, made with oil*
26127143	Perch, coated, fried, no added fat*
26131131	Pompano, coated, baked or broiled, no added fat*
26131140	Pompano, coated, fried*
26133130	Porgy, coated, baked or broiled, fat added*
26133140	Porgy, coated, fried*
26137130	Salmon, coated, baked or broiled, made with oil*
26137131	Salmon, coated, baked or broiled, made with butter*
26137133	Salmon, coated, baked or broiled, no added fat*
26137134	Salmon, coated, baked or broiled, made with cooking spray*
26137140	Salmon, coated, fried, made with oil*
26137141	Salmon, coated, fried, made with butter*
26137142	Salmon, coated, fried, made with margarine*
26137143	Salmon, coated, fried, no added fat*
26141130	Sea bass, coated, baked or broiled, fat added*
26141140	Sea bass, coated, fried*
26151130	Trout, coated, baked or broiled, made with oil*
26151133	Trout, coated, baked or broiled, no added fat*
26151140	Trout, coated, fried, made with oil*
26151142	Trout, coated, fried, made with margarine*
26153131	Tuna, fresh, coated, baked or broiled, no added fat*
26157110	Whiting, cooked, NS as to cooking method*
26157132	Whiting, coated, baked or broiled, made with margarine*
26157133	Whiting, coated, baked or broiled, no added fat*
26157140	Whiting, coated, fried, made with oil*
26158020	Tilapia, coated, baked or broiled, made with oil*
26158021	Tilapia, coated, baked or broiled, made with butter*
26158023	Tilapia, coated, baked or broiled, no added fat*
26158024	Tilapia, coated, baked or broiled, made with cooking spray*
26158030	Tilapia, coated, fried, made with oil*
26158031	Tilapia, coated, fried, made with butter*
26158032	Tilapia, coated, fried, made with margarine*
26158033	Tilapia, coated, fried, no added fat*
26158034	Tilapia, coated, fried, made with cooking spray*
26203110	Frog legs, NS as to cooking method*
26205110	Octopus, cooked, NS as to cooking method*
26213140	Squid, coated, fried*
26303140	Clams, coated, fried*
26305130	Crab, coated, baked or broiled, fat added*
26307140	Crab, soft shell, coated, fried*
26309140	Crayfish, coated, fried*
26311140	Lobster, coated, fried*
26315110	Oysters, cooked, NS as to cooking method*
26315140	Oysters, coated, fried*
26317140	Scallops, coated, fried*
26319110	Shrimp, cooked, NS as to cooking method*

Food code	Food description
26319140	Shrimp, coated, fried, made with oil*
26319143	Shrimp, coated, fried, no added fat*
26319145	Shrimp, coated, fried, from fast food / restaurant*
26319160	Shrimp, coated, baked or broiled, made with oil*
26319161	Shrimp, coated, baked or broiled, made with butter*
26319163	Shrimp, coated, baked or broiled, no added fat*
27120060	Sweet and sour pork*
27135110	Veal parmigiana*
27146250	Chicken or turkey cordon bleu*
27146300	Chicken or turkey parmigiana*
27150170	Sweet and sour shrimp*
27220080	Ham croquette*
27250040	Crab cake*
27250070	Salmon cake or patty*
27250160	Tuna cake or patty*
27250400	Shrimp cake or patty*
27416400	Stir fried beef and vegetables in soy sauce*
27446320	Chicken or turkey, breaded, fried, garden salad with bacon and cheese, chicken and/or turkey, bacon, cheese, lettuce and/or greens, tomato and/or carrots, other vegetables, no dressing*
27446362	Chicken or turkey, breaded, fried, caesar garden salad, chicken and/or turkey, lettuce, tomatoes, cheese, no dressing*
27515070	Steak and cheese submarine sandwich, with fried peppers and onions, on roll*
27520166	Bacon, breaded fried chicken fillet, and tomato club sandwich with cheese, lettuce and spread*
27540140	Chicken fillet, breaded, fried, sandwich*
27540150	Chicken fillet, breaded, fried, sandwich with lettuce, tomato and spread*
27540151	Chicken fillet, breaded, fried, sandwich with cheese, lettuce, tomato and spread*
27540210	Chicken fillet wrap sandwich, fried, from fast food*
27550000	Fish sandwich, fried, from fast food*
27550100	Fish sandwich, fried, from fast food, with cheese*
27550150	Fried seafood sandwich*
27550200	Fish sandwich, from school cafeteria*
27550300	Fish sandwich, NFS*
27550400	Fish sandwich, fried, on white bun*
27550405	Fish sandwich, fried, on white bun, with cheese*
27550410	Fish sandwich, fried, on wheat bun*
28140710	Chicken, fried, with potatoes, vegetable, frozen meal*
28140810	Chicken, fried, with potatoes, vegetable, dessert, frozen meal*
28141010	Chicken, fried, with potatoes, vegetable, dessert, frozen meal, large meat portion*
41421020	Soybean curd, breaded, fried*
71905120	Plantain, ripe, rolled in flour, fried*
72202030	Fried broccoli*
74205010	Fried green tomatoes*
75205200	Fried green beans*
75409020	Fried cauliflower*
75412010	Fried eggplant*
75414030	Fried mushrooms*
75414500	Fried okra*
75415020	Onion rings, NS as to form, batter-dipped, baked or fried*
75415022	Fried onion rings*
75418010	Fried summer squash, yellow or green*
75511300	Pickles, fried*
Cereal, RTE	
57000100	Cereal, oat, NFS
57100100	Cereal, ready-to-eat, NFS
57101000	Cereal (Kellogg's All-Bran)

Food code	Food description
57103000	Cereal (Post Alpha-Bits)
57103100	Cereal (General Mills Cheerios Apple Cinnamon)
57104000	Cereal (Kellogg's Apple Jacks)
57106050	Cereal (Post Great Grains Banana Nut Crunch)
57106060	Cereal (General Mills Cheerios Banana Nut)
57106100	Cereal (General Mills Basic 4)
57106250	Cereal (General Mills Kix Berry Berry)
57106260	Cereal (General Mills Cheerios Berry Burst)
57107000	Cereal (General Mills Boo Berry)
57110000	Cereal (Kellogg's All-Bran Bran Buds)
57117000	Cereal (Quaker Cap'n Crunch)
57117500	Cereal (Quaker Christmas Crunch)
57119000	Cereal (Quaker Cap'n Crunch's Crunchberries)
57120000	Cereal (Quaker Cap'n Crunch's Peanut Butter Crunch)
57123000	Cereal (General Mills Cheerios)
57124030	Cereal (General Mills Chex Chocolate)
57124050	Cereal (General Mills Chex Cinnamon)
57124100	Cereal (General Mills Cheerios Chocolate)
57124200	Cereal, chocolate flavored, frosted, puffed corn
57124300	Cereal (General Mills Lucky Charms Chocolate)
57125000	Cereal (General Mills Cinnamon Toast Crunch)
57125010	Cereal (General Mills 25% Less Sugar Cinnamon Toast Crunch)
57125900	Cereal (General Mills Honey Nut Clusters)
57126000	Cereal (Kellogg's Cocoa Krispies)
57127000	Cereal (Post Cocoa Pebbles)
57128000	Cereal (General Mills Cocoa Puffs)
57128005	Cereal (General Mills 25% Less Sugar Cocoa Puffs)
57130000	Cereal (General Mills Cookie Crisp)
57132000	Cereal (General Mills Chex Corn)
57134000	Cereal, corn flakes
57135000	Cereal (Kellogg's Corn Flakes)
57137000	Cereal, corn puffs
57139000	Cereal (General Mills Count Chocula)
57143000	Cereal (Kellogg's Cracklin' Oat Bran)
57143500	Cereal (Post Great Grains, Cranberry Almond Crunch)
57148000	Cereal (Kellogg's Crispix)
57148500	Cereal, crispy brown rice
57151000	Cereal, crispy rice
57201900	Cereal (General Mills Dora The Explorer)
57206700	Cereal (General Mills Fiber One)
57206710	Cereal (General Mills Fiber One Honey Clusters)
57206715	Cereal (General Mills Fiber One Raisin Bran Clusters)
57207000	Cereal, bran flakes
57208000	Cereal (Kellogg's All-Bran Complete Wheat Flakes)
57209000	Cereal (Post Bran Flakes)
57211000	Cereal (General Mills Frankenberry)
57213000	Cereal (Kellogg's Froot Loops)
57213010	Cereal (Kellogg's Froot Loops Marshmallow)
57213850	Cereal (General Mills Cheerios Frosted)
57214000	Cereal (Kellogg's Frosted Mini-Wheats)
57218000	Cereal (Kellogg's Frosted Krispies)
57221700	Cereal, fruit rings
57221810	Cereal (General Mills Cheerios Fruity)
57223000	Cereal (Post Fruity Pebbles)
57224000	Cereal (General Mills Golden Grahams)

Food code	Food description
57227000	Cereal, granola
57228000	Granola, homemade
57229000	Cereal (Kellogg's Low Fat Granola)
57229500	Cereal (Kellogg's Low Fat Granola with Raisins)
57230000	Cereal (Post Grape-Nuts)
57231000	Cereal (Post Grape-Nuts Flakes)
57231200	Cereal (Post Great Grains Raisins, Dates, and Pecans)
57231250	Cereal (Post Great Grains Double Pecan Whole Grain Cereal)
57237100	Cereal (Post Honey Bunches of Oats Honey Roasted)
57237200	Cereal (Post Honey Bunches of Oats with Vanilla Bunches)
57237300	Cereal (Post Honey Bunches of Oats with Almonds)
57237900	Cereal (Post Honey Bunches of Oats Just Bunches)
57238000	Cereal (Post Honeycomb)
57240100	Cereal (General Mills Chex Honey Nut)
57241000	Cereal (General Mills Cheerios Honey Nut)
57241200	Cereal (Post Shredded Wheat Honey Nut)
57243000	Cereal (Kellogg's Honey Smacks)
57301500	Cereal (Kashi 7 Whole Grain Puffs)
57301505	Cereal (Kashi Autumn Wheat)
57301510	Cereal (Kashi GOLEAN)
57301511	Cereal (Kashi GOLEAN Crunch)
57301512	Cereal (Kashi GOLEAN Crunch Honey Almond Flax)
57301530	Cereal (Kashi Heart to Heart Honey Toasted Oat)
57303100	Cereal (General Mills Kix)
57303105	Cereal (General Mills Honey Kix)
57303200	Cereal (Kellogg's Krave)
57304100	Cereal (Quaker Life)
57305100	Cereal (General Mills Lucky Charms)
57305150	Cereal, frosted oat cereal with marshmallows
57305160	Cereal (Malt-O-Meal Blueberry Muffin Tops)
57305165	Cereal (Malt-O-Meal Cinnamon Toasters)
57305170	Cereal (Malt-O-Meal Coco-Roos)
57305174	Cereal (Malt-O-Meal Colossal Crunch)
57305175	Cereal (Malt-O-Meal Cocoa Dyno-Bites)
57305180	Cereal (Malt-O-Meal Corn Bursts)
57305200	Cereal (Malt-O-Meal Crispy Rice)
57305210	Cereal (Malt-O-Meal Frosted Flakes)
57305215	Cereal (Malt-O-Meal Frosted Mini Spooners)
57305300	Cereal (Malt-O-Meal Fruity Dyno-Bites)
57305400	Cereal (Malt-O-Meal Honey Graham Squares)
57305500	Cereal (Malt-O-Meal Honey Nut Toasty O's)
57305600	Cereal (Malt-O-Meal Marshmallow Mateys)
57306130	Cereal (Malt-O-Meal Raisin Bran)
57306500	Cereal (Malt-O-Meal Golden Puffs)
57306700	Cereal (Malt-O-Meal Toasted Oat Cereal)
57306800	Cereal (Malt-O-Meal Tootie Fruities)
57307500	Cereal, millet, puffed
57308190	Cereal, muesli
57308400	Cereal (General Mills Cheerios Multigrain)
57309100	Cereal (Nature Valley Granola)
57316300	Cereal (Health Valley Oat Bran Flakes)
57316380	Cereal (General Mills Cheerios Oat Cluster Crunch)
57316385	Cereal (General Mills Cheerios Protein)
57316450	Cereal (General Mills Oatmeal Crisp with Almonds)
57316710	Cereal (Quaker Honey Graham Oh's)

Food code	Food description
57320500	Cereal (Quaker Granola with Oats, Honey, and Raisins)
57321900	Cereal (Nature's Path Organic Flax Plus)
57326000	Cereal (Barbara's Puffins)
57327450	Cereal (Quaker Toasted Oat Bran)
57327500	Cereal (Quaker Oatmeal Squares)
57329000	Cereal, raisin bran
57330000	Cereal (Kellogg's Raisin Bran)
57330010	Cereal (Kellogg's Raisin Bran Crunch)
57331000	Cereal (Post Raisin Bran)
57332050	Cereal (General Mills Total Raisin Bran)
57332100	Cereal (General Mills Raisin Nut Bran)
57335550	Cereal (General Mills Reese's Puffs)
57336000	Cereal (General Mills Chex Rice)
57337000	Cereal, rice flakes
57339000	Cereal (Kellogg's Rice Krispies)
57339500	Cereal (Kellogg's Rice Krispies Treats Cereal)
57340000	Cereal, puffed rice
57341000	Cereal (Post Shredded Wheat'n Bran)
57341200	Cereal (Kellogg's Smart Start Strong)
57341300	Cereal (Kellogg's Smorz)
57344000	Cereal (Kellogg's Special K)
57344001	Cereal (Kellogg's Special K Blueberry)
57344005	Cereal (Kellogg's Special K Chocolatey Delight)
57344007	Cereal (Kellogg's Special K Low Fat Granola)
57344010	Cereal (Kellogg's Special K Red Berries)
57344015	Cereal (Kellogg's Special K Fruit & Yogurt)
57344020	Cereal (Kellogg's Special K Vanilla Almond)
57344025	Cereal (Kellogg's Special K Cinnamon Pecan)
57347000	Cereal (Kellogg's Corn Pops)
57348000	Cereal, frosted corn flakes
57349000	Cereal (Kellogg's Frosted Flakes)
57355000	Cereal (Post Golden Crisp)
57401100	Cereal, toasted oat
57406100	Cereal (General Mills Total)
57407100	Cereal (General Mills Trix)
57407110	Cereal (General Mills 25% Less Sugar Trix)
57408100	Cereal (Uncle Sam)
57410000	Cereal (Weetabix Whole Grain)
57411000	Cereal (General Mills Chex Wheat)
57416000	Cereal, puffed wheat, plain
57416010	Cereal, puffed wheat, sweetened
57417000	Cereal (Post Shredded Wheat)
57418000	Cereal (General Mills Wheaties)
Dairy analog products	
12200100	Coffee creamer, NFS
12210200	Coffee creamer, liquid
12210210	Coffee creamer, liquid, flavored
12210260	Coffee creamer, liquid, fat free
12210270	Coffee creamer, liquid, fat free, flavored
12210280	Coffee creamer, liquid, fat free, sugar free, flavored
12210310	Coffee creamer, liquid, sugar free, flavored
12210400	Coffee creamer, powder
12210420	Coffee creamer, powder, flavored
12210430	Coffee creamer, powder, fat free
12210440	Coffee creamer,powder, fat free, flavored

Food code	Food description
12210505	Coffee creamer,powder, sugar free, flavored
12210520	Coffee creamer, soy, liquid
12220200	Whipped topping
13210110	Pudding, bread*
13210810	Pumpkin pudding, Puerto Rican style*
14502000	Imitation cheese
14640050	Cheese sandwich, American cheese, on white bread, with butter*
14640052	Cheese sandwich, American cheese, on wheat bread, with butter*
14640054	Cheese sandwich, American cheese, on whole wheat bread, with butter*
14640056	Cheese sandwich, Cheddar cheese, on white bread, with butter*
14640058	Cheese sandwich, Cheddar cheese, on wheat bread, with butter*
14640060	Cheese sandwich, Cheddar cheese, on whole wheat bread, with butter*
14640062	Cheese sandwich, reduced fat American cheese, on white bread, with butter*
14640068	Cheese sandwich, reduced fat Cheddar cheese, on white bread, with butter*
14640100	Grilled cheese sandwich, NFS*
14640105	Grilled cheese sandwich, American cheese, on white bread*
14640110	Grilled cheese sandwich, American cheese, on wheat bread*
14640115	Grilled cheese sandwich, American cheese, on whole wheat bread*
14640125	Grilled cheese sandwich, Cheddar cheese, on white bread*
14640130	Grilled cheese sandwich, Cheddar cheese, on wheat bread*
14640135	Grilled cheese sandwich, Cheddar cheese, on whole wheat bread*
14640155	Grilled cheese sandwich, reduced fat American cheese, on white bread*
14640160	Grilled cheese sandwich, reduced fat American cheese, on wheat bread*
14640165	Grilled cheese sandwich, reduced fat American cheese, on whole wheat bread*
14640185	Grilled cheese sandwich, reduced fat Cheddar cheese, on white bread*
14640190	Grilled cheese sandwich, reduced fat Cheddar cheese, on wheat bread*
14640195	Grilled cheese sandwich, reduced fat Cheddar cheese, on whole wheat bread*
24168000	Chicken "wings" with hot sauce, from fast food / restaurant*
24168010	Chicken "wings" with hot sauce, from precooked*
24168020	Chicken "wings" with hot sauce, from other sources*
24168030	Chicken "wings", boneless, with hot sauce, from fast food / restaurant*
24168031	Chicken "wings", boneless, with hot sauce, from other sources*
26100122	Fish, NS as to type, baked or broiled, made with margarine*
26100142	Fish, NS as to type, coated, fried, made with margarine*
26109122	Cod, baked or broiled, made with margarine*
26137122	Salmon, baked or broiled, made with margarine*
26137142	Salmon, coated, fried, made with margarine*
26151142	Trout, coated, fried, made with margarine*
26157132	Whiting, coated, baked or broiled, made with margarine*
26158012	Tilapia, baked or broiled, made with margarine*
26158032	Tilapia, coated, fried, made with margarine*
26319122	Shrimp, baked or broiled, made with margarine*
27120120	Sausage gravy*
27212000	Beef and noodles, no sauce*
27250080	Salmon loaf*
27250410	Shrimp with crab stuffing*
27260510	Liver dumpling*
27311510	Shepherd's pie with beef*
27350060	Shrimp creole, with rice*
27443150	Chicken or turkey divan*
27450450	Shrimp creole, no rice*
27460750	Liver, beef or calves, and onions*
27520410	Cuban sandwich, with spread*
28140810	Chicken, fried, with potatoes, vegetable, dessert, frozen meal*
28141010	Chicken, fried, with potatoes, vegetable, dessert, frozen meal, large meat portion*

Food code	Food description
31105005	Egg, whole, fried, NS as to fat*
31105020	Egg, whole, fried with margarine*
31105085	Egg, whole, fried, NS as to fat type*
31106000	Egg, whole, baked, NS as to fat*
31106020	Egg, whole, baked, fat added*
31108100	Egg, white, cooked, NS as to fat*
31108120	Egg, white, cooked, fat added*
31111000	Egg, yolk only, cooked, NS as to fat*
31111020	Egg, yolk only, cooked, fat added*
31201000	Duck egg, cooked*
31202000	Goose egg, cooked*
32129990	Egg omelet or scrambled egg, NS as to fat*
32130000	Egg omelet or scrambled egg, made with margarine*
32130065	Egg omelet or scrambled egg, NS as to fat type*
32130100	Egg omelet or scrambled egg, with cheese, made with margarine*
32130190	Egg omelet or scrambled egg, with meat, NS as to fat*
32130200	Egg omelet or scrambled egg, with meat, made with margarine*
32130265	Egg omelet or scrambled egg, with meat, NS as to fat type*
32130290	Egg omelet or scrambled egg, with cheese and meat, NS as to fat*
32130300	Egg omelet or scrambled egg, with cheese and meat, made with margarine*
32130365	Egg omelet or scrambled egg, with cheese and meat, NS as to fat type*
32130400	Egg omelet or scrambled egg, with tomatoes, fat added*
32130420	Egg omelet or scrambled egg, with tomatoes, NS as to fat*
32130430	Egg omelet or scrambled egg, with dark-green vegetables, fat added*
32130450	Egg omelet or scrambled egg, with dark-green vegetables, NS as to fat*
32130460	Egg omelet or scrambled egg, with tomatoes and dark-green vegetables, fat added*
32130480	Egg omelet or scrambled egg, with tomatoes and dark-green vegetables, NS as to fat*
32130490	Egg omelet or scrambled egg, with vegetables other than dark green and/or tomatoes, fat added*
32130510	Egg omelet or scrambled egg, with vegetables other than dark green and/or tomatoes, NS as to fat*
32130600	Egg omelet or scrambled egg, with cheese and tomatoes, fat added*
32130620	Egg omelet or scrambled egg, with cheese and tomatoes, NS as to fat*
32130630	Egg omelet or scrambled egg, with cheese and dark-green vegetables, fat added*
32130650	Egg omelet or scrambled egg, with cheese and dark-green vegetables, NS as to fat*
32130660	Egg omelet or scrambled egg, with cheese, tomatoes, and dark-green vegetables, fat added*
32130680	Egg omelet or scrambled egg, with cheese, tomatoes, and dark-green vegetables, NS as to fat*
32130690	Egg omelet or scrambled egg, with cheese and vegetables other than dark green and/or tomatoes, fat added*
32130710	Egg omelet or scrambled egg, with cheese and vegetables other than dark green and/or tomatoes, NS as to fat*
32130800	Egg omelet or scrambled egg, with meat and tomatoes, fat added*
32130820	Egg omelet or scrambled egg, with meat and tomatoes, NS as to fat*
32130830	Egg omelet or scrambled egg, with meat and dark-green vegetables, fat added*
32130850	Egg omelet or scrambled egg, with meat and dark-green vegetables, NS as to fat*
32130890	Egg omelet or scrambled egg, with meat and vegetables other than dark-green and/or tomatoes, fat added*
32130910	Egg omelet or scrambled egg, with meat and vegetables other than dark-green and/or tomatoes, NS as to fat*
32131000	Egg omelet or scrambled egg, with cheese, meat, and tomatoes, fat added*
32131020	Egg omelet or scrambled egg, with cheese, meat, and tomatoes, NS as to fat*
32131030	Egg omelet or scrambled egg, with cheese, meat, and dark-green vegetables, fat added*
32131050	Egg omelet or scrambled egg, with cheese, meat, and dark-green vegetables, NS as to fat*
32131060	Egg omelet or scrambled egg, with cheese, meat, tomatoes, and dark-green vegetables, fat added*
32131080	Egg omelet or scrambled egg, with cheese, meat, tomatoes, and dark-green vegetables, NS as to fat*
32131090	Egg omelet or scrambled egg, with cheese, meat, and vegetables other than dark-green and/or tomatoes, fat added*
32131110	Egg omelet or scrambled egg, with cheese, meat, and vegetables other than dark-green and/or tomatoes, NS as to fat*
32131200	Egg omelet or scrambled egg, with potatoes and/or onions, fat added*

Food code	Food description
32131220	Egg omelet or scrambled egg, with potatoes and/or onions, NS as to fat*
32202130	Egg and steak on biscuit*
32202200	Egg and cheese on biscuit*
32400055	Egg white omelet, scrambled, or fried, NS as to fat*
32400060	Egg white omelet, scrambled, or fried, made with margarine*
32400078	Egg white omelet, scrambled, or fried, NS as to fat type*
32400100	Egg white, omelet, scrambled, or fried, with cheese*
32400200	Egg white, omelet, scrambled, or fried, with meat*
32400300	Egg white, omelet, scrambled, or fried, with vegetables*
32400400	Egg white, omelet, scrambled, or fried, with cheese and meat*
32400500	Egg white, omelet, scrambled, or fried, with cheese and vegetables*
32400600	Egg white, omelet, scrambled, or fried, with meat and vegetables*
32400700	Egg white, omelet, scrambled, or fried, with cheese, meat, and vegetables*
33000990	Egg substitute, omelet, scrambled, or fried, NS as to fat added in cooking*
33001010	Egg substitute, omelet, scrambled, or fried, fat added*
33401000	Egg substitute, omelet, scrambled, or fried, with cheese*
33401100	Egg substitute, omelet, scrambled, or fried, with meat*
33401200	Egg substitute, omelet, scrambled, or fried, with vegetables*
33401300	Egg substitute, omelet, scrambled, or fried, with cheese and meat*
33401400	Egg substitute, omelet, scrambled, or fried, with cheese and vegetables*
33401500	Egg substitute, omelet, scrambled, or fried, with meat and vegetables*
33401600	Egg substitute, omelet, scrambled, or fried, with cheese, meat, and vegetables*
41102013	Black, brown, or Bayo beans, dry, cooked, made with margarine*
41104013	Pinto, calico, or red Mexican beans, dry, cooked, made with margarine*
41106013	Red kidney beans, dry, cooked, made with margarine*
41205013	Refried beans, made with margarine*
41420020	Edamame, cooked*
41420380	Yogurt, soy
41480020	Frozen dessert, non-dairy
42204100	Gravy, vegetarian*
42401100	Yogurt, coconut milk
51161270	Pan Dulce, with sugar topping*
51182010	Bread stuffing*
52220110	Arepa Dominicana*
53115410	Cake or cupcake, oatmeal*
53116570	Cake, Ravani*
53200100	Cookie, batter or dough, raw*
53224250	Cookie, lemon bar*
53244020	Cookie, butter or sugar, with icing or filling other than chocolate*
53301500	Pie, apple, one crust*
53303000	Pie, blackberry, two crust*
53303500	Pie, berry, not blackberry, blueberry, boysenberry, huckleberry, raspberry, or strawberry; two crust*
53303570	Pie, berry, not blackberry, blueberry, boysenberry, huckleberry, raspberry, or strawberry, individual size or tart*
53305010	Pie, cherry, one crust*
53305700	Pie, lemon, not cream or meringue*
53305720	Pie, lemon, not cream or meringue, individual size or tart*
53310000	Pie, raspberry, one crust*
53310050	Pie, raspberry, two crust*
53385500	Pie, oatmeal*
53387000	Pie, Toll house chocolate chip*
53400200	Blintz, cheese-filled*
53410100	Cobbler, apple*
53410500	Cobbler, cherry*
53410900	Cobbler, rhubarb*

Food code	Food description
53415100	Crisp, apple, apple dessert*
53415200	Fritter, banana*
53415220	Fritter, berry*
53420300	Air filled fritter or fried puff, without syrup, Puerto Rican style*
53420310	Wheat flour fritter, without syrup*
53430000	Crepe, NS as to filling*
53430100	Crepe, chocolate filled*
53430200	Crepe, fruit filled*
53440300	Strudel, berry*
53440500	Strudel, cherry*
53440800	Strudel, cheese and fruit*
53450000	Turnover or dumpling, apple*
53450500	Turnover or dumpling, cherry*
53451500	Turnover, guava*
53452450	Cheese pastry puffs*
53521100	Doughnut, chocolate, raised or yeast, with chocolate icing*
54403040	Popcorn, air-popped, with added butter or margarine*
54403046	Popcorn, popped in oil, with added butter or margarine*
55100005	Pancakes, NFS*
55100015	Pancakes, plain, reduced fat, from fozen*
55100050	Pancakes, plain, from fast food / restaurant*
55100055	Pancakes, with fruit, from fast food / restaurant*
55100060	Pancakes, with chocolate, from fast food / restaurant*
55100065	Pancakes, whole grain, from fast food / restaurant*
55101000	Pancakes, plain*
55101015	Pancakes, plain, reduced fat*
55103000	Pancakes, with fruit*
55103020	Pancakes, pumpkin*
55103100	Pancakes, with chocolate*
55105000	Pancakes, buckwheat*
55105100	Pancakes, cornmeal*
55105200	Pancakes, whole grain*
55105205	Pancakes, whole grain, reduced fat*
55200100	Waffle, plain, from fast food / restaurant*
55200110	Waffle, chocolate, from fast food / restaurant*
55200120	Waffle, fruit, from fast food / restaurant*
55200130	Waffle, whole grain, from fast food / restaurant*
55201000	Waffle, plain*
55203000	Waffle, fruit*
55203600	Waffle, chocolate*
55203700	Waffle, cinnamon*
55205000	Waffle, whole grain*
55211050	Waffle, plain, reduced fat*
55212000	Waffle, whole grain, reduced fat*
55300010	French toast, NFS*
55300050	French toast, plain, from fast food / restaurant*
55300055	French toast, whole grain, from fast food / restaurant*
55301000	French toast, plain*
55301015	French toast, whole grain*
55301025	French toast, gluten free*
55301055	French toast sticks, whole grain*
56200510	Buckwheat groats, fat added*
56200990	Grits, NS as to regular, quick, or instant, NS as to fat*
56201040	Grits, NS as to regular, quick, or instant, fat added*
56201050	Grits, regular or quick, made with water, NS as to fat*

Food code	Food description
56201052	Grits, regular or quick, made with water, fat added*
56201055	Grits, regular or quick, made with milk, NS as to fat*
56201057	Grits, regular or quick, made with milk, fat added*
56201090	Grits, with cheese, NS as to fat*
56201092	Grits, with cheese, fat added*
56201220	Grits, instant, made with water, fat added*
56201340	Grits, instant, made with milk, fat added*
56201360	Grits, instant, made with non-dairy milk, fat added*
56201515	Cornmeal mush, NS as to fat*
56201517	Cornmeal mush, fat added*
56201550	Cornmeal dumpling*
56202100	Millet, fat added*
56202960	Oatmeal, NS as to regular, quick, or instant, NS as to fat*
56203055	Oatmeal, regular or quick, made with water, NS as to fat*
56203057	Oatmeal, regular or quick, made with water, fat added*
56203065	Oatmeal, regular or quick, made with milk, NS as to fat*
56203067	Oatmeal, regular or quick, made with milk, fat added*
56203075	Oatmeal, regular or quick, made with non-dairy milk, NS as to fat*
56203077	Oatmeal, regular or quick, made with non-dairy milk, fat added*
56203087	Oatmeal, instant, plain, made with water, fat added*
56203097	Oatmeal, instant, plain, made with milk, fat added*
56203125	Oatmeal, instant, maple flavored, NS as to fat*
56203135	Oatmeal, instant, maple flavored, fat added*
56203150	Oatmeal, instant, fruit flavored, NS as to fat*
56203160	Oatmeal, instant, fruit flavored, fat added*
56203180	Oatmeal, instant, other flavors, fat added*
56203550	Oatmeal, reduced sugar, flavored, NS as to fat*
56203560	Oatmeal, reduced sugar, flavored, fat added*
56203600	Oatmeal, multigrain, NS as to fat*
56203620	Oatmeal, multigrain, fat added*
56204000	Quinoa, NS as to fat*
56204010	Quinoa, fat added*
56205006	Rice, white, cooked, made with margarine*
56205007	Rice, white, cooked, fat added, NS as to fat type*
56205016	Rice, brown, cooked, made with margarine*
56205017	Rice, brown, cooked, fat added, NS as to fat type*
56205090	Rice, cream of, cooked, fat added*
56205092	Rice, cream of, cooked, NS as to fat*
56205170	Yellow rice, cooked, fat added*
56205230	Rice dessert bar, frozen, flavors other than chocolate, nondairy, carob covered
56205320	Rice, white and wild, cooked, fat added*
56205330	Rice, white and wild, cooked, NS as to fat*
56205350	Rice, brown and wild, cooked, NS as to fat*
56207005	Cream of wheat, NS as to regular, quick, or instant, fat added*
56207017	Cream of wheat, regular or quick, made with water, fat added*
56207023	Cream of wheat, regular or quick, made with milk, fat added*
56207027	Cream of wheat, regular or quick, made with non-dairy milk, fat added*
56207060	Cream of wheat, instant, made with water, fat added*
56207094	Cream of wheat, instant, made with milk, fat added*
56207120	Bulgur, fat added*
56207210	Whole wheat cereal, cooked, fat added*
56208510	Oat bran cereal, cooked, fat added*
56208520	Oat bran cereal, cooked, NS as to fat*
58108000	Calzone, with cheese, meatless*
58108010	Calzone, with meat and cheese*

Food code	Food description
58120110	Crepe, filled with meat, poultry, or seafood, with sauce*
58122210	Gnocchi, cheese*
58122320	Knish, cheese*
58122330	Knish, meat*
58124210	Pastry, cheese-filled*
58128120	Cornmeal dressing with chicken or turkey and vegetables*
58128210	Dressing with oysters*
58128220	Dressing with chicken or turkey and vegetables*
58128250	Dressing with meat and vegetables*
58131110	Ravioli, NS as to filling, with tomato sauce*
58131320	Ravioli, meat-filled, with tomato sauce or meat sauce*
58133120	Manicotti, cheese-filled, with tomato sauce, meatless*
58134120	Stuffed shells, cheese-filled, with tomato sauce, meatless*
58134130	Stuffed shells, cheese-filled, with meat sauce*
58134310	Stuffed shells, with fish and/or shellfish, with tomato sauce*
58134610	Tortellini, meat-filled, with tomato sauce*
58134650	Tortellini, meat-filled, no sauce*
58134710	Tortellini, spinach-filled, with tomato sauce*
58134720	Tortellini, spinach-filled, no sauce*
58145135	Macaroni or noodles with cheese and meat*
58145140	Macaroni or noodles with cheese and tomato*
58145160	Macaroni or noodles with cheese and frankfurters or hot dogs*
58145170	Macaroni or noodles with cheese and egg*
58145190	Macaroni or noodles with cheese and chicken or turkey*
58145300	Macaroni or noodles with cheese, whole grain*
58163510	Rice dressing*
58164110	Rice with raisins*
58310310	Pancakes and sausage, frozen meal*
63101500	Apple, fried*
63402970	Fruit salad, excluding citrus fruits, with nondairy whipped topping*
63403100	Fruit dessert with cream and/or pudding and nuts*
71000100	Potato, NFS*
71102980	Potato, boiled, NFS*
71102990	Potato, boiled, ready-to-heat*
71103000	Potato, boiled, from fresh, peel not eaten, NS as to fat*
71103020	Potato, boiled, from fresh, peel not eaten, fat added, NS as to fat type*
71103050	Potato, boiled, from fresh, peel not eaten, made with margarine*
71103105	Potato, boiled, from fresh, peel eaten, NS as to fat*
71103115	Potato, boiled, from fresh, peel eaten, fat added, NS as to fat type*
71103150	Potato, boiled, from fresh, peel eaten, made with margarine*
71103310	Potato, canned, fat added, NS as to fat type*
71104030	Potato, roasted, NFS*
71104040	Potato, roasted, from fresh, peel eaten, NS as to fat*
71104060	Potato, roasted, from fresh, peel eaten, fat added, NS as to fat type*
71104090	Potato, roasted, from fresh, peel eaten, made with margarine*
71104100	Potato, roasted, from fresh, peel not eaten, NS as to fat*
71104150	Potato, roasted, from fresh, peel not eaten, made with margarine*
71104200	Potato, roasted, ready-to-heat*
71501000	Potato, mashed, NFS*
71501010	Potato, mashed, from fresh, made with milk*
71501011	Potato, mashed, from fresh, made with milk, with cheese*
71501012	Potato, mashed, from fresh, made with milk, with gravy*
71501013	Potato, mashed, from fresh, NFS*
71501016	Potato, mashed, from restaurant*
71501017	Potato, mashed, from restaurant, with gravy*

Food code	Food description
71501018	Potato, mashed, from school lunch*
71501035	Potato, mashed, from dry mix, NFS*
71501040	Potato, mashed, from dry mix, made with milk*
71501045	Potato, mashed, from dry mix, made with milk, with cheese*
71702000	Potato pudding*
71801100	Potato and cheese soup*
71905008	Plantain, cooked, fat added, NS as to fat type*
71905100	Plantain, cooked with butter or margarine*
71930090	Cassava, cooked, NS as to fat added in cooking*
71930120	Cassava, cooked*
71945020	Yam buns; Puerto Rican style*
71950010	Tannier, cooked*
71962020	Dasheen, cooked*
71962040	Taro, cooked*
71970200	Fufu*
72101200	Beet greens, cooked, NS as to fat added in cooking*
72101220	Beet greens, cooked*
72103030	Broccoli raab, cooked*
72103060	Broccoli raab, cooked, made with margarine*
72104220	Chard, cooked*
72107200	Collards, cooked, NS as to form, NS as to fat added in cooking*
72107201	Collards, cooked, from fresh, NS as to fat added in cooking*
72107203	Collards, cooked, from canned, NS as to fat added in cooking*
72107220	Collards, NS as to form, cooked*
72107221	Collards, fresh, cooked, fat added, NS as to fat type*
72107228	Collards, fresh, cooked with butter or margarine*
72107231	Collards, frozen, cooked with butter or margarine*
72107234	Collards, canned, cooked with butter or margarine*
72116220	Escarole, cooked*
72118201	Greens, cooked, from fresh, NS as to fat added in cooking*
72118220	Greens, NS as to form, cooked*
72118221	Greens, fresh, cooked, fat added*
72118222	Greens, frozen, cooked, fat added*
72119200	Kale, cooked, NS as to form, NS as to fat added in cooking*
72119201	Kale, cooked, from fresh, NS as to fat added in cooking*
72119220	Kale, NS as to form, cooked*
72119221	Kale, fresh, cooked, fat added*
72122200	Mustard greens, cooked, NS as to form, NS as to fat added in cooking*
72122201	Mustard greens, cooked, from fresh, NS as to fat added in cooking*
72122203	Mustard greens, cooked, from canned, NS as to fat added in cooking*
72122221	Mustard greens, fresh, cooked, fat added*
72122229	Mustard greens, cooked, from fresh, made with margarine*
72125200	Spinach, cooked, NS as to form, NS as to fat added in cooking*
72125201	Spinach, cooked, from fresh, NS as to fat added in cooking*
72125214	Spinach, cooked, NS as to form, made with oil*
72125218	Spinach, fresh, cooked with butter or margarine*
72125220	Spinach, NS as to form, cooked*
72125221	Spinach, fresh, cooked, fat added, NS as to fat type*
72125222	Spinach, frozen, cooked, fat added, NS as to fat type*
72125225	Spinach, frozen, cooked with butter or margarine*
72125228	Spinach, canned, cooked with butter or margarine*
72126001	Taro leaves, cooked*
72128200	Turnip greens, cooked, NS as to form, NS as to fat added in cooking*
72128203	Turnip greens, cooked, from canned, NS as to fat added in cooking*
72128221	Turnip greens, fresh, cooked, fat added*

Food code	Food description
72128222	Turnip greens, frozen, cooked, fat added*
72130201	Watercress, cooked*
72132199	Bitter melon leaves, horseradish leaves, jute leaves, or radish leaves, cooked, NS as to fat added in cooking*
72132201	Bitter melon, horseradish, jute, or radish leaves, cooked*
72133201	Sweet potato, squash, pumpkin, chrysanthemum, or bean leaves, cooked*
72201190	Broccoli, cooked, from restaurant*
72201200	Broccoli, cooked, NS as to form, NS as to fat added in cooking*
72201201	Broccoli, cooked, from fresh, NS as to fat added in cooking*
72201202	Broccoli, cooked, from frozen, NS as to fat added in cooking*
72201220	Broccoli, NS as to form, cooked*
72201221	Broccoli, fresh, cooked, fat added, NS as to fat type*
72201222	Broccoli, frozen, cooked, fat added, NS as to fat type*
72201224	Broccoli, fresh, cooked with butter or margarine*
72201225	Broccoli, cooked, from fresh, made with margarine*
72201227	Broccoli, frozen, cooked with butter or margarine*
72201228	Broccoli, cooked, from frozen, made with margarine*
72203070	Broccoli, Chinese, cooked*
73102190	Carrots, cooked, from restaurant*
73102200	Carrots, cooked, NS as to form, NS as to fat added in cooking*
73102201	Carrots, cooked, from fresh, NS as to fat added in cooking*
73102202	Carrots, cooked, from frozen, NS as to fat added in cooking*
73102218	Carrots, fresh, cooked with butter or margarine*
73102219	Carrots, cooked, from fresh, made with margarine*
73102220	Carrots, NS as to form, cooked*
73102221	Carrots, fresh, cooked, fat added, NS as to fat type*
73102222	Carrots, frozen, cooked, fat added, NS as to fat type*
73102225	Carrots, frozen, cooked with butter or margarine*
73102228	Carrots, canned, cooked with butter or margarine*
73102229	Carrots, cooked, from canned, made with margarine*
73103000	Carrots, canned, low sodium, NS as to fat added in cooking*
73103022	Carrots, canned, reduced sodium, cooked with butter or margarine*
73103023	Carrots, canned, low sodium, made with margarine*
73111200	Peas and carrots, cooked, NS as to form, NS as to fat added in cooking*
73111203	Peas and carrots, cooked, from canned, NS as to fat added in cooking*
73111220	Peas and carrots, cooked, NS as to form*
73111221	Peas and carrots, fresh, cooked, fat added*
73111222	Peas and carrots, frozen, cooked, fat added*
73111223	Peas and carrots, canned, cooked, fat added*
73111232	Peas and carrots, cooked, from frozen, made with margarine*
73111235	Peas and carrots, cooked, from canned, made with margarine*
73201000	Pumpkin, cooked, NS as to form, NS as to fat added in cooking*
73201013	Pumpkin, canned, cooked*
73201020	Pumpkin, cooked*
73210010	Calabaza, cooked*
73211110	Sweet potato and pumpkin casserole, Puerto Rican style*
73301000	Squash, winter type, mashed, NS as to fat or sugar added in cooking*
73303000	Squash, winter type, baked, NS as to fat or sugar added in cooking*
73303020	Winter squash, cooked, fat added*
73401000	Sweet potato, NFS*
73402000	Sweet potato, baked, peel eaten, NS as to fat*
73403000	Sweet potato, baked, peel not eaten, NS as to fat*
73403020	Sweet potato, baked, peel not eaten, fat added, NS as to fat type*
73403023	Sweet potato, baked, peel not eaten, made with margarine*
73405000	Sweet potato, boiled, NS as to fat*
73405020	Sweet potato, boiled, fat added, NS as to fat type*

Food code	Food description
73405023	Sweet potato, boiled, made with margarine*
73406000	Sweet potato, candied*
73407060	Sweet potato, canned, fat added*
74201000	Tomatoes, NS as to form, cooked*
74201001	Tomatoes, fresh, cooked*
74201003	Tomatoes, canned, cooked*
74504020	Tomato and okra, cooked, fat added in cooking, NS as to type of fat*
74504100	Tomato and onion, cooked, NS as to fat added in cooking*
74504120	Tomato and onion, cooked, fat added in cooking, NS as to type of fat*
75200100	Vegetables, NS as to type, cooked, NS as to fat added in cooking*
75201000	Artichoke, cooked, NS as to form, NS as to fat added in cooking*
75201020	Artichokes, NS as to form, cooked*
75201021	Artichoke, fresh, cooked, fat added*
75201023	Artichoke, canned, cooked, fat added*
75202000	Asparagus, cooked, NS as to form, NS as to fat added in cooking*
75202001	Asparagus, cooked, from fresh, NS as to fat added in cooking*
75202020	Asparagus, NS as to form, cooked*
75202021	Asparagus, fresh, cooked, fat added, NS as to fat type*
75202022	Asparagus, frozen, cooked, fat added, NS as to fat type*
75202023	Asparagus, canned, cooked, fat added, NS as to fat type*
75202026	Asparagus, cooked, NS as to form, made with margarine*
75202028	Asparagus, fresh, cooked with butter or margarine*
75202029	Asparagus, cooked, from fresh, made with margarine*
75202032	Asparagus, frozen, cooked with butter or margarine*
75202035	Asparagus, canned, cooked with butter or margarine*
75203028	Bamboo shoots, cooked*
75204003	Beans, lima, immature, cooked, from canned, NS as to fat added in cooking*
75204022	Lima beans, from frozen, fat added*
75204023	Lima beans, from canned*
75204032	Beans, lima, immature, cooked, from frozen, made with margarine*
75204971	Beans, string, cooked, from canned, NS as to color, made with margarine*
75204980	Beans, string, cooked, NS as to form, NS as to color, fat added in cooking, NS as to type of fat*
75204981	Beans, string, cooked, from fresh, NS as to color, fat added in cooking, NS as to type of fat*
75204982	Beans, string, cooked, from frozen, NS as to color, fat added in cooking, NS as to type of fat*
75205000	Beans, string, cooked, NS as to form, NS as to color, NS as to fat added in cooking*
75205001	Beans, string, cooked, from fresh, NS as to color, NS as to fat added in cooking*
75205003	Beans, string, cooked, from canned, NS as to color, NS as to fat added in cooking*
75205005	Green beans, cooked, from restaurant*
75205010	Beans, string, green, cooked, NS as to form, NS as to fat added in cooking*
75205011	Beans, string, green, cooked, from fresh, NS as to fat added in cooking*
75205012	Beans, string, green, cooked, from frozen, NS as to fat added in cooking*
75205013	Beans, string, green, cooked, from canned, NS as to fat added in cooking*
75205030	Green beans, NS as to form, cooked*
75205031	Green beans, fresh, cooked, fat added, NS as to fat type*
75205032	Green beans, frozen, cooked, fat added, NS as to fat type*
75205033	Green beans, canned, cooked, fat added, NS as to fat type*
75205043	Beans, string, green, cooked, NS as to form, made with margarine*
75205045	Green beans, fresh, cooked with butter or margarine*
75205046	Beans, string, green, cooked, from fresh, made with margarine*
75205048	Green beans, frozen, cooked with butter or margarine*
75205049	Beans, string, green, cooked, from frozen, made with margarine*
75205051	Green beans, canned, cooked with butter or margarine*
75205052	Beans, string, green, cooked, from canned, made with margarine*
75205110	Beans, string, green, canned, low sodium, NS as to fat added in cooking*
75205130	Green beans, canned, reduced sodium, cooked, fat added, NS as to fat type*

Food code	Food description
75205132	Green beans, canned, reduced sodium, cooked with butter or margarine*
75205133	Beans, string, green, canned, low sodium, made with margarine*
75206010	Beans, string, yellow, cooked, NS as to form, fat not added in cooking*
75206020	Yellow string beans, cooked*
75207021	Bean sprouts, cooked*
75208000	Beets, cooked, NS as to form, NS as to fat added in cooking*
75208020	Beets, NS as to form, cooked*
75208021	Beets, fresh, cooked, fat added*
75208023	Beets, canned, cooked, fat added*
75208310	Bitter melon, cooked*
75209000	Brussels sprouts, cooked, NS as to form, NS as to fat added in cooking*
75209002	Brussels sprouts, cooked, from frozen, NS as to fat added in cooking*
75209020	Brussels sprouts, NS as to form, cooked*
75209021	Brussels sprouts, fresh, cooked, fat added*
75209022	Brussels sprouts, frozen, cooked, fat added*
75209052	Brussels sprouts, cooked, from frozen, made with margarine*
75210020	Cabbage, Chinese, cooked, fat added*
75211010	Cabbage, green, cooked, NS as to fat added in cooking*
75211030	Cabbage, green, cooked, fat added, NS as to fat type*
75211032	Cabbage, green, cooked with butter or margarine*
75211033	Cabbage, green, cooked, made with margarine*
75212000	Cabbage, red, cooked, NS as to fat added in cooking*
75212020	Cabbage, red, cooked*
75213100	Cactus, cooked, NS as to fat added in cooking*
75213120	Cactus, cooked, fat added*
75214000	Cauliflower, cooked, NS as to form, NS as to fat added in cooking*
75214001	Cauliflower, cooked, from fresh, NS as to fat added in cooking*
75214020	Cauliflower, NS as to form, cooked*
75214021	Cauliflower, fresh, cooked, fat added, NS as to fat type*
75214022	Cauliflower, frozen, cooked, fat added, NS as to fat type*
75214028	Cauliflower, fresh, cooked with butter or margarine*
75214029	Cauliflower, cooked, from fresh, made with margarine*
75214031	Cauliflower, frozen, cooked with butter or margarine*
75214032	Cauliflower, cooked, from frozen, made with margarine*
75215000	Celery, cooked, NS as to fat added in cooking*
75215020	Celery, cooked*
75215120	Fennel bulb, cooked*
75215511	Christophine, cooked*
75215990	Corn, cooked, from restaurant*
75216000	Corn, cooked, NS as to form, NS as to color, NS as to fat added in cooking*
75216003	Corn, cooked, from canned, NS as to color, NS as to fat added in cooking*
75216036	Corn, cooked, from canned, NS as to color, made with margarine*
75216070	Corn, dried, cooked*
75216100	Corn, yellow, cooked, NS as to form, NS as to fat added in cooking*
75216101	Corn, yellow, cooked, from fresh, NS as to fat added in cooking*
75216102	Corn, yellow, cooked, from frozen, NS as to fat added in cooking*
75216103	Corn, yellow, cooked, from canned, NS as to fat added in cooking*
75216120	Corn, NS as to form, cooked*
75216121	Corn, fresh, cooked, fat added, NS as to fat type*
75216122	Corn, frozen, cooked, fat added, NS as to fat type*
75216123	Corn, canned, cooked, fat added, NS as to fat type*
75216133	Corn, yellow, cooked, NS as to form, made with margarine*
75216135	Corn, fresh, cooked with butter or margarine*
75216136	Corn, yellow, cooked, from fresh, made with margarine*
75216138	Corn, frozen, cooked with butter or margarine*

Food code	Food description
75216139	Corn, yellow, cooked, from frozen, made with margarine*
75216142	Corn, canned, cooked with butter or margarine*
75216143	Corn, yellow, cooked, from canned, made with margarine*
75216179	Corn, yellow and white, cooked, from fresh, made with margarine*
75216229	Corn, white, cooked, from fresh, made with margarine*
75216300	Corn, yellow, canned, low sodium, NS as to fat added in cooking*
75216322	Corn, canned, reduced sodium, cooked with butter or margarine*
75216323	Corn, yellow, canned, low sodium, made with margarine*
75216700	Cucumber, cooked, NS as to fat added in cooking*
75216720	Cucumber, cooked*
75217000	Eggplant, cooked, NS as to fat added in cooking*
75217020	Eggplant, cooked, fat added*
75217301	Flowers or blossoms of sesbania, squash, or lily, cooked*
75217490	Hominy, cooked, NS as to fat added in cooking*
75217520	Hominy, cooked*
75218400	Leek, cooked*
75218501	Lotus root, cooked*
75219000	Mushrooms, cooked, NS as to form, NS as to fat added in cooking*
75219001	Mushrooms, cooked, from fresh, NS as to fat added in cooking*
75219020	Mushrooms, NS as to form, cooked*
75219021	Mushrooms, fresh, cooked, fat added, NS as to fat type*
75219023	Mushrooms, canned, cooked*
75219034	Mushrooms, fresh, cooked with butter or margarine*
75219035	Mushrooms, cooked, from fresh, made with margarine*
75220020	Okra, NS as to form, cooked*
75220021	Okra, fresh, cooked, fat added*
75220022	Okra, frozen, cooked, fat added*
75220033	Okra, cooked, from frozen, made with margarine*
75220049	Lettuce, cooked, NS as to fat added in cooking*
75220051	Lettuce, cooked*
75220101	Luffa, cooked*
75221000	Onions, cooked, NS as to form, NS as to fat added in cooking*
75221001	Onions, cooked, from fresh, NS as to fat added in cooking*
75221002	Onions, cooked, from frozen, NS as to fat added in cooking*
75221019	Onions, cooked, from fresh, made with margarine*
75221020	Onions, cooked, NS as to form, fat added in cooking, NS as to type of fat*
75221021	Onions, cooked, fat added*
75221030	Onions, pearl, cooked*
75221040	Onions, green, cooked, NS as to form, NS as to fat added in cooking*
75221061	Onions, green, cooked*
75221160	Palm hearts, cooked*
75222020	Parsnips, cooked*
75223003	Peas, cowpeas, field peas, or blackeye peas, not dried, cooked, from canned, NS as to fat added in cooking*
75223022	Blackeyed peas, from frozen*
75223023	Blackeyed peas, from canned*
75224000	Green peas, cooked, from restaurant*
75224010	Peas, green, cooked, NS as to form, NS as to fat added in cooking*
75224012	Peas, green, cooked, from frozen, NS as to fat added in cooking*
75224013	Peas, green, cooked, from canned, NS as to fat added in cooking*
75224030	Green peas, NS as to form, cooked*
75224031	Green peas, fresh, cooked, fat added, NS as to fat type*
75224032	Green peas, frozen, cooked, fat added, NS as to fat type*
75224033	Green peas, canned, cooked, fat added, NS as to fat type*
75224044	Green peas, fresh, cooked with butter or margarine*
75224047	Green peas, frozen, cooked with butter or margarine*

Food code	Food description
75224048	Peas, green, cooked, from frozen, made with margarine*
75224050	Green peas, canned, cooked with butter or margarine*
75224051	Peas, green, cooked, from canned, made with margarine*
75224132	Green peas, canned, reduced sodium, cooked with butter or margarine*
75224133	Peas, green, canned, low sodium, made with margarine*
75225014	Pigeon peas, cooked, NS as to form, NS as to fat added in cooking*
75225015	Pigeon peas, cooked, NS as to form, fat added in cooking*
75226000	Peppers, green, cooked, NS as to fat added in cooking*
75226020	Peppers, green, cooked*
75226040	Peppers, red, cooked, NS as to fat added in cooking*
75226060	Peppers, red, cooked*
75226090	Peppers, hot, cooked, NS as to form, NS as to fat added in cooking*
75226093	Peppers, hot, cooked, from canned, NS as to fat added in cooking*
75226110	Peppers, hot, cooked, NS as to form, fat added in cooking, NS as to type of fat*
75226111	Hot peppers, cooked*
75227110	Daikon radish, cooked*
75228020	Rutabaga, cooked*
75230000	Sauerkraut*
75230020	Sauerkraut, cooked, fat added in cooking*
75231020	Snowpea, NS as to form, cooked*
75231021	Snowpea, fresh, cooked, fat added*
75231022	Snowpea, frozen, cooked, fat added*
75231031	Snowpea, cooked, from frozen, made with margarine*
75232120	Seaweed, cooked, fat added*
75233000	Squash, summer, yellow or green, cooked, NS as to form, NS as to fat added in cooking*
75233001	Squash, summer, yellow or green, cooked, from fresh, NS as to fat added in cooking*
75233020	Summer squash, yellow or green, NS as to form, cooked*
75233021	Summer squash, yellow or green, fresh, cooked, fat added, NS as to fat type*
75233022	Summer squash, yellow or green, frozen, cooked, fat added, NS as to fat type*
75233028	Summer squash, yellow or green, fresh, cooked with butter or margarine*
75233029	Squash, summer, yellow or green, cooked, from fresh, made with margarine*
75233031	Summer squash, yellow or green, frozen, cooked with butter or margarine*
75233220	Spaghetti squash, cooked*
75233223	Squash, spaghetti, cooked, made with margarine*
75234000	Turnip, cooked, NS as to form, NS as to fat added in cooking*
75234021	Turnip, cooked*
75235750	Winter melon, cooked*
75301120	Lima beans and corn, cooked, fat added*
75302009	Beans, string, green, with tomatoes, cooked, NS as to fat added in cooking*
75302011	Beans, string, green, with tomatoes, cooked, fat added in cooking*
75302200	Beans, string, green, with onions, NS as to fat added in cooking*
75302500	Beans, string, green, and potatoes, cooked, NS as to fat added in cooking*
75306999	Green peppers and onions, cooked, NS as to fat added in cooking*
75307000	Peppers and onions, cooked, fat added*
75307003	Green peppers and onions, cooked, made with margarine*
75310990	Classic mixed vegetables, cooked, from restaurant*
75311000	Mixed vegetables, cooked, NS as to form, NS as to fat added in cooking*
75311002	Mixed vegetables, cooked, from frozen, NS as to fat added in cooking*
75311003	Mixed vegetables, cooked, from canned, NS as to fat added in cooking*
75311020	Classic mixed vegetables, NS as to form, cooked*
75311022	Classic mixed vegetables, frozen, cooked, fat added, NS as to fat type*
75311023	Classic mixed vegetables, canned, cooked, fat added, NS as to fat type*
75311026	Mixed vegetables, cooked, NS as to form, made with margarine*
75311028	Classic mixed vegetables, frozen, cooked with butter or margarine*
75311029	Mixed vegetables, cooked, from frozen, made with margarine*

Food code	Food description
75311031	Classic mixed vegetables, canned, cooked with butter or margarine*
75311100	Mixed vegetables, canned, low sodium, NS as to fat added in cooking*
75315000	Peas and corn, cooked, NS as to fat added in cooking*
75315200	Peas and mushrooms, cooked, NS as to fat added in cooking*
75315999	Squash, summer, yellow or green, and onions, cooked, NS as to fat added in cooking*
75316024	Squash, summer, yellow or green, and onions, cooked, made with margarine*
75316031	Squash, summer, yellow or green, with tomato sauce, cooked, fat added in cooking*
75316032	Squash, summer, yellow or green, with tomato sauce, cooked, NS as to fat added in cooking*
75317000	Vegetables, stew type, cooked, NS as to fat added in cooking*
75317010	Vegetables, stew type, cooked, fat added*
75330060	Broccoli and cauliflower, cooked, fat added*
75330090	Broccoli, cauliflower and carrots, cooked, fat added*
75330100	Vegetable combination, including carrots, broccoli, and/or dark-green leafy; cooked, no sauce, NS as to fat added in cooking*
75330123	Vegetable combination, including carrots, broccoli, and/or dark-green leafy; cooked, no sauce, made with margarine*
75330130	Vegetable combination, excluding carrots, broccoli, and dark-green leafy; cooked, no sauce, NS as to fat added in cooking*
75340000	Vegetable combinations, Asian style, broccoli, green pepper, water chestnut, etc., cooked, NS as to fat added in cooking*
75340020	Asian stir fry vegetables, cooked, fat added*
75411010	Corn, scalloped or pudding*
75411020	Corn fritter*
75414020	Mushrooms, stuffed*
75460700	Vegetable combinations, including carrots, broccoli, and/or dark-green leafy; cooked, with pasta*
75460710	Vegetable combinations, excluding carrots, broccoli, and dark-green leafy; cooked, with pasta*
77316010	Stuffed cabbage, with meat, Puerto Rican style*
81100000	Table fat, NFS*
81102000	Margarine, NFS
81102010	Margarine, stick
81102020	Margarine, tub
81103020	Margarine, whipped, tub, salted
81103030	Margarine, stick, unsalted
81103035	Margarine-oil blend, NFS
81103040	Margarine-oil blend, stick
81103080	Margarine-oil blend, tub
81103090	Butter replacement, liquid
81104010	Margarine-oil blend, tub, light
81104011	Margarine like spread, reduced calorie, about 40% fat, made with yogurt, tub, salted
81104020	Margarine-oil blend, stick, light
81104050	Margarine like spread, reduced calorie, about 20% fat, tub, salted
81104100	Margarine like spread, fat free, tub, salted
81104110	Margarine like spread, fat free, liquid, salted
81104510	Butter-oil blend, tub
81104560	Vegetable oil-butter spread, reduced calorie, tub, salted
81105010	Butter-margarine blend, stick, salted*
81105020	Butter-margarine blend, tub, salted
81105500	Butter-vegetable oil blend
81106010	Butter replacement, powder
91501030	Gelatin dessert with whipped cream*
91511030	Gelatin dessert, dietetic, with whipped topping, sweetened with low calorie sweetener*
91735000	Pralines*
92121000	Coffee, instant, pre-lightened and pre-sweetened with sugar, reconstituted*
92121001	Coffee, instant, decaffeinated, pre-lightened and pre-sweetened with sugar, reconsitituted*
92121020	Coffee, mocha, instant, pre-lightened and pre-sweetened with sugar, reconstituted*

Food code	Food description
92121040	Coffee, instant, pre-lightened and pre-sweetened with low calorie sweetener, reconstituted*
92121041	Coffee, instant, decaffeinated, pre-lightened and pre-sweetened with low calorie sweetener, reconstituted*
92130000	Coffee, pre-lightened and pre-sweetened with sugar*
92130005	Coffee, pre-lightened and pre-sweetened with low calorie sweetener*
92130010	Coffee, pre-lightened*
92130011	Coffee, decaffeinated, pre-lightened*
92193000	Coffee, instant, pre-lightened and pre-sweetened with sugar, not reconstituted*
Meat analogs & vegetarian food products	
27564420	Frankfurter or hot dog sandwich, meatless, plain, on bun*
27564430	Frankfurter or hot dog sandwich, meatless, plain, on bread*
41440000	Textured vegetable protein, dry
41810200	Bacon strip, meatless
41810250	Bacon bits
41810400	Breakfast link, pattie, or slice, meatless
41810600	Chicken, meatless, NFS
41810610	Chicken, meatless, breaded, fried
41811400	Frankfurter or hot dog, meatless
41811600	Luncheon slice, meatless-beef, chicken, salami or turkey
41811800	Meatball, meatless
41811890	Vegetarian burger or patty, meatless, no bun
41811950	Swiss steak, with gravy, meatless
41812000	Sandwich spread, meat substitute type
41812400	Vegetarian pot pie
41812450	Vegetarian chili, made with meat substitute
41812600	Vegetarian, fillet
41812800	Vegetarian stew
41812850	Vegetarian stroganoff
41812900	Vegetarian meat loaf
59003000	Meat substitute, cereal- and vegetable protein-based, fried
75140500	Broccoli salad with cauliflower, cheese, bacon bits, and dressing*
Mixed dishes with sauce	
27111407	Chili con carne with beans, canned
27212050	Beef and macaroni with cheese sauce
27212100	Beef and noodles with tomato-based sauce
27212350	Beef stroganoff with noodles
27213500	Beef and rice with soy-based sauce
27213600	Beef and rice with cheese sauce
27241010	Chicken or turkey and potatoes with gravy
27243300	Chicken or turkey and rice with cream sauce
27243600	Chicken or turkey and rice with soy-based sauce
27246100	Chicken or turkey with dumplings
27246200	Chicken or turkey with stuffing
27317010	Beef pot pie
27347100	Chicken or turkey pot pie
27443110	Chicken or turkey a la king with vegetables including carrots, broccoli, and/or dark-green leafy; no potatoes, cream, white, or soup-based sauce
28101000	Frozen dinner, NFS
28110150	Beef with vegetable, diet frozen meal
28110220	Sirloin, chopped, with gravy, mashed potatoes, vegetable, frozen meal
28110250	Sirloin tips, with gravy, potatoes, vegetable, frozen meal
28110270	Sirloin beef, with gravy, potatoes, vegetable, frozen meal
28110300	Salisbury steak dinner, NFS, frozen meal
28110310	Salisbury steak with gravy, potatoes, vegetable, frozen meal
28110330	Salisbury steak with gravy, whipped potatoes, vegetable, dessert, frozen meal
28110350	Salisbury steak with gravy, potatoes, vegetable, dessert, frozen meal

Food code	Food description
28110380	Salisbury steak with gravy, macaroni and cheese, frozen meal
28110390	Salisbury steak, potatoes, vegetable, dessert, diet frozen meal
28110510	Beef, sliced, with gravy, potatoes, vegetable, frozen meal
28110620	Beef short ribs, boneless, with barbecue sauce, potatoes, vegetable, frozen meal
28110660	Meatballs, Swedish, in gravy, with noodles, diet frozen meal
28113140	Beef with spaetzle or rice, vegetable, frozen meal
28140100	Chicken dinner, NFS, frozen meal
28140320	Chicken and noodles with vegetable, dessert, frozen meal
28140740	Chicken patty or nuggets, boneless, breaded, with pasta and tomato sauce, fruit, dessert, frozen meal
28141050	Chicken patty parmigiana, breaded, with vegetable, diet frozen meal
28141201	Teriyaki chicken with rice and vegetable, diet frozen meal
28141250	Chicken with rice and vegetable, diet frozen meal
28141610	Chicken and vegetables in cream or white sauce, diet frozen meal
28143020	Chicken and vegetable entree with rice, diet frozen meal
28143040	Chicken chow mein with rice, diet frozen meal
28143080	Chicken with noodles and cheese sauce, diet frozen meal
28143130	Chicken and vegetable entree with noodles, frozen meal
28143150	Chicken and vegetable entree with noodles, diet frozen meal
28143170	Chicken in cream sauce with noodles and vegetable, frozen meal
28143180	Chicken in butter sauce with potatoes and vegetable, diet frozen meal
28143190	Chicken in mushroom sauce, white and wild rice, vegetable, frozen meal
28143200	Chicken in soy-based sauce, rice and vegetables, frozen meal
28143210	Chicken in orange sauce with almond rice, diet frozen meal
28144100	Chicken and vegetable entree with noodles and cream sauce, frozen meal
28145100	Turkey with gravy, dressing, vegetable and fruit, diet frozen meal
28145210	Turkey with gravy, dressing, potatoes, vegetable, frozen meal
28150510	Fish in lemon-butter sauce with starch item, vegetable, frozen meal
28154010	Shrimp and vegetables in sauce with noodles, diet frozen meal
28160310	Meat loaf with potatoes, vegetable, frozen meal
28160650	Stuffed green pepper, frozen meal
58101800	Ground beef with tomato sauce and taco seasonings on a cornbread crust
58130013	Lasagna with meat, canned
58130016	Lasagna with meat, frozen
58131323	Ravioli, meat-filled, with tomato sauce or meat sauce, canned
58131523	Ravioli, cheese-filled, with tomato sauce, canned
58134613	Tortellini, meat-filled, with tomato sauce, canned
58145110	Macaroni or noodles with cheese
58145112	Macaroni or noodles with cheese, made from packaged mix
58145113	Macaroni or noodles with cheese, canned
58145117	Macaroni or noodles with cheese, Easy Mac type
58145119	Macaroni or noodles with cheese, made from reduced fat packaged mix
58145120	Macaroni or noodles with cheese and tuna
58145136	Macaroni or noodles with cheese and meat, prepared from Hamburger Helper mix
58146223	Pasta with tomato-based sauce, ready-to-heat
58146303	Pasta with tomato-based sauce, and added vegetables, ready-to-heat
58146323	Pasta with tomato-based sauce and meat, ready-to-heat
58146333	Pasta with tomato-based sauce, meat, and added vegetables, ready-to-heat
58146343	Pasta with tomato-based sauce and poultry, ready-to-heat
58146353	Pasta with tomato-based sauce, poultry, and added vegetables, ready-to-heat
58146363	Pasta with tomato-based sauce and seafood, ready-to-heat
58146373	Pasta with tomato-based sauce, seafood, and added vegetables, ready-to-heat
58146383	Pasta with cream sauce, ready-to-heat
58146393	Pasta with cream sauce and added vegetables, ready-to-heat
58146403	Pasta with cream sauce and meat, ready-to-heat
58146413	Pasta with cream sauce, meat, and added vegetables, ready-to-heat

Food code	Food description
58146423	Pasta with cream sauce and poultry, ready-to-heat
58146433	Pasta with cream sauce, poultry, and added vegetables, ready-to-heat
58146443	Pasta with cream sauce and seafood, ready-to-heat
58146603	Pasta, whole grain, with tomato-based sauce, ready-to-heat
58146613	Pasta, whole grain, with tomato-based sauce and added vegetables, ready-to-heat
58146623	Pasta, whole grain, with tomato-based sauce and meat, ready-to-heat
58146653	Pasta, whole grain, with tomato-based sauce, poultry, and added vegetables, ready-to-heat
58146683	Pasta, whole grain, with cream sauce, ready-to-heat
58146693	Pasta, whole grain, with cream sauce, and added vegetables, ready-to-heat
58146713	Pasta, whole grain, with cream sauce, meat, and added vegetables, ready-to-heat
58146723	Pasta, whole grain, with cream sauce and poultry, ready-to-heat
58146733	Pasta, whole grain, with cream sauce, poultry, and added vegetables, ready-to-heat
58147340	Macaroni or noodles, creamed, with cheese and tuna
58147510	Flavored pasta
58148110	Macaroni or pasta salad, made with mayonnaise
58163310	Flavored rice mixture
58163330	Flavored rice mixture with cheese
58163360	Flavored rice, brown and wild
58163380	Flavored rice and pasta mixture
58301050	Lasagna with cheese and meat sauce, diet frozen meal
58301110	Vegetable lasagna, frozen meal
58302000	Macaroni and cheese, diet frozen meal
58302050	Beef and noodles with meat sauce and cheese, diet frozen meal
58302080	Noodles with vegetables in tomato-based sauce, diet frozen meal
58303100	Rice, with broccoli, cheese sauce, frozen side dish
58304010	Spaghetti and meatballs dinner, NFS, frozen meal
58304060	Spaghetti with meat sauce, diet frozen meal
58304200	Ravioli, cheese-filled, with tomato sauce, diet frozen meal
58305250	Pasta with vegetable and cheese sauce, diet frozen meal
58306020	Beef enchilada, chili gravy, rice, refried beans, frozen meal
58306070	Cheese enchilada, frozen meal
58306100	Chicken enchilada, diet frozen meal
71305050	Potato, scalloped, from dry mix
71305070	Potato, scalloped, ready-to-heat
71501054	Potato, mashed, from dry mix, made with milk, with gravy
71501075	Potato, mashed, ready-to-heat, with gravy
72125232	Spinach, from frozen, creamed
72125253	Spinach, cooked, from canned, with cheese sauce
72201232	Broccoli, cooked, from frozen, with cheese sauce
72201252	Broccoli, cooked, from frozen, with cream sauce
75216053	Corn, from canned, NS as to color, cream style
75216193	Corn, yellow, from canned, cream style, fat added in cooking
75403012	Beans, string, green, from frozen, creamed or with cheese sauce
75403013	Beans, string, green, from canned, creamed or with cheese sauce
75403022	Beans, string, green, cooked, from frozen, with mushroom sauce
75411032	Corn, cooked, from frozen, with cream sauce, made with milk
75414013	Mushrooms, from canned, creamed
75417012	Peas, from frozen, creamed
75417022	Peas, cooked, from frozen, with mushroom sauce
75417032	Peas, cooked, from frozen, with tomato sauce
75450600	Vegetable combination, including carrots, broccoli, and/or dark-green leafy; cooked, with butter sauce
75460800	Vegetable combinations, including carrots, broccoli, and/or dark-green leafy; cooked, with butter sauce and pasta
Non-dairy beverages	
11320000	Soy milk

Food code	Food description
11320100	Soy milk, light
11320200	Soy milk, nonfat
11321000	Soy milk, chocolate
11321100	Soy milk, light, chocolate
11321200	Soy milk, nonfat, chocolate
11350000	Almond milk, sweetened
11350010	Almond milk, sweetened, chocolate
11350020	Almond milk, unsweetened
11350030	Almond milk, unsweetened, chocolate
11360000	Rice milk
11370000	Coconut milk
11512030	Hot chocolate / Cocoa, ready to drink, made with non-dairy milk*
11513310	Chocolate milk, made from dry mix with non-dairy milk*
11513395	Chocolate milk, made from no sugar added dry mix with non-dairy milk (Nesquik)*
11513750	Chocolate milk, made from syrup with non-dairy milk*
11514150	Hot chocolate / Cocoa, made with dry mix and non-dairy milk*
11514360	Hot chocolate / Cocoa, made with no sugar added dry mix and non-dairy milk*
56201360	Grits, instant, made with non-dairy milk, fat added*
56203075	Oatmeal, regular or quick, made with non-dairy milk, NS as to fat*
56203076	Oatmeal, regular or quick, made with non-dairy milk, no added fat*
56203077	Oatmeal, regular or quick, made with non-dairy milk, fat added*
56203106	Oatmeal, instant, plain, made with non-dairy milk, no added fat*
56207027	Cream of wheat, regular or quick, made with non-dairy milk, fat added*
56207102	Cream of wheat, instant, made with non-dairy milk, no added fat*
64134025	Fruit smoothie, with whole fruit, non-dairy*
78101115	Fruit and vegetable smoothie, non-dairy*
78101118	Fruit and vegetable smoothie, non-dairy, added protein*
92101903	Coffee, Latte, with non-dairy milk*
92101906	Coffee, Latte, with non-dairy milk, flavored*
92101923	Frozen coffee drink, with non-dairy milk*
92101960	Coffee, Cafe Mocha, with non-dairy milk*
92101975	Coffee, Cafe Mocha, decaffeinated, with non-dairy milk*
92102020	Frozen mocha coffee drink, with non-dairy milk*
92102050	Frozen mocha coffee drink, with non-dairy milk and whipped cream*
92102502	Coffee, Iced Latte, with non-dairy milk*
92102505	Coffee, Iced Latte, with non-dairy milk, flavored*
92102602	Coffee, Iced Cafe Mocha, with non-dairy milk*
92161002	Coffee, Cappuccino, with non-dairy milk*
Nut butters (except full-fat peanut butter)	
42200500	Almond butter
42200510	Almond butter, lower sodium
42201000	Cashew butter
42202150	Peanut butter, reduced fat
42301115	Peanut butter sandwich, with reduced fat peanut butter, on white bread*
42301120	Peanut butter sandwich, with reduced fat peanut butter, on wheat bread*
42301125	Peanut butter sandwich, with reduced fat peanut butter, on whole wheat bread*
42302055	Peanut butter and jelly sandwich, with reduced fat peanut butter, regular jelly, on white bread*
42302060	Peanut butter and jelly sandwich, with reduced fat peanut butter, regular jelly, on wheat bread*
42302065	Peanut butter and jelly sandwich, with reduced fat peanut butter, regular jelly, on whole wheat bread*
42302155	Peanut butter and jelly sandwich, with reduced fat peanut butter, reduced sugar jelly, on white bread*
42302160	Peanut butter and jelly sandwich, with reduced fat peanut butter, reduced sugar jelly, on wheat bread*
42302165	Peanut butter and jelly sandwich, with reduced fat peanut butter, reduced sugar jelly, on whole wheat bread*
Nutritional bars	
53710800	Cereal or granola bar (Kashi Chewy)
53710802	Cereal or granola bar (Kashi Crunchy)

Food code	Food description
53720100	Nutrition bar (Balance Original Bar)
53720200	Nutrition bar (Clif Bar)
53720210	Nutrition bar (Clif Kids Organic Zbar)
53720300	Nutrition bar (PowerBar)
53720400	Nutrition bar (Slim Fast Original Meal Bar)
53720500	Nutrition bar (Snickers Marathon Protein Bar)
53720600	Nutrition bar (South Beach Living Meal Bar)
53720610	Nutrition bar (South Beach Living High Protein Bar)
53720700	Nutrition bar (Tiger's Milk)
53720800	Nutrition bar (Zone Perfect Classic Crunch)
53729000	Nutrition bar or meal replacement bar, NFS
Pasta, cooked	
27212000	Beef and noodles, no sauce*
27212120	Chili con carne with beans and macaroni*
27212150	Beef goulash with noodles*
27212200	Beef and noodles with gravy*
27212300	Beef and noodles with cream or white sauce*
27212400	Beef and noodles with mushroom sauce*
27220210	Ham and noodles, no sauce*
27242000	Chicken or turkey and noodles, no sauce*
27242200	Chicken or turkey and noodles with gravy*
27242300	Chicken or turkey and noodles with cream or white sauce*
27242310	Chicken or turkey and noodles with cheese sauce*
27242400	Chicken or turkey and noodles with tomato-based sauce*
27242500	Chicken or turkey and noodles with soy-based sauce*
27250120	Shrimp and noodles, no sauce*
27250126	Shrimp and noodles with cream or white sauce*
27250128	Shrimp and noodles with soy-based sauce*
27250130	Shrimp and noodles with cheese sauce*
27250132	Shrimp and noodles with tomato sauce*
27250610	Tuna noodle casserole with cream or white sauce*
27250630	Tuna noodle casserole with mushroom sauce*
27313010	Beef, noodles, and vegetables including carrots, broccoli, and/or dark-green leafy; no sauce*
27313020	Beef, noodles, and vegetables excluding carrots, broccoli, and dark-green leafy; no sauce*
27313110	Beef chow mein or chop suey with noodles*
27313150	Beef, noodles, and vegetables including carrots, broccoli, and/or dark-green leafy; soy-based sauce*
27313160	Beef, noodles, and vegetables excluding carrots, broccoli, and dark-green leafy; soy-based sauce*
27313210	Beef, noodles, and vegetables including carrots, broccoli, and/or dark-green leafy; tomato-based sauce*
27313220	Beef, noodles, and vegetables excluding carrots, broccoli, and dark-green leafy; tomato-based sauce*
27313410	Beef, noodles, and vegetables including carrots, broccoli, and/or dark-green leafy; gravy*
27313420	Beef, noodles, and vegetables excluding carrots, broccoli, and dark-green leafy; gravy*
27320025	Ham or pork, noodles and vegetables excluding carrots, broccoli, and dark-green leafy; no sauce*
27320027	Ham or pork, noodles, and vegetables including carrots, broccoli, and/or dark-green leafy; no sauce*
27320080	Sausage, noodles, and vegetables excluding carrots, broccoli, and dark-green leafy; tomato-based sauce*
27320310	Pork chow mein or chop suey with noodles*
27343010	Chicken or turkey, noodles, and vegetables including carrots, broccoli, and/or dark-green leafy; no sauce*
27343020	Chicken or turkey, noodles, and vegetables excluding carrots, broccoli, and dark-green leafy; no sauce*
27343410	Chicken or turkey, noodles, and vegetables including carrots, broccoli, and/or dark-green leafy; gravy*
27343420	Chicken or turkey, noodles, and vegetables excluding carrots, broccoli, and dark-green leafy; gravy*
27343470	Chicken or turkey, noodles, and vegetables including carrots, broccoli, and/or dark-green leafy; cream sauce, white sauce, or mushroom sauce*
27343480	Chicken or turkey, noodles, and vegetables excluding carrots, broccoli, and/or dark-green leafy; cream sauce, white sauce, or mushroom sauce*
27343520	Chicken or turkey, noodles, and vegetables excluding carrots, broccoli, and dark-green leafy; tomato-based sauce*

Food code	Food description
27343910	Chicken or turkey chow mein or chop suey with noodles*
27343950	Chicken or turkey, noodles, and vegetables including carrots, broccoli, and/or dark-green leafy; cheese sauce*
27350050	Shrimp chow mein or chop suey with noodles*
27350080	Tuna noodle casserole with vegetables, cream or white sauce*
27360010	Goulash, NFS*
27446350	Asian chicken or turkey garden salad, chicken and/or turkey, lettuce, fruit, nuts, no dressing*
27446355	Asian chicken or turkey garden salad with crispy noodles, chicken and/or turkey, lettuce, fruit, nuts, crispy noodles, no dressing*
28310320	Beef noodle soup, Puerto Rican style*
28310330	Pho*
28315160	Italian Wedding Soup*
28320140	Ham, noodle, and vegetable soup, Puerto Rican style*
28340220	Chicken soup with noodles and potatoes, Puerto Rican style*
28340510	Chicken or turkey noodle soup, chunky style, canned or ready-to-serve*
28340590	Chicken or turkey corn soup with noodles, home recipe*
41425010	Vermicelli, made from soybeans
41601090	Bean soup, with macaroni, home recipe, canned, or ready-to-serve*
56104000	Pasta, vegetable, cooked
56112000	Noodles, cooked
56113000	Noodles, whole grain, cooked
56113990	Noodles, vegetable, cooked
56116990	Long rice noodles, made from mung beans, cooked
56117090	Rice noodles, cooked
56130000	Pasta, cooked
56132990	Pasta, whole grain, cooked
56140100	Pasta, gluten free
58130011	Lasagna with meat*
58130014	Lasagna with meat, from restaurant*
58130015	Lasagna with meat, home recipe*
58130020	Lasagna with meat and spinach*
58130140	Lasagna with chicken or turkey*
58130150	Lasagna, with chicken or turkey, and spinach*
58130310	Lasagna, meatless*
58130320	Lasagna, meatless, with vegetables*
58131110	Ravioli, NS as to filling, with tomato sauce*
58131120	Ravioli, NS as to filling, with cream sauce*
58131310	Ravioli, meat-filled, no sauce*
58131320	Ravioli, meat-filled, with tomato sauce or meat sauce*
58131330	Ravioli, meat-filled, with cream sauce*
58131510	Ravioli, cheese-filled, no sauce*
58131520	Ravioli, cheese-filled, with tomato sauce*
58131535	Ravioli, cheese-filled, with cream sauce*
58131590	Ravioli, cheese and spinach-filled, no sauce*
58131600	Ravioli, cheese and spinach-filled, with cream sauce*
58131610	Ravioli, cheese and spinach filled, with tomato sauce*
58133120	Manicotti, cheese-filled, with tomato sauce, meatless*
58134120	Stuffed shells, cheese-filled, with tomato sauce, meatless*
58134130	Stuffed shells, cheese-filled, with meat sauce*
58134160	Stuffed shells, cheese- and spinach- filled, no sauce*
58134310	Stuffed shells, with fish and/or shellfish, with tomato sauce*
58134610	Tortellini, meat-filled, with tomato sauce*
58134620	Tortellini, cheese-filled, meatless, with tomato sauce*
58134640	Tortellini, cheese-filled, meatless, with vinaigrette dressing*
58134650	Tortellini, meat-filled, no sauce*

Food code	Food description
58134660	Tortellini, cheese-filled, with cream sauce*
58134680	Tortellini, cheese-filled, no sauce*
58134710	Tortellini, spinach-filled, with tomato sauce*
58134720	Tortellini, spinach-filled, no sauce*
58135110	Chow fun noodles with meat and vegetables*
58135120	Chow fun noodles with vegetables, meatless*
58136120	Lo mein, meatless*
58136130	Lo mein, with shrimp*
58136140	Lo mein, with pork*
58136150	Lo mein, with beef*
58136160	Lo mein, with chicken*
58137220	Pad Thai, meatless*
58137230	Pad Thai with chicken*
58137240	Pad Thai with seafood*
58137250	Pad Thai with meat*
58137300	Adobo, with noodles*
58145111	Macaroni or noodles with cheese, from restaurant*
58145135	Macaroni or noodles with cheese and meat*
58145140	Macaroni or noodles with cheese and tomato*
58145160	Macaroni or noodles with cheese and frankfurters or hot dogs*
58145170	Macaroni or noodles with cheese and egg*
58145190	Macaroni or noodles with cheese and chicken or turkey*
58145300	Macaroni or noodles with cheese, whole grain*
58146120	Pasta with tomato-based sauce, cheese and meat*
58146150	Pasta with tomato-based sauce and cheese*
58146160	Pasta with vegetables, no sauce or dressing*
58146210	Pasta with sauce, NFS*
58146215	Pasta with sauce, meatless, school lunch*
58146221	Pasta with tomato-based sauce, restaurant*
58146222	Pasta with tomato-based sauce, home recipe*
58146301	Pasta with tomato-based sauce, and added vegetables, restaurant*
58146302	Pasta with tomato-based sauce, and added vegetables, home recipe*
58146315	Pasta with sauce and meat, from school lunch*
58146321	Pasta with tomato-based sauce and meat, restaurant*
58146322	Pasta with tomato-based sauce and meat, home recipe*
58146331	Pasta with tomato-based sauce, meat, and added vegetables, restaurant*
58146332	Pasta with tomato-based sauce, meat, and added vegetables, home recipe*
58146341	Pasta with tomato-based sauce and poultry, restaurant*
58146342	Pasta with tomato-based sauce and poultry, home recipe*
58146351	Pasta with tomato-based sauce, poultry, and added vegetables, restaurant*
58146352	Pasta with tomato-based sauce, poultry, and added vegetables, home recipe*
58146361	Pasta with tomato-based sauce and seafood, restaurant*
58146362	Pasta with tomato-based sauce and seafood, home recipe*
58146371	Pasta with tomato-based sauce, seafood, and added vegetables, restaurant*
58146372	Pasta with tomato-based sauce, seafood, and added vegetables, home recipe*
58146381	Pasta with cream sauce, restaurant*
58146382	Pasta with cream sauce, home recipe*
58146391	Pasta with cream sauce and added vegetables, restaurant*
58146392	Pasta with cream sauce and added vegetables, from home recipe*
58146401	Pasta with cream sauce and meat, restaurant*
58146402	Pasta with cream sauce and meat, home recipe*
58146411	Pasta with cream sauce, meat, and added vegetables, restaurant*
58146412	Pasta with cream sauce, meat, and added vegetables, home recipe*
58146421	Pasta with cream sauce and poultry, restaurant*
58146422	Pasta with cream sauce and poultry, home recipe*

Food code	Food description
58146431	Pasta with cream sauce, poultry, and added vegetables, restaurant*
58146432	Pasta with cream sauce, poultry, and added vegetables, home recipe*
58146441	Pasta with cream sauce and seafood, restaurant*
58146442	Pasta with cream sauce and seafood, home recipe*
58146451	Pasta with cream sauce, seafood, and added vegetables, restaurant*
58146452	Pasta with cream sauce, seafood, and added vegetables, home recipe*
58146601	Pasta, whole grain, with tomato-based sauce, restaurant*
58146602	Pasta, whole grain, with tomato-based sauce, home recipe*
58146612	Pasta, whole grain, with tomato-based sauce and added vegetables, home recipe*
58146622	Pasta, whole grain, with tomato-based sauce and meat, home recipe*
58146632	Pasta, whole grain, with tomato-based sauce, meat, and added vegetables, home recipe*
58146641	Pasta, whole grain, with tomato-based sauce and poultry, restaurant*
58146642	Pasta, whole grain, with tomato-based sauce and poultry, home recipe*
58146652	Pasta, whole grain, with tomato-based sauce, poultry, and added vegetables, home recipe*
58146662	Pasta, whole grain, with tomato-based sauce and seafood, home recipe*
58146672	Pasta, whole grain, with tomato-based sauce, seafood, and added vegetables, home recipe*
58146682	Pasta, whole grain, with cream sauce, home recipe*
58146692	Pasta, whole grain, with cream sauce, and added vegetables, home recipe*
58146702	Pasta, whole grain, with cream sauce and meat, home recipe*
58146722	Pasta, whole grain, with cream sauce and poultry, home recipe*
58146732	Pasta, whole grain, with cream sauce, poultry, and added vegetables, home recipe*
58146741	Pasta, whole grain, with cream sauce and seafood, restaurant*
58147330	Macaroni or noodles, creamed, with cheese*
58148111	Macaroni or pasta salad, made with light mayonnaise*
58148112	Macaroni or pasta salad, made with mayonnaise-type salad dressing*
58148114	Macaroni or pasta salad, made with Italian dressing*
58148117	Macaroni or pasta salad, made with light creamy dressing*
58148118	Macaroni or pasta salad, made with any type of fat free dressing*
58148120	Macaroni or pasta salad with egg*
58148130	Macaroni or pasta salad with tuna*
58148150	Macaroni or pasta salad with shrimp*
58148160	Macaroni or pasta salad with tuna and egg*
58148170	Macaroni or pasta salad with chicken*
58148180	Macaroni or pasta salad with cheese*
58148550	Macaroni or pasta salad with meat*
58400000	Soup, NFS*
58400100	Noodle soup, NFS*
58402010	Beef noodle soup, canned or ready-to-serve*
58402100	Beef noodle soup, home recipe*
58403010	Chicken or turkey noodle soup, canned or ready-to-serve*
58403040	Chicken or turkey noodle soup, home recipe*
58403050	Chicken or turkey noodle soup, cream of, home recipe, canned, or ready-to-serve*
58403060	Chicken or turkey noodle soup, reduced sodium, canned or ready-to-serve*
58403100	Noodle and potato soup, Puerto Rican style*
58404510	Chicken or turkey soup with dumplings and potatoes, home recipe, canned, or ready-to-serve*
58404520	Chicken or turkey soup with dumplings, home recipe, canned or ready-to-serve*
58407010	Instant soup, noodle*
58407030	Soup, mostly noodles*
58407035	Soup, mostly noodles, reduced sodium*
58408500	Noodle soup with vegetables, Asian style*
58409000	Noodle soup, with fish ball, shrimp, and dark green leafy vegetable*
58421010	Sopa Seca de Fideo, Mexican style, made with dry noodles, home recipe*
58421020	Sopa de Fideo Aguada, Mexican style noodle soup, home recipe*
72202010	Broccoli casserole with noodles*
74603010	Tomato beef soup, prepared with water*

Food code	Food description
74604010	Tomato beef noodle soup, prepared with water*
74604100	Tomato beef rice soup, prepared with water*
74604500	Tomato noodle soup, canned, prepared with water or ready-to-serve*
74604600	Tomato noodle soup, canned, prepared with milk*
75340160	Vegetable and pasta combinations with cream or cheese sauce, broccoli, pasta, carrots, corn, zucchini, peppers, cauliflower, peas, etc., cooked*
75460700	Vegetable combinations, including carrots, broccoli, and/or dark-green leafy; cooked, with pasta*
75460710	Vegetable combinations, excluding carrots, broccoli, and dark-green leafy; cooked, with pasta*
75460900	Chow mein or chop suey, meatless, with noodles*
75649150	Vegetable noodle soup, home recipe*
75651000	Minestrone soup, home recipe*
75651150	Vegetable noodle soup, reduced sodium, canned, prepared with water or ready-to-serve*
75652040	Vegetable beef soup with noodles or pasta, home recipe*
75656040	Vegetable soup, with pasta, chunky style*
Processed meats	
14610520	Cheese ball*
14620320	Topping from meat pizza*
14620330	Topping from meat and vegetable pizza*
21416000	Corned beef, cooked, NS as to fat eaten
21416110	Corned beef, cooked, lean and fat eaten
21416120	Corned beef, cooked, lean only eaten
21416150	Corned beef, canned, ready-to-eat
21601000	Beef, bacon, cooked
21601010	Beef, bacon, reduced sodium, cooked
21602000	Beef, dried, chipped, uncooked
21602010	Beef, dried, chipped, cooked in fat
21602100	Beef jerky
22002800	Pork jerky
22107010	Pork chop, smoked or cured, cooked, lean and fat eaten
22107020	Pork chop, smoked or cured, cooked, lean only eaten
22300120	Ham, fried, NS as to fat eaten*
22300130	Ham, fried, lean and fat eaten*
22300140	Ham, fried, lean only eaten*
22300150	Ham, breaded or floured, fried, NS as to fat eaten*
22300160	Ham, breaded or floured, fried, lean and fat eaten*
22311000	Ham, smoked or cured, cooked, NS as to fat eaten
22311010	Ham, smoked or cured, cooked, lean and fat eaten
22311020	Ham, smoked or cured, cooked, lean only eaten
22311450	Ham, prosciutto
22311510	Ham, smoked or cured, canned, lean and fat eaten
22321110	Ham, smoked or cured, ground patty
22421000	Pork roast, smoked or cured, cooked, NS as to fat eaten
22421010	Pork roast, smoked or cured, cooked, lean and fat eaten
22421020	Pork roast, smoked or cured, cooked, lean only eaten
22431000	Pork roll, cured, fried*
22501010	Canadian bacon, cooked
22600100	Bacon, NS as to type of meat, cooked
22600200	Pork bacon, NS as to fresh, smoked or cured, cooked
22600210	Pork bacon, NS as to fresh, smoked or cured, reduced sodium, cooked
22601000	Pork bacon, smoked or cured, cooked
22601040	Bacon or side pork, fresh, cooked
22602010	Pork bacon, smoked or cured, reduced sodium, cooked
22621000	Salt pork, cooked
22704010	Pork, cracklings, cooked
22706010	Pork, neck bones, cooked*

Food code	Food description
22707020	Pork, pig's feet, pickled
22709010	Pork skin rinds
22709110	Pork skin, boiled
23321900	Venison/deer jerky
23322100	Deer sausage
24198570	Chicken, canned, meat only
24198671	Chicken patty, breaded
24198677	Chicken fillet, breaded
24198729	Chicken nuggets, NFS
24198731	Chicken nuggets, from fast food
24198732	Chicken nuggets, from restaurant
24198735	Chicken nuggets, from school lunch
24198736	Chicken nuggets, from frozen
24198737	Chicken nuggets, from other sources
24198739	Chicken tenders or strips, NFS
24198741	Chicken tenders or strips, breaded, from fast food
24198742	Chicken tenders or strips, breaded, from restaurant
24198745	Chicken tenders or strips, breaded, from school lunch
24198746	Chicken tenders or strips, breaded, from frozen
24198747	Chicken tenders or strips, breaded, from other sources*
24208000	Turkey, nuggets
24208500	Turkey bacon, cooked
24208510	Turkey bacon, reduced sodium, cooked
25112200	Liver paste or pate, chicken
25160110	Tongue, smoked, cured, or pickled, cooked
25210110	Frankfurter or hot dog, NFS
25210150	Frankfurter or hot dog, cheese-filled
25210210	Frankfurter or hot dog, beef
25210220	Frankfurter or hot dog, beef and pork
25210240	Frankfurter or hot dog, beef and pork, reduced fat or light
25210250	Frankfurter or hot dog, meat and poultry, fat free
25210280	Frankfurter or hot dog, meat and poultry
25210290	Frankfurter or hot dog, meat and poultry, reduced fat or light
25210310	Frankfurter or hot dog, chicken
25210410	Frankfurter or hot dog, turkey
25210620	Frankfurter or hot dog, beef, reduced fat or light
25220105	Beef sausage
25220106	Beef sausage, reduced fat
25220108	Beef sausage, reduced sodium
25220150	Beef sausage with cheese
25220210	Blood sausage
25220350	Bratwurst
25220360	Bratwurst, with cheese
25220410	Bologna, NFS
25220425	Bologna, made from any kind of meat, reduced fat
25220435	Bologna, made from any kind of meat, reduced sodium
25220445	Bologna, made from any kind of meat, reduced fat and reduced sodium
25220650	Turkey or chicken and beef sausage
25220710	Chorizo
25221210	Mortadella
25221215	Pastrami, NFS
25221220	Pastrami, made from any kind of meat, reduced fat
25221250	Pepperoni, NFS
25221255	Pepperoni, reduced fat
25221260	Pepperoni, reduced sodium

Food code	Food description
25221310	Polish sausage
25221350	Italian sausage
25221400	Sausage, NFS
25221405	Pork sausage
25221406	Pork sausage, reduced fat
25221408	Pork sausage, reduced sodium
25221450	Pork sausage rice links
25221460	Pork and beef sausage
25221500	Salami, NFS
25221505	Salami, made from any type of meat, reduced fat
25221515	Salami, made from any type of meat, reduced sodium
25221610	Scrapple, cooked
25221810	Thuringer
25221830	Turkey or chicken sausage
25221855	Turkey or chicken sausage, reduced sodium
25221860	Turkey or chicken sausage, reduced fat
25221870	Turkey or chicken and pork sausage
25221875	Turkey or chicken, pork, and beef sausage, reduced sodium
25221910	Vienna sausage, canned
25221950	Pickled sausage
25230110	Luncheon meat, NFS
25230210	Ham, prepackaged or deli, luncheon meat
25230220	Ham, prepackaged or deli, luncheon meat, reduced sodium
25230320	Chicken, prepackaged or deli, luncheon meat
25230340	Chicken, prepackaged or deli, luncheon meat, reduced sodium
25230420	Ham luncheon meat, loaf type
25230530	Ham and pork, canned luncheon meat, chopped, minced, pressed, spiced
25230540	Ham, pork and chicken, canned luncheon meat, chopped, minced, pressed, spiced, reduced fat and reduced sodium
25230550	Ham, pork, and chicken, canned luncheon meat, chopped, minced, pressed, spiced, reduced sodium
25230560	Liverwurst
25230610	Luncheon meat, loaf type
25230780	Turkey, prepackaged or deli, luncheon meat
25230785	Turkey, prepackaged or deli, luncheon meat, reduced sodium
25230800	Turkey ham, prepackaged or deli, luncheon meat
25231110	Beef, prepackaged or deli, luncheon meat
25231120	Beef, prepackaged or deli, luncheon meat, reduced sodium
25240000	Meat spread or potted meat, NFS
25240110	Chicken salad spread
25240220	Ham salad spread
26100260	Fish stick, patty or nugget from fast food
26100270	Fish stick, patty or nugget from restaurant, home, or other place
27113200	Creamed chipped or dried beef*
27118120	Stewed seasoned ground beef, Puerto Rican style*
27118130	Stewed dried beef, Puerto Rican style*
27118180	Beef stew, meat with gravy, no potatoes, Puerto Rican style*
27120080	Ham stroganoff*
27120110	Sausage with tomato-based sauce*
27120120	Sausage gravy*
27120210	Frankfurter or hot dog, with chili, no bun*
27120250	Frankfurters or hot dogs with tomato-based sauce*
27133010	Stewed goat, Puerto Rican style*
27146250	Chicken or turkey cordon bleu*
27211400	Corned beef hash*
27218210	Beef stew with potatoes, Puerto Rican style*

Food code	Food description
27218310	Stewed corned beef, Puerto Rican style*
27220010	Meat loaf made with ham*
27220080	Ham croquette*
27220120	Sausage and rice with tomato-based sauce*
27220170	Sausage and rice with cheese sauce*
27220210	Ham and noodles, no sauce*
27246300	Chicken or turkey cake, patty, or croquette
27260110	Hash, NS as to type of meat*
27311210	Corned beef, potatoes, and vegetables including carrots, broccoli, and/or dark-green leafy; no sauce*
27320080	Sausage, noodles, and vegetables excluding carrots, broccoli, and dark-green leafy; tomato-based sauce*
27320120	Sausage, potatoes, and vegetables including carrots, broccoli, and/or dark-green leafy; gravy*
27320410	Ham, potatoes, and vegetables excluding carrots, broccoli, and dark-green leafy; no sauce*
27320450	Ham, potatoes, and vegetables including carrots, broccoli, and/or dark-green leafy; no sauce*
27360090	Paella, NFS*
27362000	Stewed tripe, with potatoes, Puerto Rican style*
27363100	Jambalaya with meat and rice*
27411150	Beef rolls, stuffed with vegetables or meat mixture, tomato-based sauce*
27418310	Corned beef with tomato sauce and onion, Puerto Rican style*
27420020	Ham or pork salad*
27420040	Frankfurters or hot dogs and sauerkraut*
27420080	Greens with ham or pork*
27420250	Ham and vegetables including carrots broccoli, and/or dark- green leafy; no potatoes, no sauce*
27420460	Sausage and vegetables, excluding carrots, broccoli, and dark-green leafy; no potatoes, tomato-based sauce*
27420470	Sausage and peppers, no sauce*
27446315	Chicken or turkey garden salad with bacon and cheese, chicken and/or turkey, bacon, cheese, lettuce and/or greens, tomato and/or carrots, other vegetables, no dressing*
27446320	Chicken or turkey, breaded, fried, garden salad with bacon and cheese, chicken and/or turkey, bacon, cheese, lettuce and/or greens, tomato and/or carrots, other vegetables, no dressing*
27450250	Oysters Rockefeller*
27460510	Antipasto with ham, fish, cheese, vegetables*
27500050	Sandwich, NFS*
27500100	Meat sandwich, NFS*
27510276	Bacon cheeseburger, 1 small patty, with condiments, on bun, from fast food / restaurant*
27510281	Bacon cheeseburger, 1 small patty, with condiments, on bun, from fast food / restaurant (Wendy's Jr. Bacon Cheeseburger)*
27510305	Bacon cheeseburger, 1 medium patty, plain, on bun, from fast food / restaurant*
27510312	Bacon cheeseburger, 1 medium patty, with condiments, on bun, from fast food / restaurant*
27510331	Bacon cheeseburger, 1 medium patty, plain, on white bun*
27510341	Bacon cheeseburger, 1 medium patty, with condiments, on white bun*
27510342	Bacon cheeseburger, 1 medium patty, with condiments, on wheat bun*
27510343	Bacon cheeseburger, 1 medium patty, with condiments, on whole wheat bun*
27510346	Bacon cheeseburger, 1 large patty, with condiments, on bun, from fast food / restaurant*
27510431	Double bacon cheeseburger, 2 small patties, with condiments, on bun, from fast food / restaurant (Burger King Bacon Double Cheeseburger)*
27510446	Double bacon cheeseburger, 2 medium patties, plain, on bun, from fast food / restaurant*
27510451	Double bacon cheeseburger, 2 medium patties, with condiments, on bun, from fast food / restaurant*
27510465	Double bacon cheeseburger, 2 medium patties, with condiments, on bun, from fast food / restaurant (Wendy's Baconator)*
27510475	Double bacon cheeseburger, 2 large patties, with condiments, on bun, from fast food / restaurant*
27510910	Corned beef sandwich*
27510950	Reuben sandwich, corned beef sandwich with sauerkraut and cheese, with spread*
27513010	Roast beef sandwich*
27520135	Bacon, chicken, and tomato club sandwich, with cheese, lettuce and spread*
27520140	Bacon and egg sandwich*

Food code	Food description
27520150	Bacon, lettuce, and tomato sandwich with spread*
27520155	Bacon, lettuce, and tomato submarine sandwich, with spread*
27520156	Bacon, lettuce, tomato, and cheese submarine sandwich, with spread*
27520160	Bacon, chicken, and tomato club sandwich, on multigrain roll with lettuce and spread*
27520166	Bacon, breaded fried chicken fillet, and tomato club sandwich with cheese, lettuce and spread*
27520170	Bacon on biscuit*
27520250	Ham on biscuit*
27520310	Ham sandwich with lettuce and spread*
27520320	Ham and cheese sandwich, with lettuce and spread*
27520350	Ham and cheese sandwich, with spread, grilled*
27520370	Hot ham and cheese sandwich, on bun*
27520390	Ham and cheese submarine sandwich, with lettuce, tomato and spread*
27520410	Cuban sandwich, with spread*
27540139	Chicken fillet sandwich, from school cafeteria*
27540140	Chicken fillet, breaded, fried, sandwich*
27540145	Chicken fillet biscuit, from fast food*
27540146	Chicken fillet sandwich, fried, from fast food*
27540147	Chicken fillet sandwich, fried, from fast food, with cheese*
27540150	Chicken fillet, breaded, fried, sandwich with lettuce, tomato and spread*
27540151	Chicken fillet, breaded, fried, sandwich with cheese, lettuce, tomato and spread*
27540160	Chicken fillet sandwich, NS as to fried or grilled, from fast food*
27540170	Chicken patty sandwich, miniature, with spread*
27540175	Chicken fillet sandwich, fried, on white bun*
27540176	Chicken fillet sandwich, fried, on white bun; with cheese*
27540180	Chicken patty sandwich or biscuit*
27540185	Chicken fillet sandwich, fried, on wheat bun*
27540186	Chicken fillet sandwich, fried, on wheat bun, with cheese*
27540190	Chicken patty sandwich, with lettuce and spread*
27540210	Chicken fillet wrap sandwich, fried, from fast food*
27540285	Chicken, bacon, and tomato club sandwich, with lettuce and spread*
27540360	Turkey and bacon submarine sandwich, with lettuce, tomato and spread*
27540361	Turkey and bacon submarine sandwich, with cheese, lettuce, tomato and spread*
27541000	Turkey, ham, and roast beef club sandwich, with lettuce, tomato and spread*
27541001	Turkey, ham, and roast beef club sandwich with cheese, lettuce, tomato, and spread*
27560120	Bologna and cheese sandwich, with spread*
27560300	Corn dog, frankfurter or hot dog with cornbread coating*
27560350	Pig in a blanket, frankfurter or hot dog wrapped in dough*
27560500	Pepperoni and salami submarine sandwich, with lettuce, tomato and spread*
27560650	Sausage on biscuit*
27560660	Sausage griddle cake sandwich*
27560670	Sausage and cheese on English muffin*
27560705	Sausage balls, made with biscuit mix and cheese*
27560710	Sausage sandwich*
27564000	Frankfurter or hot dog sandwich, NFS, plain, on white bun*
27564001	Frankfurter or hot dog sandwich, NFS, plain, on wheat bun*
27564002	Frankfurter or hot dog sandwich, NFS, plain, on whole wheat bun*
27564010	Frankfurter or hot dog sandwich, NFS, plain, on white bread*
27564020	Frankfurter or hot dog sandwich, NFS, plain, on wheat bread*
27564030	Frankfurter or hot dog sandwich, NFS, plain, on whole wheat bread*
27564060	Frankfurter or hot dog sandwich, beef, plain, on white bun*
27564061	Frankfurter or hot dog sandwich, beef, plain, on wheat bun*
27564062	Frankfurter or hot dog sandwich, beef, plain, on whole wheat bun*
27564064	Frankfurter or hot dog sandwich, beef, plain, on multigrain bun*
27564070	Frankfurter or hot dog sandwich, beef, plain, on white bread*
27564080	Frankfurter or hot dog sandwich, beef, plain, on wheat bread*

Food code	Food description
27564090	Frankfurter or hot dog sandwich, beef, plain, on whole wheat bread*
27564100	Frankfurter or hot dog sandwich, beef, plain, on whole grain white bread*
27564110	Frankfurter or hot dog sandwich, beef, plain, on multigrain bread*
27564120	Frankfurter or hot dog sandwich, beef and pork, plain, on white bun*
27564121	Frankfurter or hot dog sandwich, beef and pork, plain, on wheat bun*
27564122	Frankfurter or hot dog sandwich, beef and pork, plain, on whole wheat bun*
27564130	Frankfurter or hot dog sandwich, beef and pork, plain, on white bread*
27564140	Frankfurter or hot dog sandwich, beef and pork, plain, on wheat bread*
27564150	Frankfurter or hot dog sandwich, beef and pork, plain, on whole wheat bread*
27564180	Frankfurter or hot dog sandwich, meat and poultry, plain, on white bun*
27564182	Frankfurter or hot dog sandwich, meat and poultry, plain, on whole wheat bun*
27564190	Frankfurter or hot dog sandwich, meat and poultry, plain, on white bread*
27564200	Frankfurter or hot dog sandwich, meat and poultry, plain, on wheat bread*
27564210	Frankfurter or hot dog sandwich, meat and poultry, plain, on whole wheat bread*
27564220	Frankfurter or hot dog sandwich, meat and poultry, plain, on whole grain white bread*
27564240	Frankfurter or hot dog sandwich, chicken and/or turkey, plain, on white bun*
27564241	Frankfurter or hot dog sandwich, chicken and/or turkey, plain, on wheat bun*
27564243	Frankfurter or hot dog sandwich, chicken and/or turkey, plain, on whole grain white bun*
27564250	Frankfurter or hot dog sandwich, chicken and/or turkey, plain, on white bread*
27564260	Frankfurter or hot dog sandwich, chicken and/or turkey, plain, on wheat bread*
27564270	Frankfurter or hot dog sandwich, chicken and/or turkey, plain, on whole wheat bread*
27564290	Frankfurter or hot dog sandwich, chicken and/or turkey, plain, on multigrain bread*
27564300	Frankfurter or hot dog sandwich, reduced fat or light, plain, on white bun*
27564301	Frankfurter or hot dog sandwich, reduced fat or light, plain, on wheat bun*
27564330	Frankfurter or hot dog sandwich, reduced fat or light, plain, on whole wheat bread*
27564360	Frankfurter or hot dog sandwich, fat free, plain, on white bun*
27564370	Frankfurter or hot dog sandwich, fat free, plain, on white bread*
27564380	Frankfurter or hot dog sandwich, fat free, plain, on wheat bread*
27564418	Frankfurter or hot dog sandwich, reduced sodium*
27564440	Frankfurter or hot dog sandwich, with chili, on white bun*
27564441	Frankfurter or hot dog sandwich, with chili, on wheat bun*
27564442	Frankfurter or hot dog sandwich, with chili, on whole wheat bun*
27564443	Frankfurter or hot dog sandwich, with chili, on whole grain white bun*
27564450	Frankfurter or hot dog sandwich, with chili, on white bread*
27564500	Frankfurter or hot dog sandwich, with meatless chili, on white bun*
27564510	Frankfurter or hot dog sandwich, with meatless chili, on white bread*
27564520	Frankfurter or hot dog sandwich, with meatless chili, on wheat bread*
28140720	Chicken patty, or nuggets, boneless, breaded, potatoes, vegetable, frozen meal*
28310230	Meatball soup, home recipe, Mexican style*
28311010	Pepperpot soup*
28320130	Ham, rice, and potato soup, Puerto Rican style*
28320140	Ham, noodle, and vegetable soup, Puerto Rican style*
28340210	Chicken rice soup, Puerto Rican style*
28340220	Chicken soup with noodles and potatoes, Puerto Rican style*
28340700	Bird's nest soup*
28350050	Fish chowder*
32101500	Egg, Benedict*
32105190	Egg casserole with bread, cheese, milk and meat*
32130190	Egg omelet or scrambled egg, with meat, NS as to fat*
32130200	Egg omelet or scrambled egg, with meat, made with margarine*
32130210	Egg omelet or scrambled egg, with meat, made with oil*
32130220	Egg omelet or scrambled egg, with meat, made with butter*
32130240	Egg omelet or scrambled egg, with meat, made with animal fat or meat drippings*
32130260	Egg omelet or scrambled egg, with meat, made with cooking spray*
32130265	Egg omelet or scrambled egg, with meat, NS as to fat type*

Food code	Food description
32130270	Egg omelet or scrambled egg, with meat, no added fat*
32130290	Egg omelet or scrambled egg, with cheese and meat, NS as to fat*
32130300	Egg omelet or scrambled egg, with cheese and meat, made with margarine*
32130310	Egg omelet or scrambled egg, with cheese and meat, made with oil*
32130320	Egg omelet or scrambled egg, with cheese and meat, made with butter*
32130360	Egg omelet or scrambled egg, with cheese and meat, made with cooking spray*
32130365	Egg omelet or scrambled egg, with cheese and meat, NS as to fat type*
32130370	Egg omelet or scrambled egg, with cheese and meat, no added fat*
32130800	Egg omelet or scrambled egg, with meat and tomatoes, fat added*
32130810	Egg omelet or scrambled egg, with meat and tomatoes, no added fat*
32130820	Egg omelet or scrambled egg, with meat and tomatoes, NS as to fat*
32130830	Egg omelet or scrambled egg, with meat and dark-green vegetables, fat added*
32130840	Egg omelet or scrambled egg, with meat and dark-green vegetables, no added fat*
32130850	Egg omelet or scrambled egg, with meat and dark-green vegetables, NS as to fat*
32130890	Egg omelet or scrambled egg, with meat and vegetables other than dark-green and/or tomatoes, fat added*
32130900	Egg omelet or scrambled egg, with meat and vegetables other than dark-green and/or tomatoes, no added fat*
32130910	Egg omelet or scrambled egg, with meat and vegetables other than dark-green and/or tomatoes, NS as to fat*
32131000	Egg omelet or scrambled egg, with cheese, meat, and tomatoes, fat added*
32131010	Egg omelet or scrambled egg, with cheese, meat, and tomatoes, no added fat*
32131020	Egg omelet or scrambled egg, with cheese, meat, and tomatoes, NS as to fat*
32131030	Egg omelet or scrambled egg, with cheese, meat, and dark-green vegetables, fat added*
32131040	Egg omelet or scrambled egg, with cheese, meat, and dark-green vegetables, no added fat*
32131050	Egg omelet or scrambled egg, with cheese, meat, and dark-green vegetables, NS as to fat*
32131060	Egg omelet or scrambled egg, with cheese, meat, tomatoes, and dark-green vegetables, fat added*
32131070	Egg omelet or scrambled egg, with cheese, meat, tomatoes, and dark-green vegetables, no added fat*
32131080	Egg omelet or scrambled egg, with cheese, meat, tomatoes, and dark-green vegetables, NS as to fat*
32131090	Egg omelet or scrambled egg, with cheese, meat, and vegetables other than dark-green and/or tomatoes, fat added*
32131100	Egg omelet or scrambled egg, with cheese, meat, and vegetables other than dark-green and/or tomatoes, no added fat*
32131110	Egg omelet or scrambled egg, with cheese, meat, and vegetables other than dark-green and/or tomatoes, NS as to fat*
32202000	Egg, cheese, ham, and bacon on bun*
32202010	Egg, cheese, and ham on English muffin*
32202025	Egg, cheese and ham on bagel*
32202030	Egg, cheese, and sausage on English muffin*
32202034	Egg, cheese, and sausage on bun*
32202035	Egg, extra cheese, and extra sausage, on bun*
32202050	Egg, cheese, and sausage on biscuit*
32202055	Egg, cheese, and sausage griddle cake sandwich*
32202060	Egg and sausage on biscuit*
32202070	Egg, cheese, and bacon on biscuit*
32202075	Egg, cheese, and bacon griddle cake sandwich*
32202080	Egg, cheese, and bacon on English muffin*
32202085	Egg, cheese and bacon on bagel*
32202090	Egg and bacon on biscuit*
32202110	Egg and ham on biscuit*
32202120	Egg, cheese and sausage on bagel*
32400200	Egg white, omelet, scrambled, or fried, with meat*
32400210	Egg white, omelet, scrambled, or fried, with meat, fat not added in cooking*
32400400	Egg white, omelet, scrambled, or fried, with cheese and meat*
32400600	Egg white, omelet, scrambled, or fried, with meat and vegetables*
32400610	Egg white, omelet, scrambled, or fried, with meat and vegetables, fat not added in cooking*
32400620	Egg white, omelet, scrambled, or fried, with meat and vegetables, NS as to fat added in cooking*

Food code	Food description
32400700	Egg white, omelet, scrambled, or fried, with cheese, meat, and vegetables*
32400710	Egg white, omelet, scrambled, or fried, with cheese, meat, and vegetables, fat not added in cooking*
33401100	Egg substitute, omelet, scrambled, or fried, with meat*
33401300	Egg substitute, omelet, scrambled, or fried, with cheese and meat*
33401310	Egg substitute, omelet, scrambled, or fried, with cheese and meat, fat not added in cooking*
33401500	Egg substitute, omelet, scrambled, or fried, with meat and vegetables*
33401600	Egg substitute, omelet, scrambled, or fried, with cheese, meat, and vegetables*
41102170	Black beans with meat*
41104250	Pinto beans with meat*
41106170	Kidney beans with meat*
41205030	Refried beans with meat*
41206030	Beans and franks*
41208100	Beans with meat, NS as to type*
41210090	Stewed beans with pork, tomatoes, and chili peppers, Mexican style*
41310150	Stewed chickpeas, Puerto Rican style*
41310160	Stewed chickpeas, with potatoes, Puerto Rican style*
41601040	Lima bean soup, home recipe, canned or ready-to-serve*
41601080	Pinto bean soup, home recipe, canned or ready-to-serve*
41601130	Bean soup, mixed beans, home recipe, canned or ready-to-serve*
41601140	Bean soup, home recipe*
41601180	Bean and ham soup, home recipe*
41602020	Garbanzo bean or chickpea soup, home recipe, canned or ready-to-serve*
54408430	Pretzels, soft, ready-to-eat, topped with meat*
58100010	Burrito, taco, or quesadilla with egg and breakfast meat*
58100013	Burrito, taco, or quesadilla with egg and breakfast meat, from fast food*
58100015	Burrito, taco, or quesadilla with egg, potato, and breakfast meat*
58100017	Burrito, taco, or quesadilla with egg, potato, and breakfast meat, from fast food*
58100020	Burrito, taco, or quesadilla with egg, beans, and breakfast meat*
58104905	Taquito or flauta with egg and breakfast meat*
58106512	Pizza with pepperoni, from frozen, thin crust*
58106514	Pizza with pepperoni, from frozen, medium crust*
58106516	Pizza with pepperoni, from frozen, thick crust*
58106540	Pizza with pepperoni, from restaurant or fast food, NS as to type of crust*
58106550	Pizza with pepperoni, from restaurant or fast food, thin crust*
58106555	Pizza with pepperoni, from restaurant or fast food, medium crust*
58106560	Pizza with pepperoni, from restaurant or fast food, thick crust*
58106565	Pizza with pepperoni, stuffed crust*
58106570	Pizza with pepperoni, from school lunch, thin crust*
58106578	Pizza, with pepperoni, from school lunch, medium crust*
58106580	Pizza with pepperoni, from school lunch, thick crust*
58106602	Pizza with meat other than pepperoni, from frozen, thin crust*
58106604	Pizza with meat other than pepperoni, from frozen, medium crust*
58106606	Pizza with meat other than pepperoni, from frozen, thick crust*
58106610	Pizza with meat other than pepperoni, from restaurant or fast food, NS as to type of crust*
58106620	Pizza with meat other than pepperoni, from restaurant or fast food, thin crust*
58106625	Pizza with meat other than pepperoni, from restaurant or fast food, medium crust*
58106630	Pizza with meat other than pepperoni, from restaurant or fast food, thick crust*
58106633	Pizza, with meat other than pepperoni, stuffed crust*
58106634	Pizza, with meat other than pepperoni, from school lunch, medium crust*
58106635	Pizza, with meat other than pepperoni, from school lunch, thin crust*
58106636	Pizza, with meat other than pepperoni, from school lunch, thick crust*
58106650	Pizza with extra meat, thin crust*
58106655	Pizza with extra meat, medium crust*
58106660	Pizza with extra meat, thick crust*
58106720	Pizza with meat and vegetables, from restaurant or fast food, thin crust*

Food code	Food description
58106730	Pizza with meat and vegetables, from restaurant or fast food, thick crust*
58106736	Pizza with extra meat and extra vegetables, thin crust*
58106737	Pizza with extra meat and extra vegetables, thick crust*
58106738	Pizza with extra meat and extra vegetables, medium crust*
58106750	Pizza with meat and fruit, thin crust*
58106755	Pizza with meat and fruit, medium crust*
58106760	Pizza with meat and fruit, thick crust*
58107050	Pizza, no cheese, thin crust*
58107222	White pizza, cheese, with meat, thin crust*
58107224	White pizza, cheese, with meat, thick crust*
58107232	White pizza, cheese, with meat and vegetables, thin crust*
58108010	Calzone, with meat and cheese*
58109030	Pizza, with meat, whole wheat thin crust*
58109040	Pizza, with meat, whole wheat thick crust*
58109120	Pizza, with meat, gluten-free thin crust*
58109130	Pizza, with meat, gluten-free thick crust*
58109210	Breakfast pizza with egg*
58116110	Meat turnover, Puerto Rican style*
58116210	Meat pie, Puerto Rican style*
58117510	Hayacas, Puerto Rican style*
58124230	Pastry, meat / poultry-filled*
58125110	Quiche with meat, poultry or fish*
58126130	Turnover, meat- and cheese-filled, no gravy*
58126290	Turnover, meat- and cheese-filled, lower in fat*
58126410	Turnover, filled with egg, meat, and cheese, lower in fat*
58127210	Croissant sandwich, filled with ham and cheese*
58127270	Croissant sandwich with sausage and egg*
58127290	Croissant sandwich with bacon and egg*
58127310	Croissant sandwich with ham, egg, and cheese*
58127330	Croissant sandwich with sausage, egg, and cheese*
58127350	Croissant sandwich with bacon, egg, and cheese*
58128250	Dressing with meat and vegetables*
58130011	Lasagna with meat*
58130014	Lasagna with meat, from restaurant*
58134610	Tortellini, meat-filled, with tomato sauce*
58134650	Tortellini, meat-filled, no sauce*
58134710	Tortellini, spinach-filled, with tomato sauce*
58134720	Tortellini, spinach-filled, no sauce*
58145160	Macaroni or noodles with cheese and frankfurters or hot dogs*
58148550	Macaroni or pasta salad with meat*
58160132	Beans and rice, with meat*
58163410	Spanish rice, fat added*
58163420	Spanish rice, no added fat*
58163430	Spanish rice, NS as to fat*
58163450	Spanish rice with ground beef*
58310210	Sausage and french toast, frozen meal*
58310310	Pancakes and sausage, frozen meal*
58404100	Rice and potato soup, Puerto Rican style*
71305040	Potato, scalloped, from fresh, with meat*
71305060	Potato, scalloped, from dry mix, with meat*
71411000	Potato skins, with cheese and bacon*
71507025	Potato, baked, peel not eaten, with meat*
71508025	Potato, baked, peel eaten, with meat*
71602010	Potato salad, German style*
71803010	Potato chowder*

Food code	Food description
75147000	Spinach salad, no dressing*
75148010	Cobb salad, no dressing*
75414020	Mushrooms, stuffed*
77121010	Fried stuffed potatoes, Puerto Rican style*
77201210	Green plantain with cracklings, Puerto Rican style*
77205110	Ripe plantain fritters, Puerto Rican style*
77250110	Stuffed tannier fritters, Puerto Rican style*
77272010	Puerto Rican pasteles*
77316010	Stuffed cabbage, with meat, Puerto Rican style*
77513010	Spanish stew*
89901000	Bacon, for use with vegetables
89901002	Ham, for use with vegetables
89902100	Bacon, for use on a sandwich
Protein and nutritional powders	
11553120	Fruit smoothie, with whole fruit and dairy, added protein*
64134020	Fruit smoothie, with whole fruit, no dairy, added protein*
78101110	Fruit and vegetable smoothie, added protein*
78101118	Fruit and vegetable smoothie, non-dairy, added protein*
95201000	Nutritional powder mix (Carnation Instant Breakfast)*
95201010	Nutritional powder mix, sugar free (Carnation Instant Breakfast)*
95201200	Nutritional powder mix (EAS Whey Protein Powder)*
95201300	Nutritional powder mix (EAS Soy Protein Powder)*
95201500	Nutritional powder mix, high protein (Herbalife)*
95201600	Nutritional powder mix (Isopure)*
95201700	Nutritional powder mix (Kellogg's Special K20 Protein Water)*
95202000	Nutritional powder mix (Muscle Milk)*
95210000	Nutritional powder mix (Slim Fast)*
95210020	Nutritional powder mix, high protein (Slim Fast)*
95220000	Nutritional powder mix, NFS*
95220010	Nutritional powder mix, high protein, NFS*
95230000	Nutritional powder mix, whey based, NFS*
95230010	Nutritional powder mix, protein, soy based, NFS*
95230020	Nutritional powder mix, protein, light, NFS*
95230030	Nutritional powder mix, protein, NFS*
Protein beverages, RTD	
95103000	Nutritional drink or shake, ready-to-drink (Ensure)
95103010	Nutritional drink or shake, ready-to-drink (Ensure Plus)
95105000	Nutritional drink or shake, ready-to-drink (Kellogg's Special K Protein)
95106000	Nutritional drink or shake, ready-to-drink (Muscle Milk)
95106010	Nutritional drink or shake, ready-to-drink, light (Muscle Milk)
95110020	Nutritional drink or shake, high protein, ready-to-drink (Slim Fast)
95120000	Nutritional drink or shake, ready-to-drink, NFS
95120010	Nutritional drink or shake, high protein, ready-to-drink, NFS
95120020	Nutritional drink or shake, high protein, light, ready-to-drink, NFS
95120050	Nutritional drink or shake, liquid, soy-based
Sauces, cream-based	
13411000	White sauce or gravy
14650100	Cheese sauce
14650150	Cheese sauce made with lowfat cheese
14650160	Alfredo sauce
27113000	Beef with cream or white sauce*
27113200	Creamed chipped or dried beef*
27113300	Swedish meatballs with cream or white sauce*
27120080	Ham stroganoff*
27143000	Chicken or turkey with cream sauce*

Food code	Food description
27146200	Chicken or turkey with cheese sauce*
27150060	Lobster newburg*
27150140	Seafood sauce
27150200	Oyster sauce
27211500	Beef and potatoes with cheese sauce*
27212300	Beef and noodles with cream or white sauce*
27220170	Sausage and rice with cheese sauce*
27220520	Ham or pork and potatoes with cheese sauce*
27242300	Chicken or turkey and noodles with cream or white sauce*
27242310	Chicken or turkey and noodles with cheese sauce*
27250126	Shrimp and noodles with cream or white sauce*
27250130	Shrimp and noodles with cheese sauce*
27250610	Tuna noodle casserole with cream or white sauce*
27311610	Beef, potatoes, and vegetables including carrots, broccoli, and/or dark-green leafy; cream sauce, white sauce, or mushroom sauce*
27311620	Beef, potatoes, and vegetables excluding carrots, broccoli, and dark-green leafy; cream sauce, white sauce, or mushroom sauce*
27311635	Beef, potatoes, and vegetables including carrots, broccoli, and/or dark-green leafy; cheese sauce*
27311640	Beef, potatoes, and vegetables excluding carrots, broccoli, and dark-green leafy; cheese sauce*
27315340	Beef, rice, and vegetables excluding carrots, broccoli, and dark-green leafy; cheese sauce*
27341035	Chicken or turkey, potatoes, and vegetables including carrots, broccoli, and/or dark-green leafy; cream sauce, white sauce, or mushroom sauce*
27341040	Chicken or turkey, potatoes, and vegetables excluding carrots, broccoli, and dark-green leafy; cream sauce, white sauce, or mushroom sauce*
27341045	Chicken or turkey, potatoes, and vegetables including carrots, broccoli, and/or dark-green leafy; cheese sauce*
27341050	Chicken or turkey, potatoes, and vegetables excluding carrots, broccoli, and dark-green leafy; cheese sauce*
27343470	Chicken or turkey, noodles, and vegetables including carrots, broccoli, and/or dark-green leafy; cream sauce, white sauce, or mushroom sauce*
27343480	Chicken or turkey, noodles, and vegetables excluding carrots, broccoli, and/or dark-green leafy; cream sauce, white sauce, or mushroom sauce*
27343950	Chicken or turkey, noodles, and vegetables including carrots, broccoli, and/or dark-green leafy; cheese sauce*
27345410	Chicken or turkey, rice, and vegetables including carrots, broccoli, and/or dark-green leafy; cream sauce, white sauce, or mushroom sauce*
27345420	Chicken or turkey, rice, and vegetables excluding carrots, broccoli, and dark-green leafy; cream sauce, white sauce, or mushroom sauce*
27345440	Chicken or turkey, rice, and vegetables including carrots, broccoli, and/or dark-green leafy; cheese sauce*
27345450	Chicken or turkey, rice, and vegetables excluding carrots, broccoli, and dark-green leafy; cheese sauce*
27350080	Tuna noodle casserole with vegetables, cream or white sauce*
27443120	Chicken or turkey a la king with vegetables excluding carrorts, broccoli, and dark-green leafy; no potatoes, cream, white, or soup-based sauce*
27446400	Chicken or turkey and vegetables including carrots, broccoli, and/or dark-green leafy; no potatoes, cheese sauce*
32101500	Egg, Benedict*
58131120	Ravioli, NS as to filling, with cream sauce*
58131330	Ravioli, meat-filled, with cream sauce*
58131535	Ravioli, cheese-filled, with cream sauce*
58131600	Ravioli, cheese and spinach-filled, with cream sauce*
58134660	Tortellini, cheese-filled, with cream sauce*
58146381	Pasta with cream sauce, restaurant*
58146382	Pasta with cream sauce, home recipe*
58146391	Pasta with cream sauce and added vegetables, restaurant*
58146392	Pasta with cream sauce and added vegetables, from home recipe*
58146401	Pasta with cream sauce and meat, restaurant*

Food code	Food description
58146402	Pasta with cream sauce and meat, home recipe*
58146411	Pasta with cream sauce, meat, and added vegetables, restaurant*
58146412	Pasta with cream sauce, meat, and added vegetables, home recipe*
58146421	Pasta with cream sauce and poultry, restaurant*
58146422	Pasta with cream sauce and poultry, home recipe*
58146431	Pasta with cream sauce, poultry, and added vegetables, restaurant*
58146432	Pasta with cream sauce, poultry, and added vegetables, home recipe*
58146441	Pasta with cream sauce and seafood, restaurant*
58146442	Pasta with cream sauce and seafood, home recipe*
58146451	Pasta with cream sauce, seafood, and added vegetables, restaurant*
58146452	Pasta with cream sauce, seafood, and added vegetables, home recipe*
58146682	Pasta, whole grain, with cream sauce, home recipe*
58146692	Pasta, whole grain, with cream sauce, and added vegetables, home recipe*
58146702	Pasta, whole grain, with cream sauce and meat, home recipe*
58146722	Pasta, whole grain, with cream sauce and poultry, home recipe*
58146732	Pasta, whole grain, with cream sauce, poultry, and added vegetables, home recipe*
58146741	Pasta, whole grain, with cream sauce and seafood, restaurant*
58147330	Macaroni or noodles, creamed, with cheese*
58164500	Rice, white, with cheese and/or cream based sauce, NS as to fat*
58164510	Rice, white, with cheese and/or cream based sauce, no added fat*
58164520	Rice, white, with cheese and/or cream based sauce, fat added*
58164800	Rice, brown, with cheese and/or cream based sauce, NS as to fat*
58164820	Rice, brown, with cheese and/or cream based sauce, fat added*
58165000	Rice, white, with vegetables, cheese and/or cream based sauce, NS as to fat*
58165010	Rice, white, with vegetables, cheese and/or cream based sauce, no added fat*
58165020	Rice, white, with vegetables, cheese and/or cream based sauce, fat added*
58165400	Rice, brown, with vegetables, cheese and/or cream based sauce, NS as to fat*
58165420	Rice, brown, with vegetables, cheese and/or cream based sauce, fat added*
71305015	Potato, scalloped, NFS*
71305020	Potato, scalloped, from fast food or restaurant*
71305030	Potato, scalloped, from fresh*
71305040	Potato, scalloped, from fresh, with meat*
71305060	Potato, scalloped, from dry mix, with meat*
72125230	Spinach, creamed*
72125231	Spinach, from fresh, creamed*
72125250	Spinach, cooked, NS as to form, with cheese sauce*
72125260	Spinach and cheese casserole*
72201230	Broccoli, cooked, NS as to form, with cheese sauce*
72201231	Broccoli, cooked, from fresh, with cheese sauce*
72201250	Broccoli, cooked, NS as to form, with cream sauce*
72202010	Broccoli casserole with noodles*
73102230	Carrots, cooked, NS as to form, creamed*
73102231	Carrots, cooked, from fresh, creamed*
74404090	Vodka sauce with tomatoes and cream
75216150	Corn, yellow, NS as to form, cream style*
75216153	Corn, creamed*
75216250	Corn, white, NS as to form, cream style*
75340160	Vegetable and pasta combinations with cream or cheese sauce, broccoli, pasta, carrots, corn, zucchini, peppers, cauliflower, peas, etc., cooked*
75401010	Asparagus, NS as to form, creamed or with cheese sauce*
75401011	Asparagus, from fresh, creamed or with cheese sauce*
75403010	Beans, string, green, NS as to form, creamed or with cheese sauce*
75403011	Beans, string, green, from fresh, creamed or with cheese sauce*
75409010	Cauliflower, NS as to form, creamed*
75409011	Cauliflower, from fresh, creamed*

Food code	Food description
75414010	Mushrooms, NS as to form, creamed*
75414011	Mushrooms, from fresh, creamed*
75415010	Onions, NS as to form, creamed*
75417010	Peas, NS as to form, creamed*
75418040	Squash, summer, casserole, with cheese sauce*
75440500	Vegetable combinations, including carrots, broccoli, and/or dark-green leafy; cooked, with cheese sauce*
75440510	Vegetable combinations, excluding carrots, broccoli, and dark-green leafy; cooked, with cheese sauce*
75450500	Vegetable combination, including carrots, broccoli, and/or dark-green leafy; cooked, with cream sauce*
75450510	Vegetable combination, excluding carrots, broccoli, and dark-green leafy; cooked, with cream sauce*
81301020	Lemon-butter sauce
81302010	Hollandaise sauce
81302060	Horseradish sauce
89901010	Cream sauce, for use with vegetables
89901020	Cheese sauce, for use with vegetables
Snack foods	
41310900	Bean chips
51184000	Breadsticks, hard, NFS
51184100	Breadsticks, hard, reduced sodium
51185000	Croutons
51187000	Melba toast
51188500	Zwieback toast
51306000	Breadsticks, hard, whole wheat
51808050	Breadsticks, hard, gluten free
53710400	Cereal or granola bar (General Mills Fiber One Chewy Bar)
53710500	Cereal or granola bar (Kellogg's Nutri-Grain Cereal Bar)
53710502	Cereal or granola bar (Kellogg's Nutri-Grain Yogurt Bar)
53710504	Cereal or granola bar (Kellogg's Nutri-Grain Fruit and Nut Bar)
53710600	Milk 'n Cereal bar
53710700	Cereal or granola bar (Kellogg's Special K bar)
53710810	Cereal or granola bar (KIND Fruit and Nut Bar)
53710900	Cereal or granola bar (General Mills Nature Valley Chewy Trail Mix)
53710902	Cereal or granola bar, with yogurt coating (General Mills Nature Valley Chewy Granola Bar)
53710904	Cereal or granola bar (General Mills Nature Valley Sweet and Salty Granola Bar)
53710906	Cereal or granola bar (General Mills Nature Valley Crunchy Granola Bar)
53711000	Cereal or granola bar (Quaker Chewy Granola Bar)
53711002	Cereal or granola bar (Quaker Chewy 90 Calorie Granola Bar)
53711004	Cereal or granola bar (Quaker Chewy 25% Less Sugar Granola Bar)
53711006	Cereal or granola bar (Quaker Chewy Dipps Granola Bar)
53711100	Cereal or granola bar (Quaker Granola Bites)
53712000	Snack bar, oatmeal
53712100	Cereal or Granola bar, NFS
53712200	Cereal or granola bar, lowfat, NFS
53712210	Cereal or granola bar, nonfat
53713010	Cereal or granola bar, fruit and nut
53713100	Cereal or granola bar, peanuts , oats, sugar, wheat germ
53714200	Cereal or granola bar, chocolate coated, NFS
53714210	Cereal or granola bar, with coconut, chocolate coated
53714220	Cereal or granola bar with nuts, chocolate coated
53714230	Cereal or granola bar, oats, nuts, coated with non-chocolate coating
53714250	Cereal or granola bar, coated with non-chocolate coating
53714300	Cereal or granola bar, high fiber, coated with non-chocolate yogurt coating
53714400	Cereal or granola bar, with rice cereal
53714500	Breakfast bar, NFS
53714520	Breakfast bar, cereal crust with fruit filling, lowfat
54001000	Crackers, NFS

Food code	Food description
54102010	Graham crackers
54102015	Graham crackers (Teddy Grahams)
54102020	Graham crackers, chocolate covered
54102050	Crackers, oatmeal
54102060	Crackers, Cuban
54102100	Graham crackers, reduced fat
54102200	Graham crackers, sandwich, with filling
54103000	Crackers, breakfast biscuit
54200100	Crackers, butter, reduced sodium
54201010	Crackers, matzo, reduced sodium
54202020	Crackers, saltine, reduced sodium
54204020	Crackers, wheat, reduced sodium
54204030	Crackers, woven wheat, reduced sodium
54301010	Crackers, butter, plain
54301020	Crackers, butter, flavored
54301030	Crackers, butter (Ritz)
54301100	Crackers, butter, reduced fat
54304000	Crackers, cheese
54304005	Crackers, cheese (Cheez-It)
54304020	Crackers, cheese (Goldfish)
54304100	Crackers, cheese, reduced fat
54304110	Crackers, cheese, reduced sodium
54304150	Crackers, cheese, whole grain
54305010	Crackers, crispbread
54305020	Crackers, flatbread
54307000	Crackers, matzo
54308000	Crackers, milk
54313000	Crackers, oyster
54318000	Chips, rice
54318500	Rice cake
54319000	Crackers, rice
54319005	Crackers, rice and nuts
54319020	Popcorn cake
54325000	Crackers, saltine
54325010	Crackers, saltine, reduced fat
54325060	Crackers, saltine, multigrain
54326000	Crackers, multigrain
54328000	Crackers, sandwich
54328100	Crackers, sandwich, peanut butter filled
54328105	Crackers, sandwich, peanut butter filled (Ritz)
54328110	Crackers, sandwich, reduced fat, peanut butter filled
54328120	Crackers, whole grain, sandwich, peanut butter filled
54328200	Crackers, sandwich, cheese filled
54328210	Crackers, sandwich, cheese filled (Ritz)
54336000	Crackers, water
54336100	Crackers, wonton
54337010	Crackers, woven wheat
54337020	Crackers, woven wheat, plain (Triscuit)
54337030	Crackers, woven wheat, flavored (Triscuit)
54337060	Crackers, woven wheat, reduced fat
54338000	Crackers, wheat
54338010	Crackers, wheat, plain (Wheat Thins)
54338020	Crackers, wheat, flavored (Wheat Thins)
54338100	Crackers, wheat, reduced fat
54339000	Crackers, corn

Food code	Food description
54340100	Crackers, gluten free, plain
54340110	Crackers, gluten free, flavored
54401011	Corn nuts
54401021	Corn chips, plain
54401026	Corn chips, flavored
54401031	Corn chips, plain (Fritos)
54401035	Corn chips, flavored (Fritos)
54401055	Cheese flavored corn snacks
54401065	Cheese flavored corn snacks, reduced fat
54401075	Tortilla chips, plain
54401081	Cheese flavored corn snacks (Cheetos)
54401085	Tortilla chips, flavored
54401090	Corn chips, reduced sodium
54401110	Tortilla chips, nacho cheese flavor (Doritos)
54401111	Tortilla chips, cool ranch flavor (Doritos)
54401112	Tortilla chips, other flavors (Doritos)
54401121	Tortilla chips, reduced fat, plain
54401122	Tortilla chips, reduced fat, flavored
54401170	Tortilla chips, low fat, unsalted
54402080	Tortilla chips, reduced sodium
54402200	Snack mix
54402700	Pita chips
54404000	Popcorn chips, plain
54404010	Popcorn chips, other flavors
54404020	Popcorn chips, sweet flavors
54406010	Onion flavored rings
54406200	Shrimp chips
54408000	Pretzels, NFS
54408015	Pretzels, hard, NFS
54408016	Pretzels, hard, plain, salted
54408017	Pretzels, hard, plain, lightly salted
54408030	Pretzels, hard, plain, unsalted
54408035	Pretzels, hard, flavored
54408070	Pretzels, hard, multigrain
54408081	Pretzels, hard, plain, gluten free
54408082	Pretzels, hard, flavored, gluten free
54408105	Pretzel chips, hard, plain
54408110	Pretzel chips, hard, flavored
54408190	Pretzels, hard, coated, NFS
54408200	Pretzels, hard, chocolate coated
54408210	Pretzels, hard, white chocolate coated
54408250	Pretzels, hard, yogurt coated
54408290	Pretzels, hard, filled, NFS
54408300	Pretzels, hard, cheese filled
54408310	Pretzels, hard, peanut butter filled
54420210	Multigrain chips (Sun Chips)
54420220	Snack mix, plain (Chex Mix)
54440010	Bagel chips
54440020	Cracker chips
56116000	Noodles, chow mein
58104090	Nachos with cheese and sour cream*
58104120	Nachos with cheese*
58104130	Nachos with meat and cheese*
58104150	Nachos with chicken and cheese*
58104160	Nachos with chili*

Food code	Food description
58104180	Nachos with meat, cheese, and sour cream*
58104190	Nachos with chicken, cheese, and sour cream*
71200300	Potato chips, restructured, plain
71200310	Potato chips, restructured, flavored
71200400	Potato chips, baked, plain
71200410	Potato chips, baked, flavored
71201200	Potato chips, restructured, reduced fat, lightly salted
71201210	Potato chips, restructured, fat free
71202510	Potato chips, restructured, lightly salted
71203010	Potato chips, popped, plain
71203020	Potato chips, popped, flavored
71205020	Potato sticks, plain
71205030	Potato sticks, flavored
71205040	Potato sticks, fry shaped
71220000	Vegetable chips

*Only the proposed food use component of the food was included towards the EDI.

Exhibit I. GRAS Expert Panel Report

Expert Panel Report on the Generally Recognized As Safe (GRAS) Conclusion for Corn Protein

April 23, 2019

Introduction

Cargill intends to use corn protein as a source of protein, and for functional uses such as thickening, water absorption, fat/oil absorption, gelation, and solid fat emulsification in a variety of food categories. A panel of independent experts (the "Expert Panel"), qualified by their scientific training and relevant national and international experience to evaluate the safety of food ingredients, was convened to conduct an independent, critical and comprehensive evaluation of the available technical and safety information on corn protein and to determine if the proposed uses as a food ingredient are safe and suitable and can be considered Generally Recognized As Safe (GRAS) based on scientific procedures in accordance with 21 CFR §170.30(a) and (b). The Expert Panel consisted of James R. Coughlin, Ph.D., CFS, Carol Knight, Ph.D, and Michael Carakostas, DVM, Ph.D.

A technical dossier, "Safety Evaluation Dossier Supporting a Generally Recognized As Safe (GRAS) Conclusion for Corn Protein" (originally issued 19 May 2017; revised 6 July 2017 and 18 April 2019), was prepared by Toxicology Regulatory Services, Inc. (TRS) and made available to the Expert Panel. The Dossier contained data and information on the characterization, method of manufacture, product specifications, composition and stability, analytical testing, proposed levels of use, consumer exposure estimates, and safety assessment of corn protein. The Expert Panel, independently and collectively, critically evaluated this document and other publicly available information deemed appropriate and relevant to the GRAS status of corn protein. The Expert Panel convened by telephone with Dr. Andrey I. Nikiforov (TRS, Inc.) and Ms. Marisa O. Rihner (TRS, Inc.) on 2 June 2017.

The Expert Panel unanimously concluded that the proposed uses of corn protein, manufactured consistent with current Good Manufacturing Practices (cGMPs) and meeting appropriate food-grade specifications, are safe and suitable and GRAS based on scientific procedures. A summary of the basis for this conclusion appears below.

Basis for GRAS Determination of the Proposed Uses of Corn Protein

GRAS Substance Identity and Characterization

Cargill's corn protein is composed of at least 65% protein; the remainder being carbohydrates, fat/oil, ash, organic acid, and water. It typically appears as a pale yellow to light tan powder. Compositional data and detailed nutritional analysis data are available for multiple batches of corn protein and its raw material.

Method of Manufacture

Cargill's corn protein is manufactured in accordance with current good manufacturing practices (cGMP) for food (21 CFR Part 110). Briefly, the corn protein product is obtained *via* wet milling of maize to yield corn gluten meal, from which protein is recovered, dried, extracted, and heated to remove residual solvent. The resulting powder, consisting of 88% solids, may be milled, physically processed or sprayed with food grade oil, lecithin or other safe and suitable processing aid prior to bulk packaging. All raw materials and processing aids used in the manufacture of corn protein are considered safe and appropriate for use in foods.

Conformance to proposed specifications and consistency in the manufacturing process of corn protein has been demonstrated by the analyses of multiple non-consecutive lots of commercially representative corn protein. In addition to food grade specifications, appropriate food safety and quality controls are in place to ensure that potential contaminants (e.g., mycotoxins and pesticides) are absent from the product or below levels of safety concern.

Cargill's corn protein product is considered to be stable for 24 months when stored under recommended storage conditions, *i.e.*, in a cool (20-30°C), dry location and in the original sealed package away from odorous material. There are no known degradation products of safety concern associated with corn protein.

Intended Use and Consumer Exposure

Corn protein is intended for use as a source of protein in a variety of food categories, and for such functional effects as thickening, water absorption, fat/oil absorption, gelation, and solid fat emulsification at levels ranging from 0.08% to 40%, depending on the product.

Based on these use levels and daily consumption estimates derived from the NHANES 2013-2014 and 2015-2016 database (NCHS, 2016, 2018), the conservative estimated

daily intake (EDI) of corn protein from all proposed uses (and assuming the maximum proposed use level for each food category) on a "per user" basis is less than or equal to 0.22 g/kg bw/day at the mean and 0.49 g/kg bw/day at the 90th percentile (equivalent to 12.5 and 24.3 g/day, respectively). On a body weight basis, the highest "per user" mean and 90th percentile intake estimates for corn protein are among children 1-6 years at 0.68 g/kg bw/day and 1.18 g/kg bw/day, respectively.

There are no safety concerns associated with the worst-case, conservative intake estimates for corn protein from proposed food categories and use levels. Because the proposed uses of corn protein will not result in an increase in the overall consumption of protein, but simply will provide an alternative source of well-characterized protein from corn for use in food, cumulative intake analysis is not considered necessary.

Safety Evaluation

Regulatory Status of Similar Materials

To date, GRAS conclusions have been reached for several plant protein isolates and concentrates [e.g., GRN No. 26 (isolated wheat protein); GRN No. 134 (soy protein); GRN No. 609 (rice protein); GRN 386 (canola protein isolate and hydrolyzed canola protein isolate); GRN No. 447 (potato protein isolates); GRN No. 575 (oat protein), GRN No. 581 (pea protein), and GRN No. 608 and 788 (pea protein concentrate); GRN No. 683 (canola protein isolate); and GRN 684 (mung bean protein isolate)] based on data and information confirming that there is a history of safe consumption of the source plants and their proteins, there are no toxicologically or clinically relevant effects observed in studies where these plant proteins were fed to animals or humans, and estimated consumer intake levels for these plant proteins are consistent with established Recommended Dietary Allowances (RDAs) (IOM 2002/2005) or safe consumption values (WHO, 2007) for protein.

Overview of Safety Database Supporting Safety Evaluation of Corn Protein

Corn [also referred to as "maize" (*Zea mays*) and belonging to the grass family (Gramineae)] has been part of the normal human diet for centuries, with the earliest recorded presence of the crop in Mexico reported as early as 8700 BP (Piperno, 2011). With the long history of safe human consumption of corn and its proteins, traditional toxicology and clinical safety studies on corn protein are not available in the published literature, but there are no known reports of adverse health effects related to corn or its proteins. No adverse effects were reported in animal studies with a major corn protein, zein hydrolysate (ZeinH), which has been studied for its potential to stimulate glucagon-like peptide-1 (GLP-1) secretion (Hira et al., 2009; Higuchi et al., 2013).

The human metabolic pathway for protein and amino acids is well understood and would be similar for corn protein supporting its safety. Briefly, dietary proteins undergo acid-catalyzed or enzymatic hydrolysis to yield individual amino acids which are further broken down by deamination, yielding amino acid carbon skeletons (α-keto acids) that can be converted to common metabolic intermediates (Voet and Voet, 1995). Amino groups resulting from deamination are converted either to ammonia or to the amino group of aspartate which may be excreted in the urine unchanged or as urea (Voet and Voet, 1995).

Food allergy to maize, although relatively rare, has been reported in the literature (Scibilia et al., 2008; Pastorello et al., 2009; Goodman et al., 2013; Krishnan and Chen, 2013). The primary maize allergen responsible for food-induced allergic reactions is a nonspecific lipid transfer protein (LTP), which is considered a pathogenesis-related protein that may be induced by stress (Goodman et al., 2013; Pastorello et al., 2000; Pastorello et al., 2009). Corn (maize) is not listed as one of eight major allergen groups by the FDA under the Food Allergen Labeling and Consumer Protection Act of 2004 (Public Law 108-282, Title II); however, formulated finished food product ingredient lists will declare the presence of a corn protein as a corn-derived ingredient.

Safety Evaluation of Potential Corn Protein Impurities and Contaminants

Current food-grade specifications and quality controls for corn protein ensure that potential impurities and contaminants of safety concern are absent from the processed material or below levels of safety concern based on relevant Acceptable Daily Intakes (ADIs), Tolerable Daily Intakes (TDIs), or Provisional Maximum Tolerable Daily Intakes (PMTDIs). As discussed in the corn protein GRAS Dossier, adequate margins of safety compared to applicable ADI, TDI or PMTDI values exist for each of these impurities and contaminants at maximum potential exposure levels using worst-case, conservative estimates of corn protein intake among the total population and population subgroups.

Nutritional and Safety Considerations for Protein Intake

Corn protein is intended to be an alternative source of protein for current uses in food and is not expected to result in an increase in the overall consumption of protein. The minimum daily protein intake values recommended by the FDA (Daily Reference Values, DRV) and Institute of Medicine (IOM) (Recommended Dietary Allowances, RDA) are 50 g/day or 56/46 g/day (males/females) for adults, respectively (FDA, 2016; IOM, 2002/2005), while USDA reports that the 90th percentile intake of protein from food and beverages ranges from 68.3-139.1 g/day (USDA, 2015a). Therefore, even at the most

conservative, upper range of estimated intake for the total US population (i.e., 24.3 g/day at the 90th percentile per user intake estimate) based on NHANES dietary survey data, the proposed uses of corn protein would contribute only a small portion of the background protein consumption in the US, or the dietary protein recommendations of the FDA and IOM. In addition, because consumers are not likely to consume all corn protein-containing products at the 90th percentile of intake, even larger margins of safety would be achieved based on more typical consumption patterns.

Potential adverse effects associated with consumption of extremely high levels of protein have been reported in the literature; however, the proposed food uses of corn protein are expected to result in consumption amounts well below the safe protein ingestion levels recommended by the WHO (2007) (i.e., 33-66 g/day for adults depending on body weight, 10.8-17.1 g/day for children ages 1-6, and 25.9-41.0 g/day for children ages 7-12).

Conclusion

We, the independent qualified members of the Expert Panel, have individually and collectively critically evaluated the data and information summarized above, and other data and information that we deemed pertinent to the safety of the proposed uses of corn protein as a source of protein, and for functional uses such as thickening, water absorption, fat/oil absorption, gelation, and solid fat emulsification in a variety of food categories. We unanimously conclude that the proposed uses of corn protein, produced consistent with current good manufacturing practices (cGMPs) and meeting appropriate food grade specifications, are safe and suitable and Generally Recognized As Safe (GRAS) based on scientific procedures.

It is our opinion that other qualified experts would concur with these conclusions.

Michael Carakostas, DVM, Ph.D. MC Scientific Consulting, LLC	Date
James R. Coughlin, Ph.D., CFS Coughlin & Associates	Date
Carol Knight, Ph.D. Knight International	Date

Conclusion

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[redacted]

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MC Scientific Consulting, LLC

9-Apr.1 2019
Date

[redacted]

James R. Coughlin, Ph.D., CF
Coughlin & Associates

23 April 2019
Date

[redacted]

Carol Knight, Ph.D.
Knight International

23 April 2019
Date

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GRN (GRAS Notification) No. 134: soy protein hydrolyzate with enzyme-modified lecithin. Filed on July 14, 2003 by Kyowa Hakko USA, Inc. Agency Response Letter dated January 8, 2004.

GRN (GRAS Notification) No. 386: canola protein isolate and hydrolyzed canola protein isolate. Filed on June 22, 2011 by BioExx Specialty Proteins, Ltd. Agency Response Letter dated December 28, 2011.

GRN (GRAS Notification) No. 447: potato protein isolates. Filed on November 5, 2012 by Solanic B.V., an AVEBE Group Company. Agency Response Letter dated July 3, 2013.

GRN (GRAS Notification) No. 575: oat protein. Filed on April 15, 2015 by Tate and Lyle. Agency Response Letter dated September 18, 2015.

GRN (GRAS Notification) No. 581: pea protein. Filed on June 18, 2015 by World Food Processing, LLC. Agency Response Letter dated March 20, 2016.

GRN (GRAS Notification) No. 608: pea protein concentrate. Filed on December 7, 2015 by Axiom Foods, Inc. and SPRIM Strategy and Intelligent Innovation. Agency Response Letter dated May 27, 2016.

GRN (GRAS Notification) No. 609: rice protein. Filed on November 16, 2015 (amended February 19, 2016) by Soni & Associates, Inc. Agency Response Letter dated June 6, 2016.

GRN (GRAS Notification) No. 683: canola protein isolate. Filed on January 10, 2017 for DSM Innovation Company. Agency Response Letter dated May 10, 2017.

GRN (GRAS Notification) No. 684: mung bean protein isolate. Filed on January 13, 2017 (amended March 7, 9, and 24, 2017) for Hampton Creek, Inc. Agency Response Letter dated August 4, 2017.

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Exhibit II. Stability Data for Corn Protein

Name CSST R&D

Minneapolis, MN

Report Type: Technical report

Reanalysis of corn protein isolate samples after shelf storage

Authors: Michael Porter
Date: August 11, 2021

Sponsor: CSST
Keywords: corn germ, ethanol extraction, , chemical composition,.
Embedded files: (no)

SUMMARY
Corn protein isolate samples originally prepared in 2018 and 2019 were reanalyzed to determine if changes to the microbial contamination levels or select proximate compositional elements had meaningfully deteriorated. The results suggest that there has been little change during storage.

1.0 INTRODUCTION
As part of demonstrating the suitability of corn protein for human use, the stability of the product over a storage period must be determined. There is no reason to believe that many components of the ingredient would change, but some could change. For example, there is no reason to believe that the heavy metal or pesticide components of the analysis would change. There are also components in the ingredient that might change but are not essential to the ingredient's intended use; for example, vitamins might diminish.

There remains a small set of characteristics that could change in storage and that might impact safety. To understand the effect of storage on these measures, samples of corn protein isolate that met the specifications being proposed to EFSA were reanalyzed with results reported below.

2.0 MATERIALS AND METHODS
Two sets of samples were analyzed. In the first samples originally produced in May and June of 2019 were reanalyzed for bacterial contamination and basic proximate measures. In the second, samples produced in May of 2018 were analyzed for microbial contamination. This second set of samples was created by combination of lots of corn protein isolate that met all specifications and bulk production of a milled composite. Distinct lots were prepared over the course of a day representing many individual days of primary production.

Samples were stored in closed plastic or Mylar bags in spaces that were cool (20-25^{o}C), dry (relative humidity 20-40%) and away from light.

Proximate analyses were conducted using internal methods (1). Microbial analyses were conducted by Silliker Laboratories using their standard methods.

3.0 RESULTS AND DISCUSSION

Table 1 shows the original analysis of bacterial contamination plus some proximate measures of composition. Ebac and Salmonella were unchanged from less than LOQ. Aerobic plate counts were the same or lower than originally measured. Yeast and mold were not always measured as these were not part of final product specifications at that time.

Loss on drying had increased slightly and protein and EtOH had apparently decreased slightly. Fat and sulfite concentrations were unchanged. Practically, these all results were within the variation of the assay method.

Table 1. Microbial and proximate analysis of samples prepared in 2019 and reanalyzed in 2021.

Original	APC	Ebac	Salmonella	Yeast	Mold	LOD (%)	protein (%, db)	fat (%, db)	EtOH (g/kg)	sulfite (ppm, db)
190522-CP-P-350	<10	<10	negative			1.9	88.9	0.2	8.4	50
190612-CP-P-359	1702	<10	negative			1.8	88.3	0.3	1.1	49
Reanalysis										
190522-CP-P-350	<10	<10	negative	<10	<10	2.15	87.2	0.3	3.2	51
190612-CP-P-359	<10	<10	negative	<10	<10	3.29	87.3	0.1	0.5	42

Table 2 shows microbial analysis of a separate set of samples that were produced through compositing and milling. Ebac, Salmonella, yeast and mold were not detected in the original or subsequent samples. Aerobic plate counts were unchanged or lower after storage.

Table 2. Microbial analysis of samples prepared in 2018 and reanalyzed in 2021.

Original	APC	Ebac	Salmonella	Yeast	Mold
Lot number					
18052901CP	350	<10	negative	<10	<10
18052903CP	3100	<10	negative	<10	<10
18052904CP	3900	<10	negative	<10	<10
Analysis July 2021					
18052901CP	130	<10	negative	<10	<10
18052903CP	3200	<10	negative	<10	<10
18052904CP	960	<10	negative	<10	<10

4.0 CONCLUSIONS

There were no meaningful negative changes in the properties of the corn protein isolate during storage under standard “good” storage conditions.

5.0 CITATIONS

1. Porter, MA, E McConville (2021) Samples for Support of Novel Foods application to the European Food Safety Administration. Cargill Internal Report

Exhibit III: Suitability Data for Corn Protein Use in Processed Meats

Use of corn protein as a functional ingredient as extender in processed meat products

Objectives

The objectives of this study were to evaluate the quality characteristics of processed meat containing 2.0-3.5% corn protein as a replacement of soy protein in a sausage link and 2.0% inclusion replacing a portion of the meat in ground patty meat products.

Materials and Methods

Boston Butts-1/4”grind and mechanically separated turkey 18% fat and beef chuck roast and brisket were obtained from Von Hansen’s Meats, Minneapolis, MN. Soy protein (70% protein) was obtained from DuPont, Wilmington, DE. Pea Protein (80% protein) was obtained from Puris Pea, Minneapolis, MN. Corn protein (CP) (87% protein) was produced by Cargill in Baupte, France. Three treatments were formulated for the sausage links shown in Table 1. One control treatment using 3.5% soy protein as a meat extender ingredient and 2 test treatments using corn protein to partially (1.5% soy, 2.0% corn) and fully replace the 3.5% soy protein (0.0% soy protein, 3.5% corn protein). Four treatments were formulated for the beef patty shown in Table 2. One control treatment of all beef, and 3 test treatments using soy, pea, and corn protein at 2.0% inclusion.

Table 1. Sausage Link Formulation

	Control	CP test 1	CP test 2
Boston Butts-1/4”grind	42.50%	42.50%	42.50%
Mechanically Separated Turkey-18% fat	42.50%	42.50%	42.50%
Soy Protein	3.50%	1.50%	0.0%
Corn Protein	0.0%	2.00%	3.50%
Salt	1.50%	1.50%	1.50%
Water	10.00%	10.00%	10.00%
Total	100.00%	100.00%	100.00%

Table 2. Patty Formulation

	Control	Soy Protein	Corn Protein	Pea Protein
Ground Beef	88.5%	86.5%	86.5%	86.5%
Soy Protein	0.0%	2.0%	0.0%	0.0%
Corn Protein	0.0%	0.0%	2.0%	0.0%
Pea Protein	0.0%	0.0%	0.0%	2.0%
Salt	1.50%	1.50%	1.50%	1.50%
Water	10.00%	10.0%	10.00%	10.00%
Total	100.00%	100.00%	100.00%	100.00%

Process

Sausages:

Mix protein and water on speed 1 until full mixed. Add mechanically separated turkey (MST) and pork, mix for 30 seconds while adding seasoning on speed 1. Stop the mixer, scrape the mixing attachment, and mix for 2 1/2 min on speed 1. Fill the sausages stuffer with the mix and form 3-inch sausages using a 5/8" tube. Bake sausages to an internal temperature of 165°F. Blast chill sausages then calculate yield and yield difference.

Patties:

Grind cuts of meat to be used (chuck roast and brisket). Cut beef into chunks, pass through grinder attached to Hobart mixer (one time pass). Mix meat and protein slurry (protein slurry is for test samples). Add water and protein to Hobart bowl. Combine with hand whisk. Add meat to the mixture. Mix with paddle for 1 minute on speed #1. Form 170g (approx. 6 oz) balls and press into patties. Prepare as desired Grill Stove top - sear and finish in 300F oven.

Evaluations

For each individual treatment, product cooked yield was calculated by dividing the chilled product weight 24h by the uncooked product weight (cooked product weight/uncooked product weight x 100). Cooked yield, therefore, represented product weight losses that occurred primarily during thermal processing and chilling.

Sensory properties were assessed with an informal sensory panel.

Results and Discussion

Sausage Cooked yield: Comparison yield are shown in Figure 1 and individual yield values for control and test product are shown in Figure 2. Average yield of 2.0% CP-formulated sausages was 0.4% lower than that formulated with 3.5% soy protein. Average yield in 3.5% CP-formulated sausage was 5% higher than the all-meat control, while the soy-formulated sausage was 8.5%

higher than control, and pea-formulated sausage was 2% higher than control. Corn protein sausages had a trend toward higher cooked yield compared to the all-meat control, but they were lower than the soy protein sausages.

Figure 3 and 4 show images of the sausages and patties, pre-cooked and post-cook products, respectively. Figure 4 contain the sensory results for the patties.

Figure 1. Sausage Cooked % Yield

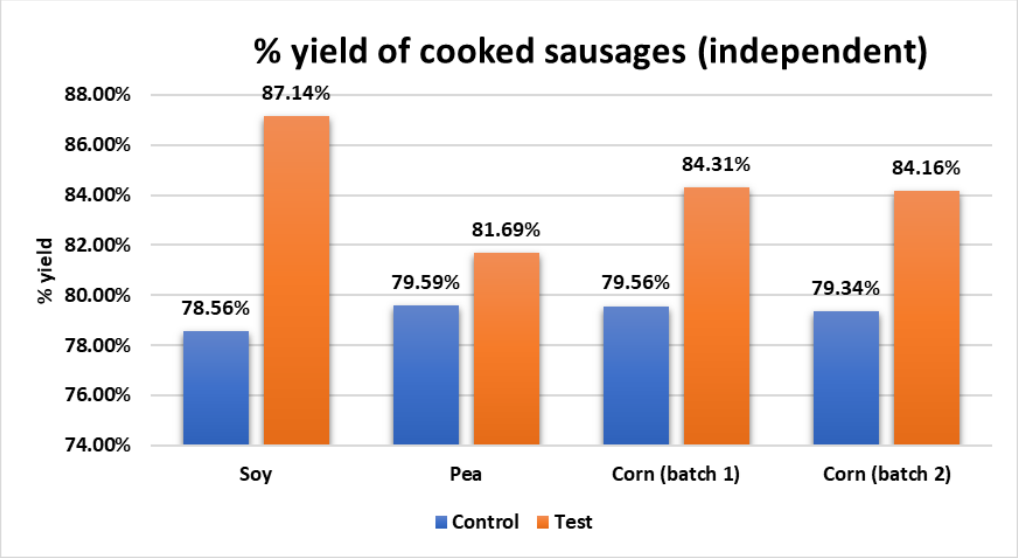


Figure 2. Cooked yield differences

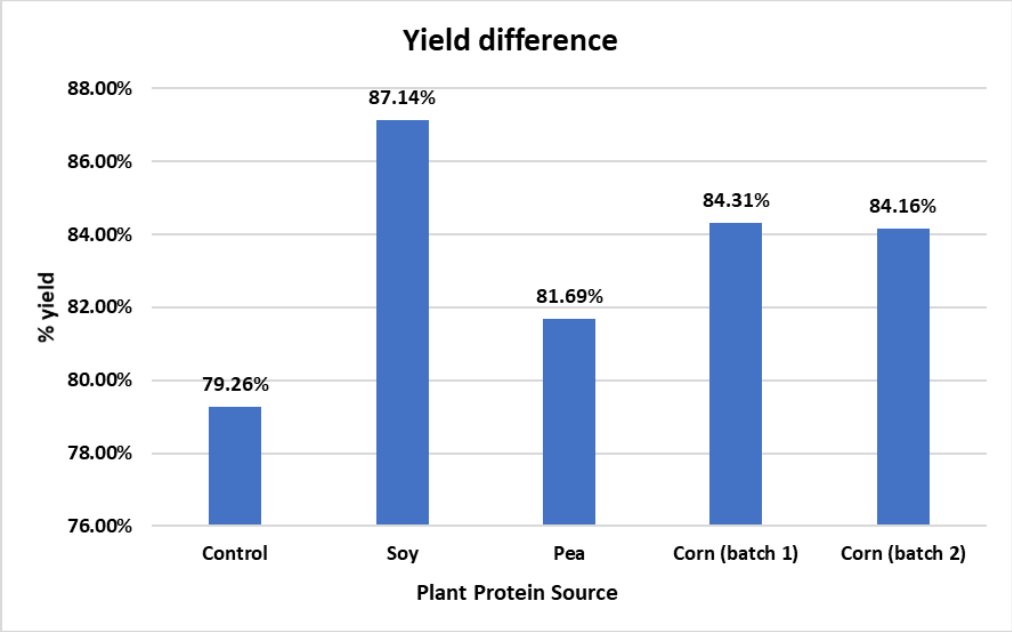


Figure 3. Sausage mass (A. control, B. soy, C. pea, D. corn), formed (E. control, F. soy, G. pea, H. corn), and cooked (I. control, soy, pea, corn).

A. B. C.

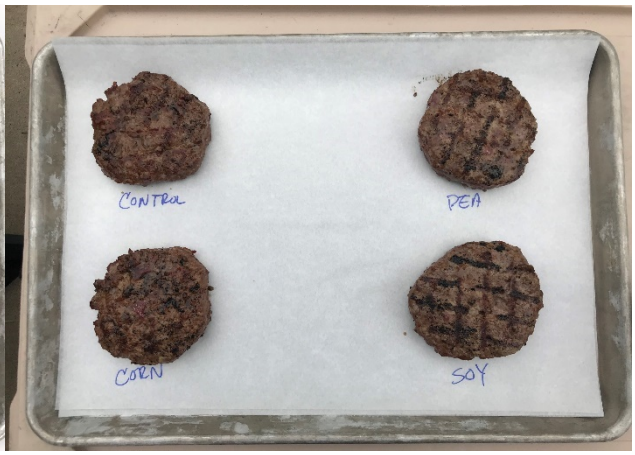
D. E. F.

G. H. I.

Figure 4. Formed (A), grilled (B) patty, skillet (C) patty

A.

B.



C.

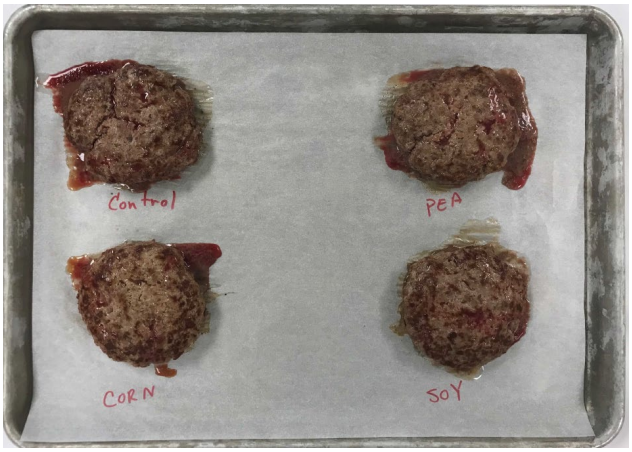


Figure 6. Beef patty sensory outcomes

Beef Patties	**Control**	**Pea**	**Soy**	**Corn**
Appearance	Dark brown	Dark brown	Dark brown	Lighter brown, yellow (different in color than others)
Flavor	Beef, metallic, iron	Beef, metallic, iron, grassy	Beef, metallic, iron	Metallic, corn (wet mill), beef, iron
Texture	Firm bite, crumbly chew down	Firm bite, crumbly chew down	Firm bite, crumbly chew down	Firm bite, crumbly chew down, gritty during chew down

The corn protein test product resulted in a lighter color, distinct corn/mill flavor with slight grittiness detected compared to the all-meat control and to the other test materials. However, the texture of corn protein sausage samples was comparable in all tests to the all-meat control with a soft, pliable texture.

Conclusions

The corn protein performed very similar to the soy protein in terms of yield in the sausages, with post-cook yield averages resulting in higher yields than the all-meat control alone. The corn protein sausages were slightly dryer than the soy protein sausages. There were no significant difference in the corn protein-formulated sausages and patties in terms of flavor impact, although a corn/wet mill flavor note was detected in both. Corn protein is suitable for a meat extension ingredient with results similar to soy protein in both sausage links and ground beef patties.

Responses to FDA Questions on Cargill's GRAS Notice (GRN) 001069 for Corn Protein
June 2, 2023

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1. Cargill notes, on pg. 33 of GRN 001069, that corn gluten, also known as corn gluten meal (CGM), is affirmed as GRAS (21 CFR 184.1321) for use at levels not to exceed current good manufacturing practice as a nutrient supplement and texturizer in food. Cargill concludes: "Therefore, the GRAS status of CGM for use in human foods supports its safety as the raw material used to produce corn protein." We request additional clarification of how the "corn protein" ingredient that is the subject of GRN 001069 differs from CGM, the subject of 21 CFR 184.1321. From the information provided in the notice and results of the batch analyses (Table 3, pg. 9 of GRN 001069), it appears that "corn protein" produced without amylase treatment is similar in composition to CGM and may fall under 21 CFR 184.1321.

    a. Please provide additional information to characterize the "non-protein components," removed with the ethanol wash and any resulting differences in composition between CGM and:

        i. "corn protein" produced without amylase treatment

        Response:

        Corn protein without amylase treatment is only subjected to an ethanolic extraction removing fat. Consequently, fat content is comparable to that of corn protein with amylase treatment, but protein content and starch content are lower and higher, respectively.

        Corn protein without amylase treatment is consistent with the description for corn gluten in 21 CFR § 184.1321. However, as corn does not naturally contain gluten, the name "corn protein" is a more appropriate common and usual name to represent this ingredient. Further, GRN 001069 defines food grade specifications for corn protein and expands its uses in foods not only as a source of protein, but for functional uses such as thickening, water absorption, fat/oil absorption, and gelation in a variety of food categories, and solid fat emulsification.

        ii. "corn protein" produced with amylase treatment

        Response:

        Corn protein with amylase treatment is subjected to both aqueous extraction with amylase removing starch, and ethanolic extraction removing fat. Consequently, fat content is comparable to that of corn protein without amylase treatment, but protein content and starch content are higher and lower, respectively.

    b. For the record, please indicate the stage of the production process where the heat-stable amylase enzyme is denatured or removed.

Response:

A very large fraction of the dissolved solids (including the enzyme) is removed during the dewatering and cake washing steps, and any residual enzyme is inactivated by exposure to aqueous ethanol, followed by desolventizing at high temperatures.

c. The Figure 1 process flow diagram on pg. 6 of GRN 001069 does not clearly reflect the removal of the fibrous hull and starch from degermed corn to produce corn gluten meal. Additionally, there is some ambiguity in the terminology used in Figure 1, where "corn protein feed" is obtained from corn gluten meal (direct byproduct of wet-milling) or corn gluten meal treated with an enzyme to liquefy starch, which is then treated with ethanol to precipitate the protein. We note that the corn wet milling process and composition of the resulting byproducts have been well-characterized in the literature.[1] Corn gluten feed is comprised of evaporated steep water, the germ meal/press cake remaining after pressing of the germ fraction to recover oil, and corn kernel hulls, cleanings and screenings. Corn gluten meal is obtained from removal of starch and fibrous hulls from degermed maize. Please clarify the following:

   i. Please confirm that "corn gluten meal" is produced in accordance with standard industry processes (e.g., as described in OECD, 2002), including removal of fibrous hull from degermed maize and separation of starch and gluten of degermed maize.

      Response:

      Cargill confirms that the corn gluten meal starting material is produced in accordance with standard industry processes, including removal of fibrous hull from degermed maize and separation of starch and gluten of degermed maize.

   ii. Please confirm that "corn protein feed" does not refer to the wet-milling byproduct commonly known as "corn gluten feed."

      Response:

      Cargill confirms that "corn protein feed" does not refer to the wet-milling byproduct described as "corn gluten feed" or "maize gluten feed" in OECD (2002), which may contain pressed (deoiled) germ from the corn endosperm and fibrous hulls. The "corn protein feed" in Figure 1 of page 6 of GRN 001069 should have been similarly labeled as "corn gluten meal" as it refers to the corn gluten slurry (either destarched or not) from which the corn protein is extracted with ethyl alcohol, desolventized, and subjected to final processing steps prior to bulk packaging.

[1] OECD Consensus Document on Compositional Considerations for New Varieties of Maize (Zea mays): Key food and feed nutrients, antinutrients, and secondary plant metabolites. *ENV/JM/MONO*(2002)25. https://www.oecd.org/env/ehs/biotrack/46815196.pdf

2. Cargill notes that treatment with amylase is optional. Please clarify if the batch analyses in Table 4 (pg. 12) reflect both untreated and amylase-treated "corn protein." It appears, based on the total starch composition (>20%) in CPC1207, CPC1209, CPC1211, CPC1215, and CPC1221, that these batches are not amylase treated, while the remaining batches in Table 4 are amylase treated.

   Response:

   Cargill confirms that batches CPC1207, CPC1209, CPC1211, CPC1215, and CPC1221 are not amylase-treated, while the remaining batches in Table 4 are amylase-treated.

3. Cargill notes on pg. 6 that alpha-amylase is sourced from a nonpathogenic and nontoxigenic strain of *Bacillus licheniformis*. Please address if the amylase from *B. lichenformis* has been the subject of a previous GRAS notice that has received a no questions letter. We note the following GRAS notices have described amylase enzymes produced using modified *B. lichenformis* production organisms: GRNs 000974, 000664, 000617, 000594, 000079, 000024, 000022.

   Response:

   Cargill confirms that the alpha-amylase enzyme that is sourced from a nonpathogenic and nontoxigenic strain of *Bacillus licheniformis* has been the subject of previous GRAS notices that have received no questions letters from the FDA (i.e., GRN 000079 and GRN 000024).

4. The ingredient is described as a pale yellow to light tan powder. Yellow corn is known to contain provitamin A carotenoids (e.g., α- and β-carotenes, β-cryptoxanthin) and non-provitamin A carotenoids (e.g., lutein, zeaxanthin); all of these carotenoids may be present in CGM. Given that the "corn protein" ingredient appears to be depleted of carotenoids, based on the results of the batch analyses for total carotene (<0.25 µg/kg) and the description of the ingredient as "pale yellow to light tan" in color, please address the following:

   a. Please confirm that values for "total carotene" in Table 4 (pg. 12) include lutein/zeaxanthin and β-cryptoxanthin as well as α- and β-carotenes.

      Response:

      The values for "total carotene" in Table 4 (page 12) are expected to include provitamin A and non-provitamin A carotenoids common to corn – i.e., lutein, zeaxanthin, and beta-carotene.

   b. Please address if the ethanol wash step enables reduction of total carotene levels. If another factor contributes to the low level of carotenoids, please describe.

Response:

Yes, the ethanol wash step enables reduction of total carotene levels. The pigment concentrations in corn protein are intended to be as low as possible so that corn protein does not impart any color to the foods to which it is added.

5. Please address the following issues regarding heavy metals:

   a. The heavy metal specifications for corn protein are different in Table 1 (pg.7) and Table 2 (pg. 8) (limits and results in Table 2, pg. 8). Please confirm that the Table 1 specifications are the correct specifications for "corn protein".

   Response:

   The correct heavy metal specifications for Cargill's corn protein are presented in Table 1 (page 7 of GRN 001069). Cargill also establishes a specification of mercury < 0.1 ppm for its corn protein ingredient. The revised food grade specifications for corn protein are as follows:

   Food Grade Specifications for Corn Protein

Item	Corn Protein Specifications	Method
Loss on drying (%)	≤ 12	CRA Method MOIST.04
Protein (% dry basis)	minimum 65	CRA PROTE.03
Ethyl alcohol (g/kg)	< 10	CRA SACCH.03
SO_2 (mg/kg)	< 100	AOAC 990.28
Aerobic Plate Count (cfu/g)	< 10,000	AOAC 990.12
Enterobacteriaceae (cfu/g)	< 10	AOAC 2003.01
Salmonella (cfu/25g)	Absent	AOAC 2004.03
Yeast and Mold (cfu/g)	< 5,000	FDA-BAM 7th Ed.
Heavy Metals		
Cadmium (ppm)	< 0.1	J. AOAC vol 90 (2007) 844-856
Arsenic (ppm)	< 0.1	J. AOAC vol 90 (2007) 844-856
Lead (ppm)	< 0.2	J. AOAC vol 90 (2007) 844-856
Mercury (ppm)	< 0.1	J. AOAC vol 90 (2007) 844-856

AOAC = Association of Official Analytical Chemists; CRA = Corn Refiners Association

   b. Assuming Table 1 reflects current heavy metal specifications for "corn protein", the specified limits are ≤ 0.1 mg/kg for cadmium and arsenic and ≤ 0.2 mg/kg lead; these levels are higher compared to the levels reflected in the results of the batch analyses (each ≤ 0.04 mg/kg). If the Table 2 specifications are correct, the discrepancy between the specification limits and results of the batch analyses is even greater. We recommended that specifications for cadmium, arsenic,

and lead be as low as possible[2] and reflective of the batch analyses. We request that you consider reducing the lead specification to ≤ 0.1 mg/kg and consider if other heavy metal specifications could otherwise be reduced.

Response:

Cargill understands FDA's interest in ensuring that heavy metal concentrations in foods are as low as possible and will consider lowering specification limits as appropriate. Cargill also appreciates that FDA recognizes "the amount of arsenic, lead, cadmium, or mercury in certain foods depends on the amount in the environment and how much the plant or animal 'takes up' from the environment."[3] In order to account for the potential variability in corn harvest from year to year, it is prudent that the food grade specifications for corn protein represent what is practically achievable to produce a safe, economical, and commercially viable product. Further, it should be noted that the proposed heavy metal specifications for corn protein are similar to those proposed for other plant-derived proteins that have previously received letters of no objection from the FDA – e.g., barley and rice protein hydrolysate (GRN 1031), partially defatted almond protein flour (GRN 918), fava bean protein (GRN 879), pea protein (GRN 851), pea protein (GRN 803), canola protein isolate (GRN 683).

c. We note Cargill includes results of batch analyses for mercury in Table 3 (pg. 9), but it is not included in Table 1 (pg. 7). Please include a specification for mercury or address why one is not included.

Response:

As mentioned above, Cargill establishes a specification for mercury of < 0.1 ppm, and results of corn protein batch analyses presented in Table 3 (page 9) of GRN 001069 demonstrates compliance with this specification.

6. We note that the estimates of dietary exposure for infants and children (pg. 26 of GRN 001069) are particularly high given that the intended uses do not include either infant formula or infant and toddler foods. Further, these dietary exposures would represent a larger portion of total protein in the diet of infants and young children than is apparent for older populations with larger baseline protein intakes. For context, on pg. 32 of GRN 001069 (summarized in table below) Cargill compares "safe protein consumption levels" for children set by WHO to estimated dietary exposure for "corn protein."

Age (years)	Safe protein consumption levels in grams (g)/day (d) (WHO, 2007)	Estimated dietary exposure at 90th percentile to "corn protein" (GRN 001069)
1-6	11.6-17.1 g/d (boys)	23.0 g/p/d

[22] https://www.fda.gov/food/environmental-contaminants-food/closer-zero-reducing-childhood-exposure-contaminants-foods
[3] Ibid.

Age (years)	Safe protein consumption levels in grams (g)/day (d) (WHO, 2007)	Estimated dietary exposure at 90th percentile to "corn protein" (GRN 001069)
	10.8-16.2 g/d (girls)	
7-12	25.9-40.5 g/d (boys) 26.2-41.0 g/d (girls)	28.9 g/p/d

Cargill notes that the estimates of dietary exposure to corn protein at the 90th percentile "are similar to, or slightly above the range of safe protein consumption levels identified by WHO" and that "WHO stated that no safe upper limit had been identified." Cargill compares these estimates of dietary exposure to corn protein at the 90th percentile to USDA estimates for 90th percentile intake of protein from all food and beverages ranges from 68.3-139.1 g/d for males and females ≥1 year of age, based on 2007-2010 National Health and Nutrition Examination Survey (NHANES) data (USDA, 2015). However, this discussion does not address infants 0-11 months, which based on Cargill's dietary exposure estimate, may consume 7.6 g/p/d corn protein at the 90th percentile. We request that Cargill provides context about the relative contribution of corn protein to total dietary intake of protein for infants. Given that infants 0-5 months of age, consuming primarily human milk and/or infant formula, would not be expected to have the same dietary intakes of corn protein as older infants 6-11 months, it may be useful to separately address these populations. Please address the following:

a. Confirm that the ingredient is not intended for use in infant and toddler foods. If corn protein is intended for use in infant and toddler foods, please specify these uses (foods, use levels) separately in the table of intended uses.

   Response:

   Corn protein is not proposed for use in foods targeted specifically to infants; hence, no baby food or infant formula was included in the assessment. It is acknowledged, however, that older infants (6 months and above) and toddlers (1-3 years) may consume conventional foods provided to them by their parents or guardians (e.g., bakery products, RTE cereals, cooked pasta, etc.). Based on the safety evaluation for corn protein detailed in GRN 001069, consumption of foods formulated with corn protein by older infants and toddlers is not expected to result in adverse effects.

b. Confirm that the 33% consumers are comprised largely of older infants consuming complementary foods.

   Response:

   Cargill confirms that the 33% consumers in the infant population group (aged 0-11 months) are comprised largely of older infants (i.e., 6-11 months) consuming complementary foods. The following table summarizes the age distribution of the 205 infants identified as potential consumers of corn protein-formulated foods presented in Table 9 (page 26) of GRN 001069:

Age (months)	Un-weighted N[1]	Percent of infants (%)
0-11	*205*	*100*
0	0	0
1	0	0
2	0	0
3	3	1.2
4	8	5.6
5	5	2.5
6	16	7.8
7	18	10.2
8	37	18.5
9	32	13.1
10	31	15.6
11	55	25.6

[1] Un-weighted number of users; % user estimates were based on NHANES 2015-2018 using the statistical weights provided by the NCHS

c. Please provide a comparison of the estimated dietary exposure to corn protein to current estimates of dietary intake of total protein for infants 0-5 months and infants 6-11 months of age.

Response:

The two-day average estimated daily intakes (EDI) of corn protein from all proposed foods uses among infants 0-5 months and infants 6-11 months is summarized below:

Population	N[1]	% Users	*Per Capita* Intake of Corn Protein (g/day)		*Per User* Intake of Corn Protein (g/day)		*Per Capita* Intake of Corn Protein (g/kg bw/day)		*Per User* Intake of Corn Protein (g/kg bw/day)	
			Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile
0-5 months*	16	6	< 0.05	0	0.1	0.3	< 0.005	0	0.01	0.05
6-11 months**	189	66	2.2	5.9	3.3	8.4	0.24	0.63	0.36	0.86

[1] Un-weighted number of users; % user, *per capita,* and *per user* estimates were based on NHANES 2015-2018 using the statistical weights provided by the NCHS.

* The estimated per user mean and 90th percentile daily intakes are likely not statistically reliable due to an inadequate number of users.

** The estimated per user 90th percentile daily intake is likely not statistically reliable due to an inadequate number of users.

To compare the EDI values of corn protein to the dietary intake of total protein, the two-day average EDI of total dietary protein among infants 0-5 months and infants 6-11 months is presented below:

Population	N[1]	% Users	Total Protein (g/day)[2]			
			Per Capita		*Per User*	
			Mean	90th Percentile	Mean	90th Percentile
0-5 months	250	73	7.8	16.9	10.6	18.2
6-11 months	285	100	21.4	42.9	21.4	42.9

[1] Un-weighted number of users; % user, *per capita*, and *per user* estimates were based on NHANES 2015-2018 using the statistical weights provided by the NCHS.
[2] Estimates of dietary protein intake include intake of protein from infant formula and complementary foods; the estimates do not include intake of protein from human milk.

In infants 0-5 months old, *per capita* mean and 90th percentile intakes of corn protein from all proposed food uses were estimated at < 0.05 and 0 g/day, respectively in infants 0-5 months old, which are lower than their estimated total protein intakes in the diet (7.8 and 16.9 g/day, respectively). Similarly, on a *per user* basis, mean and 90th percentile intakes of corn protein from all proposed food uses (0.1 and 0.3 g/day, respectively) are much lower than their estimated total dietary protein intakes (10.6 and 18.2 g/day, respectively).

The same is true in infants 6-11 months old, where estimated mean and 90th percentile intakes of corn protein from all proposed food uses on a *per capita* (2.2 and 5.9 g/day, respectively) and *per user* (3.3 and 8.4 g/day, respectively) basis are also much lower than their estimated total dietary protein intakes (21.4 and 42.9 g/day, respectively).

On a body weight basis, the estimated *per capita* mean and 90th percentile intakes of corn protein are < 0.005 and 0 g/kg bw/day, respectively in infants aged 0-5 months, and 0.24 and 0.63 g/kg bw/day, respectively in infants aged 6-11 months. These values are lower than the safe level of protein intake for infants less than 6 months of age (1.24 to 1.77 g/kg bw/day), and for infants aged 6-12 months (0.95 to 1.12 g/kg bw/day) determined by the World Health Organization (WHO).[4] While the estimated *per user* intakes are likely not statistically reliable due to low number of users in this population group, the estimated *per user* mean and 90th percentile intakes of 0.01 to 0.86 g/kg bw/day are also less than the WHO's safe level of protein intake for infants less than 6 months. Therefore, the proposed uses of corn protein in foods are not expected to result in adverse effects in the US population, including infants consuming complementary foods.

d. Based on the comparison in point c, discuss the proportion of total protein in the diet of the infant consuming foods containing corn protein.

Response:

For younger infants aged 0-5 months, the estimated mean and 90th percentile intakes of corn protein (0-0.3 g/day) reflect insignificant contribution to the adequate intake (AI) level protein

[4] WHO (World Health Organization). 2007. Protein and Amino Acid Requirements in Human Nutrition. Report of a Joint WHO/FAO/UNU Expert Consultation WHO Technical Report Series 935.

of 9.1 g/day established by the Institute of Medicine for infants 0-6 months of age.[5] For older infants aged 6-11 months, the estimated *per capita* mean and 90th percentile (2.2 and 5.9 g/day for, respectively) intakes are less than the total dietary protein intake from complementary foods of infants 6-11 months old (9.9 g/day).[6] These intakes are also less than the recommended dietary allowance (RDA) of 11 g protein/day in infants aged 6-12 months. Notably, the RDA is considered the minimum average daily dietary intake level sufficient to meet the nutrient requirements of healthy individuals in a group.

Based on the EDI values presented in point c above, consumption of corn protein from all proposed uses in foods would contribute < 2% of the total dietary protein intake in infants 0-5 months old, and < 20% of the total dietary protein intake in infants 6-11 months old.
As corn protein is not proposed for use as a sole source of dietary protein, the proposed uses of corn protein in foods are not expected to result in adverse effects in the US population, including infants less than 1 year old consuming complementary foods.

7. While we understand that the use of corn protein is not intended to increase levels of total protein in the US diet, it is not clear which protein sources corn protein would replace in the current US diet. Please describe whether the intended uses replace other plant sources of protein in the diet or whether corn protein would also replace dairy, egg, and meat/poultry protein sources in the diet.

   Response:

   Corn protein is proposed for use as an alternative dietary source of plant-derived proteins similar to other sources such as soy, canola, oats, lentils, wheat, rice, potato, peas, and mung beans. It is reasonable to expect that most of the population's intake of protein will continue to be in the form of conventional foods, including dairy, egg, meat, poultry, seafood, nuts, and legumes.

8. Cargill notes that corn protein is low in lysine and tryptophan compared to other protein sources, and cites a reference (SCOGS Report, 1981) stating that corn gluten may not support adequate growth when used as the sole source of dietary protein. While Cargill addresses the implications for ages 1 year and older, you do not specifically address safe consumption of corn gluten by infants. Please confirm that your safety conclusions, relevant to all uses and consuming populations described in the notice, do not include use of corn protein as a sole source of dietary protein. It may be useful to describe use of corn protein in the context of current dietary recommendations (USDA Dietary Guidelines for Americans, 2020-2025) recognizing the importance of eating a variety of protein sources and to "vary your protein routine".

[5] IOM (Institute of Medicine). 2002/2005. Dietary Reference Intakes for Energy, Carbohydrate. Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (2002/2005). National Academy of Sciences. https://nap.nationalacademies.org/catalog/10490/dietary-reference-intakes-for-energy-carbohydrate-fiber-fat-fatty-acids-cholesterol-protein-and-amino-acids

[6] USDA (U.S. Department of Agriculture). 2020. 2020 Dietary Guidelines Advisory Committee Supplementary Data Analysis. Infants and Toddlers: Food Group and Nutrient Intakes. Table 5. https://www.dietaryguidelines.gov/sites/default/files/2020-07/DA_Supplement_Infants_and_Toddlers_0.pdf

Response:

Cargill confirms that its safety conclusions, relevant to all uses and consuming populations described in GRN 001069, pertain to the use of corn protein as an alternative dietary source of plant-derived proteins similar to other sources such as soy, canola, oats, lentils, wheat, rice, potato, peas, and mung beans. Since corn protein is not proposed for use as a sole source of dietary protein, it would contribute only a portion of the background protein consumption in the US. Consistent with the current recommendations of the USDA Dietary Guidelines for Americans, 2020-2025, Cargill recognizes the importance of eating a variety of protein sources and to "vary your protein routine."

9. Foods with standards of identity are included in the exposure estimates. Please provide a statement, for the record, that the intended uses in food categories do not include foods with standards of identity where the standards do not permit addition of the ingredient.

Response:

Corn protein is proposed for use in unstandardized foods identified on pages 19-20 of GRN 001069, and in appropriate standardized foods identified in GRN 001069 only if the standards permit addition of the ingredient.

10. Regarding the estimates of dietary exposure provided in Appendix 3:

a. Is dietary exposure based on the ingredient weight basis or the level of protein in the "corn protein" ingredient?

Response:

The dietary exposure assessment is based on the proposed level of use of corn protein as a whole ingredient, not solely on its protein content.

b. A number of foods are included in the dietary exposure estimate described in Appendix 3 that do not appear to be among the intended uses described in the notice. Please clarify the following:

i. For cooked vegetables and egg-based dishes without sauce or coating, are these foods included in the estimates of dietary exposure because they are presumed to contain margarine or another source of corn protein (e.g., processed meat), or are these intended uses inadvertently omitted from Table 7 (pg. 19) listing the intended uses? Please clarify the use level of corn protein in cooked vegetables and egg-based dishes.

Response:

The food codes for dairy analog products included in the dietary exposure assessment for corn protein are listed on pages 27- 41 of Appendix I in Appendix 3 of GRN 001069. Egg-based

dishes listed on pages 29-30 and cooked vegetables on pages 33-40 have been included due to the fat, dairy, or dairy analog component. Hence, the proposed use-level for corn protein in dairy analog products (10%) has been applied only to the fat or dairy component of these dishes to take into account the potential intake of these foods by the US population.

Similarly, the food codes for processed meats category included in the dietary exposure assessment for corn protein are listed on pages 49-58 of Appendix I in Appendix 3 of GRN 001069. Egg-based dishes with meat have been included on pages 54-56 and cooked vegetable dishes on pages 56-58 to account for the processed meat component in these foods, and the use-level for processed meats category (7%) was applied to only to the processed meat component of these dishes.

ii. For categories such as Asian chicken or turkey garden salad, German style potato salad, and spinach salad without dressing, please clarify the intended use category these foods fall within?

Response:

The German style potato salad and spinach salad without dressing contain bacon (i.e., processed meats). The Asian chicken or turkey garden salad contains a noodle ingredient (i.e., cooked pasta).

iii. Please clarify if there are intended uses that are not listed in the notice or provide additional context explaining why these categories are included in the dietary exposure estimate.

Response:

Cargill confirms that all proposed uses for corn protein in foods have been summarized in Table 1 of Appendix 3, and all NHANES food codes included in the dietary intake assessment for corn protein have been listed in Appendix I of Appendix 3.

The USDA Food and Nutrient Database for Dietary Studies (FNDDS) databases translates foods as reported consumed into one or more ingredients (and gram amounts) or recipes. Any ingredient corresponding to a proposed use of corn protein was included in the assessment at the gram weight amount of the ingredient. For instance, 100 grams of the food code *73102219 Carrots, cooked, from fresh, made with margarine* contains 2.97 grams margarine, so only 2.97% of the food code was included in the assessment. The section 'NHANES Food Selection' starting on page 5 of Appendix 3 of GRN 001069 further explains the food selection approach for this assessment.

c. What is the use level or range of use levels in the powder used to make protein drinks?

Response:

The formulation of a non-reconstituted powder drink product will be up to the final food manufacturer. However, Cargill calculated the amount of corn protein that will be consumed if it is present at a proposed use level of 5% in the reconstituted drink. This means that for the powder/dry mix food codes, the gram amount included in the assessment was brought up to the reconstituted amount based on the FNDDS portion weight. For instance, 1 scoop of the food code *95220000 Nutritional powder mix, NFS* is 34 grams. The typical serving size for the prepared beverage is 240 mL, so the reconstituted amount is 706 grams (240/34*100).

11. Please confirm that the corn grain starting material is produced in compliance with current good agricultural practices and in compliance with 40 CFR 180 Tolerances and exemptions for pesticide and chemical residues in food.

    Response:

    Corn protein is produced from corn gluten meal starting material. The corn grain raw material, which is used to produce corn gluten meal, is produced in compliance with current good agricultural practices and in compliance with 40 CFR 180 Tolerances and exemptions for pesticide and chemical residues in food.

12. While Cargill includes "limits" for mycotoxins in Table 3 (pg.), these impurities are not included in the Table 1 (pg. 7) list of "food-grade specifications for corn protein". Please clarify the specifications for these impurities.

    Response:

    Cargill's acceptance criteria for corn protein intended for use in foods include limiting mycotoxin levels to the following:

    Aflatoxin B1 < 2 ppb
    Sum Aflatoxins (B1+B2+G1+G2) < 4 ppb
    Deoxynivalenol < 800 ppb
    Sum Fumonisins (B1+B2) < 1,500 ppb
    Sum Toxins (HT-2 + T-2) < 40 ppb
    Ochratoxin A < 6 ppb
    Zearalenone < 200 ppb

13. For Table 3 (pg. 9-10), the results of the batch analyses for Fumonisin B1 and Fumonisin B2 are presented. A limit for sum of Fumonisins B1+B2 of <1500 µg/kg is stated in the Table, with reference to footnotes d, e, and f. In footnote d, the FDA Guidance Level[7] is given as 2-4 mg/kg for whole,

[7] https://www.fda.gov/regulatory-information/search-fda-guidance-documents/guidance-industry-fumonisin-levels-human-foods-and-animal-feeds

degermed, or partially degermed dry milled corn products. We note that, since the "corn protein" is produced from fully degermed corn product, that the 2 mg/kg limit would be most relevant. In addition, we request that Cargill clarifies or correct the following:

a. The guidance level is for the sum of Fumonisins B1 + B2 + B3. We note that all three forms have been reported to be present in corn (Lauren and Ringrose, 1997).[8] Please comment on your use of B1 + B2 to represent total fumonisins in Table 3. We note the narrative on pg. 45 implies that B1 + B2 + B3 are included in the total fumonisins limit of ≤1.5 mg/kg; however, analytical data for B3 is not included in the notice.

Response:

The analytical data for fumonisin B3 was inadvertently left out of Table 3 of GRN 1069. Based on the certificates of analysis submitted in Appendix 1 of GRN 001069, the analytical results for fumonisins B1, B2, and B3 from multiple non-consecutive batches of corn protein are summarized in the table below.

Parameter	**Limit**	**CPC12 0720F**	**CPC12 0920F**	**CPC12 1120F**	**CPC121 520F**	**CPC12 2120F**	**CP1203 20F**	**CP1208 20F**	**CP1210 20F**	**CP1214 20F**	**CP1216 20F**
Fumonisin B1 (ppb)	--	300	200	200	200	200	ND	100	200	200	100
Fumonisin B2 (ppb)	--	300	300	300	300	300	100	200	200	200	200
Fumonisin B3 (ppb)	--	100	ND	ND	ND	100	ND	ND	ND	ND	ND
Sum of Fum B1+B2+B3 (ppb)	< 1,500	700	500	500	500	600	100	300	400	400	300

ND = not detected (detection limit of 100 ppb)

b. In light of the background levels of fumonisins discussed on pg. 46 of the notice, please comment on whether corn protein would/would not provide additional fumonisins to the overall diet that would affect the overall dietary exposure to fumonisins.

Response:

The theoretical exposure to fumonisins from proposed uses of corn protein are below, or within the lower range of, international estimates of background dietary exposure to fumonisins. Hence, the proposed uses of corn protein are not expected to affect the overall dietary exposure of the US population to fumonisins.

14. Regarding the amino acid content of "corn protein":

a. On pg. 14 of GRN 001069, in Table 5, Cargill presents the amino acid profile of Cargill's corn protein ingredient. Tryptophan is not included in this table. Is it assumed that the proportion of amino acids reflects that of the raw material (corn grain) shown on pg. 13 of GRN 001069? If

[8] Lauren, D.R., Ringrose, M.A. 1997. Determination of the fate of three *Fusarium* mycotoxins through wet-milling of maize using an improved HPLC analytical technique. *Food Additives & Contaminants*, 14(5): 435-43.

yes, please provide a statement that the relative proportions of amino acids are unchanged from CGM.

Response:

Tryptophan is included in Table 5 on page 14 of GRN 001069, which was presented as follows:

Table 5. Amino Acid Profile of Corn Protein (w/w%)

Amino Acids	Corn Protein Batch No.[#]					
	CP120320	CP121020	CP121620	CPC120720	CPC120920	CPC122120
Taurine*	0.00	0.00	0.00	0.07	0.07	0.07
Hydroxyproline	0.01	0.02	0.02	0.00	0.00	0.00
Aspartic Acid	5.10	4.95	5.01	4.03	3.90	3.86
Threonine	2.82	2.66	2.70	2.14	2.09	2.10
Serine	3.97	3.51	3.63	2.73	2.70	2.76
Glutamic Acid	19.07	18.56	18.81	14.71	14.58	14.47
Proline	7.39	7.16	7.29	5.51	5.51	5.35
Lanthionine*	0.00	0.00	0.00	0.00	0.00	0.00
Glycine	2.33	2.26	2.29	1.85	1.81	1.77
Alanine	7.63	7.43	7.53	5.90	5.84	5.79
Cysteine	1.58	1.54	1.55	1.23	1.19	1.18
Valine	4.05	4.04	4.08	3.19	3.14	3.13
Methionine	2.27	2.23	2.25	1.86	1.80	1.74
Isoleucine	3.67	3.72	3.75	2.93	2.90	2.89
Leucine	14.40	14.08	14.26	11.05	10.98	10.99
Tyrosine	4.21	3.97	4.07	2.95	2.94	2.94
Phenylalanine	5.47	5.37	5.48	4.19	4.16	4.17
Hydroxylysine	0.00	0.01	0.01	0.00	0.00	0.00
Ornithine*	0.07	0.07	0.07	0.06	0.05	0.05
Lysine	1.48	1.43	1.46	1.20	1.17	1.17
Histidine	1.71	1.69	1.71	1.35	1.31	1.31
Arginine	2.71	2.61	2.65	2.08	2.05	2.03
Tryptophan	0.34	0.38	0.38	0.34	0.33	0.32
Total	90.28	87.69	89.00	69.37	68.52	68.09
Crude Protein**	91.08	91.48	92.14	70.46	69.56	70.27

w/w% = grams per 100 grams of sample; [#]Results are expressed on an "as is" basis unless otherwise indicated; *Non-proteinogenic amino acids; Crude Protein** = %N x 6.25

The profile and relative proportions of amino acids in corn protein are expected to be similar to its starting material, corn gluten meal, which is confirmed with the data presented in Figure 2 and Table 5 on pages 13-14 of GRN 001069.

b. Please clarify the source of the data shown in the pie chart Figure 2 on pg. 13 of GRN 001069 and clarify if data refers to corn grain or CGM.

Response:

The source of the data shown in the pie chart on Figure 2 on page 13 refers to the amino acid profile of corn gluten meal (slurry), which is the starting material for the production of corn protein.

15. Regarding the intended uses and use levels provided in Table 7. pg. 19-20 of GRN 001069:

    a. Does the level of 2% for "batter/breading/coating for frying" refer to the final food (e.g., fried chicken) or to the amount of corn protein in the batter, breading, or coating?

    Response:

    The 2% level refers to the amount of corn protein in the batter, breading, or coating.

    b. For the food category "nutritional powders", what is the concentration of corn protein in the non-reconstituted powder?

    Response:

    The formulation of a non-reconstituted powder drink product will be up to the final food manufacturer. However, Cargill calculated the amount of corn protein that will be consumed if it is present at a proposed use level of 5% in the reconstituted drink. This means that for the powder/dry mix food codes, the gram amount included in the assessment was brought up to the reconstituted amount based on the FNDDS portion weight. For instance, 1 scoop of the food code *95220000 Nutritional powder mix, NFS* is 34 grams. The typical serving size for the prepared beverage is 240 mL, so the reconstituted amount is 706 grams (240/34*100).

    c. Does the 1.5% level for "cream-based sauces" refer to the final food (e.g., broccoli with cheese sauce) or to the amount of corn protein in the sauce only?

    Response:

    The 1.5% level refers to the amount of corn protein in cream-based sauces only.

    d. Please clarify if the intended uses of corn protein in bread, English muffins, and muffins is for gluten-free versions of these foods or for these foods in general.

    Response:

    Corn protein is proposed for use in all types of flatbread and pizza crust, and in gluten-free biscuits, breads, English muffins, and muffins.

    e. Please clarify if the use in cooked pasta includes gluten free versions of these foods.

Response:

Corn protein is proposed for use in all types of cooked pastas, including gluten-free versions.

16. On pg. 33 of the notice, Cargill briefly mentions the safety of zein and glutelin in the context of exposure to the starting material, corn gluten meal; and for zein only, for its use as a surface finishing agent. However, you do not discuss exposure to zein and/or glutelin from your corn protein ingredient. Please discuss if these constituents are expected to be concentrated in your corn protein ingredient, and if this enrichment is anticipated to pose a safety concern for consumers.

    Response:

    The objective of Cargill's corn protein production process is to extract and purify the proteins from the endosperm of corn kernels. With the removal of starch and fat content, it is expected that the extraction and purification of proteins from the corn gluten starting material will increase the concentration of corn proteins, including zein and glutelin, accordingly (from 65% to 85% on a dry weight basis). Zein and glutelin are the predominant types of proteins found in maize endosperm. Zein, the alcohol-soluble protein (prolamin, prolamin-like protein), is the major seed storage protein of maize kernel that constitutes approximately 50-70% of kernel endosperm, whereas the non-zein protein consists of globulins (3%), glutelins (34%), and albumins (3%). Scientific literature search of publications on zein or glutelin did not reveal any relevant safety concerns with respect to human consumption of these proteins. It is reasonable to expect that a nominal (1.3-fold) increase in zein and glutelin levels in the corn protein final product will not result in adverse effects in humans.

17. On pg. 37 of the notice, Cargill discusses the digestibility of corn and corn gluten meal, and provide their PDCAAS and DIAAS scores, noting that they are expected to be similar for your corn protein ingredient. However, the most relevant publication you provided (Kim et al., 2012), reports results from a standardized ileal amino acid digestibility chick assay (SIAAD), which has a method of calculating digestibility different from the digestible indispensable amino acid score (DIAAS). Please provide an additional reference for the DIAAS scores for corn (or maize) and corn gluten meal reported, or correct your safety discussion to address this discrepancy. Additionally, we suggest that you discuss the PDCAAS and/or DIAAS for your corn protein ingredient, even if unpublished, for completeness of your safety narrative.

    Response:

    In an *in vitro* digestion model simulating oral, gastric and small intestinal fluids,[9] Cargill's corn protein (containing 80-85% protein) was determined to have an *in vitro* digestibility of 64%, which correlates to an estimated *in vivo* digestibility of 93% (data not published). This is similar to *in vivo*

[9] Garcia-Campayo, V., Han, S., Vercauteren, R., Franck, A. 2018. Digestion of Food Ingredients and Food Using an In Vitro Model Integrating Intestinal Mucosal Enzymes. *Food Nutr Sci*, 9, 711-734.

digestibility values of 93% for canola protein,[10] and 95% for vital wheat gluten,[11] but higher than the digestibility value of 87% for rice protein.[12]

The following table provides a summary of the amino acid scores for corn protein using the recommended amino acid scoring pattern for young children (aged 6 months to 3 years) established by FAO/WHO in 2011 (FAO, 2013).[13]

Essential Amino Acids (mg/g protein)	**FAO (2013) Amino Acid Reference for 6 mos. to 3 yrs. (mg/g protein)**	**Corn Protein (90% protein) Amino Acid Score Using AA Ref. for 6 mos. to 3 yrs.**	**Corn Protein (69% protein) Amino Acid Score Using AA Ref. for 6 mos. to 3 yrs.**
Histidine	20	0.96	0.97
Isoleucine	32	1.31	1.33
Leucine	66	2.43	2.43
Lysine	57	0.29	0.30
Methionine + Cysteine	27	1.59	1.62
Phenylalanine + Tyrosine	52	2.06	2.00
Threonine	31	0.99	0.99
Tryptophan	8.5	0.48	0.56
Valine	43	1.06	1.07

Based on estimated *in vivo* digestibility of 93% and using the FAO (2013) amino acid reference pattern for young children (6 months to 3 years), corn protein has a calculated DIAAS of 28 , which is comparable to calculated DIAAS value for wheat gluten protein of 28 for young children.

18. On pg. 40 of the notice, Cargill discusses two genetic toxicology studies performed on two "corn protein materials" but it is unclear if either of these test articles are representative of the notified substance. Please state if the test article from these studies came from a certain batch of the notified substance, or further elaborate on how the test articles from these studies compare in manufacturing and/or composition to the notified substance.

[10] Fleddermann M, Fechner A, Rößler A, Bähr M, Pastor A, Liebert F, Jahreis G. 2013. Nutritional evaluation of rapeseed protein compared to soy protein for quality, plasma amino acids, and nitrogen balance--a randomized cross-over intervention study in humans. *Clin Nutr* 32(4):519-526.
[11] FAO (Food and Agriculture Organization of the United Nations). 1991. Protein Quality Evaluation: Report of the Joint FAO/WHO Expert Consultation. *FAO Food and Nutrition Paper* No. 51
[12] Rutherfurd SM, Fanning AC, Miller BJ, Moughan PJ. 2015. Protein digestibility-corrected amino acid scores and digestible indispensable amino acid scores differentially describe protein quality in growing male rats. *J Nutr* 145(2):372-379.
[13] FAO (Food and Agriculture Organization of the United Nations). 2013 Dietary Protein Quality Evaluation in Human Nutrition: Report of an FAO Expert Consultation. *FAO Food and Nutrition Paper* No. 92.

Response:

Yes, corn protein samples representative of the substance notified in GRN 001069 (i.e., batches CPC120920F and CP121020F) were evaluated in the genetic toxicity tests described on page 40 of GRN 001069.

19. On pg. 41 of the notice, Cargill concludes that safety data on corn protein-derived bioactive peptides are not relevant to the corn protein ingredient that is the subject of this GRAS conclusion, as these peptides are "mainly produced via enzymatic hydrolysis of corn gluten meal". However, it is not clear from your description of the manufacturing process whether the use of a "heat-resistant food grade enzyme" with corn gluten meal could include enzymes capable of proteolytic digestion. Please specify if any heat-resistant food grade enzymes capable of protein hydrolysis are added in your enzymatic step. If so, please include a safety discussion of exposure to bioactive corn protein-derived peptides from your corn protein ingredient.

    Response:

    Proteolytic enzymes are not used in the manufacturing process for corn protein.

20. On pg. 43 of the notice, when discussing the primary corn allergen, lipid transfer protein (LTP), you state that corn protein is not expected to have concentrated levels of LTP, and that the potential for corn protein to elicit an allergic response is "perhaps" lower than corn. However, because you have not provided any analytical data in support of these conclusions, it is not clear how your conclusion was made. We note that LTPs appear to be ubiquitously expressed in plant tissues. As such, removal of the lipid-rich fraction of native corn alone likely does not eliminate all LTPs from the starting material. If your substance contains detectable levels of LTPs, please discuss how these levels relate to what has been observed in native corn (maize) and/or corn gluten meal.

    Response:

    SDS-PAGE analyses of 10 corn protein samples indicate similarity of the protein fraction with SDS-PAGE protein profiles for maize and corn gluten meal (see Appendix A below). Thus, if present, the level of lipid transfer protein (LTP) in corn protein would likely be similar to that found in the starting material, corn gluten (meal), which is GRAS-affirmed for use as a direct food substance with no limitations other than current good manufacturing practice (21 CFR § 184.1321). It is reasonable to expect that the nominal (1.3-fold) increase in protein content from the corn gluten starting material to the corn protein final product (from 65% to 85% on a dry weight basis) will not result in a higher risk of allergenic potential.

    Corn-derived ingredients for consumption as human food, such as corn gluten, are not recognized as major allergenic foods requiring source allergen labeling in any regulatory jurisdiction in the world, including the US. Certain studies analyzing the sensitivity of patients to LTP have shown that

allergenicity caused by LTP from corn is not highly common.[14,15] Further, corn proteins are not generally considered capable of triggering allergenic cross-reactivity responses.[16] Therefore, it is expected that Cargill's corn protein is unlikely to trigger allergic reactions to the majority of the US population, although these cannot be completely ruled out for certain susceptible individuals. However, formulated finished food product ingredient lists would state the presence of a corn protein ingredient and individuals who wish to avoid corn protein consumption for any reason would be able to identify the presence of a corn-derived ingredient.

21. On pg. 31, 35, 51 and 53, Cargill mentions the historical consumption of corn and/or "its proteins" and use this sentiment in support of your safety conclusion. However, the reference cited in support of this statement (Piperno, 2011), does not support the notion that isolated corn proteins have been consumed historically. Please confirm that by using the phrase "corn [and/or] its proteins" you are only referring to the edible portion of whole native corn (maize). If not, please clarify, and provide an additional peer-reviewed reference in support of the historical consumption of corn protein isolates if needed.

    Response:

    Cargill confirms that the statement refers to the historical consumption of the edible portion of whole native corn (maize), which includes the protein content of corn.

22. Please perform an updated literature search (from February 2022 to present) on the safety of corn protein and discuss whether any new data were found that would contradict your current GRAS conclusion.

    Response:

    An updated search of the published scientific literature, from February 2022 to present, on the safety of corn protein did not reveal any new data that would contradict Cargill's conclusion of GRAS for the use of corn protein in foods for human consumption.

[14] Asero, R. 2011. Lipid transfer protein cross-reactivity assessed in vivo and in vitro in the office: pros and cons. *Journal of Investigational Allergology and Clinical Immunology,* 21, 129-136.
[15] Violan, V.V., Heras, M.D.L., Valverde-Monge, M., Betancor, D., Garcia, B.B., Vera, R.N., and Herranz, J.C. 2019. The intriguing allergy to LTP: guilty foods after a survey. *Journal of Allergy and Clinical Immunology*, 143.
[16] Hileman, R.E., Silvanovich, A., Goodman, R.E., Rice, E.A., Holleschak, G., Astwood, J.D., Hefle, S.L. 2002. Bioinformatic methods for allergenicity assessment using a comprehensive allergen database. *Int Arch Allergy Immunol,* 128, 280-291.

Appendix A: SDS-PAGE Analysis of Corn Protein Samples

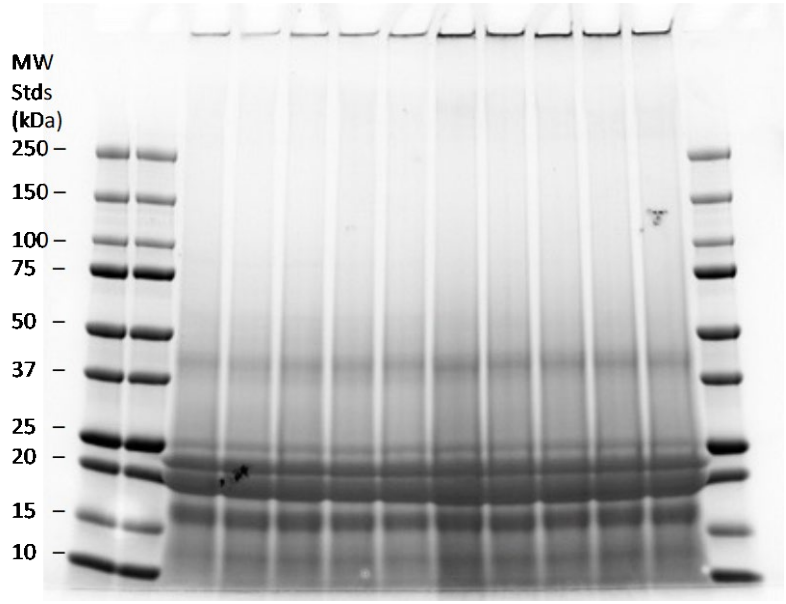
Maize endosperm consists of two types of protein (i.e., zeins and non-zeins). Zein, the alcohol-soluble protein (prolamin, prolamin-like protein), is the major seed storage protein of maize kernel that constitutes approximately 50–70% of kernel endosperm, whereas the non-zein protein consists of globulins (3%), glutelins (34%), and albumins (3%). Zeins are by far the best characterized of the corn grain protein groups, and they can be further fractionated into the distinct classes of α (19 kd) and 22 kD), β (15 kD), γ (16, 27 and 50 kD), and δ (10 and 18 kD). All zein classes are localized in the endosperm of the grain. Out of all zeins, the α-zeins (19- and 22-kDa) are the most abundant. Glutelins are usually divided into 2 groups according to their molecular weight – high molecular weight glutelin subunits (HMW-GS) with the size of 80–120 kDa and low molecular weight glutelin subunits (LMW-GS) with the size of 30-80 kDa. Other endosperm proteins include legumin-1, a 51-kD protein, and α-globulin, an 18-kD protein.

Corn protein samples were analyzed by SDS-PAGE to identify the main proteins or protein fractions present. Ten (10) corn protein samples were resuspended in 2X Laemmli sample buffer (BioRad Catalog 1610737) plus b-ME in volume noted in last column of table. Samples were dissolved, then heated to 100C for 20 minutes, cooled to room temp, loaded onto 4 – 20% Acrylamide Tris Glycine gel (BioRad Catalog 5671094). 30 uL was loaded; gel was run in 1X Tris/Glycine/SDS buffer at 200V, approximately 50 minutes.

Sample	tube number	mg (as is)	corrected volume (uL)
CPC112922	1	3.3	1100
CPC120122	2	3.1	1033
CPC120522	3	3.2	1067
CPC120722	4	3.3	1100
CPC121422	5	3.3	1100
CPI112822	6	3.2	1067
CPI113022	7	3	1000
CPI120222	8	2.8	933
CPI120622	9	3	1000
CPI120822	10	3	1000

The SDS-PAGE analysis of corn protein samples indicates that the two main polypeptides found can be associated to α-zeins of 19 and 22 kD, which are the most predominant storage proteins in corn endosperm. What seems to be a multiple band migrating between molecular weights 15 and 20 kD could be associated to β-zeins of 15 kD and γ-zeins of 16 kD, as well as possibly α-globulin of 18-kD. The

band around 25 kD, which demonstrated lower density, could be identified as γ-zeins of 27 kD. A lighter band located at the bottom of the gel could be δ-zein of 10 kD. Higher molecular weight band(s) are detected around 40 kD; they could be identified as glutelins. Finally, some very faint bands between markers could be observed that are difficult to associate with specific proteins. Glutelin proteins are less characterized in literature, and it is complicated to specifically identify them in such SDS-PAGE gels using total protein endosperm protein fraction where zeins are the predominant polypeptides present.



As reported by several authors, molecular masses of the constituent proteins of corn and products thereof as determined by SDS-PAGE can appear as slightly different from one study to another. This could be explained by the intrinsic variability in protein composition among the corn varieties analyzed, as well as extraction and electrophoretic conditions used in the studies. An important issue to consider is that the starting raw material used for the production of corn protein is a mix of corn varieties, which share a common family of divergent genes that are expressed as structurally similar proteins with slightly different molecular masses. For this reason, the unique and unequivocal identity of each of the bands observed is difficult to ascertain.

Cargill concludes that the profile of predominantly detected polypeptides appear to be very consistent with major proteins expected from the extraction of the protein fraction of corn endosperm, in particular, from the predominant zein family. Moreover, the SDS-PAGE profile for Cargill's corn protein appears very similar to profiles for maize and corn gluten meal published in various studies (see below).

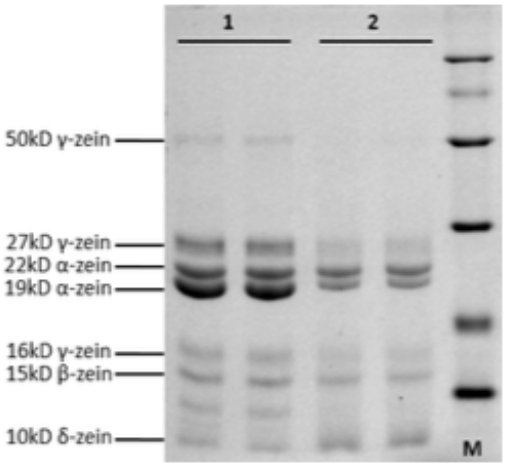


Figure 2. SDS-PAGE (Fraction B). This figure shows zein protein extraction. 1, 2 represent two different maize cultivars (two replicates for each maize cultivar).

Source: Chen *et al.* (2013)

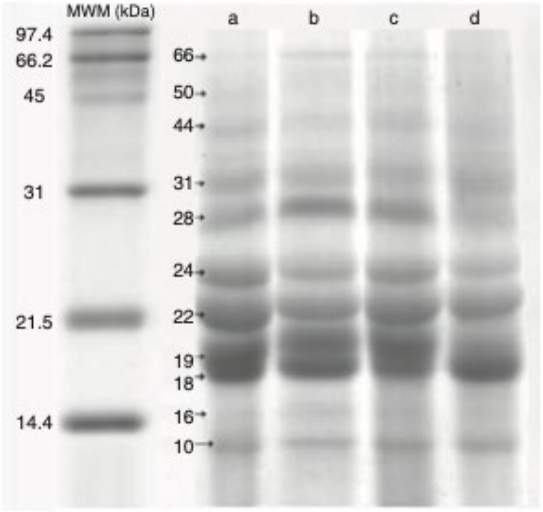


Figure 4. SDS-PAGE analysis of proteins from: (a) native corn gluten meal (CGM), (b) proteins extracted from the emulsion made with native CGM, (c) deamidated CGM and (d) proteins extracted from the emulsion made with the modified CGM.

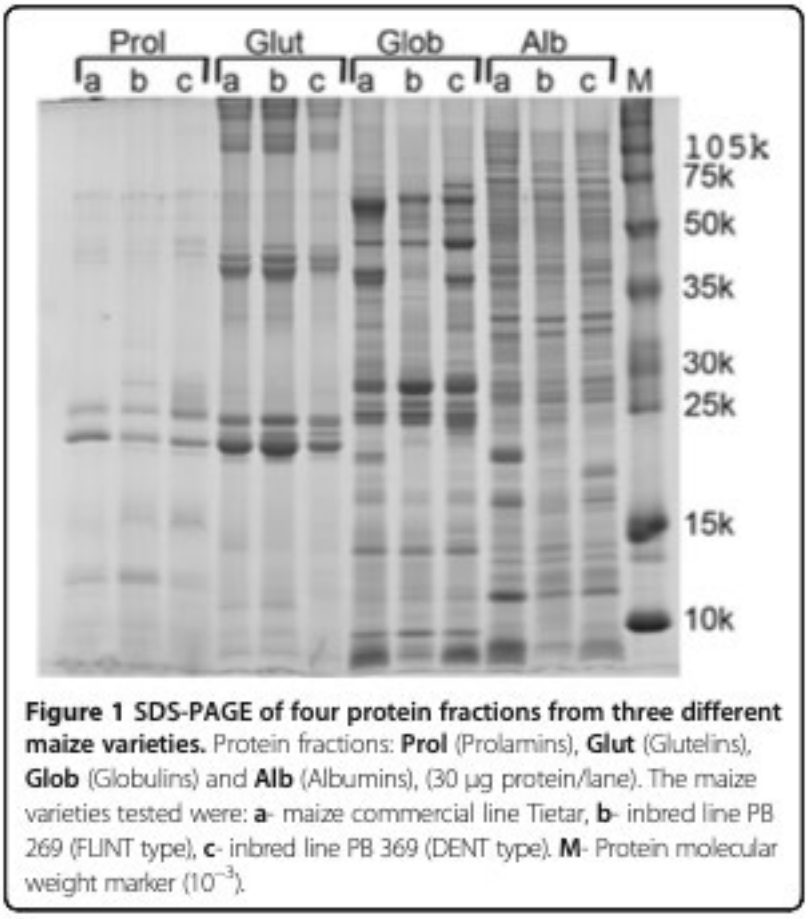


Figure 1 SDS-PAGE of four protein fractions from three different maize varieties. Protein fractions: **Prol** (Prolamins), **Glut** (Glutelins), **Glob** (Globulins) and **Alb** (Albumins), (30 µg protein/lane). The maize varieties tested were: **a**- maize commercial line Tietar, **b**- inbred line PB 269 (FLINT type), **c**- inbred line PB 369 (DENT type). **M**- Protein molecular weight marker (10^{-3}).

Source: Fonseca *et al*. (2014)

References

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Fonseca, C., Planchon, S., Pinheiro, C., Renaut, J., Ricardo, C.C., Oliveira, M.M., Batista, R. Maize IgE binding proteins: Each plant a different profile? *Proteome science,* 2014, 12:17, pp. 1-11.

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Sethi, M., Singh, A., Kaur, H., Phagna, R.K., Rakshit, S., Chaudhary, D.P. Expression profile of protein fractions in the developing kernel of normal, *Opaque-2* and quality protein maize. *Sci Rep,* 2021, 11:2469, pp. 1-9.

Yau, J.C., Bockholt, A.J., Smith, J.D., Rooney, L.W., Waniska, R.D. Maize endosperm proteins that contribute to endosperm lysine content. *Cereal Chem*., 1999, 76, pp. 668-672.

Responses to FDA and USDA Questions on Cargill's Corn Protein GRAS Notice (GRN 001069)
July 21, 2023

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1. In FDA's questions, we had asked that you consider reducing the lead specification to ≤ 0.1 mg/kg, given the results of the batch analyses ranging from 0.019-0.037 mg/kg and the similar results for other heavy metals (cadmium, arsenic, mercury) with lower specifications (≤ 0.1 mg/kg each). In the June 2, 2023 amendment, you responded that Cargill prefers to maintain the current specified limits "in order to account for the potential variability in corn harvest from year to year" and that "the proposed heavy metal specifications for corn protein are similar to those proposed for other plant-derived proteins that have previously received letters of no objection from FDA."

   In view of FDA's recent "Closer to Zero" initiative[1] focusing on reducing dietary exposure to arsenic, lead, cadmium, and mercury from foods consumed by infants and young children, we would anticipate acceptable limits for heavy metals, particularly those for macronutrients, to be reduced over time. We request that specifications for ingredients, particularly those consumed by infants and young children, be as low as possible and reflect the results of batch analyses for an ingredient produced in accordance with current good manufacturing practices (GMPs). Please provide a revised limit for lead that is consistent with the results of the batch analyses or provide additional results from batch analyses that are reflective of the range of levels of lead anticipated in the "corn protein" ingredient accompanied by an expanded discussion comparing the levels of lead in "corn protein" to analytical levels reported in other protein sources it is intended to replace.

   Response:

   Cargill appreciates FDA's Closer to Zero initiative, and hence, revises the specification limit for lead in corn protein to ≤ 0.1 mg/kg. This specification limit is similar to, or even better than, other plant protein ingredients that have received letters of no objection from the FDA from the past 4 years (2019-2023), or those that are established in the Food Chemicals Codex (FCC 13).

   Fava bean protein (GRN 879) lead ≤ 0.1 mg/kg
   Pea protein (GRN 851) lead < 0.2 mg/kg
   Pea protein (GRN 804) lead ≤ 0.2 mg/kg
   Pea protein (GRN 803) lead ≤ 0.5 mg/kg
   Soy protein concentrate (FCC 13) lead ≤ 1 mg/kg
   Wheat gluten (FCC 13) lead ≤ 1 mg/kg
   Wheat protein isolate (FCC 13) lead ≤ 0.5 mg/kg

   Although corn protein has not been hydrolyzed with a protease enzyme, the following plant protein lead specification references are included to capture other examples of completed GRN notices with closure dates between 2019 and 2023 for completeness:

   Barley and rice protein hydrolysate (GRN 1031) lead < 0.2 mg/kg
   Enzyme-treated pea protein (GRN 948) lead < 0.1 mg/kg
   Rice protein hydrolysate (GRN 944) lead ≤ 0.4 mg/kg

[1] https://www.fda.gov/food/environmental-contaminants-food/closer-zero-reducing-childhood-exposure-contaminants-foods

2. In response to question 15b, you note "The typical serving size for the prepared beverage is 240 mL, so the reconstituted amount is 706 grams (240/34*100)." It is our understanding that, given the proposed use level of 5% in the prepared beverage, the final volume of the beverage (240 mL), and the weight of powder mix (34 g) that the concentration of corn protein would be (240/34)*(5g/100g) or approximately 35.3 g/100g powder.

   Response:

   Cargill confirms that the concentration of corn protein in non-reconstituted powdered drinks is approximately 35.3 g/100 g powder.

3. In your response to question 3, you cite two different GRAS notices that refer to the alpha-amylase enzyme. However, these notices describe two different sources of alpha-amylase enzyme. Please clarify which of these notices describes the enzyme used in the manufacture of corn protein and confirm that the enzyme preparation does not contain a major allergen.
   Response:

   The alpha-amylase enzyme used as a processing aid in the production of Cargill's corn protein is a blended alpha-amylase enzyme preparation produced by submerged fermentation of strains of *Bacillus licheniformis*, which have been the subject of GRN 000079 and GRN 000024. This enzyme preparation does not contain a major allergen.

4. In response to question 15d, you state that "Corn protein is proposed for use in all types of flatbread and pizza crust, and in gluten-free biscuits, breads, English muffins, and muffins." However, we note that the dietary exposure estimate includes gluten-free versions of these foods. Inclusion of these foods may result in higher estimates of dietary exposure to corn protein for older infants and young children consuming table food. Please clarify if the intended uses include all muffins, English muffins, and biscuits or only gluten-free versions of these foods.

   Response:

   Indeed, the dietary intake assessment for GRN 001069 included all types of muffins, English muffins, and biscuits, not just gluten-free versions. This was done because there are no NHANES food codes (with the exception of gluten-free breads/rolls, pancakes, and waffles) that indicate the gluten-free variety of these proposed uses. The non-gluten free varieties were included to provide a surrogate use for the gluten-free variety and capture that consumption pattern. However, as the non-gluten free versions have already been captured in GRN 001069, Cargill revises the intended use of corn protein in bakery products to: "Bakery products including flatbread, pizza crust, biscuits, English muffins, muffins, gluten-free bread/rolls, gluten-free pancakes, and gluten-free waffles."

Responses to USDA FSIS Questions on Cargill's Corn Protein GRAS Notice (GRN 001069)
August 11, 2023

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1. The narrative states soy formulation is the control and two different formulations (corn and soy [presumably batch 1?], and corn only [presumably batch 2?] are the tested formulations, but Fig 1 appears to show a meat protein only control as compared to soy, pea, corn/soy, and corn. It is not clear why the graph for sausages (Fig 1) showed data for pea protein, but the narrative did not mention pea protein.

   a. Please provide formulation for the pork/turkey control without any binders.

   Response:

   The formulations for the meat protein-only control and pea protein-containing sausages were inadvertently left out of Table 1 in Exhibit III of GRN 001069. The narrative should have stated that there were five treatment formulations for the sausage links as shown in the corrected version of Table 1 as follows:

Table 1. Sausage Link Formulation

Ingredients	Control	Soy Protein	Pea Protein	Corn/Soy Protein (Batch 1)	Corn Protein (Batch 2)
Boston Butts-1/4"grind	44.25%	42.50%	42.50%	42.50%	42.50%
Mechanically Separated Turkey-18% fat	44.25%	42.50%	42.50%	42.50%	42.50%
Soy Protein Concentrate	0.0%	3.50%	3.50%	1.50%	0.0%
Corn Protein	0.0%	0.0%	0.0%	2.00%	3.50%
Salt	1.50%	1.50%	1.50%	1.50%	1.50%
Water	10.00%	10.00%	10.00%	10.00%	10.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

2. There is only suitability for corn protein at levels up to 3.5% in the mixed red meat and poultry sausage. Is there any data or support available for use levels up to 7%?

   Response:

   Cargill does not currently have suitability data for corn protein at use levels up to 7% in meat and poultry products. It is anticipated that corn protein formulation in comminuted products will occur only if the appropriate quality and sensory parameters are satisfied at levels higher than 3.5% to 7%.

3. Is this intended for use in whole muscle products or only comminuted products? Suitability data was only provided for comminuted products. If this product is going to be considered for use in whole muscle products, additional data should be provided on whole muscle poultry and whole muscle red meat and binder type product, preferably comparing a control with no binders to test product with different levels of corn protein (recommend 2%, 7%). It would be preferable to have no other binders present so all effects can be attributed to the corn protein.

Response:

Corn protein is intended for use only in comminuted meat and poultry products.

4. Would this product be used in FSIS regulated products as part of a batter/breading/coating mixes for frying at levels up to 2%? No suitability data was provided for this use.

   Response:

   Corn protein is proposed for use in batter, breading, or coating mixes for FSIS-regulated products at levels up to 2%. Please find attached suitability data provided in *Exhibit IV. Suitability Data for Corn Protein Use in Batter, Breading, or Coating for Fried Product*s.

5. What percentage of the corn protein is an oil-based carrier? Are specification sheets available?

   In the GRAS notice it says: "The resulting powder, which consists of at least 88% solids, may be milled, physically processed or sprayed with food grade oil, lecithin or other safe and suitable processing aid prior to bulk packaging." The next page also has a reference to the food grade oil as a processing aid in the manufacturing flow chart.

   We are looking for an amount for the oil to confirm the levels are consistent with what FSIS typically sees for flow/carrier/anti-dusting agents. This information is usually captured on a specification sheet. If the amount of oil is excessive it may require sub-listing.

   Response:

   As an optional downstream processing step, it is anticipated that corn protein may be sprayed with less than 2% food grade oil as anti-dusting agent. Currently, product specifications for corn protein do not include limits for processing aids, including anti-dusting agents. However, it is important that only the least amount of oil is used to reduce dustiness so as not to affect the quality and safety of corn protein. Maintaining the low water activity and low fat/oil content of corn protein is critical in limiting the possibility of microbial growth and contamination of the product.

Exhibit IV. Suitability Data for Corn Protein Use in Batter, Breading, or Coating for Fried Products

Use of Corn Protein in Batter, Breading, or Coating for Fried Products

Objectives

The objective of this study is to investigate the potential effect of corn protein on oil absorption in a deep-fried chicken tender batter and understand its effect on appearance, flavor, and texture.

Materials and Methods

BatterCrisp 90240 Modified Starch, Cargill Gel 30002 Native Potato Starch, Salt, and Guar Gum were sourced from Cargill. Corn Protein (CP) (87% protein) was produced by Cargill in Baupte, France. Bob's Red Mill Tapioca Flour, Bob's Red Mill Corn Flour, and Erawan Thai rice flour were obtained from Cub Foods grocery store in Plymouth, MN. Just Bare Chicken Tenderloins Boneless, Skinless and Progesso plain breadcrumbs were also obtained from Cub Foods. AB Mauri Sodium Bicarbonate was sourced from BakeMark in Shakopee, MN. The CP was evaluated in the gluten-free batter on chicken tenders shown in the formulations on Table 1. The Control formulation did not contain CP. The Test 1 formulation contained 4% CP and 4% corn flour. In the Test 2 formulation, CP was completely substituted in the batter formulation for corn flour at 8%.

Table 1. Dry Gluten-Free Batter Formulation

Ingredient Description	Control	Test 1	Test 2
Modified Corn Starch	25.00%	25.00%	25.00%
Tapioca Flour	21.00%	21.00%	21.00%
Rice Flour	27.50%	27.50%	27.50%
Potato Starch	10.00%	10.00%	10.00%
Corn Flour	8.00%	4.00%	-
Corn Protein	-	4.00%	8.00%
Salt	6.00%	6.00%	6.00%
Guar Gum	1.50%	1.50%	1.50%
Sodium Bicarbonate	1.00%	1.00%	1.00%
Total	100.00%	100.00%	100.00%

Process

The benchtop deep fryer was filled with soybean oil and preheated to 375°F. The chicken tenderloins were brought to room temperature for frying. All batter ingredients were mixed in a 5qt Hobart mixer with a spiral attachment at low speed for 5 minutes to create a dry batter mix. The wet batter was created by mixing 40% dry batter with 60% water in a 5qt Hobart mixer with a spiral attachment for 4 minutes at speed 2. Chicken tenders were pre-dusted with tapioca flour, dipped in the wet batter and coated in plain breadcrumbs. The coated chicken tenders were then

fried for 5 minutes, or until reaching an internal temperature of 170°F. the largest chicken tender in every batch was probed with a thermocouple to ensure all the chicken tenders were fully cooked. The fully cooked chicken tenders were immediately blast frozen.

Evaluations

For each individual treatment, the product yield was calculated by dividing the weight of the battered raw chicken tender by the cooked weight of the chicken tender (Battered Raw Weight/ Battered Cooked weight) x 100). The batter pickup was calculated by subtracting the non-battered raw chicken tender weight from the battered raw weight then divided by the battered raw weight (Batter Raw Weight-Nonbattered Raw weight)/ Battered Raw Chicken Tender Weight x 100. The consistency of the wet batter was measured using a Bostwick consistometer. The Bostwick reservoir was filled with the wet batter at ~ 40ºF and leveled off. The gate was then opened, and product was allowed to flow for 30 seconds. Fat analysis by gas chromatography was conducted at Medallion Laboratories in Minneapolis, MN with the official AOAC 996.06 method. Sensory was conducted to capture observations on appearance, flavor, and texture.

Results and Discussion

Yield of the deep-fried chicken tenders are shown in Figure 1. The average yield of the control products was the highest overall. However, the yield difference between the Control and Test 1 treatment was only 0.86%, while the yield difference between the Control and the Test 2 treatment was 2.51%. The Batter Pickup results are shown in Figure 2. The Control and Test 1 treatment were comparable with an average batter pickup of 40.11% and 40.97% respectively, while the Test 2 treatment was significantly lower at 37.55%.

The Bostwick consistency measurements are shown in Figure 3. The Control was more viscous flowing to 10 cm, while the Test 1 and 2 treatments flowed to 12 cm. Figure 4 displays the fat analysis results. The Control had the most total fat overall with 9.45%. The Test 1 treatment contained the least amount of total fat overall at 7.48%. Contents of saturated fat for all variables were similar. There was more variability between the samples in the monounsaturated and polyunsaturated contents of the chicken tenders.

The photos in Figure 5 show both treatments, Test 1 and 2, having a similar coating as the control with the golden-brown appearance. However, there were some light, uncoated spots on the test variables, not seen on the control chicken tenders. The coating on the Control and Test 1 treatment did not separate from the chicken substrate when broken by the hand, while the Test 2 coating was slightly less adhesive. The flavor and texture of all tenders was similar (Figure 6). There was a mild corn note in the coating of the Test 2 chicken tenders.

Figure 1. Yield of Deep-Fried Chicken Tenders

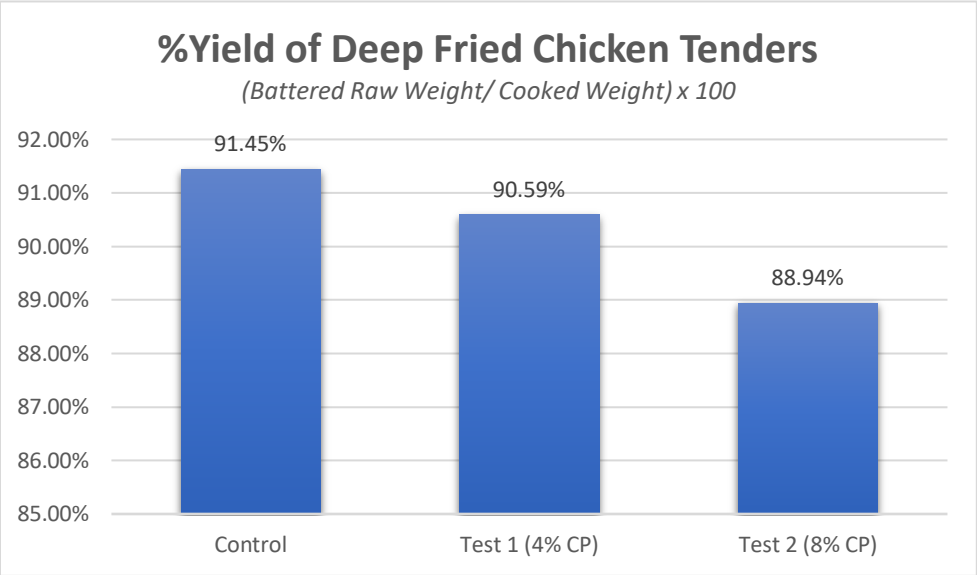

Figure 2. Batter Pickup of Chicken Tenders

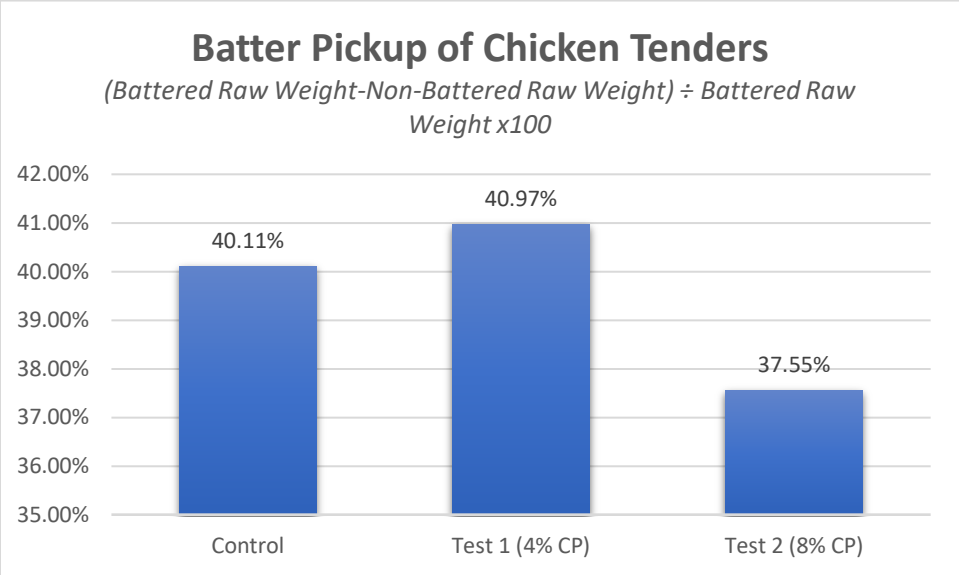

Figure 3. Consistency of Wet Batter

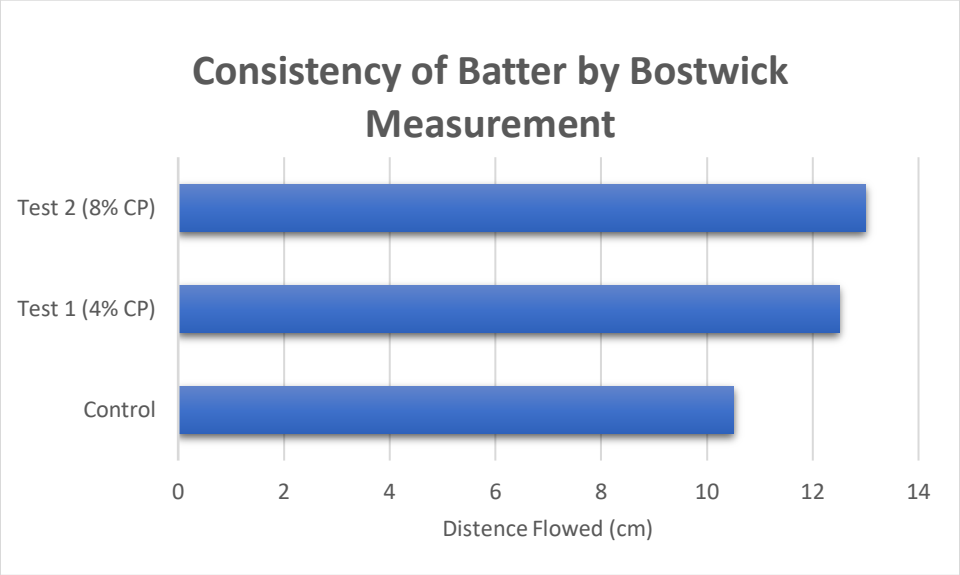

Figure 4. Fat Analysis by Gas Chromatography

	Control	Test 1 (4% CP)	Test 2 (8% CP)
Total Fat	9.45%	7.48%	8.70%
Saturated Fat	1.46%	1.16%	1.34%
Monounsaturated Fat	2.04%	1.62%	1.90%
Polyunsaturated Fat	5.52%	4.37%	5.06%

Figure 5. Photos: Fully Cooked Chicken Tenders (A. Control, B. Test 1, C. Test 2), Adhesion (D. Control, E. Test 1, F. Test 2), and Coating (G. Control, H. Test 1, K. Test 2).

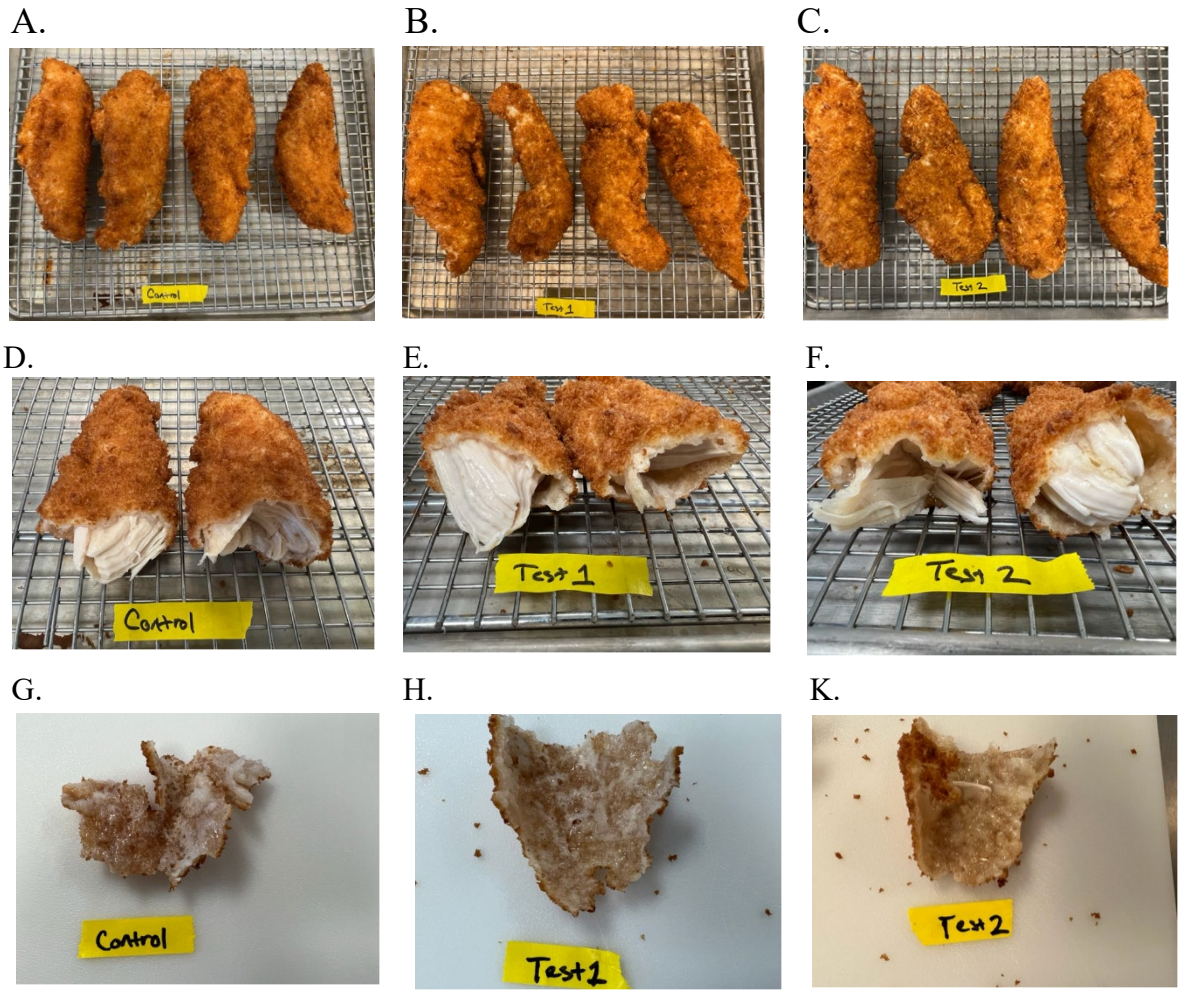

Figure 6. Sensory Attributes

	Control	**Test 1**	**Test 2**
Appearance	Golden Brown, Fully Coated, Good adhesion of coating	Golden brown, Light and uncoated spots, Good adhesion of coating	Golden brown, Light and uncoated spots, coating somewhat not adhesive
Flavor	Oily, Chicken Flavor	Oily, Chicken Flavor	Oily, Chicken flavor, mild corn flavor
Texture	Succulent, Crispy Coating, Tender	Succulent, Crispy Coating, Tender	Succulent, Crispy Coating, Tender

Conclusions

In this study, corn protein (CP) did not have a significant effect on oil absorption when added to a gluten-free batter system. However, CP showed potential for controlling or lowering fat content in a battered and fried product. Further, results between the Control and Test 1 treatments were similar in yield, batter pickup, and organoleptic properties. The Test 2 treatment did not display comparable functionality as that of the Control. While CP did not improve oil absorption, overall, it showed suitability for use in batter, breading, or coating used for fried products at up to 4%.

From: Witty Brathwaite
To: DiFranco, Stephen
Subject: [EXTERNAL] RE: GRN 1069 Levels used in meat products
Date: Wednesday, October 18, 2023 12:38:03 PM
Attachments: image001.png

Hello Steve,

Yes, we would concur with revising our proposed use-level of corn protein in meat and poultry products to a limit of 3.5%.

Kind regards,
Witty

From: DiFranco, Stephen <Stephen.DiFranco@fda.hhs.gov>
Sent: Wednesday, October 18, 2023 12:32 PM
To: Witty Brathwaite <Witty_Brathwaite@cargill.com>
Subject: GRN 1069 Levels used in meat products

Hello Witty,

In reviewing the use of corn protein in meat products USDA-FSIS indicated that the suitability data only supports use up to 3.5%, however Table 7 of the original notice indicates an intent to use corn protein in processed meats up to a maximum level of 7%. In your August 11, 2023 responses to our questions, you also indicated that you presently do not have suitability data for use in meats at levels above 3.5%.

As such we would like your concurrence on our intend to move forward and issue a response letter specifying a maximum use of 3.5% in these products.

Happy to discuss if needed.

Best,
Steve

Stephen DiFranco, PhD
Regulatory Review Scientist/Chemist

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Office of Food Additive Safety
Division of Food Ingredients
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