AI-Assisted Tool to Improve the Quality and Assessment of PLGA Formulations

Jayanti Das[1], Md Easin Hasan[1], William Smith[1], John Garner[2], Bin Qin[3], Yan Wang[3], Kinam Park[2,4], Geng Tian[1], Xiaoming Xu[1]

[1]Division of Product Quality Research, Office of Testing and Research, OPQ, CDER, USA, FDA, [2]Akina, Inc., West Lafayette, IN 47906, USA, [3]Division of Therapeutic Performance I, Office of Research and Standards, OGD, CDER, U.S. FDA, [4]Purdue University, Biomedical Engineering and Pharmaceutics, West Lafayette, IN 47907, USA

SUMMARY

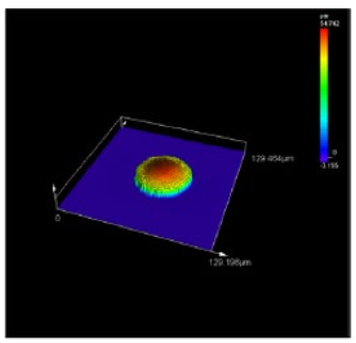
❖ The AI-based method provides high-throughput analysis of PLGA (poly (lactic-co-glycolic acid))-based long-acting injectable (LAI) formulations to establish a correlation between material attributes, processing conditions, and product quality/performance.

❖ This AI method may serve as a tool in the future to evaluate the sameness of proposed generic products to reference listed drugs (RLD) by analyzing feature similarity across different formulations.

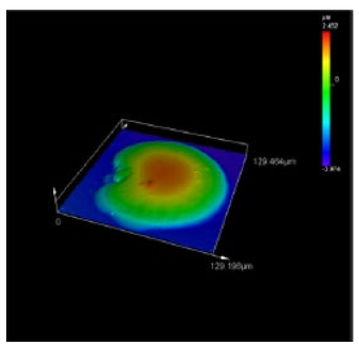
METHODS

❖ The study has compiled a comprehensive dataset of PLGA formulations from a previous FDA-funded research project [1].

❖ The dataset includes different formulation details, corresponding manufacturing data, detailed surface topographical characterization data due to solvent changes, and *in vitro* release testing data [1].



Formulation



After exposure to semi-solvent liquid to Formulation

QR Code of Previous Work

Fig 1: Microparticles of formulations in the dry state and after exposure to a semi-solvent liquid at 0°C for 1 min and details of previous work in the QR code [1]

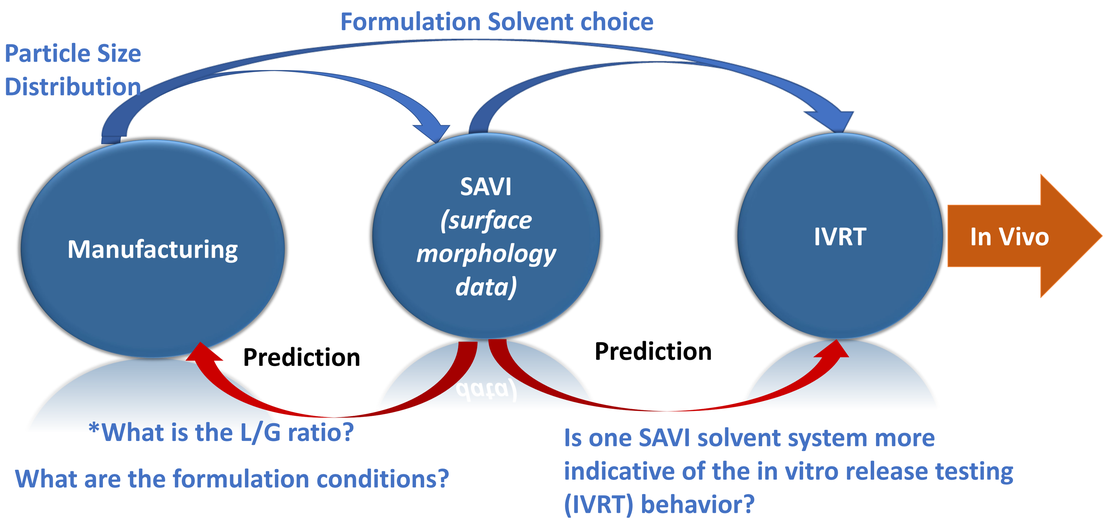


Fig 2: Functional flow of the work

RESULTS

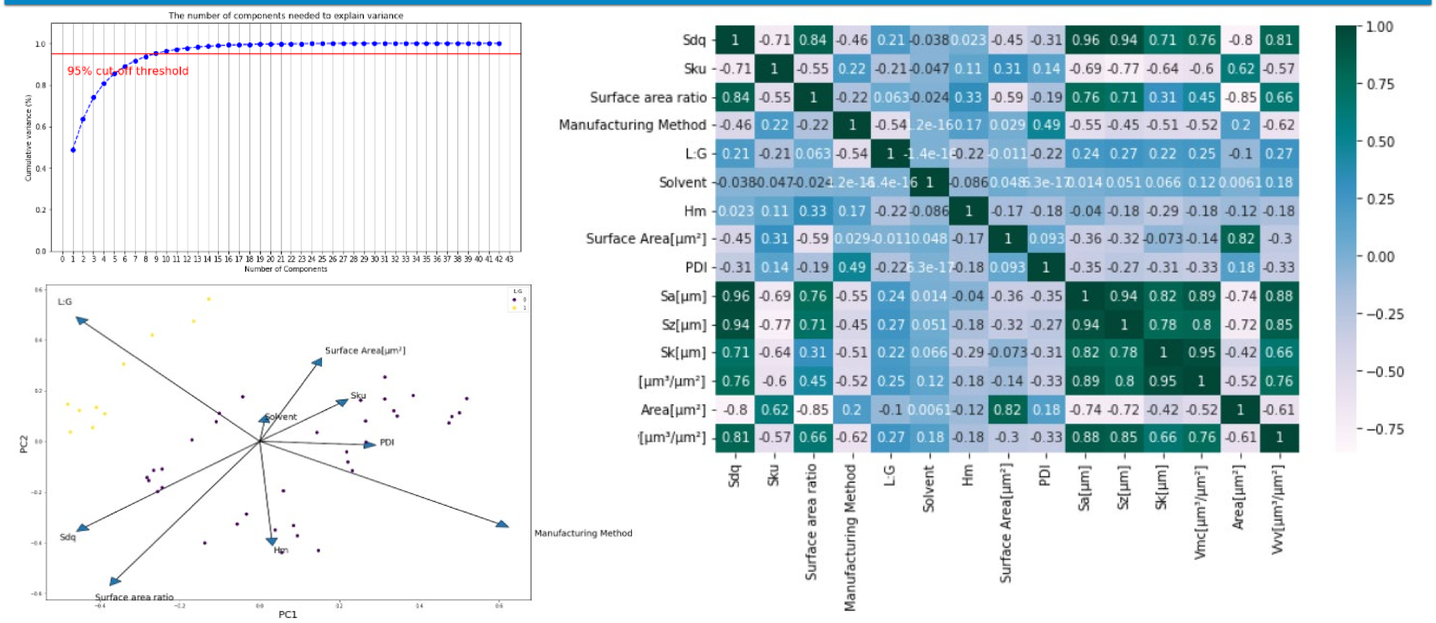


Fig 3: Principal component analysis (PCA) on the left and correlation matrix study on the right to find significant parameters

(A) Prediction of Formulation Conditions

Machine Learning Techniques	MSE	MAE	Accuracy (%)
Linear Regression	0.001	0.02	99.5002
Decision Tree	0	0	100
Random Forest	0.3439	0.4	90
Extra Trees Regressor	0.0042	0.0289	99.2778

(B) Prediction of L:G Ratios from PLGA Formulations

Table 1: Different machine learning (ML) algorithms were applied (A) to predict the formulation conditions and (B) to predict L:G ratios

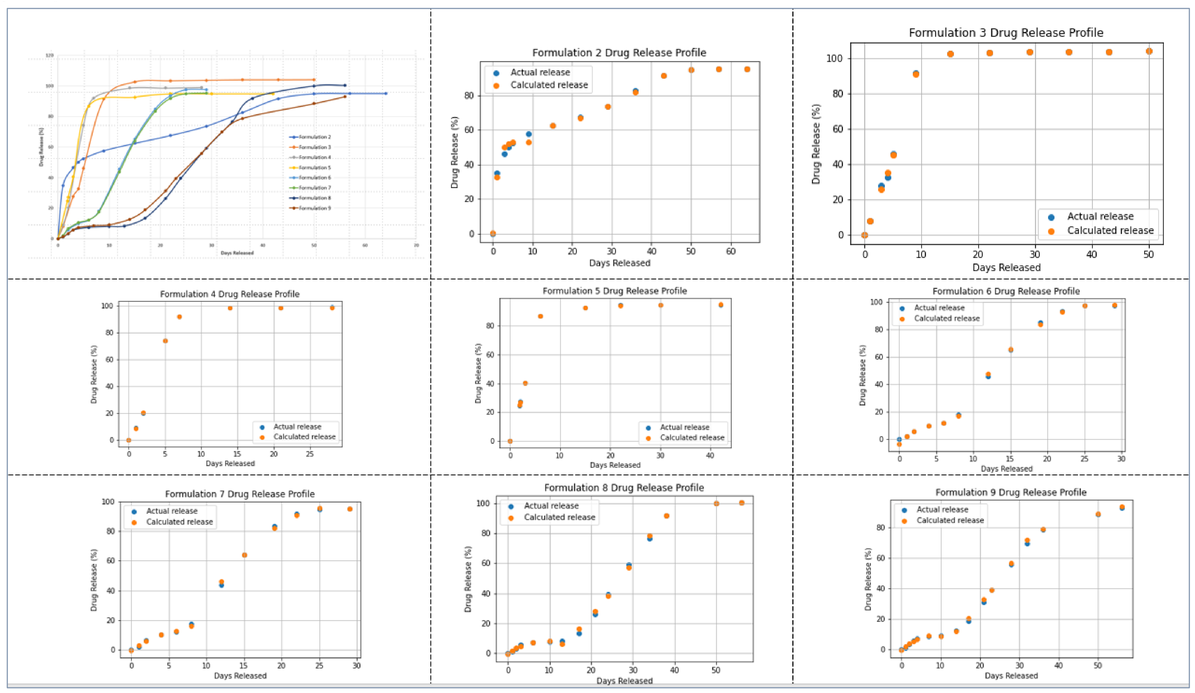


Fig 4: Prediction of IVRT profiles and compared with experimental release profiles

REFERENCE

1. Surface analysis of sequential semi-solvent vapor impact (SAVI) for studying microstructural arrangements of poly (lactide-co-glycolide) microparticles; John Garner, Sarah Skidmore, Justin Hadar, Haesum Park, Kinam Park, Bin Qin, Yan Wang; Journal of Controlled Release, 2022, 350, 600-612

ACKNOWLEDGEMENT

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DISCLAIMER

The views expressed in this work reflect the views of authors and do not reflect the official policies of the U.S. Food and Drug Administration or the U.S. Department of Health and Human Services.