**The Summer Undergraduate Research Fellowship (SURF) Symposium**
**3 August 2017**
**Purdue University, West Lafayette, Indiana, USA**

# Capsule-Based Dropwise Additive Manufacturing with Pharmaceutical Suspensions

Kaitlyn N. Buck, Andrew J. Radcliffe, and Gintaras V. Reklaitis
Davidson School of Chemical Engineering, Purdue University

## ABSTRACT

Current manufacturing of pharmaceutical products focuses on creating a standard dosage of the active pharmaceutical ingredient (API); however, dosages often need to be altered or customized to account for a patient's age, weight, comorbidity, and other genetic factors. A potential method for dispensing precise dosages of API suspensions through dropwise addition is detailed in the following paper. By using a drop-on-demand printing rig, a series of suspensions comprised of varying volume fractions of a micron-scale API in a carrier fluid were printed, and individual drop volumes were analyzed using high-resolution imaging. From this, capsules with 1 mg dosages and 100 mg dosages were manufactured. Completed trials yielded respective means of 1.043 mg and 99.946 mg of API being deposited across varying suspension compositions. The relative standard deviations of the 1 mg capsules averaged to be 1.51% and 0.30% for the 100 mg capsules. Further combinations of APIs and carrier fluids are continuing to be tested. The relative standard deviations of both dosage sizes are well under the 6% maximum variability imposed by the US Food and Drug Administration to regulate dosages of API, which provides evidence for the feasibility of printing pharmaceutical suspensions to create customized dosages for patient consumption.

## KEYWORDS

Drop-on-demand printing, suspensions, dosages, pharmaceutical manufacturing, dropwise addition

Mentor Feedback:

After showing the first draft to my grad mentor, he said that the major points were covered well. The problem statement and anticipated results were written in a way consistent with how he structures his own abstracts. The only potential changes that need to be made are in the reporting of the conclusion, as based on our future experimentation, the aspects of the feasibility of printing suspenions may need to be elaborated slightly.