

The Summer Undergraduate Research Fellowship (SURF) Symposium

2 August 2018

Purdue University, West Lafayette, Indiana, USA

# High-Throughput Nanoliter Dispensing Device for Biological Applications

Cole B. Reynolds, Euiwon Bae, and J Paul Robinson  
School of Biomedical Engineering, Purdue University

## ABSTRACT

Pathogen identification is a field that can contribute largely to the prevention of the spreading of illness and disease. In the past, pathogen identification has been a long and arduous process due to the time-consuming processes and steps that requires technician's time and effort. With new technologies emerging however, screening of bacteria colonies can be done in a quick and high-throughput way. The problem is that using the current methods, bacteria cannot be transferred to petri dishes fast enough to keep up with the new screening methods. The current study focuses on exploring different methods to create an ergonomic device that can dispense and inoculate bacteria cells onto petri dishes in a fast, repeatable, and high-throughput manner. The testing of bacteria in liquid allows for the most versatility because bacteria already suspended in liquid could be tested or bacteria could be suspended in liquid from a solid if needed. Different methods of dispensing liquid were tested such as solenoid valves, and different methods of dispenser movements in the X-Y plane around the surface of the petri dishes were tested such as a five-bar mechanism controlled by two rotary motors. It was found that a small solenoid valve in combination with either a five-bar mechanism with two motors or a simple XY stage were both ergonomic and able to provide high-throughput dispensing of bacteria colonies. Based on the devices performance, it can dispense 86 microliter droplets with 8 millimeters of spacing in 69 seconds (1.25 drops per second).

## KEYWORDS

dispensing, small-volume, bacteria identification, high-throughput, solenoid valves, and five-bar mechanism