Separation and Preconcentration Of Viable Pathogens By Chemotaxis

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Abstract

This work begins with chemotaxis studies involving *Salmonella typhimurium*. Known chemical attractants such as ribose, serine, and aspartic acid were tested, as well as chemical repellents, such as nickel and sodium acetate. The experimental setup involved capillary tubes containing the attractant or repellent to be tested, submerged approximately half an inch in a specific concentration of bacteria for a certain amount of time. Based on the concentration of bacteria within the capillary tube by the end of the experiment, the efficiency of the attractant or repellent could be determined. It was found that high concentrations of both attractant and repellent, approximately 10% chemical in deionized (DI) water, yielded better separation results than lower concentrations, such as 1% and .1% chemical in DI water. Separation of bacteria can be useful when it is necessary to determine dead bacteria from live bacteria. Utilizing these attractants or repellents appropriately can allow live bacteria to be directed in a desired manner in a microfluidic device, while dead bacteria, which yield no response, can be separated into a waste reservoir.

We have also investigated microfluidic device for the study of bacterial chemotaxis. The device uses widely available nitrocellulose membranes (Milipore Inc.) as the permeable layer for generation of a chemical gradient. Low cost fabrication methods, combined with significant flexibility in the design of channels / chambers, provide a useful platform for laboratory experiments. The device could potentially be utilized for separation of bacteria during the detection and evaluation of pathogen viability.

The microfluidic device consists of a main channel into which the bacteria sample was loaded. Response of *E. coli* to a range of chemo-attractant/chemo-repellent gradients was observed.

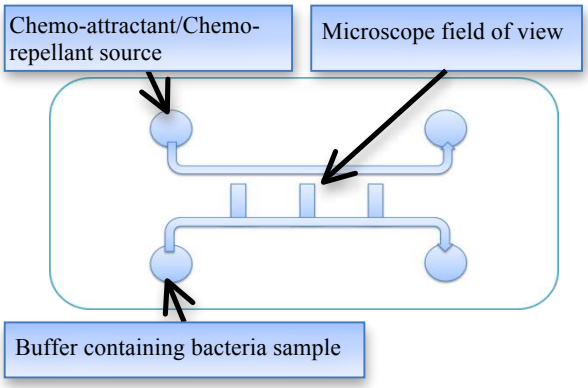

Figure 1 Schematic of the chemotaxis device, the channels are 120 um thick and 800 um wide, center chambers are about 3 mm in length.