NANO-CONSTRICTION DEVICES FOR ISOLATION AND CULTIVATION OF ENVIRONMENTAL MICROBES

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Bacterial cells are the most diverse group in nature. It has been estimated that there are 10^5 to 10^6 different bacterial species and only a few thousand of them have been isolated in pure cultures. Thus, isolation of a bacterial species from an environmental sample is a challenging procedure. Conventional methods have been used to isolate and culture bacteria by changing the composition and concentration of essential nutrients in the growth medium. However, these methods are manual processes and do not provide pure cultures. We are making micro/nanofluidic devices using microfabrication technology that will isolate and culture bacteria automatically. In our devices, food channels are connected to a main channel, which is open to the environment, via nano-constrictions. Growth medium is loaded into all of the channels. Bacteria are then inoculated at the inlet of the main channel. The size of nano-constriction is important to manipulate bacterial movement. The constriction geometry can be controlled using microfabrication techniques. In this project, we want to obtain a size that that can trap the bacteria at the inlet of the nano-constriction, preventing its swimming into the food channel. Trapped bacteria will only reach the food channel by dividing. So, only one species can enter one food channel, becoming isolated from other species. This method is very important and practical because it is an autonomous process and can be easily applied. It can be used in isolating and obtaining pure cultures from environmental samples, and in water purification processes. Additionally, in medicine, it can be used to detect bacteria in blood samples and in implants to detect contamination.