Fabrication of the Bacterial Attachment System of the Medical Microrobot with Enhanced Motility and Stability

An, Jun Young

Lee, Seongwoo

Yoo, Dain

The microrobot system has emerged as a powerful drug delivery system in the medical field. If microrobots can move automatically to affected area, we can load drugs on the microrobots and expect them to release drugs at affected area efficiently. To make microrobots move, the method of using bacterial chemotaxis as a power source instead of electromagnetic motor is being studied. The efficiency of bacteria-based microrobot depends on how bacteria are attached to the selective surface of microrobot's body. Conventional method utilizes chemicals (such as BSA and EDTA) only to hinder attachment on the specific surface of the microrobot. However, this method is expensive, limits spectrum for drugs and harmful to the human body. In this study, we have designed, fabricated and evaluated a new system for effective attachment of bacteria on the microrobot's body. To attach bacteria by using fluid flow, we fabricated the microfluidic channel, which was made of PDMS by photolithography process. In addition, we created filter structures inside it to achieve selective attachment of bacteria. This microfluidic channel was powered by syringe pumps assembled with Lego Mindstorm NXT and programmed to control the flux. And to enhance adhesion, we used chitosan-coated bead as a robot's body. As a result of evaluating our system and the control groups, the bacterial density on the bead increased by 43%, the speed of bacteriobot increased by 33% compared to the previous method while the decreasing rate reduced by 50%. The results indicate that our bacteria attachment system makes the microrobots faster and more stable, which would improve the efficiency of microrobot delivering drugs through the blood flow.