İskelet Kası Dokusu ile Harekete Geçen Mikro Anahtar

Boğaziçi Üniversitesi Bilimsel Araştırma Projeleri

Özet

Employing living cells is emerging as a novel means to operate microdevices. We have previously demonstrated that engineered bacteria can be used to reconfigure antennas. The project proposed here aims to expand on this work by employing a novel cell type and mechanism to actuate a miniature switch.

The new biohybrid switch will be composed of (1) a 3D-printed microwell studded with two pillars and a beam, (2) a conductive coating covering the top surface of the beam and microwell, and (3) 3D muscle tissue grown from precursor cell-laden hydrogel. Muscle tissue will both sense the chemical within the medium and operate the switch via its contractile response. Stimulant (acetylcholine)-induced muscle contraction will deflect the compliant pillars and beam, and break the closed circuit formed by the conductive coating. Thus, the proposed biohybrid device will enable the control of a switch in response to a chemical owing to the biosensing and actuating capabilities of muscle tissue.

In future studies, we plan to improve the microswitch by integrating (1) genetically engineered muscle cells that respond to non-native agonists such as biomarkers for disease states or infection and (2) an antenna reconfigurable with the contractile response of muscle tissue. We envision these advances will ultimately lead to implantable biohybrid devices that monitor potential infections and inflammation in the human body and report to wearable devices.