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How can microsystems improve our health?

Abstract

Microsystem technology has revolutionized many industrial areas, such as automobile, lightning and display, or motion control, among others, using miniaturized and highly efficient sensors and actuators. Their ability to manipulate minute amount of fluids and to build complete chemical and biological reactors and labs on a single chip is now revolutionizing the way we look at our health. In this talk, some of the developments in this field will be presented.

Early diagnosing of some diseases is key for a better prognosis. One of the most widely used techniques for tumor diagnosis is imaging by positron-emission tomography (PET). The production of the injectable drug used in PET is currently done in a way that is inefficient in terms of wasted reagents and in terms of patient convenience. Recent advances in lab-on-chips promise ways to improve the situation, moving the production closer to the final user and in a more efficient manner.

A second development that will help in health treatments is that of organs-on-chip, where real cells and tissues can be grown inside a chip, and then be used to test personalized drugs and to better understand their effects. One particular type, brains-on-chip, aims to cultivate neurons and their synapses inside of a chip, and to be able to extract useful information from them. The possibility of estimulating the cells in a controlled way will open the door to better machine-brain interfaces where artificially-simulated neurons can replace damaged biological ones.