Microfluidic Device Mimics Tumor Microenvironment, Helps Drug Discovery Efforts

February 23 2009

One of the challenges that cancer researchers face in designing new antitumor agents is that of predicting how drug molecules will behave in the complex microenvironment that surrounds a tumor. In particular, tumors create all sorts of chemical and physical barriers that limit how much drug is able to enter a tumor, let alone reach cells deep within a tumor. Now, Neil Forbes, Ph.D., and his colleagues at the University of Massachusetts have built a microfluidic device that can mimic these chemical and physical barriers, providing researchers with a new screening tool that may help with the design of more effective anticancer drugs.

Dr. Forbes and his colleagues, who reported their findings in the journal *Lab on a Chip*, designed this device to reproduce the three-dimensionality of a tumor, including areas of low pH and regions that contain cells resistant to therapy. To create this device, the investigators tested seven different cell growth chamber designs, using various imaging technologies to determine how closely cell masses growing in the device mimicked the behavior of a tumor. From these experiments, the investigators were able to select a growth chamber design that caused cells to grow into tumor masses that displayed heterogeneity closely resembling that of native tumors.

The investigators then used the device to study how doxorubicin, a widely used and widely studied anticancer drug, diffuses into and through a tumor. The device accurately modeled doxorubicin diffusion as seen in humans treated with this drug. The device also was able to recreate the accumulation patterns of anticancer bacteria that actively penetrate a tumor.

This work was detailed in the paper “A multipurpose microfluidic device designed to mimic microenvironment gradients and develop targeted cancer therapeutics.” An abstract of this paper is available at the journal’s Web site.

Provided by National Cancer Institute