Webcam technology used to measure medications' effects on the heart

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A common component in webcams may help drug makers and prescribers address a common side-effect of drugs called cardiotoxicity, an unhealthy change in the way the heart beats. Researchers at Brigham and Women's Hospital (BWH) have used the basic webcam technology to create a tool to look at the effects of medications in real time on heart cells, called cardiomyocytes. These findings were published in the journal, *Lab on a Chip* on April 11, 2011.

Researchers developed a cost-effective, portable cell-based biosensor for real time cardiotoxicity detection using an image sensor from a webcam. They took cardiomyocytes, derived from mouse stem cells, and introduced the cells to different drugs. Using the biosensor, the researchers were able to monitor the beating rate of the cardiomyocytes in real time and detect any drug-induced changes in the beating rates.

The technology provides a simple approach to perform evaluative studies of different drugs effects on cardiac cells. Cardiotoxicity is a significant problem in drug development, with more than 30 percent of drugs withdrawn from the market between 1996 to 2006 related to cardiac dysfunction. "Assessing the toxic effects of new drugs during the early phases of drug development can accelerate the drug discovery process, resulting in significant cost and time savings, and leading to faster treatment discovery," said Ali Khademhosseini, PhD, of the Center for Biomedical Engineering at the Department of Medicine at BWH.

"This technology could also play a role in personalized medicine," said

Sang Bok Kim, PhD, a Research Fellow in the Renal Division at BWH. "By first extracting somatic cells from patients which can be reprogrammed to stem cells called induced pluripotent stem (iPS) cells. Then these iPS cells can be differentiated into cardiac cells to be studied, the biosensor can monitor the cardiac cells as they're introduced to a medication, providing a glimpse at how the drugs may affect the individual's heart, and thus shaping the treatment plan for that person."

Monitoring cardiac cells in the past required using expensive equipment that had a limited measurement area. This low cost (less than $10) biosensor is compatible with conventional equipment but will enable reliable, yet faster and more cost-effective studies.

"Our next goal is to combine our detection sensor with our microwell arrays and perform screening studies of thousands of drugs to cardiac cells simultaneously in a fast and reliable manner," said Dr. Khademhosseini.

Provided by Brigham and Women's Hospital

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