

Nanosensor systems. e-bra, e-band and wireless electronics for monitoring and control of cardiovascular diseases and neurological disorders

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Nanotechnology has been broadly defined as the one for not only the creation of functional materials and devices as well as systems through control of matter at the scale of 1-100 nm, but also the exploitation of novel properties and phenomena at the same scale. Growing needs in the point-of-care (POC) that is an increasing market for improving patient's quality of life, are driving the development of nanotechnologies for diagnosis and treatment of various life threatening diseases. This paper talk will address the recent development of nanodiagnostic sensors and nanotherapeutic devices with functionalized nanosensors on a flexible polymer based thin film electronics to monitor and control of two leading diseases namely 1) neurodegenerative diseases, 2) cardiovascular diseases. The sensors developed include implantable and biocompatible devices, light weight wearable devices in wrist-watches, hats, shoes and clothes. Many of these sensors are integrated with the wireless systems for the remote physiological monitoring. The author's research team has also developed a wireless neural probe using nanowires, nanotubes and magnetic nanotubes for monitoring and control of Parkinson's and Alzheimer's diseases. They have demonstrated that magnetic nanotubes combined with nerve growth factor enable specific cells to differentiate into neurons. The results from in vitro studies show that magnetic nanotubes may be exploited to treat neurodegenerative disorders such as Parkinson's disease and Alzheimer's disease because they can be used as a delivery vehicle for nerve growth factor. Light weight and compact EEG, EOG and EMG textile based monitoring system is capable of monitoring real time epileptic patients and patients with neurological and movement disorders using the Internet and cellular network. Physicians could be able to monitor these signals in real-time using portable computers, Wi-Fi, GSM or cell phones and will give early warning signal if these signals cross a pre-determined threshold level.

Selected movies illustrating the applications of nanodevices and systems to patients will be shown at the talk.