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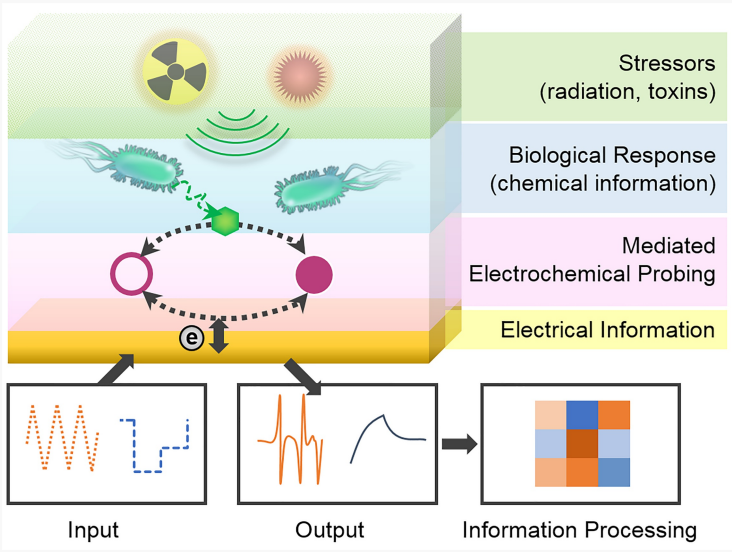
IBBR Researchers Awarded $1M from DTRA to Develop Portable Medical Sensors

Redox information may hold key to rapidly diagnosing disease

(Rockville, MD, July 15, 2019) Researchers at the Institute for Bioscience and Biotechnology Research (IBBR) recently received $1M from the Defense Threat Reduction Agency (DTRA, part of the US Department of Defense) to advance their work developing wearable sensors that measure biochemical information to diagnose disease. IBBR Fellow Dr. Gregory Payne (Research Professor, IBBR) is principal investigator on the award.



Model for redox-based bio-electronic communication in a portable device

Accessing and analyzing chemical information is the basis of much biological research and biomedical diagnostic testing. A conventional approach involves studying a biological system, identifying an important chemical, and then developing a way to measure it.

Payne and his colleagues are turning this approach upside down. They propose to start with measurements that can be made quickly on a deployable device. From among those types of measurements, they suggest determining which datasets give valuable information that can be used for basic research and diagnostic development.

Reduction-oxidation (redox) reactions involve the transfer of electrons from one molecule to another. Chemical redox reactions are used by cells for a wide range of biological functions. And, since electronic devices are also based on the movement of electrons, “communication” between biology and a device is possible.

“We believe that redox state is an example of an easily measured modality with the potential to give us access to systems-level biological information,” Payne explains. “The ultimate goal is to be able to determine a person’s health status from a simple and rapid redox measurement, whether they are in a physician’s office, at home, or on the battlefield.”

The research team plans to collect redox measurements from a variety of biological systems and look for patterns that reveal stable and perturbed states. They will also continue to develop sensors that directly connect biology to electronic circuits. Both of these objectives will be informed by exploration of cellular mechanisms of redox detection and response.

The project is an ongoing collaboration between Payne and IBBR Fellow Dr. William Bentley (Professor, Fischell Department of Bioengineering, University of Maryland, College Park; Director, Robert E. Fischell Institute for Biomedical Devices), and researchers at the Naval and Army Research Laboratories.

“Developing biosensors to address medical challenges is an important pillar of IBBR’s biomolecular engineering program,” says IBBR Director Dr. Thomas Fuerst. “We are pleased to continue this collaboration with the Fischell Institute to advance our understanding of biological redox signals and to translate that into an innovative biomedical device.”

About IBBR

IBBR is a joint research enterprise of the University of Maryland, College Park, the University of Maryland, Baltimore, and the National Institute of Standards and Technology. IBBR is also financially supported in part by the University of Maryland Strategic Partnership: *MPowering the State*, an initiative designed to achieve innovation and impact through collaboration. The Institute sits at the nexus of academic research and commercial application, bringing together critical elements necessary to inspire transformative discoveries in the field of biotechnology that provide innovative solutions to major scientific and engineering challenges important to society. IBBR researchers seek to advance the fields of disease pathways and biomolecular targets, biomolecular measurement sciences, and biomolecular engineering, including structure-based design of vaccines and therapeutics. The Institute also serves to expand the economic base of science and technology in the state of Maryland. For more information, visit https://www.ibbr.umd.edu/.

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