

Nanophotonics for Select Agent Detection

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The objective of this project, from an interdisciplinary team of researchers at Duke University, North Carolina State University and the University of Michigan is to develop a label-free optical nanobiosensor that measures biomolecular interactions in real-time for the detection of category A pathogens. This objective is motivated by the urgent need for low-cost, portable and high-throughput sensors that can detect pathogens that pose significant danger to our society either through biological warfare or terrorist activities. The nanobiosensor is based upon *nanoparticle surface plasmon resonance (nanoSPR)*, in which the collective oscillations of electrons in noble metal nanoparticles and core-shell structures is induced by visible light. The proposed project couples fundamental research in nanostructured material properties, nanoparticle synthesis, and biomolecular interactions into a coherent program with-significant biomedical impact, because it will lead to the development of a generic nanotechnology platform for the label-free, real-time detection of protein-ligand interactions. The greatest impact of this proposal for homeland defense against bioterrorism will be the development of readily manufacturable, low-cost, easy-to-use, disposable nanobiosensors for detection of category A pathogens and their protein markers for point-of-care (poc) clinical diagnostics and environmental monitoring. The technology also transcends biodefense with potential application to other infectious agents where cost-effect, portable, and time-efficient detection is also important. The attractive features of the nanoSPR sensor are: (1) that it will enable real-time, label-free detection of biomolecular interactions so that no additional reagents are required to detect the analyte of interest; (2) it can be implemented in an array format for rapid, high-throughput screening of a panel of pathogens; and (3) the nanoSPR biosensor will be fabricated by two different technologically simple and scaleable methodologies that will enable large-volume and low-cost manufacturing of the nanoSPR chips.