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The development of an oligonucleotide, label-free electrochemical impedance based point-of-care technology

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In-office diagnostics or field deployable biosensors require more rapid and sensitive identification methods. Current biosensors have inherent limitations to sensitivity and specificity due to the monovalent characteristic of the detection method. This has led to focused efforts on using novel or improved upon molecular recognition elements. Building off of specificity and sensitivity demonstrated in enzymes, antibodies, nucleic acid sequences, antibody fragments, peptides, lectins, and the like. While some of these systems have shown improved sensitivity, some better specificity, and even some better stability, there is much work to be done though. Others have recently shown significant improvement upon these inherent limitations by constructing cooperative probes, called Tentacle Probes™ (TP), which utilize divalent binding to achieve both high sensitivity as well as extremely high specificity. The combination of Electrochemical Impedance Spectroscopy (EIS) with TP as the capture element has shown promise in DNA detection. The addition of EIS allows for ultra-sensitive analyte detection and quantification. Furthermore, high sensitivity electrochemical detection characteristics of EIS allow for inexpensive oligonucleotide biosensor manufacture. Future work includes integration with sample extraction within a closed microfluidic system and work with multimarker detection.

Biography

Aldin Maloc received his BS in Biomedical Engineering from Arizona State University and he is currently pursuing a PhD in Biomedical Engineering from Arizona State University. Industry experience includes CAD/CAM product manufacturing, electronics and robotics, device aided tissue biopsy, as well as economic market analysis.

Jeffrey T La Belle earned his BS and MS in Electrical Engineering from Western New England University in Springfield Massachusetts and next attained a MS and PhD from Arizona State University. He is currently an Assistant Professor at Arizona State University and an Adjunct Professor at the College of Medicine, Mayo Clinic. His lab includes students from bioengineering, electrical engineering, mechanical engineering, chemical engineering, computer science engineering, as well as biology and chemistry programs. His research focus revolves around label-free, noninvasive sensing and point-of-care technologies. Other interests include commercialization of biomedical devices and products and methods of manufacturing the same as well as prototyping and blacksmithing.

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