

Development of Medical Diagnostics and their attempt to translate them into a start-up venture

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Abstract:

We will introduce the field of biosensors and the necessity to improve diagnostics which will include a long survey of our previous research developments. Also, we have developed an original concept enabling affordable quantitation diagnostics at the point-of-care. The paramount idea was to link two successful commercial technologies into a single hybrid product, namely the convenient, one step, easy to use, self-contained and affordable lateral flow immunoassay, together with the quantitative, accurate and affordable reader glucometer system. In order to bring both technologies into an affordable integrated hybrid system, we created a proprietary nanoparticle which included both capture antibodies for the analyte of interest as well as an organic resilient electroactive molecule that will provide us with the quantitation needed. We have tested this system both with dengue NS1 biomarker for dengue triage of putative hemorrhagic fever (www.biosensorix.com), as well as, a home-based secondary stroke warning system using NT proBNP (www.eclipsedx.com). The stage of this technology has gone from proof-of-principle to proof-of-concept. At this stage we are now creating a manufacturable prototype.

We are also developing a multiplex diagnostic system enabled by taking the lateral flow system principle and reversing it into a vertical flow system. This enabled us to create small test circles, where a number of them, can be conveniently placed in a circle, so as to provide multiplex in a small surface area. In order to allow this to work we have created a proprietary capture layer to prevent false positives. We are still at the proof-of-principle stage for this particular technology.



Bio:

Prof. Robert S. Marks is a Full Professor at the Ben-Gurion University of the Negev, Israel, at the Department of Biotechnology Engineering, where he created the interdisciplinary Biosensors Laboratory. He was a Visiting Adjunct Professor in the NTU-MSE (2011-2016), and a program co-founder and coordinator of the multidisciplinary Singapore NRF CREATE program "Nanomaterials for Water and Energy Management" (19 Profs, 31 million USD). Robert has co-founded, and is the originator of the technologies, for a number of startups. Prof. Marks has extensive experience in developing new biosensors including chemiluminescent-based optical immunosensors to pathogen-elicited antibodies (Ebola virus, West Nile virus, Rift Valley fever, Dengue, Hepatitis C, Crimean-Congo hemorrhagic Fever), as well as, amperometric immunosensors, including the novel licensed immunolateral flow immunosensor; diagnostics based on luminescence emitted by primed neutrophils, or reverse engineered cell cultures glowing in the presence of a specific target virus. His work also includes environmental toxicology such as monitoring water pollution via fiber-optic probes glowing in the presence of toxicants through their associated luminescent bacteria, which have been now also adapted to on-line monitoring and to air toxicity monitoring. His group has also participated in developing biochips including nano-arrays of deposited proteins or enzyme nanolithography method for nano-fluidics, stack pad devices, as well as, ITO-based biochip configurations. He has created light-sensitive tissue sutures for surgery. He co-discovered new quorum sensing inhibitors which prevent biofilm formation of bacterial pathogens in vivo thus enhancing antibiotic therapy when given together. He has raised over 8 million dollars for his lab (63+ grants) out of over 50 million dollars from total grant budgets in collaborative projects. He is the Editor-in-Chief of a 2007 2-volume Wiley Handbook in Biosensors and Biochips, while editing 5 other books, and founded the Pan Stanford book series 'the high-tech of biotech'. He is the author of 155+ papers, not counting book chapters. He has 8 issued patents, as well as, a dozen filed. He has organized 19 international conferences. He was a visiting Professor in lengthy stays in France (Grenoble, Troyes, Paris), Italy (Udine), Finland (Turku), Singapore, USA (Baltimore) and Chengdu (China). He has created an extensive network of collaborations worldwide in most continents most reflected in the publications (Africa (Senegal, South Africa, Uganda)); Asia (Vietnam, China, Singapore, Indonesia, South Korea, Japan, Turkey, Israel); South America (French Guiana); North America (USA, Canada); Europe (France, UK, Italy, Spain, Germany, Finland, Netherlands, Sweden, Russia, Ukraine, Romania, Slovenia, Hungary). Most of his developed biosensors were published with real life samples.