Precision liquid biopsy based nucleic acid based molecular diagnostics powered by xenonucleic acids

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Current clinically available molecular tests for detection of pathogenic nucleic acid variations especially tumor derived oncogenic 'driver' and drug resistant somatic mutations that are performed on circulating cell-free nucleic acids present in biological fluids such as patient's blood plasma have limited sensitivity. This is because of the low frequency of these gene variations and the large excess of wild-type nucleic acids present. In order to achieve high sensitivity for the detection of only a few target molecules (mutant alleles) present in a vast excess of non-target molecules (wild-type alleles) sophisticated methodologies that require expensive instrumentation, highly skilled operators and in some cases intensive computational bioinformatics methods such as digital-droplet PCR (ddPCR), BEAMing PCR and next generation deep sequencing (NGS) are being employed in large clinical research centers. The limited availability, high cost and long analysis times of these methods prompted us to develop a new technology that can be performed globally by existing pathology personnel with instrumentation that is already present in every hospital pathology laboratory. At the heart of this innovative technology are novel molecular nucleic acid analogs that we call xenonucleic acids (XNA) that possess all the natural bases that occur in DNA appended to a new chemical backbone that imbibes these oligomeric nucleic acid binding molecules with exquisite specificity and high binding affinity for complementary target sequences. Any variation in the sequence that the XNA binds to creates a differential binding phenomena that can be exploited to develop real-time qPCR and extremely high sensitivity NGS assays that can detect as little as 2 copies of variant templates in a large excess of wild-type templates in DNA obtained from tissue biopsies or more preferably plasma. Commercial CE/IVD Certified Products have been developed and validated that include QClampTM gene specific real-time qPCR based tests, a new highly sensitive blood-based colorectal cancer detection test called ColoScapeTM and a high sensitivity targeted amplicon based target NGS platform called OptiSeqTM. This presentation will discuss the new technology and the improved and widely available opportunities that it affords for improved precision diagnostics and targeted therapies of human diseases particularly cancer.

Speaker Biography

Michael J Powell is currently chief scientific officer at DiaCarta, Inc. where he manages the company's scientific and strategic direction in molecular diagnostics for oncology and infectious disease personalized diagnostics markets, most notably the development of branched DNA (bDNA) signal amplification and a novel somatic gene mutation Real-Time PCR based assay technology called QClampTM for applications in the diagnosis of cancer and infectious diseases and the rapid detection of cancer 'driver' and drug resistance genetic variations. He was previously a founder of Odyssey Thera Inc., a privately held company that commercialized a proprietary fluorescent live cell-based assay and diagnostic imaging technology for the application in target validation and drug discovery. He was the director of new technology at Roche diagnostics (Roche acquired Boehringer Mannheim Corporation in May, 1997 for $11B). Prior to the acquisition by Roche, he was director of new technology at Boehringer mannheim. He was also the director of new technology at Microgenics corporation, in Concord, California. He was pioneer and lead scientist and inventor of the electrochemiluminescence (ECL) assay technology and also developed catalytic antibodies at IGEN, Inc. The ECL technology is the basis of Roche Diagnostics automated '*in-vitro*' diagnostics immunoassay platform: 'ElecSys'. He has held several other R & D senior management positions at integrated genetics Inc., Medisense and Celltech PLC, in the UK. He has published many research papers in leading scientific journals and holds over 30 patents and patent-pending applications. He received his PhD in medicinal organic chemistry from Loughborough University, UK and PhD from University of Nottingham, UK.

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