

Multiplexed assays: the way forward

Procurement managers will increasingly look to multiplexing solutions, whether as bought-ins or as outsourced services, to assist in getting products to market more quickly and economically.

The pharmaceutical and biotech industries are experiencing an era of intensive innovation, investment and competition. Every day saved in getting a new product to market can increase annual revenues by up to \$350m. However, the costs of developing new chemical entities have been rising, while return on investment has not.

Screening has the potential both to improve speed to market and to achieve economies in R&D. With the number of samples screened per day now ranging from tens to tens of thousands, and reagent costs representing up to 75 per cent of screening expense overall, screening costs are spiralling. Pharmaceutical and diagnostics companies therefore need access to powerful, cost-efficient tools, either in-house or outsourced, that will generate more information from each test sample. A genuine 'more from less' solution for improving productivity while generating cost savings is multiplexing – performing multiple assays simultaneously.

Particle-based arrays: the advantages

Over the past few years, companies such as SmartBead, Luminex, Illumina, Nanoplex, Quantum Dot and Pharmaseq have begun developing multiplexing solutions based on microparticle array technologies. These technologies have broad applications and great promise for improved productivity and miniaturisation across drug discovery and development, diagnostics and the life sciences in general. A particular advantage of particle-based arrays over existing 2D microarray platforms is that because they are in liquid solution, they provide the best environment for the protein assays used in drug discovery, *in vitro* diagnostics and proteomics.

SmartBead has developed a powerful enabling solution, UltraPlex™, which provides multiplexed bioassays whereby test molecules are tagged to barcoded microparticles so that multiple tests may be performed, tracked and analysed simultaneously in a single vessel. Decoding the microparticles reveals the identities of the tagged compounds and, depending on the outcome of the test, the amount of captured analyte. UltraPlex solutions consist of individually coded microparticles, attachment chemistries, reaction protocols and standards, reader instrumentation and analytical software. The key benefits are that more information is generated from each test sample with decreased usage of labour and reagents.

The solutions are applicable to all stages of the drug discovery process, from early stage to clinical development. SmartBead is currently developing UltraPlex immunoassay products that will include multiplexed tests for phosphokinases, proteases and cytochrome p450 isoforms. Such assays are important in the determination of drug activators, inhibitors and so on; their availability in a high-throughput screening format will streamline and speed the drug development process by facilitating identification of drug candidates with ideal pharmacological characteristics. This will provide significant assistance in achieving the 'fail early, fail cheap' goal in the face of rising drug discovery costs. Similarly, in clinical development, there is a need for downstream technologies to improve process and decrease costs. Accordingly, SmartBead is developing UltraPlex immunoassays for measuring inflammatory response, including cytokines and chemokines assays for use in clinical trials.

Looking to the future, the next generation of multiplexing solutions is likely to combine encoded microparticles with existing microarray technologies. This will enable increased multiplexing capabilities, higher throughput, further reductions in the volumes of reagents used, and new ways of testing samples against multiple targets simultaneously.

The way forward

Good procurement practice is about assisting in a company's goals of getting products to market more quickly and economically. As such, it is highly likely that procurement managers will soon become increasingly familiar with multiplexing solutions, whether bought-in or outsourced. ■

AUTHOR/COMPANY PROFILE

Robert Booth is CEO of SmartBead Technologies Ltd, which develops multiplexing assays and technologies for applications in drug development and diagnostics. The company is based in Cambridge, UK.