Decreased assay development timelines and improved productivity and sustainability by implementation of High Dimensional Experimentation

Authors: **Maxime Couturier**[1], Johan Brengdahl[2], Pia Hanson[2], Linda Kitching[1], Helena Peilot[2], Jon Tart[1], Joff Jones[3], Peter Konings[4], Bairu Zhang[3], Xiang Zhang[4]

1. Discovery Biology, Discovery Sciences, BioPharmaceuticals R&D, AstraZeneca, Cambridge, UK
2. Discovery Biology, Discovery Sciences, BioPharmaceuticals R&D, AstraZeneca, Gothenburg, Sweden
3. Data Science & Quantitative Biology, Discovery Sciences, BioPharmaceuticals R&D, AstraZeneca, Cambridge, UK
4. Data Science & Quantitative Biology, Discovery Sciences, BioPharmaceuticals R&D, AstraZeneca, Gothenburg, Sweden

High quality and robust biochemical and cell assays are critical to advance drug discovery campaigns. The development of such assays is a multifactorial complex process in search of the optimal balance of buffer and assay reagents for a robust and mechanistically relevant assay at an acceptable cost. A Design of Experiment (DoE) approach uses statistical tools to explore all the factors associated with assay development in an optimised manner. In particular, the use of DoE to design large complex experiments in order to explore many factors at once or to build the best possible models is known as High Dimensional Experimentation (HDE). In the past, such an approach was rarely used in laboratory settings as the experiments turned out to be too complex to run manually and the programming needed to use automation was not compatible with the timelines imposed by drug discovery projects.

The Discovery Biology department at AstraZeneca has developed a collaboration with Synthace Limited to use their high-level, non-coding platform to overcome these hurdles. In parallel, statistical support, education and consulting was set up in-house in collaboration with the Data Sciences & Quantitative Biology department, increasing understanding and confidence in statistical methodology and interpretation of results. Here we describe how scientists across the organisation have used the Synthace platform to perform HDE experiments designed via either in-house tools or statistical software and performed with the help of liquid dispensers such as the Dragonfly® Discovery, the Certus Flex and Echo 655.

We observed that the implementation of these new ways of working relying on HDE increased the efficiency of assay development, delivered higher quality assays, and improved the sustainability of processes across the organisation.