PLENARY LECTURE 3

Plenary Session (Monday, March 27, 8:30, Sorbonne 2)

Microfluidics in Biotherapeutic Development: Enhancing Throughput and Allowing for Heightened Characterization

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Abstract:

In biopharmaceutical development, there is a strong desire to enhance throughput to allow an organization sufficient bandwidth to support all process and formulation development activities that may simultaneously occur. There are many options available to the analytical lab but robustness is imperative for adoption of the technology. Technology that may not provide the level of quality expected from instrumentation within the quality control laboratory can be adopted within the development space if it is fit for purpose.

Conventional CE Instrumentation (Beckman and ProteinSimple) have been the workhorse for the biotherapeutic development and quality control laboratories. Microfluidic technologies including the GXII (Perkin Elmer), Bioanalyzer (Agilent), HPLC-chipLC (Agilent), and ZipChip (908 Devices) have been evaluated for potential replacement of conventional instrumentation based on expected throughput enhancements, ease of use, and data quality. Applications that have been transferred to a microfluidic format include size heterogeneity (CE-SDS), charge heterogeneity (CZE), glycan analysis, and RNA/DNA analysis.

The general separation profiles achieved with microfluidic technology were consistent with profiles generated using conventional instrumentation. Minor differences in the profile and quantitation were evident in some cases that appear to be related to the molecular substrate. Despite minor differences in some cases, the technology has been applied within Pfizer to rapidly characterize process development design space. The technology was also successfully applied to support development of a non-mAb vaccine conjugate. More recently, the ZipChip has been utilized for analysis of intact and proteolytic mapping of monoclonal antibodies (mAbs) and antibody-drug conjugates (ADCs) offering CE-MS capability that did not previously exist within our organization.

Although data was generated using microfluidic technology that showed promise for adoption in the biotherapeutic development space, our organization has been slow to transition. This is mainly due to expectations for data quality to be on par with conventional systems which in our experience has not always been the case and seems to be dependent on the molecule being analyzed. An additional drawback may be the reduced flexibility that users may have with developing new applications within the provided framework. There are however areas where microfluidic technology does have a niche such as CE coupled to MS detection.

Short Biography:

Nathan Lacher is a Senior Principal Scientist in Pfizer BioTherapeutics Pharmaceutical Sciences in Chesterfield, MO. His background and training are in analytical chemistry. After obtaining a B.S. degree (Chemistry) from Buena Vista University (Storm Lake, IA) in 1999, he received a Ph.D. (Pharmaceutical Chemistry) in 2004 from Kansas University (Lawrence, KS) under the direction of Dr. Susan Lunte.

In 2004, Nathan joined Pfizer working at the La Jolla Laboratories (La Jolla, CA) on the development of small molecule pharmaceuticals for ophthalmology and oncology in Analytical R&D. One of the first projects he worked on was the development of the initial FIH analytical package for Xalkori. Since 2005, he has worked on the development of biotherapeutic candidates covering a wide range of indications at the St. Louis Laboratories in Chesterfield, MO. Currently he leads a group within Analytical R&D supporting development of prophylactic vaccines, therapeutic vaccines, and mAbs.