CASSS: Well-Characterized Biotechnology Products

Past, Present and Future

Well-Characterized Biotechnology Products (WCBP) conference (26 - 28 January 2016) marks the 20th anniversary of the world's premier biotechnology conference. In many ways, this 20th version of the conference serves as the anniversary of well-characterized biotechnology products in that the development of the meeting has followed the explosion of the biologics industry as a whole.

The first human biotechnology product was recombinant human insulin, approved by the Food and Drug Administration (FDA) in 1982. It would be three more years before another biotechnology product, recombinant somatropin (human growth hormone) was approved, followed shortly by the first recombinant vaccine (for Hepatitis B) in 1986. Throughout the rest of the 1980s and into the 1990s, numerous biotechnology products, spanning a wide range of unmet medical needs, were approved. Biotechnology derived products offered the ability to manufacture large amounts of specific active ingredients free of worry about raw material supply or cross-species allergic reaction. Protein therapeutics, vaccines, monoclonal antibodies, and many more types of therapies could be developed and approved to the benefits of millions of patients.

In the early years of the biotechnology revolution, the process equalled the product for all biotechnology and biologic products. It was hard to understand the impact of process changes to the product unless a set of advanced analytics existed to aid in the review. It took time for these analytics to be developed and implemented. In the meantime, scientists began to realize that there was a distinction between these new biotechnologically derived products and their non-recombinant versions (if those products even existed). The genetically derived versions of these compounds were able to be better characterized due to a combination of process-related specificity and ever increasing analytical capabilities. Suddenly, it was possible to better understand and characterize process changes using "new" analytical tools like carbohydrate analysis and mass spectrometry (MS). The "process equals the
product” had the potential of becoming a thing of the past.

Science is not done in a vacuum; it is based on the sharing of knowledge.

The analytical scientists who had started to characterize their products realized there was value in sharing their experiences and data. Rather than viewing this as a competitive advantage (it really was not, since everyone was doing it), value was obtained by learning from others. Further, if the regulators were present during this sharing, then broader acceptance of the techniques and principles would follow. This could facilitate better regulatory science and improved change management. But what venue could facilitate these goals? Enter CASSS and WCBP.

The first symposium was organized by FDA for 11 - 13 December 1995, but the second version revealed its more familiar form. The second incarnation was held from 06 - 08 January 1997 in the Fairmont Hotel in San Francisco, California. Looking back at this second agenda, the symposium topics included:

- Regulatory Introduction - where speakers from FDA and industry talked about the US regulatory view, experiences with well characterized proteins in Europe, and the impact of the International Conference on Harmonization (ICH).
- Carbohydrate Analysis - covering polysaccharide vaccine analysis, characterizing protein glycosylation using anion exchange chromatography coupled with MS, and mapping of glycoprotein oligosaccharids with capillary electrophoresis.
- Immunological and Biological Characterization - featuring talks on rapid protein conformational analysis, efficacy as measured by affinity analysis, and process monitoring by HPLC and optical biosensors.
- MS of Biomolecules - which focussed on post-translational modification analysis, MALDI and MALDI-TOF studies, and characterization analysis; all using MS.
• Electrophoretic Analysis - utilizing microanalysis, capillary electrophoresis, capillary zone electrophoresis, and internal proteolysis with capillary zone electrophoresis.
• Sequencing of Biomolecules - with talks on protein sequencing and glycan sequencing using MS.
• Chromatographic Analysis - presenters discussed strategies for variant characterization, orthogonal HPLC methods for variant analysis, novel procedures for polypeptide sequence analysis, and nucleic acid chromatography.
• Manufacturing Issues - which focussed on instability in formulations, protein aggregation, case studies in monoclonal antibodies, and synthetic oligonucleotides.
• Late Breaking Papers - where speakers talked about capillary isoelectric focusing mass spectrometry and recombinant haemoglobin characterization.

Included in the program were many chances to ask questions and to participate in smaller (workshop) sessions to get more detail and to share experiences with other delegates.

The 2016 version of the conference is still in the planning stages, but what strikes me is the similarity of topics above to the latest incarnation of the conference. Consider the plenary sessions from WCBP 2015 this past January:

• Developing and commercializing biotherapeutics in a global regulatory environment,
• Fit for purpose control strategies,
• Implementing Quality by Design (QbD),
• Exploring relationships between protein structure, biological functions, and clinical performance,
• Comparability of vaccine products,
• New and emerging technologies for protein therapeutics,
• Accelerating late stage development,
• Process characterization using QbD for blood products, and
• In-process measurements, advanced process controls, and process analytical technologies.
While there is a larger focus on the regulatory science, which is critical to the implementation of the advances and practical application, there is a lot of similarity. We are still discussing carbohydrate analysis, manufacturing issues (and solutions), and characterization (which has expanded into comparability). The techniques reviewed at the first conference are the same techniques employed today to solve the complex problems facing the modern biotechnology professional.

WCBP is as important today as it was then. The meeting has grown to nearly 700 attendees last year. The focus on interaction and knowledge sharing has strengthened over the years, especially with the implementation of roundtable discussions, small (10 person), facilitated table discussions of hot topics. Regulatory topics and presenters spanning the globe have been included. If history is any guide, expect the future of WCBP to mirror the future of biotechnology.

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