

Table 2: From Sample Prep to Data Analysis

Facilitator: Yan Jiang, *Sanofi*

Scribe: Frances Namuswe *CDER, FDA*

Scope:

Mass spectrometry (MS) is a very powerful analytical technique with high resolution, sensitivity and specificity, and has been widely applied to many diverse areas. However, preparation of samples and analysis of MS data could be labor intensive and require a lot of hands-on time. To improve the efficiency, productivity, and reproducibility of MS-based analytical platforms, automation has been utilized with increasing popularity to help achieve high throughput MS analysis through increasing continuity and reducing human intervention and manual processing time. This roundtable will discuss automated sample preparation and data processing approaches for MS analysis, with a focus on the challenges and examples in developing and applying those automated platforms.

Questions for Discussion:

1. Which types of MS analysis in which application areas could greatly benefit from automation?
2. What are the challenges in developing and applying automated methods for sample preparation- What are the considerations when choosing and using integrated/automated platforms and liquid handling systems for sample preparation, e.g. capture, purification, protein digestion? Are there any common issues arising from using automated liquid handlers and how to solve them? MS Data analysis- How to choose suitable software (qualitative and/or quantitative) for automated MS data processing and analysis, based on which criteria, and what are the acceptable false-positive rate and accuracy? How do software vendors respond to issues and improvement suggestions? What are the pros and cons for developing customized software or applications in-house?
3. How do integrated and automated systems work under GMP environment? Any examples?

Discussion Notes:

8 attendees including 1 from academia, 3 vendors, 2 from industry, and 1 regulator.

General comments

- Benefits of automation are more realized if the system is used frequently for the same thing.
- The amount of automation possible depends on the workflow. Full automation is easier to accomplish for easy workflows like intact mass analysis than for more complicated workflows
- One way to achieve automation of both sample preparation and data analysis is by combining two platforms.

Automation versus flexibility for the end-user

- There's need for a balance between automation and flexibility for the end user
- Considerations: how does the system fit into your workspace, e.g. how many users?
- Needs are different for development labs and QC.
- Vendors provided an overview of their products and the advantages they offer over other products with respect to automation and flexibility

Automated sample preparation

- Sample preparation seems to be the source of most variability because instruments are getting better at data analysis.
- Automated sample preparation is the way to go. No compensation for bad sample preparation
- A lot of the currently available automated sample preparation procedures are for purified samples. End users expressed interest in automation for more crude samples.

Automated data analysis

- There's a lot of manual handling needed for data analysis.
- The need to be flexible with data analysis but stringent enough for automation makes automation of data analysis difficult.
- With respect to software automation, developing software that does multiple things is valuable but challenging.
- One pain point with data analysis automation is the unexpected changes in other parts of the system that impact the data generated.
 - e.g. small changes in peak retention time could significantly impact EIC.
 - How often do these pain points happen? Typically one has to start over.

Training/Maintenance/Management of automated systems/instruments

- Do companies have experts to help with trouble shooting and training end users?
 - This is need dependent. Some companies have automation experts but vendor are also developing tools for companies without experts.
- The issue is not the end user but the system administrator who sets up and manages the automation
- Who is going to run the instrument? If Mass spec experts and people without intricate mass spec knowledge are using the same instruments, how are they maintained?
- Demoing the system is important.

Automated systems under a GMP environment

- The goal for QC is for operators to use the instruments without need for automation experts and to have as few steps in the operator's hands as possible.

Automated systems in academia

- The issue of budgets for academic labs was discussed (differences in US versus EU funding)
- Automated sample preparation platforms already exist in non-mass spec labs in academic institutions. These could be combined with mass spec. The limiting factor for using these automated systems is expertise.