Roundtable Session 1 – Table 6 - CE/MS: Method Development, Application and Implementation in Biopharmaceutical Development

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Abstract:

Capillary Electrophoresis-Mass Spectrometry (CE/MS) is a powerful analytical technique used in biopharmaceutical analysis to separate and characterize complex biomolecules. By combining the high-resolution separation capabilities of capillary electrophoresis (CE) with mass spectrometry (MS), CE/MS provides detailed information on the molecular composition, structure, and purity of biopharmaceutical products. The integration of Capillary Electrophoresis-Mass Spectrometry (CE/MS) in biopharmaceutical development has enhanced the analysis and characterization of complex biomolecules.

Join us for a review on the current state and forward-looking perspectives on CE/MS, focusing on method development, application, and implementation within the biopharmaceutical industry. Share your knowledge and experiences to help navigate the complexities of this powerful analytical technique and stay ahead in this rapidly evolving field.

The roundtable will address common challenges encountered during method development and offer practical solutions to overcome these hurdles. Attendees will also highlight the diverse applications of CE/MS in biopharmaceutical analysis, showcasing how this technique has been successfully applied to various analytical challenges. Approaches to ensure method robustness and reproducibility in routine analysis will also be key topics of discussion.

Discussion Questions:

Method Development

1. What are the critical considerations when developing a robust CE/MS method for biopharmaceutical analysis?

2. What are the common challenges in CE/MS method development and how can they be overcome?

3. Opportunity to share insights on sample preparation best practices and avenues to achieve high sensitivity in CE/MS methods.

Application

1. Highlight the diverse applications of CE/MS in biopharmaceutical analysis. How has CE/MS been applied?

2. What are the advantages of using CE/MS over traditional characterization methods in biopharmaceutical analysis?

3. What are the latest advancements in CE/MS technology that have improved its application in biopharmaceutical development?

Implementation

1. Review strategies for successful implementation of CE-MS method.

2. What are current challenges to implementing CE/MS in a biopharmaceutical characterization setting?

3. What are the key factors to consider when transitioning a CE/MS method from development to a QC environment?

4. What are the regulatory considerations for implementing CE/MS methods?

5. How do you ensure method robustness and reproducibility when implementing CE/MS in routine analysis?

Notes:

- The participants in the roundtable range from those with extensive expertise to those who are interested in learning more about CE-MS.
- The first comments are about the requirements for CE-MS. Most typical reagents used for CE are not MS compatible or only at low concentrations , such as urea or SDS. For Maurie Flex, it is mentioned that the fractions are collected in ammonium acetate which is MS compatible. However, the stability of the sample in the fractions is a topic of concern. It is important to consider how the fractions will be used in further steps to know which additives should be added to improve sample stability or to allow analysis by other techniques (e.g. MS compatibility).
- Following the discussion of MS friendly reagents, CGE-SDS peak characterization comes soon as a topic. How to remove SDS from a CGE-SDS peak is a big concern for many of the attendees. Some kits for SDS removal are mentioned but the applicability of these kits is not clear. The amount of SDS in the samples is considered an important factor. Some other ideas mentioned in the roundtable to allow coupling of CGE-SDS with MS or the analysis of CGE-SDS peaks with MS are the following:
    - Fraction collection with Maurice Flex CGE-SDS, although the problem of the SDS in the collected fractions still remains.
    - Other ideas considered: SDS modified capillaries, CGE-SDS with MALDI, cutting out bands from SDS-PAGE, Rapigest, cationic surfactant to interact with the SDS, or modifications of the separation gel to make it MS friendly.
- Regarding CE-MS interfaces, the interface from CMP Scientific is used by some participants. It is considered a highly flexible interface, compatible with several capillaries. The triple tube interface from Agilent and the interface from David Chen are also mentioned in the roundtable. Some participants have experience with the CESI from Sciex but the robustness of the capillaries is a major drawback.

- The participants discuss about their experience with regulatory submission to FDA with CE-MS for peak characterization, specifically cIEF-MS with the CMP interface. CE-MS in QC or in general MS in QC environment is a question of concern in the roundtable. It is mentioned to depend on the company size.
- The table discusses the use of the Zipchip from 908 Devices for various purposes, such as oligonucleotide or protein analysis. Intabio for cIEF-MS is considered by the participants as fast and with good separation efficiency but with some restrictions for low pI molecules.