Workshop Report

ASMS 74th Annual Conference- San Diego, CA
Monday June 1rst, 2026

Mass Spectrometry Approaches for Characterizing Complex Biotherapeutics Modalities

Introduction

The ASMS Biotherapeutics Interest Group Workshop hosted a workshop on "Mass Spectrometry Approaches for Characterizing Complex Biotherapeutics Modalities," at ASMS Annual Meeting in San Diego, CA, held on June 1, 2026. The session was attended by ~80 people, coming from industry, academia, software and instrument vendors and regulatory agencies. Its scope connected the structural complexity of emerging therapeutic formats with the analytical capabilities and implementation challenges of mass spectrometry (MS).

Emerging biotherapeutic formats—including ADCs, bi- and multispecific antibodies, four-chain antibodies, and fusion proteins—exceed traditional monoclonal antibodies in structural complexity. These modalities deliver targeted benefits in oncology and immunology but create novel challenges for design and development.

Mass spectrometry enables detailed characterization of the molecular features of these complex therapeutic modalities and can be applied across development and commercialization. However, broad implementation of mass spectrometry workflows in quality control for therapeutic proteins remains challenging, and adoption is even more limited for complex modalities.

Coordinators and Presiders

Dr. Sara Carillo (NIBRT) and Dr. Elsa Gorre (Johnson and Johnson Innovative Medicine) presided over the session, together they served as workshop coordinator. They introduced the panelists, who presented their case studies, and organized attendees into smaller focus groups based on their interests.

Panelists

Dr. Shuai Wu (Amgen)- Senior Principal Scientist leading the MS group for characterizing all kinds of therapeutic proteins and conjugates.
Dr. Tun Liu (J&JIM)- Senior Principal Scientists in Biologics Discovery with extensive experience in biologics discovery and development. She focuses on protein characterization and protein structure/interaction by MS.
Dr. Ciaran Buckley (Eli Lilly and Company)- Senior Principal Scientist whose current focus in on the application of MS in QC environment, developing and implementing analytical methods that meet the rigorous standards of regulated quality control.

Workshop Objectives

NIBRT Protected Data

1. Characterize the complexities of emerging biotherapeutic modalities, including ADCs, bispecific antibodies (bsAbs), and fusion proteins.
2. Highlight the advantages of mass spectrometry–based analyses for these modalities and review new MS methods being developed to address their specific challenges.
3. Define the technical and practical limits of implementing mass spectrometry workflows in regulated testing environments and discuss considerations for transferring discovery MS methods into routine use.

Topics and Discussion Points

The workshop tried a new style in form of a case-study workshop in which small focus groups would explore advanced characterization techniques for new modalities, discuss cutting-edge mass spectrometry methods, and examine practical issues associated with implementing MS workflows in regulated analytical testing.

1. Highly glycosylated Fc-Fusion Proteins

- Characterize the highly glycosylated Fc-fusion protein through sequence verification and protein-level, glycopeptide, and released-glycan profiling.
- Assess chemical liabilities and aggregation.
- Key scale-up challenge: maintain consistent glycoforms as production increases.

2. Analytical Challenges for Biologics in Discovery

- Multispecifics: screen large numbers of molecules rapidly and assess heterodimer purity through subunit analysis.
- Antibody–drug conjugates: evaluate heterogeneity and serum stability.
- Investigate whether serum aggregation involves self-association or interactions with serum proteins.
- Determine how serum stability correlates with in vivo pharmacokinetics.

3. MS Based QC Applications for Monoclonal Antibodies

- Apply mass spectrometry to monoclonal antibody quality control through peptide mapping, glycosylation profiling, and intact mass analysis.
- Detect impurities and monitor critical quality attributes.
- Follow a workflow covering data generation, metadata capture, specification review, quality assurance approval, and reporting through a laboratory information management system.

Conclusion

The workshop highlighted mass spectrometry as an analytical approach for detailed characterization of increasingly complex biotherapeutic modalities throughout development and commercialization. The workshop objectives link modality-specific characterization needs with emerging MS methods and the practical challenges of transferring discovery workflows into routine, regulated testing.

NIBRT Protected Data