Ensuring quality in monoclonal antibody therapeutics with USP standards

**1. CELL LINE DEVELOPMENT & EXPANSION**
- Cell Line Selection
  - <1048>
- Clone & Banking
  - <1042> × <1050> × <1237>
- Expansion & Cryopreservation
  - <1044>

**2. UPSTREAM PRODUCTION**
- Bioreactors
- Raw Material & Cell Substrate Qualification
  - <1043> × <1050> × <1050.1>

**3. DOWNSTREAM PRODUCTION**
- Purification
  - Protein A IEX Chromatography

**4. FORMULATION & FILL FINISH**
- Formulation
  - <1059> × <1231>
- Sterile Filtration & Filling
  - <1.x> × <71> × <787> × <788> × <116> × <1211> × <1229.4> × <1787>
- Stability
  - <1049> × <1049.1> Proposed
- Purification
  - Virus Inactivation
    - Filtration
      - <1050> × <1050.1>

**5. PACKAGING & DISTRIBUTION**
- Packaging & Distribution
  - <659> × <1079> × <1079.2> × <1207>

**ANTIBODY CHARACTERIZATION**
- Identity & Structure
  - <736>: Mass Spectrometry
  - <1736>: Intact & Reduced Mass
  - <1055>: Peptide Mapping
  - <210>: <212>: <1084>: Glycan Profiling
  - <1052>: Amino Acid Analysis
  - <1054>: IEF (pI determination)
  - <1102>: <1103>: Identity ELISA
  - <1105>: Surface Plasmon Resonance
  - <891>: Thermal Analysis
  - <761>: NMR Spectroscopy
  - <1853>: Fluorescence Spectroscopy
  - <1430.3>: Dynamic Light Scattering
- General Properties
  - <507>: <1057>: Protein Concentration
  - <785>: Osmolarity
  - <781>: pH
  - <631>: Color/Clarity
  - <790>: Appearance
- Product-Related Impurities
  - <129>: SEC HPLC, CEX/IEF, CE SDS, Aggregation & Degradation
  - <621>: Chromatography
  - <1053>: Capillary Electrophoresis
- Process-Related Impurities
  - <1132>: Host Cell Proteins (HCP)
  - <1132.1>: HCP by Mass Spec (in PF 49(3))
  - <609>: Host Cell Residual DNA (HCR)
  - <1130>: Residual DNA Testing
- Potency
  - <111>: Design & Analysis of Biological Products
  - <1032>: <1033>: <1034>: Potency Bioassay
  - <108>: FcγR
- Contaminants
  - <85>: Endotoxins
  - <63>: Mycoplasma
  - <1237>: Virus Testing
  - <61>: <62>: <1229.3>: Bioburden

**Physical Materials**
- Glycan Profiling
  - N-Acetylation of Protein-A (Cat # 14612619)
  - N-Glycolylation of Protein-A (Cat # 1294284)
- Oligosaccharide System Suitability Mixture A (Cat # 1478210)
- Oligosaccharide System Suitability Mixture B (Cat # 1478221)
- Oligosaccharide System Suitability Mixture C (Cat # 1478232)
- Oligosaccharide System Suitability Mixture D (Cat # 1478243)
- Monoclonal Antibodies
  - Monoclonal IgG Suitability (Cat # 1445550)
  - Monoclonal IgG, mAbs 001 RS (Cat # 1445539)
  - Monoclonal IgG, mAbs 002 RS (Cat # 1445547)
  - Monoclonal IgG, mAbs 003 RS (Cat # 1445569)
- Impurities
  - PLB2 HCP (Cat # 15582716)
  - CHO Genomic DNA (Cat # 13235575)
  - E. coli Genomic DNA (Cat # 1231557)
- Adventitious Agents
  - Endotoxin (Cat # 1235503)

Download the Complimentary Chapter <129>
go.usp.org/1332321/2018-10-16/xxzsl

For more details contact:
USPBiologics@USP.org

* In-Process Revision

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List of Chapters

1. CELL LINE DEVELOPMENT AND EXPANSION
   - Cell Banking (In Pharmacopeial Forum 47(1)- In-Process Revision)
   - Cryopreservation of cells
   - Quality of Biotechnological Products: Analysis of the Expression Construct in Cells Used for Production of r-DNA Derived Protein Products

2. UPSTREAM PRODUCTION
   - Plastic Components and Systems Used to Manufacture Pharmaceutical Drug Products and Biopharmaceutical Drug Substances and Products. (In Pharmacopeial Forum 46(5)- In-Process Revision)
   - Ancillary Materials for Cell, Gene, and Tissue-engineered Products
   - Characterization of Plastic Components and Systems Used to Manufacture Pharmaceutical Drug Products and Biopharmaceutical Drug Substances and Products Ancillary materials (In Pharmacopeial Forum 46(5)- In-Process Revision)

3. DOWNSTREAM PRODUCTION
   - Viral safety evaluation of biotechnology products derived from cell lines of human or animal origin
   - Design, evaluation, and characterization of viral clearance procedures Cell media analysis-critical attributes and trace metals

4. FORMULATION & FILL FINISH
   - Injections
   - Sterility Tests
   - Subvisible Particulate Matter in Therapeutic Protein Injections
   - Particulate Matter in Injections
   - Quality of Biotechnological Products—Stability Testing of Biotechnological/Biological Products
   - Design of Stability Studies for Biotechnology Product Development and Lifecycle Management (Proposed)
   - Excipient Performance
   - Microbiological Control and Monitoring of Aseptic Processing Environments
   - Sterility Assurance
   - Sterilizing Filtration of Liquids
   - Water for Pharmaceutical Purposes
   - Measurement of Subvisible Particulate Matter in Therapeutic Protein Injection

5. PACKAGING & DISTRIBUTION
   - Packaging and Storage Requirements
   - Risks and mitigation strategies for the storage and transportation of finished drug products
   - Mean kinetic temperature in the evaluation of temperature excursions during storage and transportation of drug products.
   - Package integrity evaluation—sterile products

6. ANTIbody CHARACTERIZATION
   - Identity & Structure
     - Mass Spectrometry
     - Applications of Mass Spectrometry
     - Peptide mapping: Biotechnology Derived Articles—Peptide Mapping
     - Monosaccharide Analysis
     - Oligosaccharide Analysis
     - Glycoprotein and Glycan Analysis—General Considerations
     - Biotechnology-Derived Articles—Amino Acid Analysis
     - Biotechnology-derived articles—Isoelectric Focusing
     - Immunological Test Methods—General Considerations
     - Immunological Test Methods—ELISA
     - Immunological Test Methods—Surface Plasmon Resonance
     - Thermal Analysis
     - Nuclear Magnetic Resonance Spectroscopy
     - Fluorescence Spectroscopy - Theory and Practice
     - Analytical Methodologies Based on Scattering Phenomena—Dynamic Light Scattering

   - General Properties
     - Protein Determination Procedures
     - Color and Achromicity
     - Osmolality and Osmolarity
     - Visible Particulates in Injections
     - pH
     - Biotechnology-Derived Articles—Total Protein Assay

   - Product Related Impurities
     - Analytical Procedures for Recombinant Therapeutic Monoclonal Antibodies
     - Chromatographic procedures
     - Biotechnology-Derived Articles—Capillary Electrophoresis

   - Process Related Impurities
     - Residual DNA Testing
     - Nucleic Acid-based Techniques - Approaches For Detecting Trace Nucleic Acids (Residual DNA Testing)
     - Residual Host Cell Protein Measurement in Biopharmaceuticals
     - HCP by Mass Spec (in PF 49(3))

   - Potency
     - Design and Analysis of Biological Assays
     - Design and Development of Biological Assays
     - Biological Assay Validation
     - Analysis of Biological Assays
     - Assays to Evaluate Fragment Crystallizable (Fc)—Mediated Effector Function

   - Contaminants
     - Microbiological Examination of Nonsterile Products: Microbial Enumeration Tests
     - Microbiological Examination of Nonsterile Products: tests for Specified Microorganism
     - Mycoplasma Tests
     - Bacterial Endotoxins test
     - Monitoring of Bioburden
     - Virology Test Methods