LECTURE 004: Personal and Collective Protective Equipment (PPE / EPI / EPC) in High-Containment Laboratories

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Course: Biosafety and Bioprotection: Fundamentals and Advanced Practices for Containment Laboratories

Purpose of this document

This overview is designed to help participants navigate the Session 4 video. It highlights main conceptual sections, key points, and transitions to organize the lecture. It is intended as a navigation and orientation tool and does not replace the lecture.

SECTION 1 — Introduction and Scope of the Session

Main focus: Considers why personal and collective protective equipment are frequently misunderstood, undervalued, or misused in high-containment environments.

Key points

- Difference between PPE (personal) and collective protection
- Common misconceptions and inadequate selection or use
- Emphasis on an operational (not theoretical) approach
- Reinforcement of biosafety culture as the guiding principle

Orientation cue: Sets the rationale for spending extended time on PPE and EPC in this session.

SECTION 2 — Purpose of PPE and the Role of Risk Assessment

Main focus: Discusses why PPE is used, when it is needed, and how risk assessment determines selection.

Key points

- PPE prevents accidents but does not eliminate risk
- Many laboratory accidents occur due to non-use or incorrect use of PPE
- Risk is not limited to biological agents
- Risk assessment as the basis for choosing both PPE and EPC

Orientation cue: Links PPE decisions directly to risk evaluation rather than habit or fear.

SECTION 3 — Personal Protective Equipment: Types and Correct Use

Main focus: Offers detailed discussion of common PPE and how incorrect terminology, poor fit, or improper sequencing compromises protection.

Key points

- Gloves, gowns, eye protection, footwear, masks and respirators
- Importance of correct terminology (e.g., N95 vs “mask”)
- Surgical masks vs respirators
- Donning and doffing sequences and partial changes between spaces
- PPE use must be conscious, not automatic

Orientation cue: Shifts from listing equipment to explaining behavioral discipline.

SECTION 4 — Respiratory Protection: N95 and PAPRs

Main focus: Examines selection, limitations, and correct application of respiratory protection.

Key points

- Fit testing as mandatory, not optional
- Impact of facial hair and facial structure
- Reuse concerns and contamination risks
- When PAPRs are appropriate and why
- Advantages and limitations of PAPRs
- Training and post-use decontamination requirements

Orientation cue: Clarifies that higher protection is not automatically safer without proper conditions.

SECTION 5 — Protective Clothing and Tyvek: Use, Limits, and Over-Design

Main focus: Offers critical examination of full protective suits and the risks of mandatory or excessive use.

Key points:

- Different types of Tyvek and Tychem garments
- Selection based on agent, procedure, duration, and decontamination
- Increased risk during removal
- High cost and operational burden
- False sense of security when not risk-justified

Orientation cue: Reinforces that more equipment does not always mean more safety.

SECTION 6 — Collective Protective Equipment (EPC): Primary Containment

Main focus: Examines equipment that protects multiple users and the environment through containment.

Key points

- Biosafety cabinets as primary containment devices
- Centrifuges with sealed rotors
- Glove boxes vs Class III cabinets
- HEPA filtration and ventilation systems
- Autoclaves as containment barriers

Orientation cue: Transitions from individual protection to system-level protection.

SECTION 7 — Biosafety Cabinets: History, Function, and Misuse

Main focus: Examines how biosafety cabinets work, how they evolved, and how misuse undermines safety.

Key points

- Historical development of BSCs
- Classes I, II, and III and what they protect
- Airflow principles and HEPA filtration
- Common errors: blocked grilles, improper use, lack of training
- Certification and international standards

Orientation cue: Closes the session by tying equipment, behavior, and training back to biosafety culture.