

Title: Safety Guidelines for Working with Potential Agents of Bioterrorism

Prepared By: Minnesota Department of Health

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I. Rationale:

This protocol is written to ensure the safety of all laboratory personnel when handling biological cultures or specimens potentially containing dangerous infectious agents.

II. Background:

A microbiology laboratory is a unique environment that requires special containment facilities and practices in order to properly protect persons working with infectious agents. Safety in the clinical microbiology laboratory is a primary concern.

The agents that may be used in a bioterrorism attack are by nature organisms having a greater potential to be easily disseminated by aerosolization, are more stable, and can cause higher morbidity and mortality than typical organisms identified in a clinical microbiology laboratory. Many of these agents have been involved in laboratory-acquired infections throughout history with brucellosis, typhoid, tularemia, tuberculosis, hepatitis, and Venezuelan equine encephalitis being the most commonly reported laboratory acquired infections. Preventing laboratory exposures, especially to infectious aerosols, can be accomplished with the proper biological containment.

III. Containment:

Containment refers to safe methods for managing infectious material in the laboratory environment. The purpose of containment is to reduce or eliminate exposure to potentially hazardous agents. This is achieved by good laboratory technique and the use of appropriate safety equipment, including biological safety cabinets (BSC) and personal protective equipment (PPE). The three main elements of containment are laboratory practices and technique, safety equipment, and facility design. These elements can be described in four levels of biosafety. Refer to Table 1 for a summary of the four biosafety levels.

IV. Levels of Biosafety:

A. See Table 1: "Biosafety Levels 1-4" for definitions of the four biosafety levels.

1. The level of biosafety utilized also depends on the agent and the procedures that will be performed on that agent. It is recommended that a risk assessment be conducted before beginning work with any new agents.
2. All manipulations producing aerosols should be performed in a biosafety cabinet (BSC).

B. See Table 2: "Biosafety Levels for the Agents of Bioterrorism" for recommended biosafety levels for the potential agents of bioterrorism.

Table 1: Biosafety Levels One (BSL-1) – BSL-4 (CDC/NIH, 1999)

BSL	Agents	Practices	Safety Equipment	Facilities
1	Not known to cause disease in healthy adults	Standard microbiological practices	None required	Open bench top Hand washing sink required
2	Associated with human disease; main hazard is percutaneous injury, ingestion, and mucous membrane exposure.	BSL-1 plus: <ul style="list-style-type: none"> Limited access to lab Biohazard warning sign “Sharps” precautions Biosafety manual defining waste decon and medical surveillance policies 	Class I or II BSC or other physical containment device used for all manipulations of agents that cause splashes or aerosols of infectious materials; PPE: lab coats; gloves; respiratory protection as needed.	BSL-1 plus: <ul style="list-style-type: none"> Autoclave available
3	Indigenous or exotic agents with potential for aerosol transmission. Disease may have serious or lethal consequences.	BSL-2 plus: <ul style="list-style-type: none"> Controlled access Decon of all waste Decon of lab clothing before laundering Baseline serums obtained 	Class I or II BSC or other physical containment device used for all open manipulations of agents. PPE: lab coats; gloves; respiratory protection as needed.	BSL-2 plus: <ul style="list-style-type: none"> Physical separation from access corridors Self-closing, double-door access Exhaust not recirculated Negative airflow into BSL-3 lab
4	Dangerous/exotic agents which pose a risk of life-threatening disease, aerosol-transmitted lab infections, or related agents with unknown risk of transmission	BSL-3 plus: <ul style="list-style-type: none"> Clothing change before entering Shower upon exit All material decontaminated upon exit from facility 	All procedures conducted in Class III BSC or Class I or II BSC in combination with full-body, air-supplied, positive pressure personnel suit.	BSL-3 plus: <ul style="list-style-type: none"> Lab is in a separate building or isolated zone Dedicated supply and exhaust system Other as outlined in text

Table 2: Biosafety Levels for the Agents of Bioterrorism

Agent	Manipulating a Clinical Specimen or Material	Manipulating a Suspected or Confirmed Isolate
<i>Bacillus anthracis</i>	BSL-2	BSL-2
<i>Brucella spp.</i>	BSL-2	BSL-3
<i>Clostridium botulinum</i>	BSL-2	BSL-2
<i>Francisella tularensis</i>	BSL-2	BSL-3
Smallpox	BSL-4	BSL-4
<i>Yersinia pestis</i>	BSL-2	BSL-2

V. General Level A safety protocol:

1. All open manipulations involving infectious materials are conducted in a certified Class II BSC.
2. When using a BSC, assure that the cabinet does not contain unnecessary items that will interfere with proper airflow and function.
3. Lab coats and gloves shall be worn when processing specimens and performing tests.
4. Safety glasses or eye shields are recommended.
5. Any activities that bring hands in contact with mucosal surfaces (for example, eating, drinking, smoking or applying cosmetics) shall be prohibited.
6. Hands should be washed before leaving the laboratory.
7. Respiratory protection should be considered when necessary.
8. The laboratory director should consider modifications in handling of samples, when situation warrants additional precautions.
9. Additional safety information can be found in *Biosafety in Microbiological and Biomedical Laboratories, CDC/NIH 1999*.
10. Ensure that the laboratory is in compliance with all local, state and federal regulations governing the use, transport and disposal of etiologic agents.

VI. References:

- *Biosafety in Microbiological and Biomedical Laboratories*, 4th Ed, CDC/NIH, May 1999.