

PRINCIPLE OF RISK MANAGEMENT FOR LABORATORY HANDLING OF DANGEROUS PATHOGENS

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(6th Jul, 2015 50 mins)

OUTLINE

Principle of biosafety

Risk assessment

Risk management

WHAT IS A BIOHAZARD?

A potential hazard to humans, animals or the environment caused by a biological organism, or by material produced by such an organism



Examples;

Micro-organisms such as viruses, bacteria, fungi, and parasites and their toxins.

Blood and body fluids, as well as tissues from humans and animals.

Transformed cell lines and certain types of nucleic acids .

SAFETY

- Absence or minimization of risk
- Occupational safety is **not** the absence of accidents, but the result of taking positive action to identify accident causes and implement and maintain suitable preventive measures



WHAT IS BIOSAFETY?

The application of knowledge, techniques and equipment to prevent personal, laboratory and environmental exposure to potentially infectious agents or biohazards.

SAFETY ASSESSMENT

Determine **hazards** and
evaluate **risks**

Use all relevant **available data**

Determine **controls** needed to
minimise those risks



$$\text{Risk} = \text{Hazard} \times \text{Exposure}$$

RISK ASSESSMENT FOR BIOLOGICAL AGENTS

Identification of hazards

- What are you handling?
- What are the potential consequences?

How might you be exposed?

Who else might be exposed

How likely is exposure?

What controls are necessary?

Signs and symptoms of infection

WHAT ARE THE RISK FACTORS USED FOR CATEGORIZING A PATHOGEN?

Pathogenicity/Virulence

Route of Infection

Mode of Transmission

Survival in the Environment

Infectious Dose

Availability of Effective Preventative and Therapeutic Treatments

Host Range

Natural Distribution

Impact of Introduction and/or Release into the Environment

RISK GROUPS (RG)

US NIH

RG1 –not associated with disease in healthy adult humans or animals

RG2 –associated with disease which is rarely serious and for which preventative or therapeutics is often available

RG3 –associated with serious or lethal human disease for which preventative or therapeutics may be available

RG4 –associated with lethal human disease for which preventative or therapeutics are not readily available

Canadian Biosafety Standards

- Risk Group 1 (low individual and community risk)
- Risk Group 2 (moderate individual risk, low community risk)
- Risk Group 3 (high individual risk, low community risk)
- Risk Group 4 (high individual risk, high community risk)

PATHOGEN SAFETY DATA SHEETS AND RISK ASSESSMENT

<http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/index-eng.php>

Google play: Pathogen Safety Data Sheets (PSDSs)

Itunes: Pathogen Safety Data Sheets (PSDSs)

www.absa.org

CONTROLLING RISK

Eliminate - do you have to do/use it?

Substitute - is there a safer alternative?

Enclose - enclosed process/ventilated enclosure

Segregate - keep work away from others

Procedures - safe technique, limit exposure time

Train/supervise - ensure competence

Information - use of signs etc

PPE - personal protective equipment

ROUTES OF EXPOSURE

- ❑ Percutaneous inoculation
- ❑ Inhalation of aerosols
- ❑ Contact of mucous membranes
- ❑ Ingestion

BIOCONTAINMENT

The principle of holding or being capable of holding or including within a fixed limit or area

Preventing the unintentional release of biological agents through a combination of laboratory practices, containment equipment (primary barrier) and laboratory facility design (secondary barrier)

PRIMARY BARRIER

Primary barriers contain the agent at the source

Equipment/Engineering Control

- Biological safety cabinet, fumehood, glove box, animal housing, centrifuge, fermenter

SECONDARY BARRIER

Secondary barrier is the structure surrounding the primary barrier

Facility/Engineering Control

- Rooms, building

Types of Facilities

- Basic laboratory
- Containment laboratory

BIOSAFETY LEVELS (BSL)

The Four Biosafety Levels are:

BSL1 - agents not known to cause disease

BSL2 - agents associated with human disease

BSL3 - indigenous/exotic agents associated with human disease and with potential for aerosol transmission.

BSL4 - dangerous/exotic agents of life threatening nature

CONTAINMENT LEVELS: FACTORS TO BE CONSIDERED

Aerosol Generation

Quantity

Concentration of the Pathogen

Type of Proposed Work

Shedding (specific to animals)

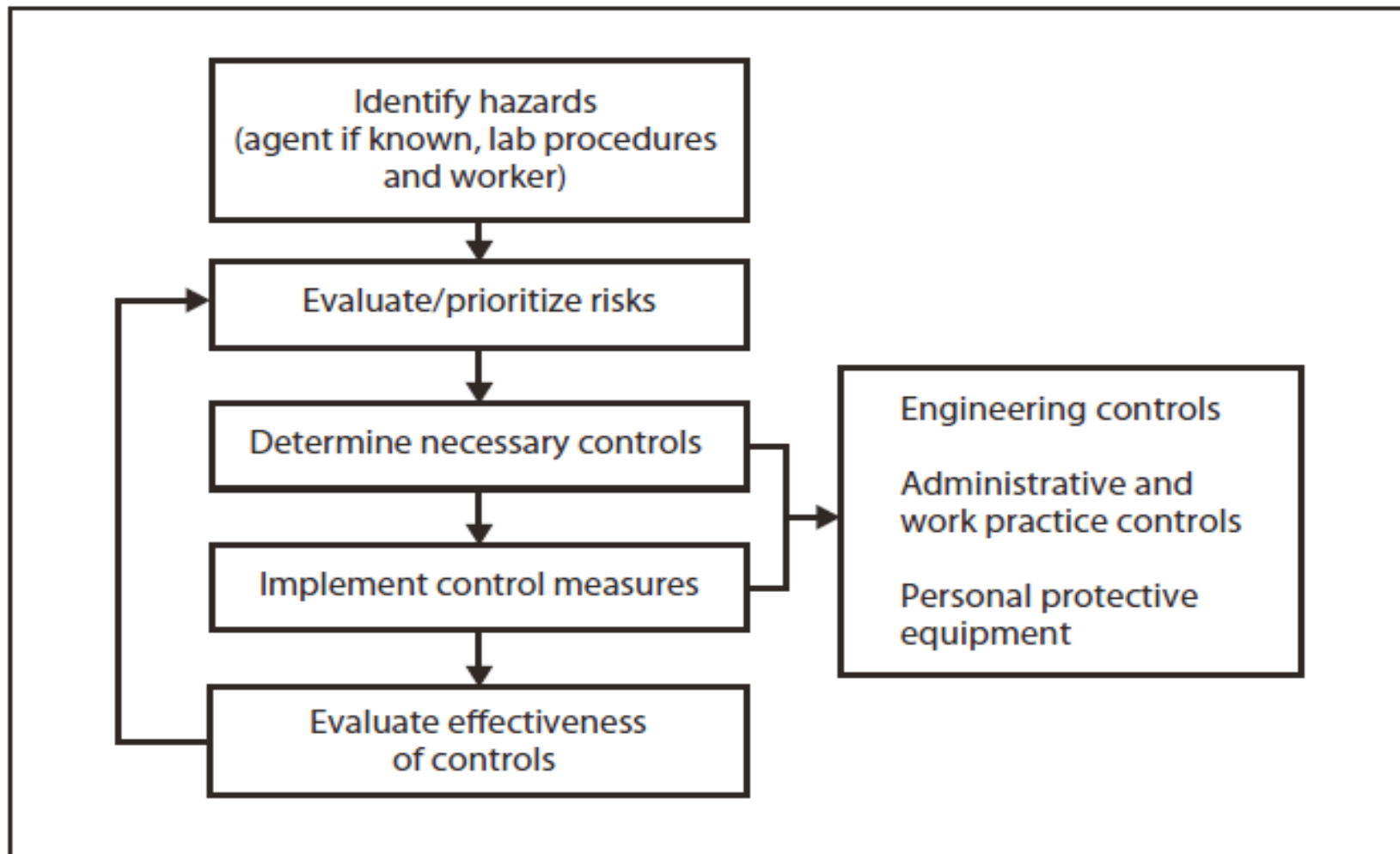
RISK MANAGEMENT: MECHANISMS TO CONTROL A HAZARD

Elimination

Engineering Controls

Administrative Controls

PPE



**COMPLETE ALL DATA ENTRY IN THIS
SECTION**