Biosafety

BY

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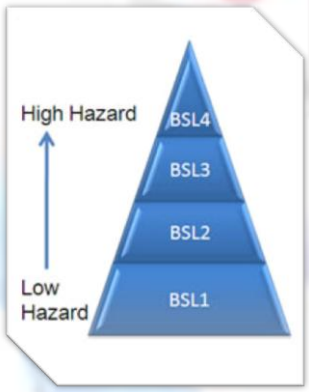
EVEN INCLUDING THE GENERAL CRITERION OF SAFETY, NOT ALL LABORATORIES ARE A LIKE

Different laboratories contain different hazard levels & uses

Biosafety Levels

CONSIST OF



- Laboratory practices & techniques
- Safety equipment
- Laboratory facilities

Biosafety Level 1 (BSL 1)

Organisms or practice known to not cause disease in healthy adult humans

Well characterized agent "Avirulent organisms", plasmid DNA

Minimal hazard to lab personnel & the environment

Examples:

- *E. coli*, *Bacillus spp*, local soil bacteria
- Exempt categories of DNA work (plasmid DNA)

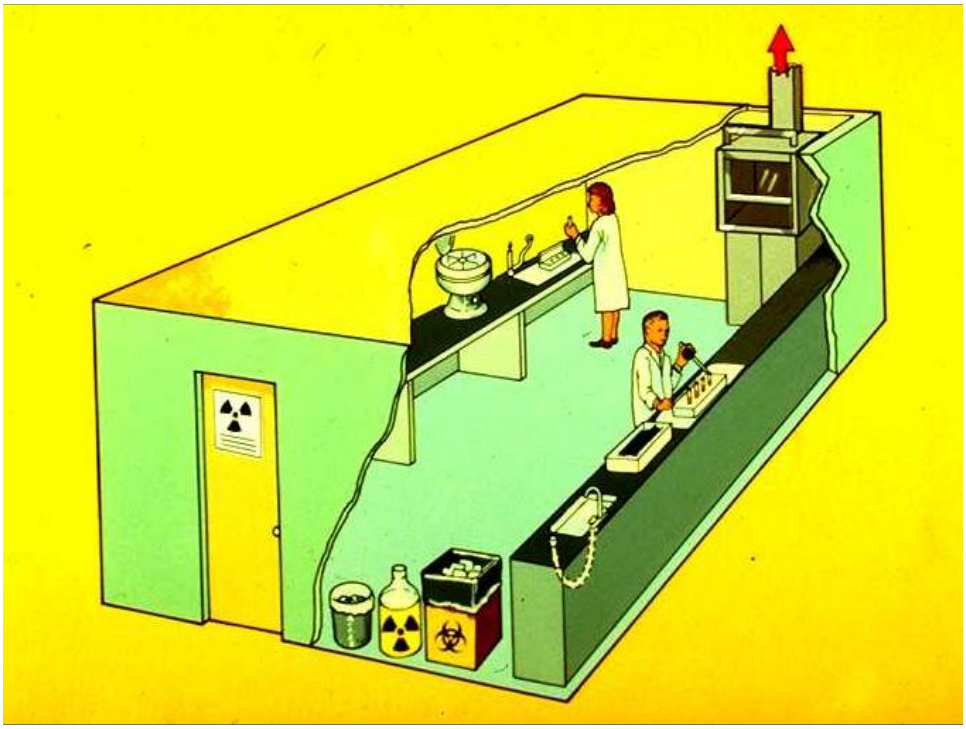
Biosafety Level 1

Facility Design (Secondary Barrier)

Requirements:

- *Laboratories have doors*
- *Sink for hand washing*
- *Work surfaces easily cleaned*
- *Bench tops are impervious to water*
- *Sturdy furniture*
- *Windows fitted with flyscreens*

2.3



Biosafety Level 2 (BSL-2)

- **BSL 2: indigenous moderate risk agents**
  - Mild or treatable disease in humans
  - Not spread by aerosol
  - Primary Hazard: Skin break, mucous membrane exposure or ingestion

Examples:

- Hepatitis A,B+C, HIV, some *Salmonellae*
- Healthy Human derived blood & blood products
- Some rDNA

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Biosafety Level 2
Facility Design (Secondary Barriers)

Requirements:

- *Laboratories have lockable doors*
- *Sink for hand washing*
- *Work surfaces easily cleaned*
- *Bench tops are impervious to water*
- *Sturdy furniture*

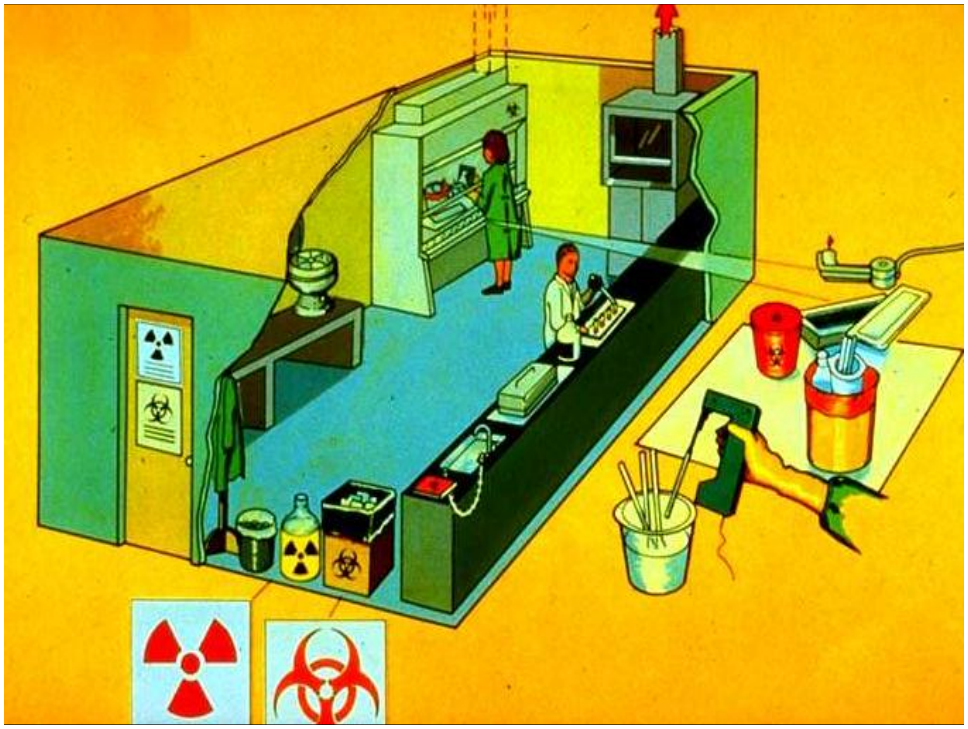
Biosafety Level 2
Facility Design (Secondary Barriers)

Requirements (cont.):

- *Biological safety cabinets installed as needed*
- *Adequate illumination*
- *Eyewash readily available*
- *Air flows into lab without re-circulation to non-lab areas*
- *Windows fitted with flyscreens*

2.4

BIOSAFETY LEVEL 2



Biosafety Level 3 (BSL 3)

Indigenous or exotic agents with potential for respiratory transmission or lethal consequences

Examples:

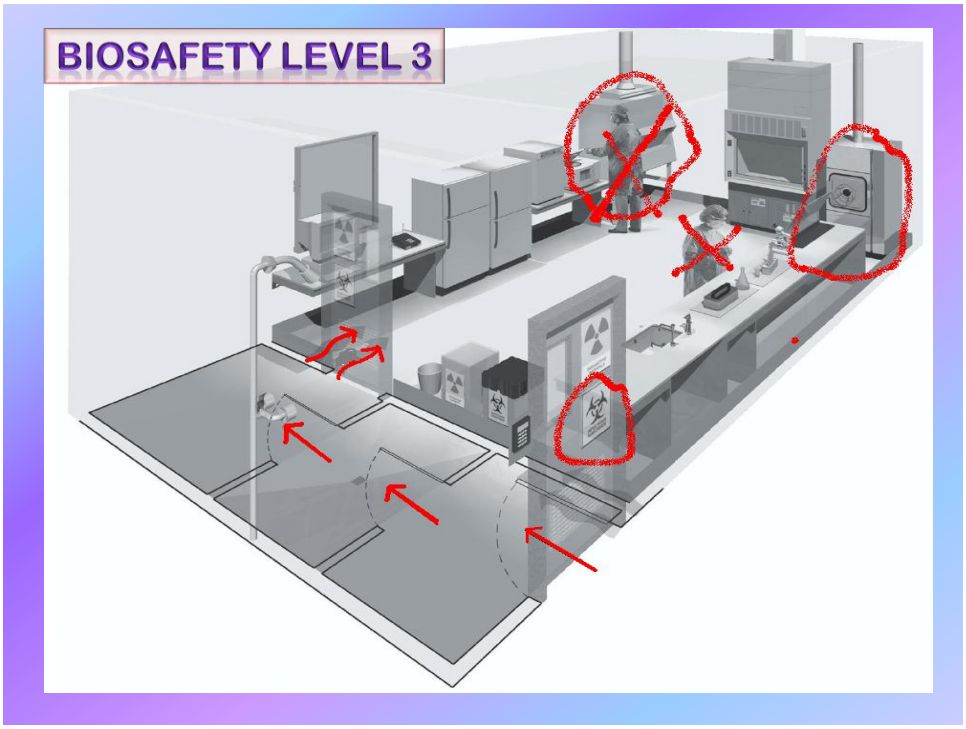
- *M. tuberculosis* (TB)
- *B. anthracis* (ANTHRAX)
- *Brucella* spp. (Malta fever)
- FMD & RVF (not in Egypt)
- SARS & West Nile viruses
- Primary & Secondary barriers to protect personnel in contiguous areas

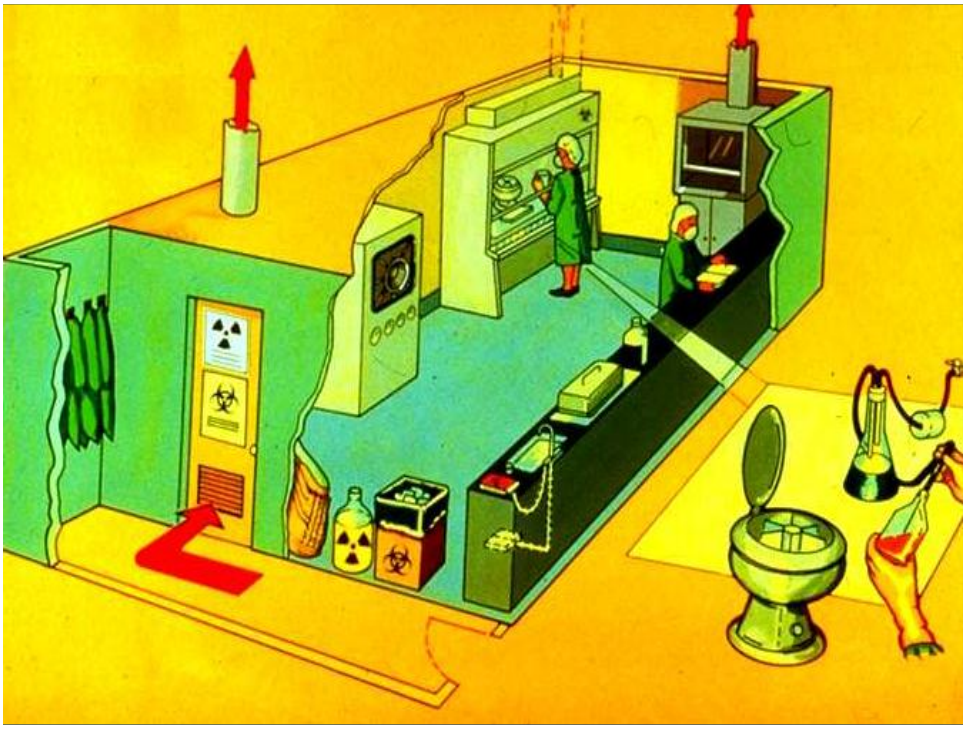
Requirement of Biosafety Level 3

BSL-1 & 2 Facilities PLUS:

- Separate building or isolated zone
- Double door entry
- Directional inward airflow (-ve pressure)
- Enclosures for aerosol generating equipment
- Room penetrations sealed
- Walls, floors & ceilings are water resistant for easy cleaning

High maintenance cost, High security, rules & regulations





Biosafety Level 4 (BSL-4)

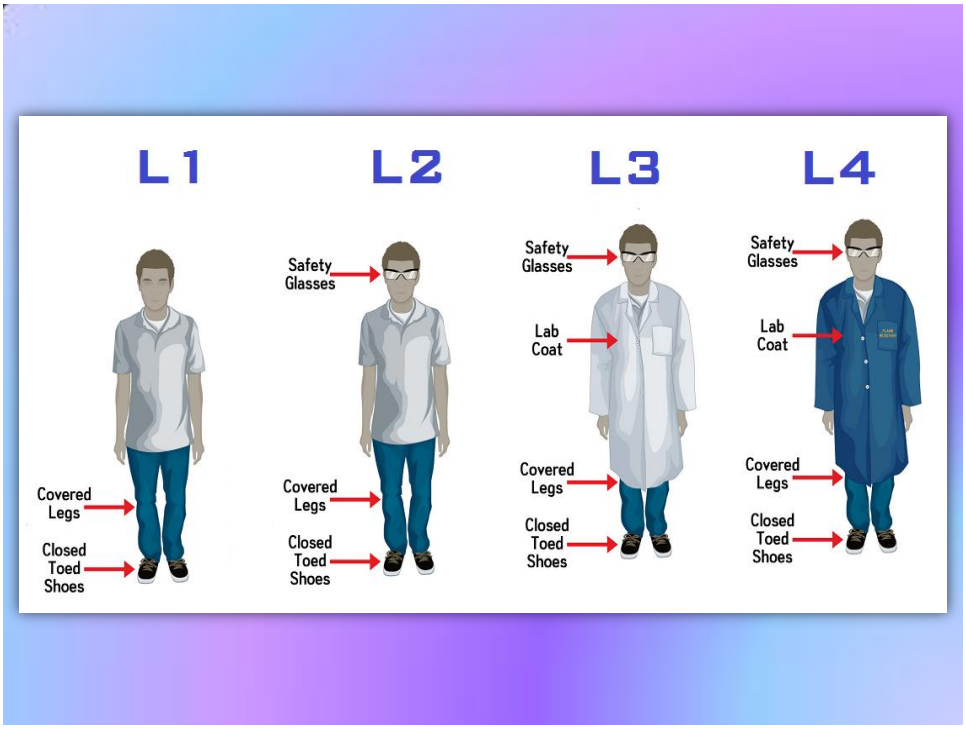
LETHAL EXOTIC AGENTS ESPECIALLY WHERE THERE IS NO VACCINE OR THERAPY

- BSL 4 facility is separate facility or HVAC isolated zone
  - Examples: Ebola, Marburg & Lassa Fever viruses

Relation of risk groups to biosafety levels, practices and equipment

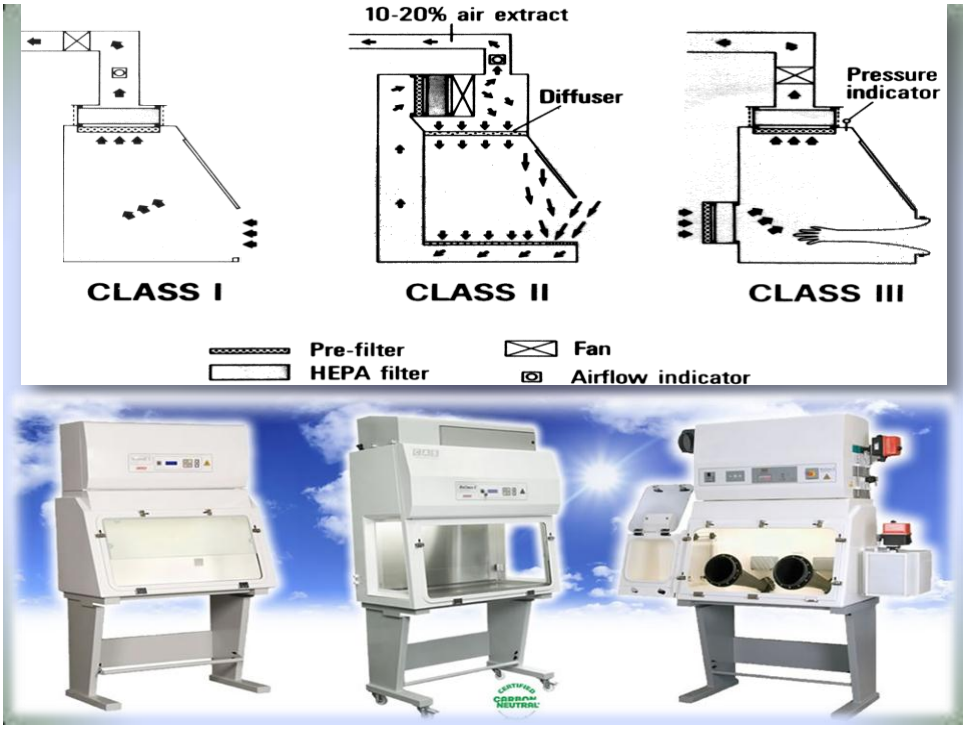
RISK GROUP	BIOSAFETY LEVEL	LABORATORY TYPE	LABORATORY PRACTICES	SAFETY EQUIPMENT
1	Basic – Biosafety Level 1	Basic teaching, research	GMT	None; open bench work
2	Basic – Biosafety Level 2	Primary health services; diagnostic services, research	GMT plus protective clothing, biohazard sign	Open bench plus BSC for potential aerosols
3	Containment – Biosafety Level 3	Special diagnostic services, research	As Level 2 plus special clothing, controlled access, directional airflow	BSC and/or other primary devices for all activities
4	Maximum containment – Biosafety Level 4	Dangerous pathogen units	As Level 3 plus airlock entry, shower exit, special waste disposal	Class III BSC, or positive pressure suits in conjunction with Class II BSCs, double-ended autoclave (through the wall), filtered air

BSC, biological safety cabinet; GMT, good microbiological techniques



BIOLOGICAL SAFETY CABINETS (BSCs)

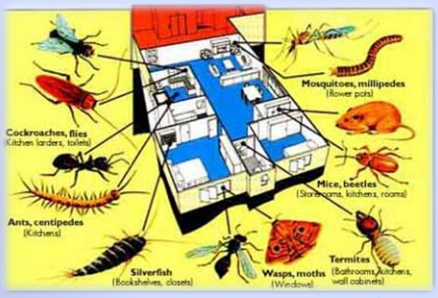
	PROTECTION			
BSC Class	Personnel	Environment	Product	Biological Risk
I	Yes	Yes	No	BSL1-?3?
II (A1, A2, B1, B2)	Yes	Yes	Yes	BSL1-3
III (II in suit room with suit)	Yes	Yes	Yes	BSL-4


10-20% air extract
Diffuser
Pressure indicator
CLASS I
CLASS II
CLASS III
Pre-filter
HEPA filter
Fan
Airflow indicator


Facility
CONTROL ACCESS TO THE LABORATORY
Closed doors
OR
Locked doors
LABORATORY BIOSECURITY ISSUE IN EGYPT
No access for unauthorised persons
No unauthorised persons allowed beyond this point

Effective Pest Management

SCREEN WINDOWS



Spray at the end of the week

Facility

LAB PRACTICE

Wash hands
After removing the gloves
Before leaving the lab

liquid soap is generally preferable to bar soap
20 seconds at least

Lab practice

No Eating, drinking, smoking, handling contact lenses, applying cosmetics, & storing food

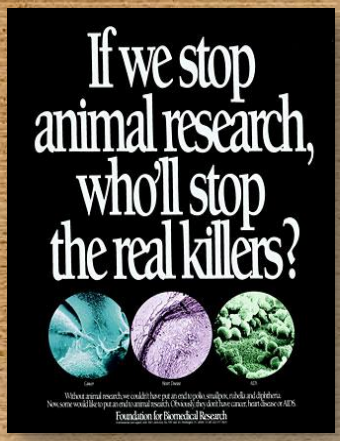
All laboratory personnel must demonstrate special practices before working with special agents

More likely you will get infected because of a bad coworker


Protective laboratory clothing


Transporting infectious agents Biosafety behind laboratory wall
INFECTIOUS SUBSTANCE
6
WARNING
JUMPING INTO TOXIC WASTE DOES NOT GIVE YOU SUPER POWERS
MAY CAUSE ADVERSE HEALTH EFFECTS - SEE FIG 1.A
FIG 1.A
INFECTIOUS WASTE
BASURA INFECCIOSA
BIOHAZARD

Animal Biosafety



Gas cylinders

- Never use without formal training
- Minimise the number in a laboratory
  - Store externally whenever possible
- Cylinders are heavy & can do serious damage to you if they fall
  - Ensure that they are chained when in use
  - Move only with a cylinder trolley
- Use regulators & control equipment suitable for the gas concerned
- Consider the consequences if your cylinder leaks

General Tidiness

- Keep your workplace tidy
- Clear up waste, deal with washing up & put things away as you finish with them
- Make sure everything is safe before you leave things unattended
- A tidy laboratory avoids accidents to everyone

First Aid

- All laboratory workers should undergo simple first aid training
  - For ALL chemical splashes, wash with plenty of water for 10 minutes
  - Control bleeding with direct pressure, avoiding any foreign bodies such as glass
- Report all accidents to your supervisor or departmental safety officer

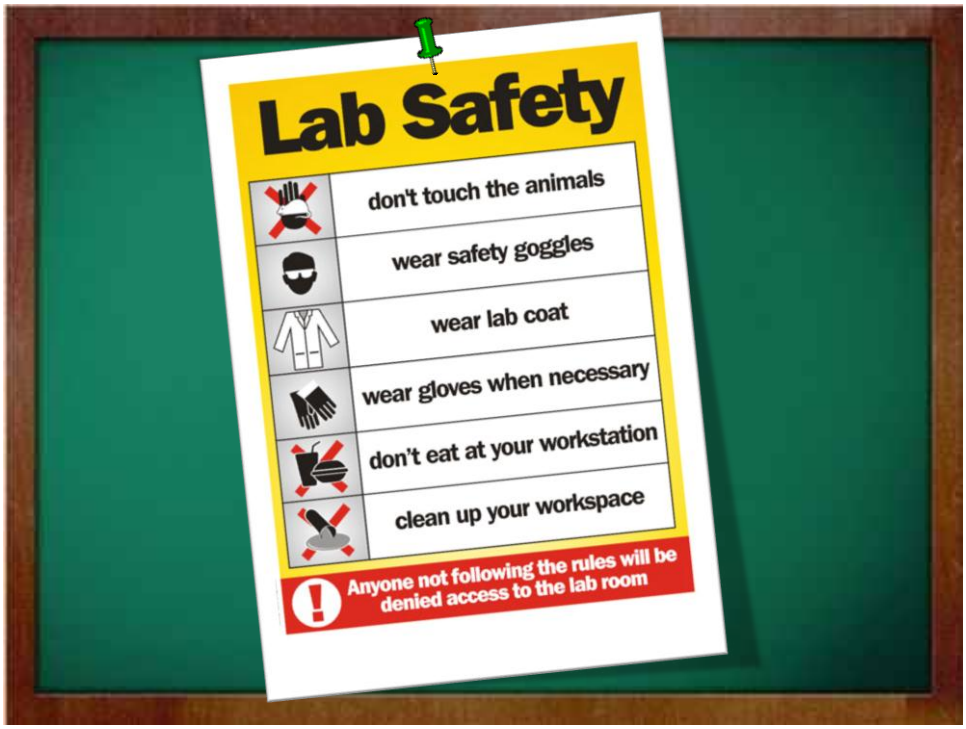
Waste Materials

- Part of your risk assessment will be to determine how to dispose of waste lab materials safely
  - Solvents & oils must be segregated into the correct waste bottle or drum
  - Your department will help you determine what to do with chemical or biological materials
- Do not put materials down the drain or in with normal waste unless authorised to do so

When in doubt – ASK!!!

- DO NOT CARRY OUT A NEW OR UNFAMILIAR PROCEDURE UNTIL YOU HAVE BEEN FULLY TRAINED & UNDERSTAND THE PRECAUTIONS NECESSARY FOR SAFE WORKING

DO NOT GUESS!!!!!


Lab Safety
don't touch the animals
wear safety goggles
wear lab coat
wear gloves when necessary
don't eat at your workstation
clean up your workspace
Anyone not following the rules will be denied access to the lab room