



Good Laboratory Work Practices (GLWP)

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Synopsis

Good Laboratory Work Practices (GLWP) are practices and procedures that can reduce or mitigate biorisk. GLWP, along with Personal Protective Equipment (PPE) and Engineering Controls, is a part of risk mitigation

Scope

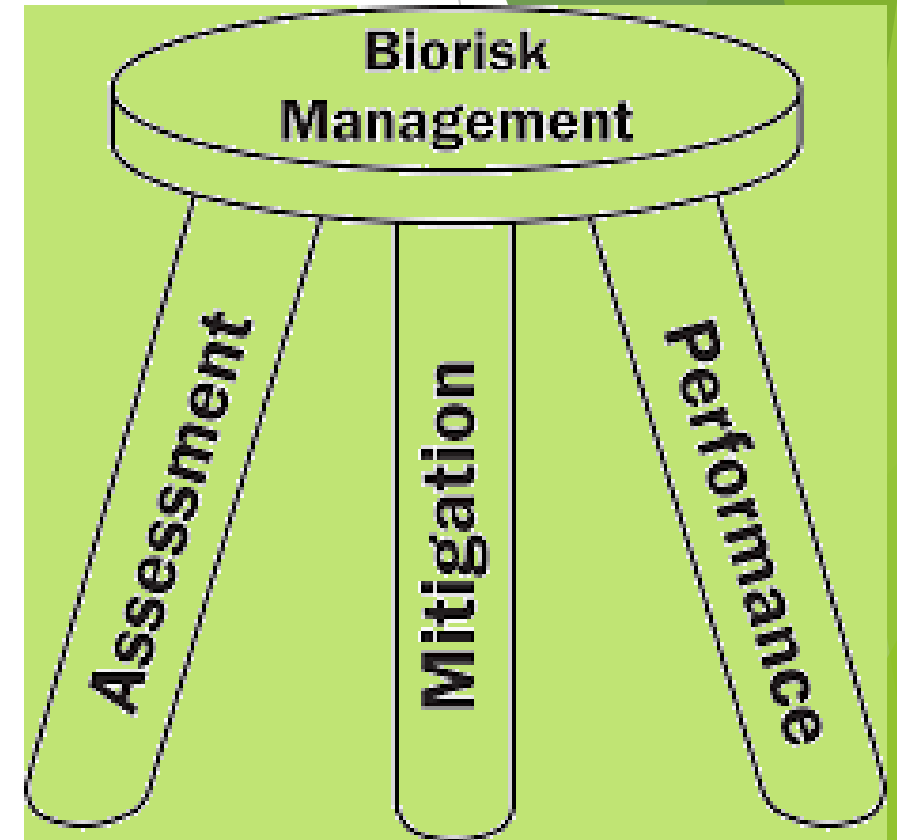
- Good housekeeping
- Biosafety cabinet
- Proper pipetting skill
- Hand hygiene
- Field GLWP (optional)

Learning Objectives

- Participants will be exposed to the importance of following GLWP
- Participants will understand some common good laboratory work practices
- Participants will recognize tasks within the laboratory's biosafety level with exposure to hazards

Review the implementation of biorisk management system

- ▶ Good Laboratory Work Practices (GLWP) are applicable to mitigation in the AMP model
- ▶ Evaluate and ensure the system is working according to the risk management goal

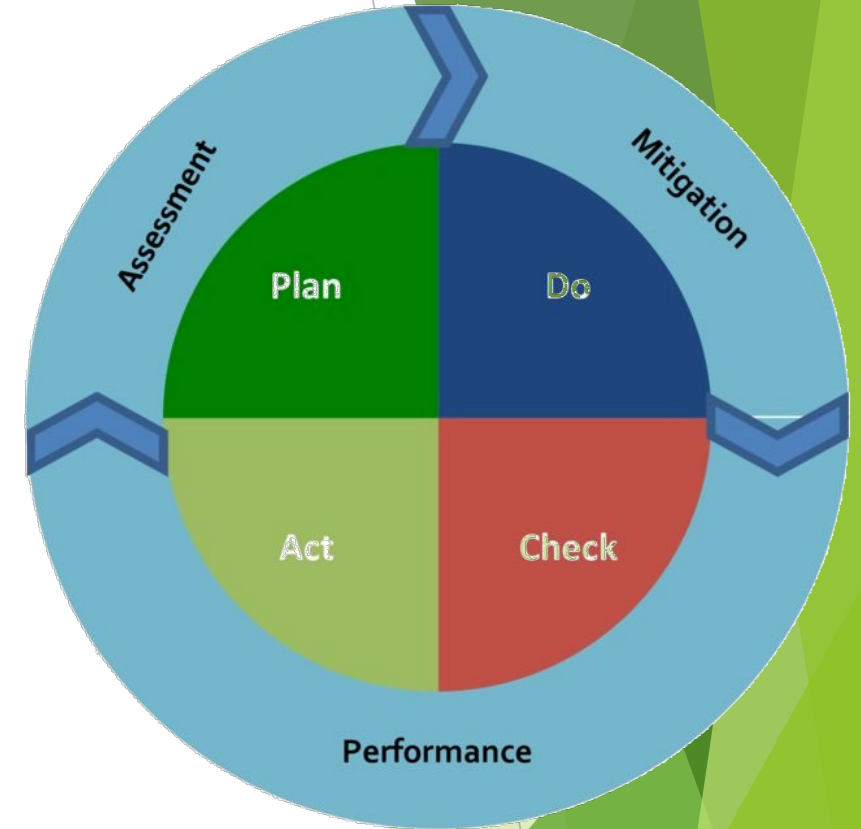


The AMP Model: Recognize suitable GLWPs according to the risk

- ▶ Plan-Do-Check-Act Cycle aligned with AMP Model for biorisk management
- ▶ Plan: Planning, identification of hazards and risk, and establishing goals
- ▶ Do: Implementing training and operational issues
- ▶ Check: Checking, monitoring, and corrective action
- ▶ Act: Reviewing, process innovation, and acting to make needed changes to the management system
- ▶ Taken together, the three elements of AMP constitute a complete biorisk management

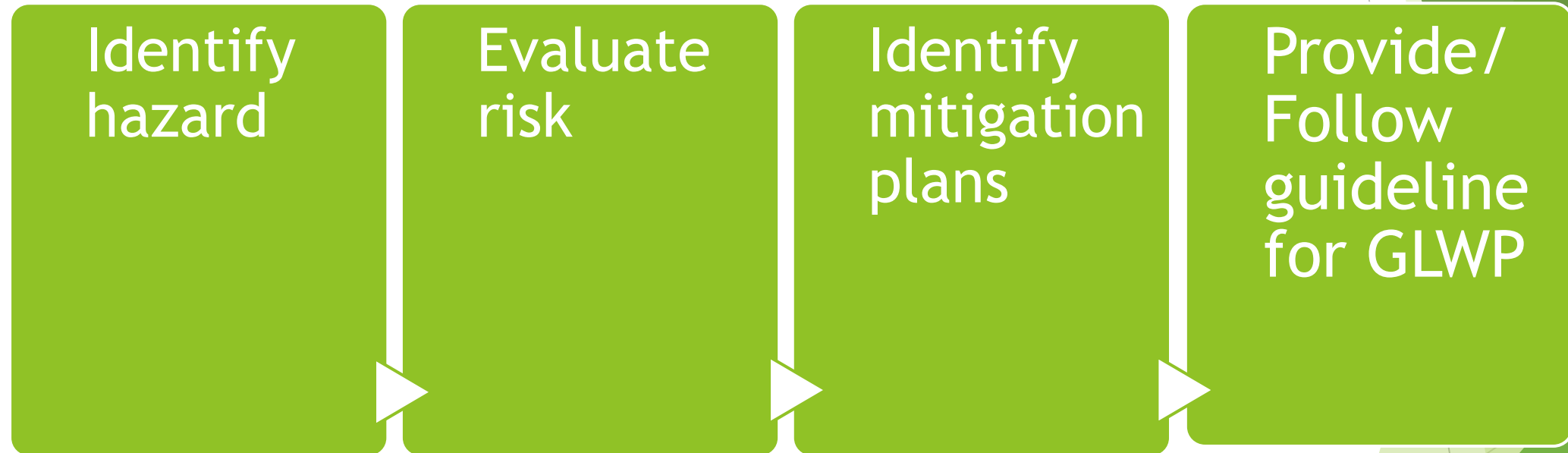
The elements of the AMP model also underpinned

CWA 15793:2011 - Laboratory Biorisk Management Standard. (ISO 35001 - Laboratory Biorisk Management Standard, 2019)



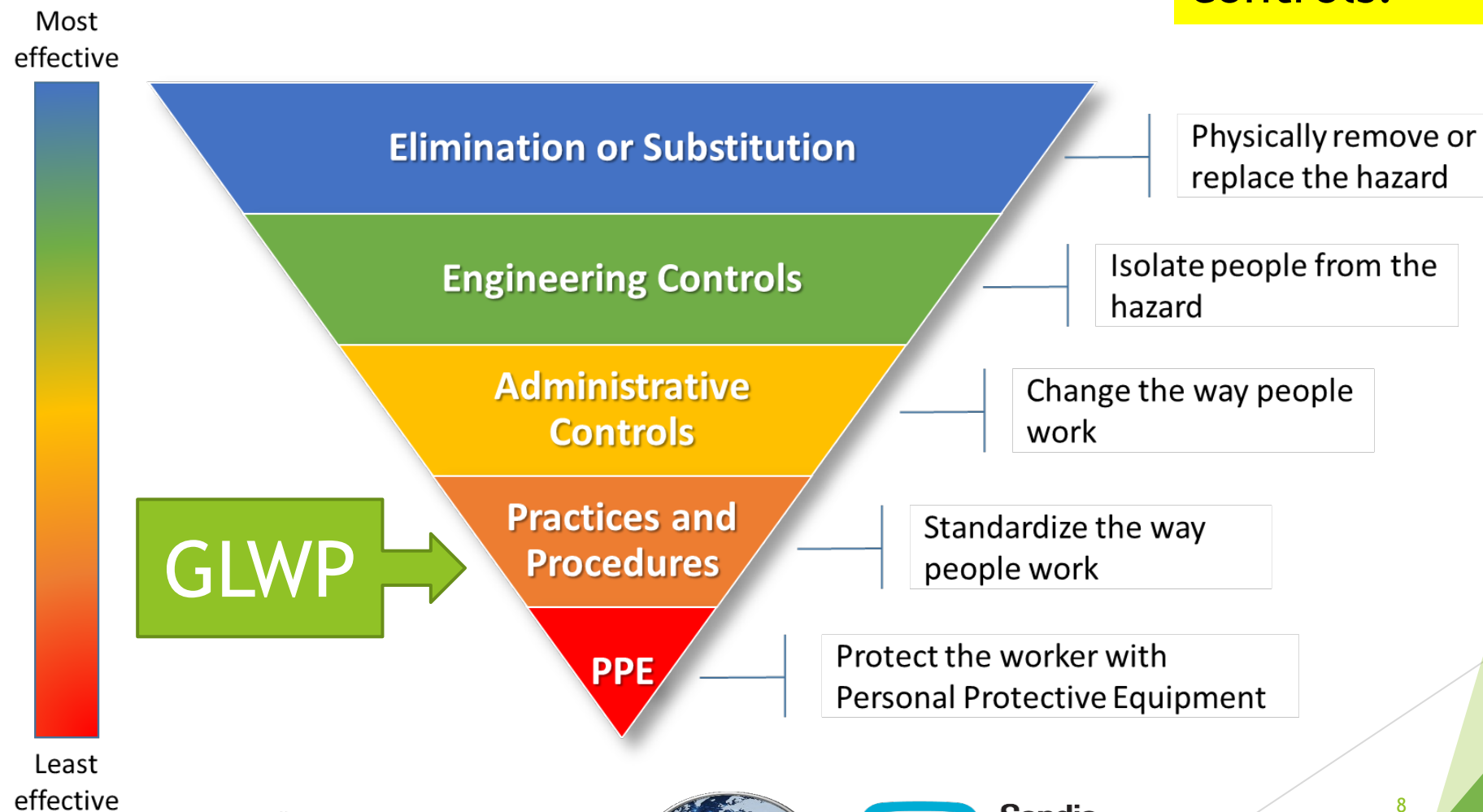


Key Components of Biorisk Management in GLWP



Hierarchy of Controls

Where can we position GLWP in the hierarchy of controls?



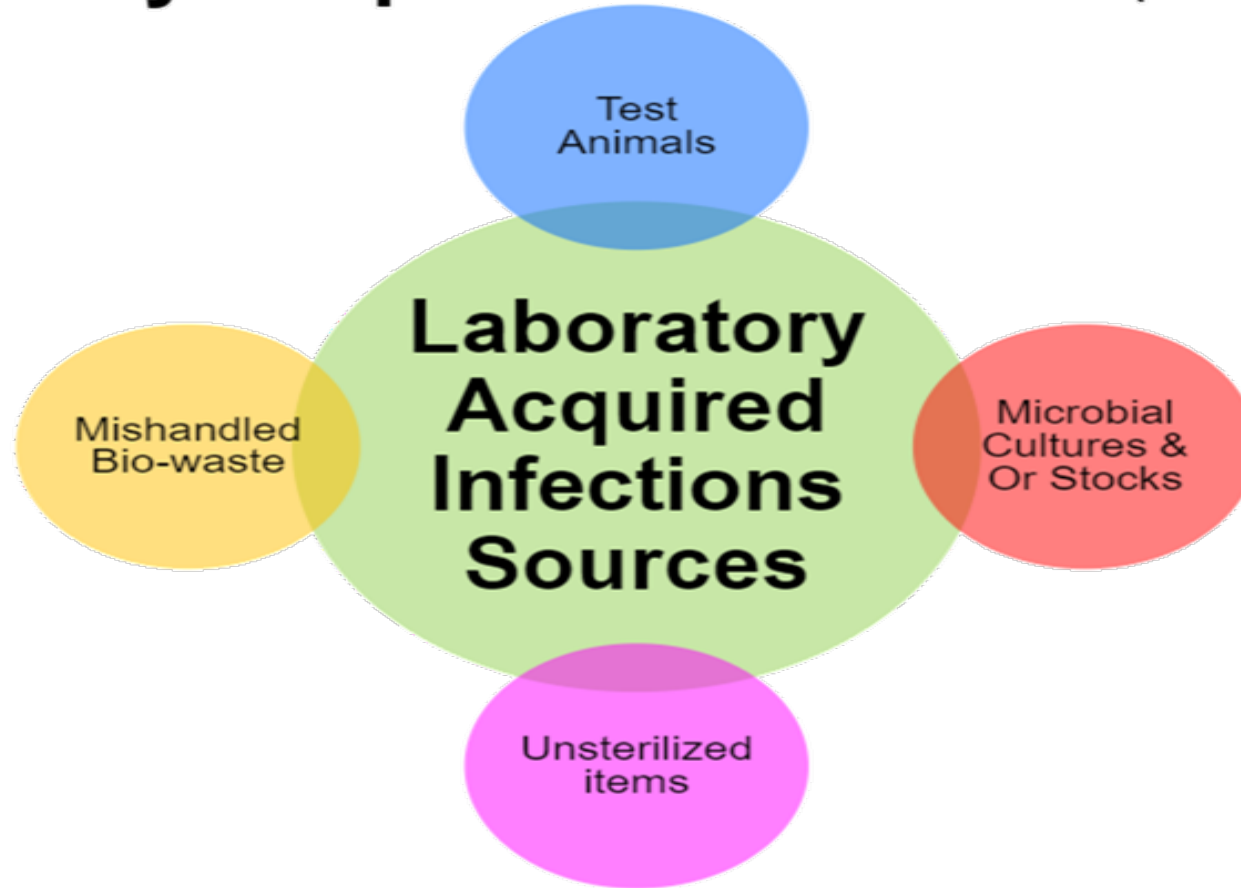


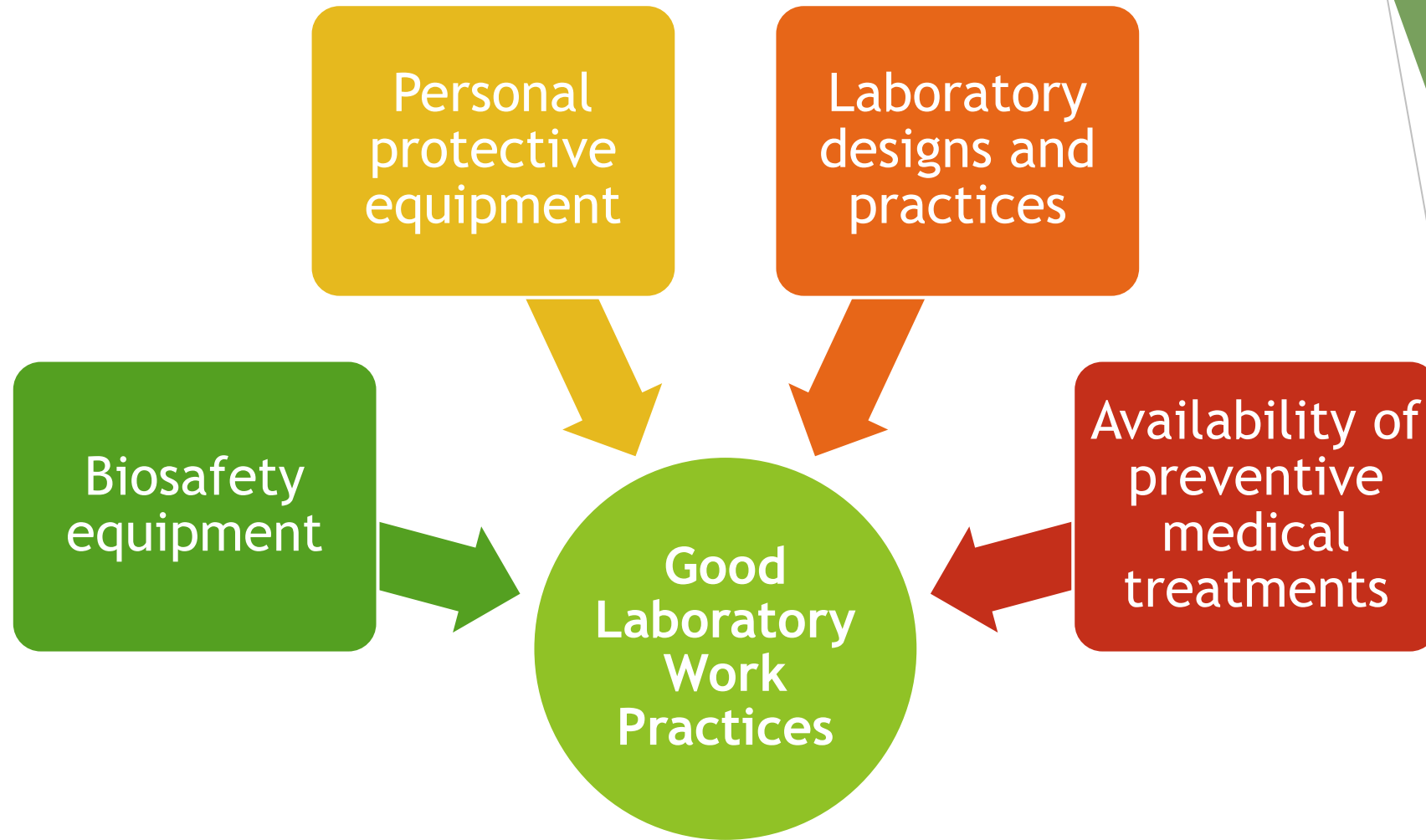
Good Laboratory Work Practices

- ▶ Practices and procedures used in the laboratory when followed protect laboratory workers and the environment from the risk of exposure or reduce the risk of hazardous agents
- ▶ Why do we practice GLWP? Following GLWP ensures:
 - ❖ own safety,
 - ❖ quality of experimental results, and
 - ❖ organization overall safety

GLWP is practiced to avoid:

Laboratory Acquired Infections (LAIs)





(Determined through biological risk assessments, evaluated by the study of infectious agents or toxins, their transmission, and their ability to cause infection)



Common sense in Laboratory Safety

- ▶ Laboratory has many hazards - e.g. source chemical, biological, electrical, ergonomic, fire
- ▶ Participants must be aware of these hazards and know how to handle them appropriately
- ▶ Participants must pay attention to these hazards to ensure a safe laboratory environment

<https://www.creative-biolabs.com/blog/index.php/common-sense-in-laboratory-safety/>



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ACTIVITY :

LIST RELEVANT GOOD LABORATORY PRACTICES THAT REQUIRE COMMON SENSE

Can you think of practices that require common sense?

Write one practice per sticky note

You have 5 minutes to answer this question



Common Sense in Laboratory Safety

Some examples

► chemical :

- ❖ when handling strong acids and alkalis, avoid spills
- ❖ do not touch these chemicals with bare hands, put on/use appropriate equipment when handling chemicals

► fire/flame:

- ❖ alcohol or combustible liquids must be poured away from fire sources
- ❖ flame on culturing glass rod must first be extinguished before dipping in methanol

Can you think
of other
practices that
require
common sense?

Poor Laboratory Work Practice

- Expired chemicals still in the laboratory
- Medium agar (with or without culture) left until dry in the fridge - not stocked in a proper manner
- Plate in biohazard plastic and not autoclaved
- Working alone during weekends
- Switching on the radio/audio equipment loudly

ANYMORE THAT YOU KNOW ???????

Some Common GLWP

- ▶ Good housekeeping:
 - ❖ Daily decontamination of work surfaces and use of chemicals with decontamination properties, e.g. 70% ethanol, 0.5% sodium hypochlorite, or 70% isopropanol (depending on the type of pathogens and work surface)
 - ❖ Use of an autoclave to reduce contamination
 - ❖ use biosafety cabinet if needed



Source: <https://www.mynewlab.com/blog/laboratory-equipment-maintenance-101/>

Biological safety cabinet (BSC)

- ▶ Biological safety cabinets are designed for the safe handling of pathogens and other potentially hazardous materials with minimal risk
- ▶ Proper use of a biosafety cabinet reduces the laboratorian's risk of exposure to potential pathogens and minimizes contamination of the work environment

Some Common GLWP

- ▶ Biosafety cabinet
 - ❖ type of BSC (according to the pathogen being handled)
 - ❖ technical competency must be acquired to use BSC properly



Source: https://www.freepik.com/premium-photo/scientist-work-sterile-hood_27067196.

Good Laboratory Work Practice related to Biosafety Cabinets



Watch and list 5 Good Work Practices related to Biosafety that you can identify in the video

SCAN ME



<https://www.youtube.com/watch?v=96-aZLom340&t=11s>

Poor Laboratory Work Practice - Activity

Watch and list 5 Poor Work Practices related to Biosafety that you can identify in the video

(Duration 3.11 minutes)



SCAN ME



<https://www.youtube.com/watch?v=dAOTg-3ev-w>

Biosafety mistakes that can be identified in the video

- ▶ Hair not covered. Hair must be tied up to avoid the possibility of dipping into chemicals/solutions
- ▶ Touching hair with gloved and ungloved hands while handling biological materials
- ▶ Biosafety cabinet filled with a lot of stuff that reduces the airflow
- ▶ The BSC airflow obstructed by items
- ▶ Presence of a non-researcher in the laboratory
- ▶ Use of soiled gloves
- ▶ Use of improper gloves
- ▶ Not wearing shoes
- ▶ Not putting on the laboratory gown properly
- ▶ Reusing the microcentrifuge

Some Common GLWP

- ▶ Proper pipetting skill is important
 - ❖ To avoid the formation of aerosol
 - ❖ For volume accuracy
 - ❖ Use of proper equipment (no mouth pipetting)



Source: Photo by Thirdman from Pexels:
<https://www.pexels.com/photo/a-scientist-using-a-laboratory-equipment-8940510/>

Potential Aerosol Generating Activities in Laboratory



Source: https://www.artel.co/learning_center/best-practices-use-micropipets/



Source: <https://www.medical-supply.ie/2019/04/bunsen-burner-biological-cabinets/>



Source: <https://blog.microbiologics.com/7-streak-plate-method-best-practices/>



Source: <https://www.emsdiasum.com/microscopy/products/equipment/centrifuge.aspx>



Source: <https://www.helscher.com/ultrasonic-protein-extraction-from-tissues-and-cell-cultures.htm>



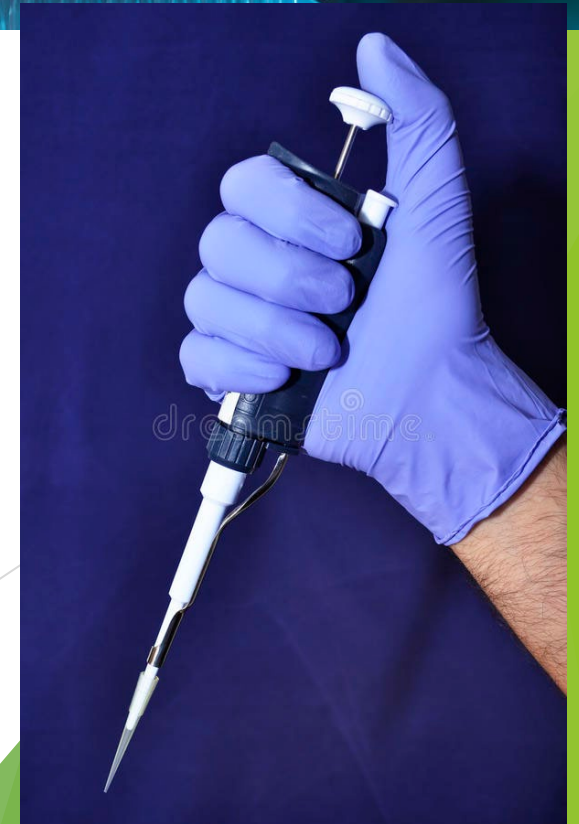
Source: <https://www.helscher.com/ultrasonic-protein-extraction-from-tissues-and-cell-cultures.htm>



Source: <https://www.sciencephoto.com/media/607032/view/blood-sample>

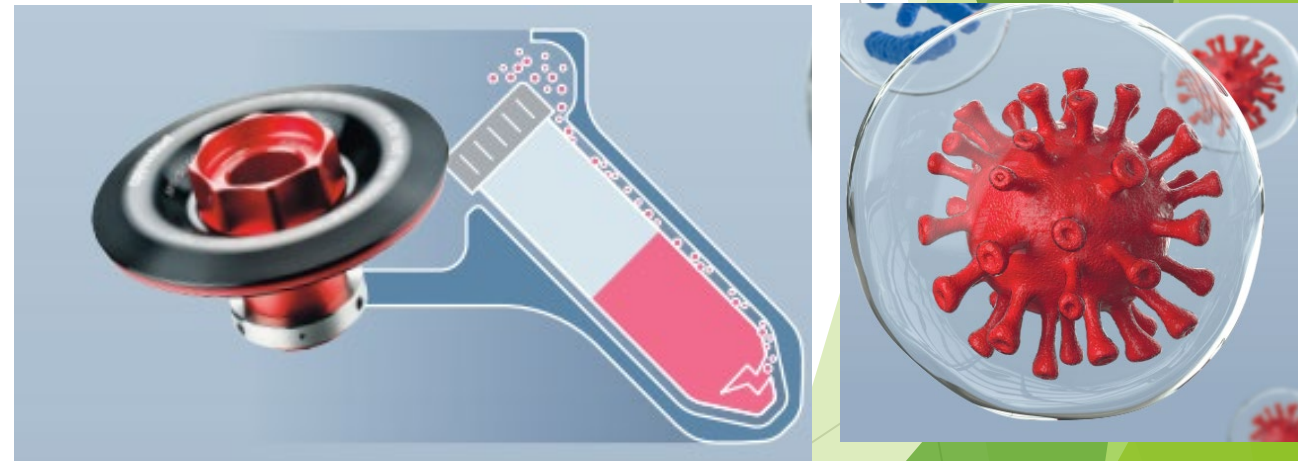
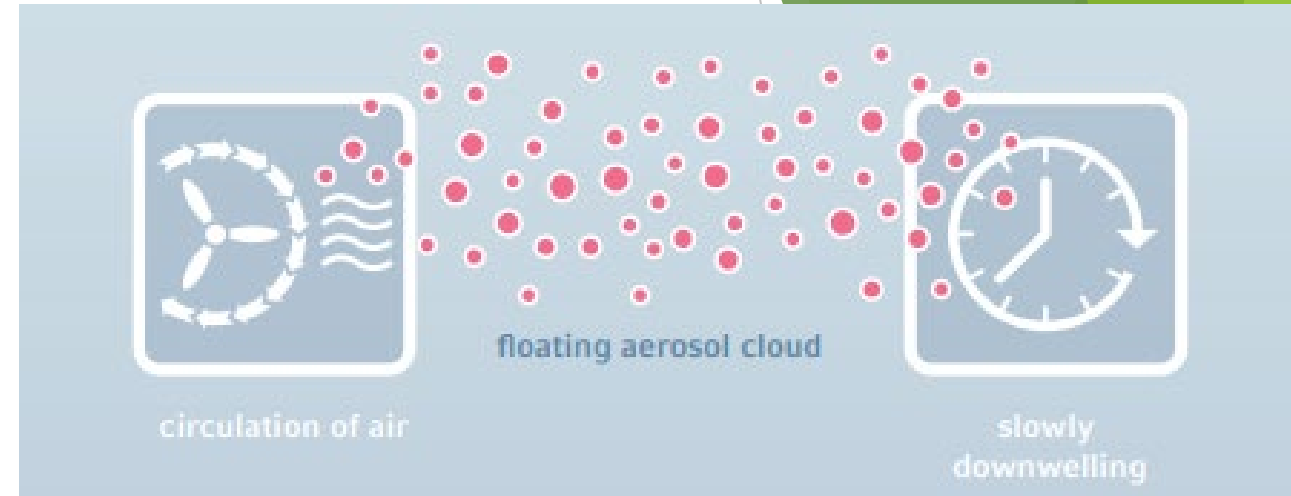
Proper Pipetting Skill

- ▶ Avoid errors with wrong pipetting technique (volume error)
- ▶ Avoid the formation of aerosol that contains Microbes
- ▶ Pre-wet the pipette tip prior to initial delivery to avoid sample loss due to evaporation, especially when handling volatile solutions such as organic solvents.
- ▶ No tip wiping
- ▶ Choose the correct pipet tips
- ▶ Do not pipet at an angle
- ▶ No mouth pipetting- use a device



Aerosols in the Lab

- ▶ Aerosols are colloidal systems of droplets and/or solid particles suspended in the air
- ▶ Being small in size ($< 10\ \mu\text{m}$), they can remain suspended in the air for several hours and get widely dispersed by the air currents. If inhaled, they can cause severe infections
- ▶ Aerosolization takes place through breathing, speech, coughing, and sneezing. Common laboratory activities such as centrifugation, pipetting, opening of ampoules, and shaking can also cause aerosols



<http://www.eppendorf.com/stayinformed>

Prevention against Aerosols in the Lab

1. Use aerosol-tight caps/lids during centrifugation
2. Consider the min./max. filling volume of vessels
3. Do not exceed the centrifuge speed limit for the vessel
4. Use plastic vessels: glass vessels are more likely to break or leak.
5. Alternatively, open and load/unload the rotor in a biosafety cabinet
6. If a tube breaks or leaks, wait 30 minutes before opening the centrifuge or aerosol-tight lid or cap, to allow for the aerosol settle



WHY IT IS IMPORTANT TO PREVENT AEROSOL FORMATION?

- Many documented cases of laboratory-acquired infections result from the inhalation of infectious aerosols
- These infections may be more or less severe, depending on the agents, and present a health hazard for everyone in the laboratory

(*1979-2005: Harding, L.H. and K.B. Byers. 2006. Epidemiology of laboratory-acquired infections.)



Hand hygiene

Will be discussed more in PPE module



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Some Common GLWP

► Hand hygiene

- ❖ before and after the use of the laboratory
- ❖ use of gloves is part of the principle in achieving hand hygiene



Source: <https://www.freepik.com/photos/washing-hands>.
Washing hands photo created by freepik - www.freepik.com

How to HANDWASH?



Ministry of Health Malaysia



Infection Control Unit
Medical Care Quality Section
Medical Development Division
Ministry of Health, Malaysia

Wash hands only when visibly soiled!
Otherwise, use handrub!



Duration of the
entire procedure:
**40-60
sec**

1

Rub
hands
palm to
palm



2

Right palm
over left dorsum
with interlaced
fingers and
vice versa



3

Palm to
palm with
fingers
interlaced



4

Backs of fingers to
opposing palms with fingers
interlocked and vice versa



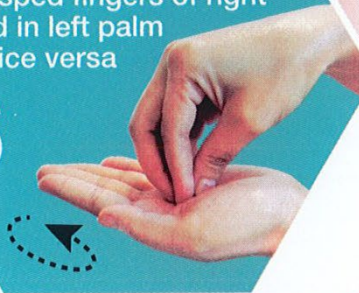
5

Rotational
rubbing of
left thumb
clapsed in
right palm
and vice
versa



6

Rotational
rubbing, backwards
and forwards with
clapsed fingers of right
hand in left palm
and vice versa



Before performing hand hygiene:

- Expose forearms
- Remove all hand/wrist jewellery and watch
- Ensure finger nails are clean, short and artificial nail or nail products are not worn
- Cover all cuts or abrasions with water proof dressing

**For the procedure
involving the wrist
(e.g palpation of the abdomen),
additional step on rotational
rubbing of right wrist clapsed in left
palm and vice versa should be included*

Source:
[https://www.infosihat.gov.my/penerbitan-multimedia/poster.raw?task=callelement&item_id=7420&element=3f91976b-5428-4aba-b4c9-d843a3316027&method=download&args\[0\]=0](https://www.infosihat.gov.my/penerbitan-multimedia/poster.raw?task=callelement&item_id=7420&element=3f91976b-5428-4aba-b4c9-d843a3316027&method=download&args[0]=0)

How to HANDRUB?



Ministry of Health Malaysia



Infection Control Unit
Medical Care Quality Section
Medical Development Division
Ministry of Health, Malaysia

Rub hands for hand hygiene!
Wash hands only when visibly soiled!



Duration of the
entire procedure:
20-30
sec

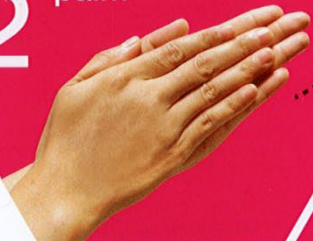
1

Dip all fingers of right hand into left palm filled with hand rub solution, pour hand rub solution over to right palm and dip all fingers of left hand into handrub solution



2

Rub hands palm to palm



3

Right palm over left dorsum with interlaced fingers and vice versa



4

Palm to palm with fingers interlaced



5

Backs of fingers to opposing palms with fingers interlocked and vice versa



6

Rotational rubbing of left thumb clasped in right palm and vice versa



Before performing hand hygiene:

- Expose forearms
- Remove all hand/wrist jewellery and watch
- Ensure finger nails are clean, short and artificial nail or nail products are not worn
- Cover all cuts or abrasions with water proof dressing

**For the procedure involving the wrist (e.g palpation of the abdomen), additional step on rotational rubbing of right wrist clasped in left palm and vice versa should be included*

Source:
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Good Work Practices (GWP) in the Field

GWP in the Field

- ▶ Remember that hazards are everywhere
- ▶ Do your AMP when planning to go on a field trip
- ▶ The goal of GWP in the field are:
 - ❖ for participants to return from the trip safely
 - ❖ for productive and valuable research and learning experience
 - ❖ to return samples, related equipment, and supplies in **Good Working Order**



PRIMARY PROBLEMS IN THE FIELD

- ▶ Injury: Trip and Fall Hazards
- ▶ Improper clothing (poor footwear, etc)
- ▶ Heavy Work Overload: 12 hours of fieldwork in 8 hours
- ▶ Heat Stroke, Heat Exhaustion
- ▶ Hypothermia
- ▶ Dehydration
- ▶ Sun burn
- ▶ Contact with wildlife, leeches, ticks, snakes, bacteria, etc
- ▶ Automobile Incidents
- ▶ The public
- ▶ Getting Lost: compass, local map, GPS, and road map
- ▶ Drowning: sea, river, flooding (undercurrents, water column, excessive river flow)

PREPARE FOR UNCERTAIN CONDITIONS

- Know the work conditions and the environment
- Know what specific safety equipment is needed?
- Know the work hazards
- Bring a field first-aid kit
- Inform at least two people about where you are going and when you will return
- Bring water, a flashlight, matches, and a snack - Just in Case!
- Check the weather forecast to prepare the necessary work clothing for the condition
- Work in Pairs
- For **all fieldwork**, field clothing/PPE will include long panties and hiking boots

Suggested GLWP when returning from field

- ▶ Decontamination/Quarantine of plant or animal samples: reduce/eliminate the possibility of bringing spores into the laboratory/building
- ▶ Take precautions when handling
 - ❖ animal feces that could contain microbes, which may be dispersed by aerosol
 - ❖ animal tissues/body fluid that may contain infectious microbes

Field etiquette

- Leave the area as you found it
- Respect private property: This is a good reason to have a camera handy to record evidence in case of issues
- Bring your trash home: Do not bury or leave your trash or waste in the field
- Fill in holes, test pits, auger holes, percolation holes, shovel pits, and cores
- When walking keep a distance of at least 6 feet between people

Key Messages

1. Good Laboratory Work Practices are techniques and methods of doing work in the laboratory that reduces biorisk.
2. Practicing GLWP is to ensure the safety of people working in the laboratory and others in the vicinity
3. Barriers to Good Laboratory Work Practices can be overcome using various strategies
4. Practice GLWP and make it a habit

Thank you

Any question?