

DLS ECHO Biosafety Session: May 30, 2023

PPE Use (What, Who, Why, When, and How)



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Agenda

- Didactic and Case Presentation
- Discussion
- Summary of Discussion
- Closing Comments and Reminders



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PPE:

What, Who, Why, When, and How

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No disclosures to reveal



Learning Objectives

- Identify biosafety practices associated with the use of PPE to advance lab safety
- Examine biosafety concepts pertaining to the appropriate use of PPE when performing lab activities
- Be able to describe alternative methods for the use of PPE applying the risk assessment process



What is PPE?



Question #1

What best describes PPE?

- a. Respirator
- b. Any piece of protective clothing or equipment worn**
- c. Biological safety cabinet
- d. Facility design
- e. Workplace controls



Definition

Personal Protective Equipment is specialized clothing or equipment worn by an employee for protection against infectious materials.



Top 10 items used in Personal Protective Equipment (PPE)



Question #2

PPE is considered a point-of-contact safety control measure since PPE:

- a. is the first line of defense to prevent exposure
- b. reduces the likelihood of exposure to the hazard since the hazard is not able to be removed**
- c. when properly used eliminates the hazard
- d. can remove any given hazard before a laboratorian comes in contact
- e. is considered the primary containment in most situations



Point-of-Contact Control

Hazard is not able to be removed

Reduces the likelihood of exposure to the hazard

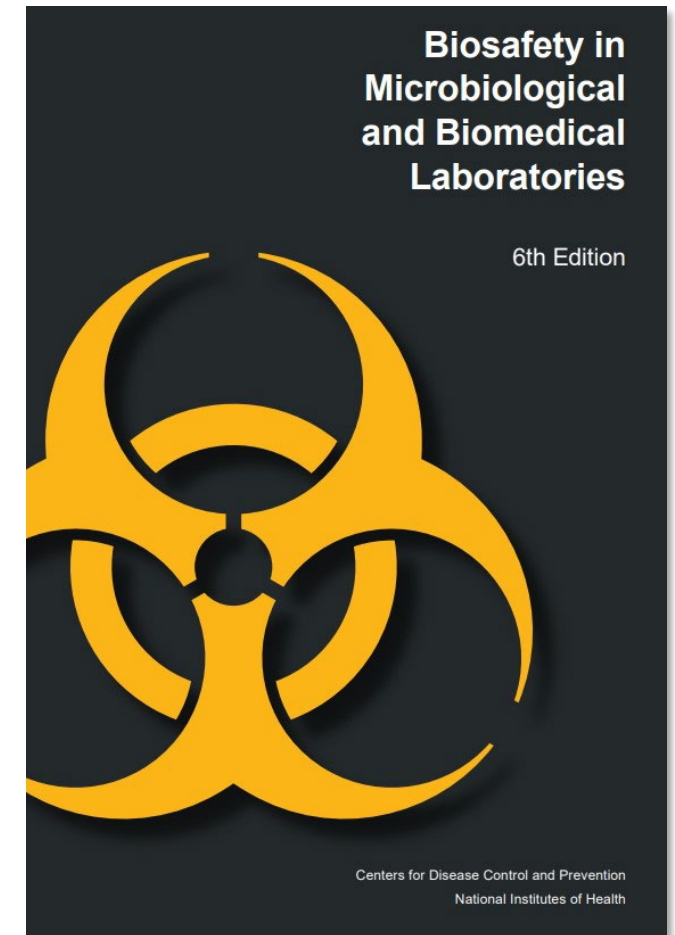
But does not eliminate the hazard

Considered a secondary containment



BMBL Describes PPE

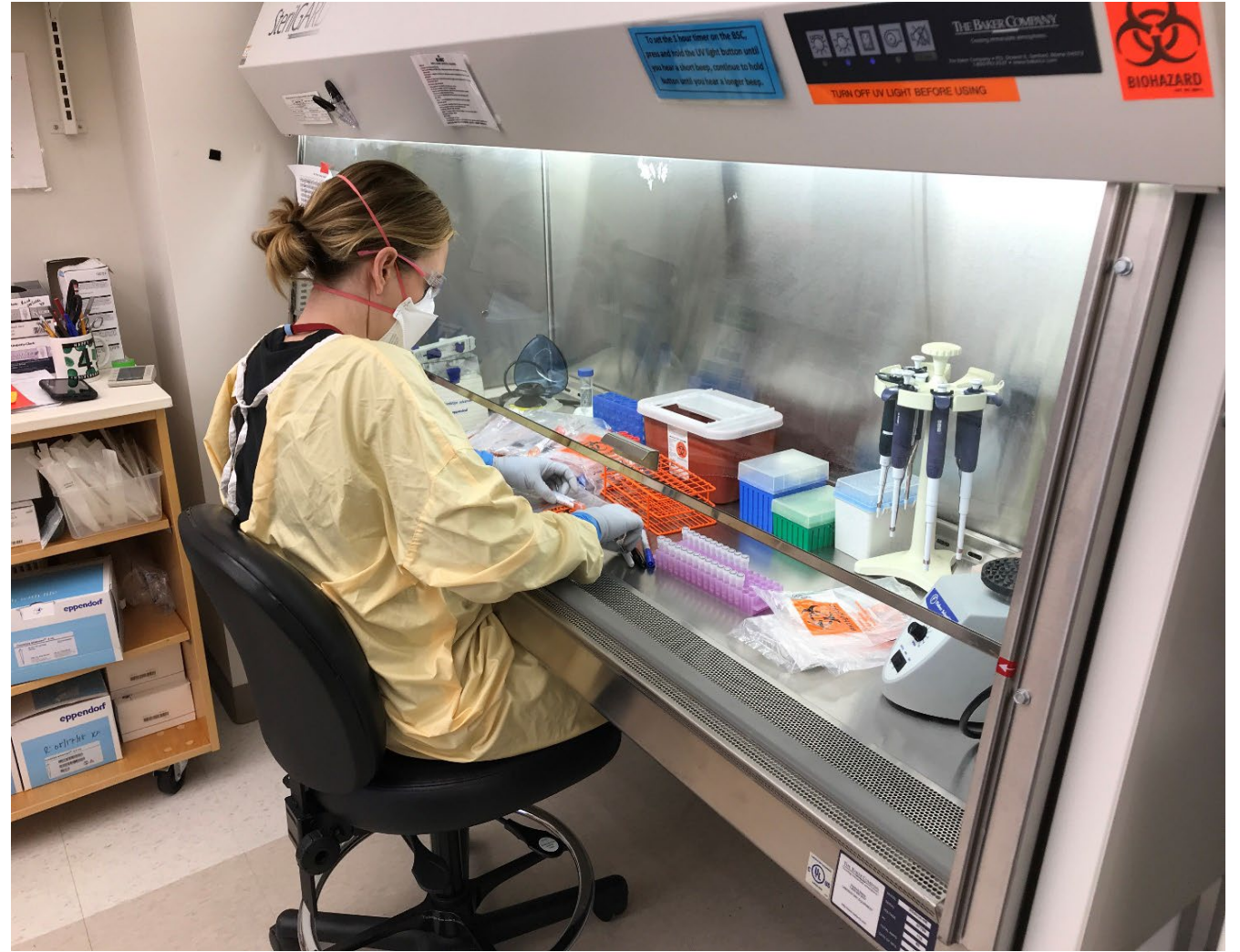
- Standard microbiological practices
- Safety equipment
- Exception of PPE as a primary barrier
 - Field work
 - Certain animal studies
 - Animal necropsy
 - Activities related
 - Operations
 - Maintenance
 - Services
 - Support of lab equipment/facilities



PPE and Patient Care Biocontainment Unit



BSL-3 practices in BSL-2 containment



BSL-4 PPE



Positive pressure suit



Question #3

Which one of the following requires both NIOSH certification and FDA clearance?

- a. Surgical face mask
- b. Filtering face piece respirator**
- c. PAPR
- d. Cloth covering
- e. None of the above



NIOSH vs OSHA

NIOSH

National Institute for Occupational Safety and Health
Governed by the CDC

Recommends

Best scientific practices

OSHA

Occupational Safety and Health Administration
Governed by the Dept of Labor

Requires

By law



Surgical N95 vs Standard N95

➤ Similarities

- Appearance
- Can effectively filter airborne biological particles when properly selected and worn.

➤ Key differences

- Surgical N95 respirator is fluid resistance.
- Sterility
- Cost



WHAT IS AN N95 MASK

95: Removes 95%
of .3+ micron-particles

VALVE: Optional, reduces
breathing resistance
during exhalation

MATERIAL: Tough, yet flexible
non-woven polypropylene fiber



N: This is a Respirator Rating Letter Class. It stands for “Non-Oil” meaning that if no oil-based particulates are present, then you can use the mask in the work environment. Other masks ratings are R (resistant to oil for 8 hours) and P (oil proof).

95: Masks ending in a 95, have a 95 percent efficiency. Masks ending in a 99 have a 99 percent efficiency. Masks ending in 100 are 99.97 percent efficient and that is the same as a HEPA quality filter.

.3 microns: The masks filter out contaminants like dusts, mists and fumes. The minimum size of .3 microns of particulates and large droplets won't pass through the barrier, according to the Centers for Disease Control and Prevention (CDC.)



Question #4

All the following are OSHA standards that employees should adhere to prevent a work exposure to illness except:

- a. PPE Standard
- b. Respiratory Protection Standard
- c. Bloodborne Pathogens Standard
- d. General Duty Clause
- e. **Select Agent Standard**



General Duty Clause

29 U.S.C. § 654, 5(a)1: **Each employer** shall furnish to each employees employment, a place of employment which is free from recognized hazards that are causing or likely to cause death or serious physical harm to employees."



- Part Number:**

- 1910

- Part Number Title:**

- Occupational Safety and Health Standards

- Subpart:**

- 1910 Subpart I

- Subpart Title:**

- Personal Protective Equipment

- Standard Number:**

- 1910.132

- Title:**

- General requirements.

1910.132(a) *Application.* **Protective equipment**, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.



Respiratory Protection Standard

Fit Testing

Under 1910.134, fit testing must be performed initially (before the employee is required to wear the respirator in the workplace) and must **be repeated at least annually**. Fit testing must also be conducted whenever respirator design or facial changes occur that could affect the proper fit of the respirator.

Examples of conditions which would require additional fit testing of an employee include (but are not limited to) the use of a different size or make of respirator, weight loss, cosmetic surgery, facial scarring, the installation of dentures or absence of dentures that are normally worn by the individual.



Qualitative vs Quantitative Fit Testing

➤ Qualitative

- Dependent on the wearer's senses

- Odor threshold

- Isoamyl acetate

Note: irritant smoke test not recommended

- Taste

- Saccharin

➤ Quantitative

- Controlled negative pressure

- Bending, talking, head side-to-side, head up and down



Respirator Fit Testing

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.



What are Air-Purifying Respirators?

Air-purifying respirators (APRs) work by removing gases, vapors, aerosols (droplets and solid particles), or a combination of contaminants from the air through the use of filters, cartridges, or canisters. These respirators do not supply oxygen and therefore cannot be used in an atmosphere that is oxygen-deficient or immediately dangerous to life or health. The appropriate respirator for a particular situation will depend on the environmental contaminant(s).

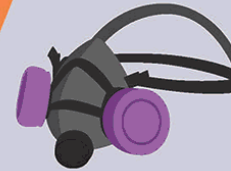
Filtering Facepiece Respirator (FFR)



- Disposable
- Covers the nose and mouth
- Filters out particles such as dust, mist, and fumes
- Select from N, R, P series and 95, 99, 100 efficiency level
- Does NOT provide protection against gases and vapors
- Fit testing required

Elastomeric Half Facepiece Respirator

- Reusable facepiece and replaceable cartridges or filters
- Can be used to protect against gases, vapors, or particles, if equipped with the appropriate cartridge or filter
- Covers the nose and mouth
- Fit testing required



Elastomeric Full Facepiece Respirator



- Reusable facepiece and replaceable canisters, cartridges, or filters
- Can be used to protect against gases, vapors, or particles, if equipped with the appropriate cartridge, canister, or filter
- Provides eye protection
- More effective face seal than FFRs or elastomeric half-facepiece respirators
- Fit testing required

Powered Air-Purifying Respirator (PAPR)

- Reusable components and replaceable filters or cartridges
- Can be used to protect against gases, vapors, or particles, if equipped with the appropriate cartridge, canister, or filter
- Battery-powered with blower that pulls air through attached filters or cartridges
- Provides eye protection
- Low breathing resistance
- Loose-fitting PAPR does NOT require fit testing and can be used with facial hair
- Tight-fitting PAPR requires fit testing



Seven Steps to Correctly Wear a Respirator at Work

Following these simple steps will help you properly put on and take off your respirator, and keep you and everyone else safe.

1 Wash Your Hands



Wash your hands with soap and water or alcohol-based hand rubs containing at least 60% alcohol.

2 Inspect the Respirator



Inspect the respirator for damage. If it appears damaged or damp, do not use it.

3 Put on the Respirator



Cup the respirator in your hand with the nosepiece at your fingertips and the straps hanging below your hand.



Cover your mouth and nose with the respirator and make sure there are no gaps (e.g., facial hair, hair, and glasses) between your face and the respirator.



Place the strap over your head and rest at the top back of your head. If you have a second strap, place the bottom strap around your neck and below your ears. Do not crisscross straps.



If your respirator has a metal nose clip, use your fingertips from both hands to mold the nose area to the shape of your nose.

4 Adjust the Respirator



Place both hands over the respirator. Inhale quickly and then exhale. If you feel leakage from the nose, readjust the nosepiece; if leakage from the respirator edges, readjust the straps.



Repeat until you get a proper seal. If you can't get a proper seal, try another respirator.



Avoid touching the respirator while using it. **If you do, wash your hands.**

5 Wear the Respirator

Note: If you reuse your respirator, wear gloves when inspecting and putting on the respirator. Avoid touching your face (including your eyes, nose, and mouth) during the process.



What is the difference between N95 and KN95?

Difference between respirators is the certification

- N95 is the US standard and the KN95 is the China standard
- Only N95 respirators are approved for healthcare use in the US
- KN95 respirators have many of the same protective properties



Who of PPE?



Who is responsible?

- Your employer for PPE supplies
 - To meet OSHA standards

1910.132(h) *Payment for protective equipment.*

1910.132(h)(1) Except as provided by paragraphs (h)(2) through (h)(6) of this section, **the protective equipment, including personal protective equipment, used to comply with this part, shall be provided by the employer at no cost to employees.**

- You are responsible to wear appropriately

29 U.S.C. § 654, 5(b): **Each employee shall comply with occupational safety and health standards** and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.



Why is PPE important?



Question #5

When establishing controls in the laboratory to decrease hazards which comes first?

- a. Substitution
- b. Elimination**
- c. Engineering controls
- d. Administrative controls
- e. PPE



Hierarchy of Controls

Most effective



Least effective

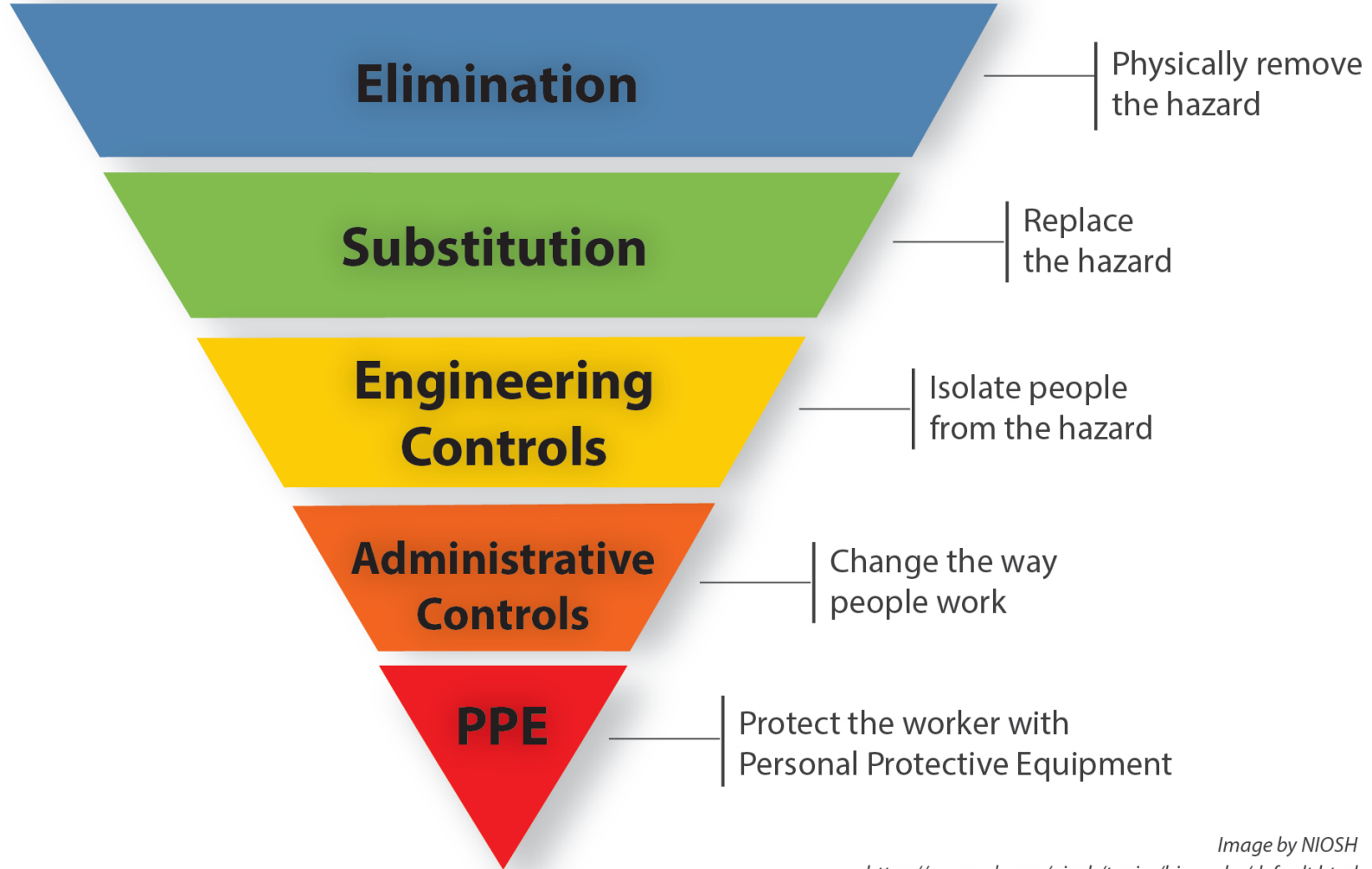


Image by NIOSH
<https://www.cdc.gov/niosh/topics/hierarchy/default.html>



Hazard vs Risk

Hazard (Potential source of harm)

Chemical

Biological

Physical

Procedural (ex. no BSC)

Risk

Probability of harm

Severity of harm



Question #6

The following are all important to prevent LAIs except:

- a. Good laboratory design
- b. Good laboratory practices
- c. Prevent aerosol production
- d. **Required vaccination of all employees**
- e. Proper disposal of infectious waste
- f. All of the above



IBC at UNMC

Offer immunizations where appropriate
Vaccine declination statement



When should PPE be used?



Question #7

An employer is required to assess the workplace to determine if a hazard necessitating the use of PPE is present or likely to be present only if an injury occurs.

- a. **False**
- b. True



Risk Assessment Process

- Who is required to perform risk assessments to determine the need for PPE?
 - Employer must certify in writing that a workplace hazard assessment has been completed as required in 1910.132(d)(2).

➤ PPE Hazard Assessment

- Identify the hazards
- Determine who is at risk
- Evaluate risk
- Determine controls
- Implement controls
- Ongoing review and update as necessary

Risk Management Process



Question #8

PPE related training must cover the following items except:

- a. When and what kind of PPE is necessary
- b. How to properly don, doff, adjust, wear, and maintain PPE
- c. How to properly dispose of the PPE
- d. The limitations of PPE
- e. **The brand name of PPE**



Training

1910.132(f) *Training.*

1910.132(f)(1) The employer shall provide training to each employee **who** is required by this section to use PPE. Each such employee shall be trained to know at least the following:

1910.132(f)(1)(i) **When** PPE is necessary;

1910.132(f)(1)(ii) **What** PPE is necessary;

1910.132(f)(1)(iii) **How** to properly don, doff, adjust, and wear PPE;

1910.132(f)(1)(iv) **Why** to include limitations of the PPE; and,

1910.132(f)(1)(v) The proper care, maintenance, useful life and disposal of the PPE.



Question #9

Evaluation of safe work practices to include the use of PPE should be done:

- a. Only after an exposure incident
- b. At least annually**
- c. When CLIA is going to be onsite for an inspection
- d. Semiannually
- e. Not required



How should PPE be used?



Question #10

What would be a typical sequence for donning PPE?

- a. Face shield, respirator, gloves, gown
- b. Respirator, face shield, gown, gloves
- c. Gloves, gown, face shield, respirator
- d. Gown, face shield, gloves, respirator
- e. **Gown, respirator, face shield, gloves**



DONNING YOUR PPE

A simple guide to the correct steps for PUTTING ON your Hospital Infection Control Personal Protective Equipment, as recommended by the Centers for Disease Control.

#1



HAND HYGIENE

#2



GOWN

#3



RESPIRATORY
PROTECTION

#4



EYE
PROTECTION

#5



GLOVES

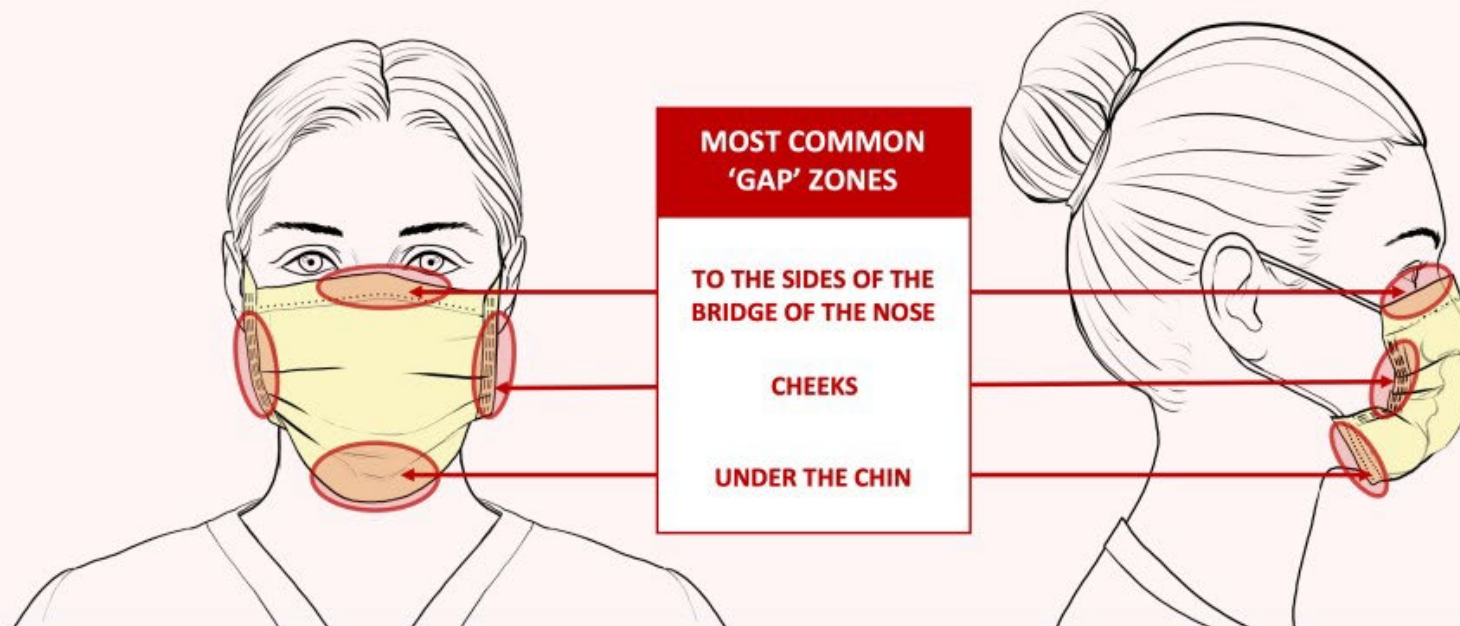
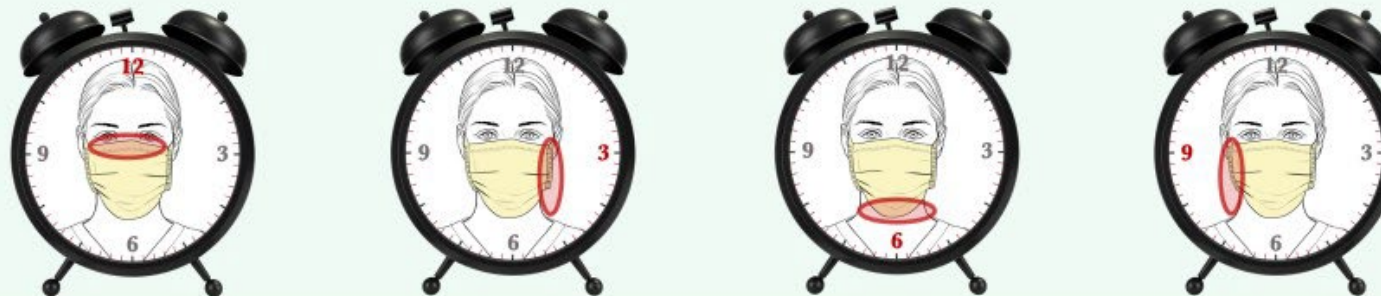


MIND THE GAP!

FACEMASK FIT MATTERS, MAXIMUM MASK-TO-SKIN CONTACT IS ESSENTIAL

UPON DONNING YOUR MASK, EXAMINE FOR GAPS AS ONE WOULD OBSERVE A CLOCK

START → MOVE AROUND YOUR FACEMASK CLOCKWISE → END



GAPS IN THE MASK-TO-SKIN CONTACT WILL GREATLY DIMINISH THE PROTECTIVE VALUE OF THE PPE



Question #11

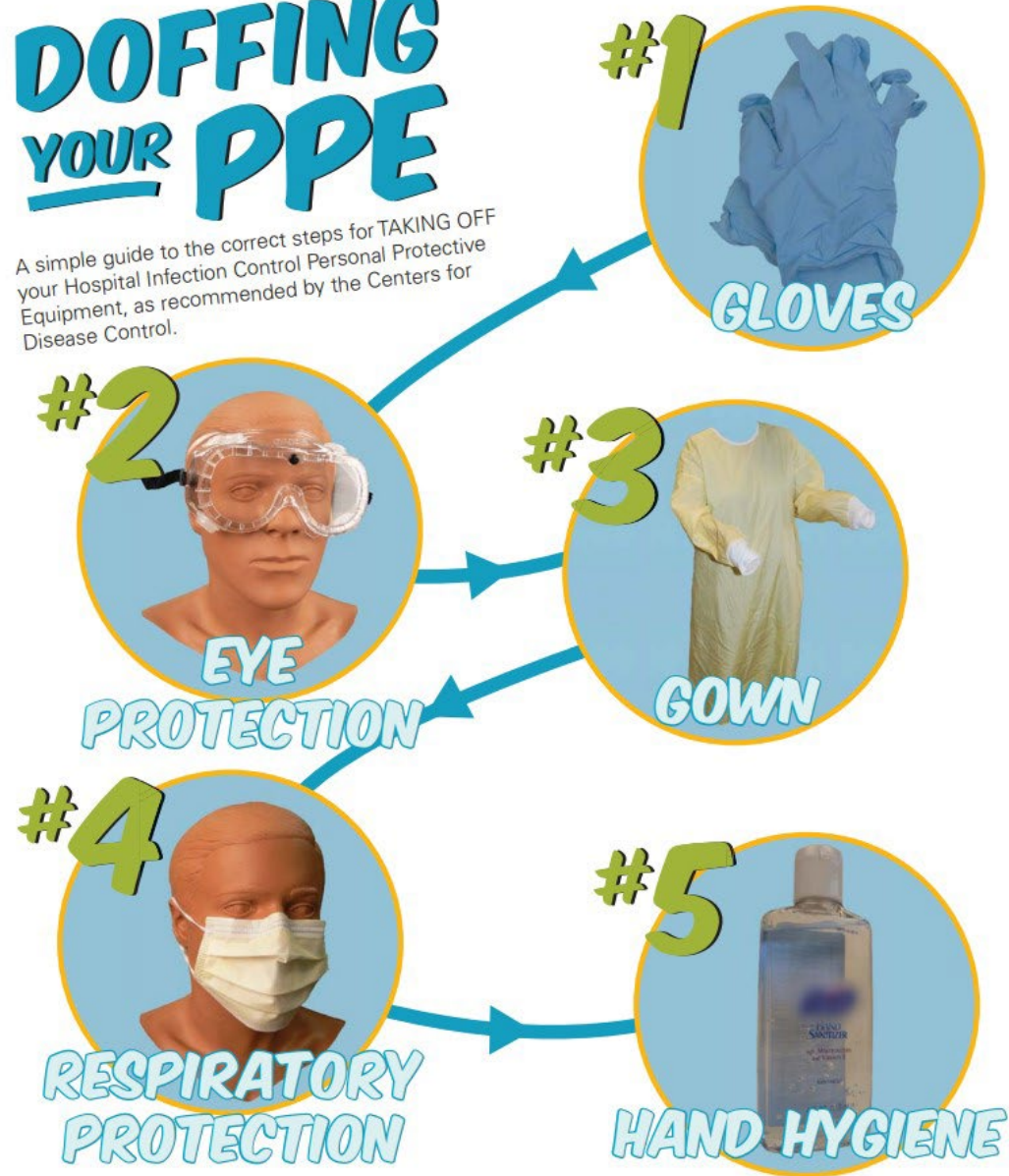
What would be a typical sequence for doffing PPE?

- a. Face shield, respirator, gloves, gown
- b. Respirator, face shield, gown, gloves
- c. **Gloves, face shield, gown, respirator**
- d. Gown, face shield, respirator gloves
- e. Gown respirator gloves, face shield



DOFFING YOUR PPE

A simple guide to the correct steps for TAKING OFF your Hospital Infection Control Personal Protective Equipment, as recommended by the Centers for Disease Control.



Question #12

What is the standard for how long a single pair of gloves can be used?

- a. 2 hours
- b. 3 hours
- c. 4 hours**
- d. Remove only if contaminated
- e. Until the task is completed



Further Group Discussion Questions



Discussion Question #1

Describe which barrier would be most likely to occur in your institution to adherence to wearing PPE?

- a. Supply shortage
- b. Fit testing
- c. Lack of education and training
- d. Peer pressure
- e. Lack of dexterity



Discussion Question #2

Given the limited resources of N95 masks early in the COVID-19 pandemic, what percent of the time did you extend the use of or reuse the respirator?

- a. 0
- b. 10%
- c. 20%
- d. 30%
- e. >40%



Discussion Question #3

What would you consider the greatest adherence to reuse of a respirator?

- a. Storage
- b. Integrity of respirator
- c. Manufacturer
- d. No place to safely doff
- e. No decontamination process



Discussion Question #4

When buying PPE all the following are appropriate except:

- a. Carryout a risk assessment
- b. User friendly and fit correctly
- c. Consider the medical condition of the wearer
- d. Passed regulatory requirements and safety tests
- e. Survey the lab staff to determine which respirator brand would be used



Other topics that could be discussed



Why wear a surgical mask over N95 respirator?

The need to conserve/reuse N95 FFRs early in the COVID-19 pandemic led public health agencies and associations to say that cloths or procedure/surgical masks can be worn over N95s to prevent or reduce respirator microbial contamination.

Dec 20, 2022



Front-line clinical laboratories

In situations in which aerosols and droplets are produced and respiratory protection such as fit testing for an N95 respirator are not available, a physical barrier such as a splash shield while using a surgical mask may be considered.

When a certified BSC is not available and there is a potential for general aerosols or droplets, or if instruments such as a centrifuge with safety cups or sealed rotors or a point-of-care device cannot be used inside a BSC, use extra precaution to provide a barrier between the specimen and personnel such as a mask or respirator plus other physical barriers such as a splash shield and other appropriate PPE.



The prolonged use of medical masks can be uncomfortable. However, it does not lead to CO2 intoxication nor oxygen deficiency.

While wearing a medical mask, make sure it fits properly and that it is tight enough to allow you to breathe normally. Do not re-use a disposable mask and always change it as soon as it gets damp.

* Medical masks (also known as surgical masks) are flat or pleated; they are affixed to the head with straps or have ear loops.



World Health Organization

#Coronavirus

#COVID19

FACT:

The prolonged use of medical masks* when properly worn, DOES NOT cause CO2 intoxication nor oxygen deficiency



5 June 2020





Resources



TRENDING [Marburg Virus Disease](#)

National Emerging Special Pathogens Training and Education Center

Working together to increase the capability of the U.S. public health and health care systems to safely and effectively manage special pathogens.

→ [About NETEC](#)

What We Offer



Educational Materials, Courses & Training

We offer courses and training for nurses, physicians, emergency responders, and other health care professionals. Our resources provide facilities and individuals with preparedness best practices.



Consultations & Support Services

We can help health care facilities and EMS agencies prepare for special pathogen events with free virtual and onsite readiness consulting and assessments.



Research Policies & Procedures

Our network provides researchers with training, tools, and resources to quickly understand clinical syndromes and study effective treatments and clinical management strategies.



Ask Our Experts

Your organization can submit any question related to special pathogen response. Inquiries range from questions about PPE, to requests to review written protocols, to onsite visits for observing exercises and drills.



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About HEROES

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The HEROES Program would love to partner with you! To schedule simulation training, propose a project, or if you have general questions, please contact our Program Coordinator via the email, phone, or mailing address below.

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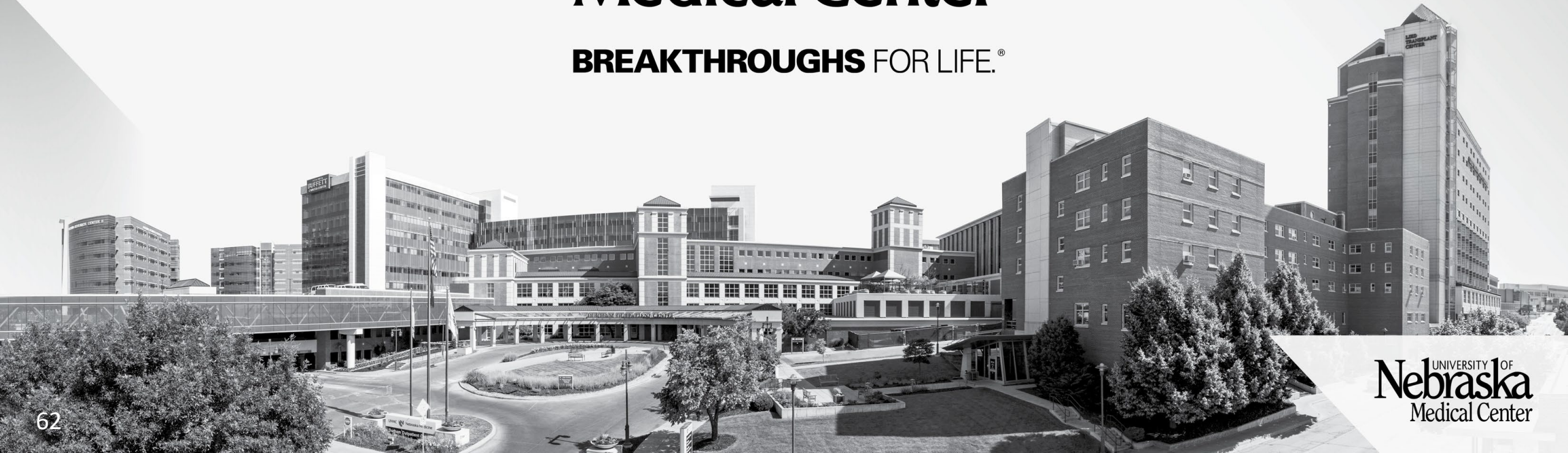
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Medical Center

Next DLS ECHO Biosafety Session: June 27, 2023

Laboratory Acquired Infections



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