

	Applying and Removing Personal Protective Equipment for working in a TB Biosafety Level 3 Laboratory	
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Written by: Kyle Tholen		Approved by:

1.0 TITLE

1.1 Applying and Removing Personal Protective Equipment (PPE)

2.0 PURPOSE

2.1 There are three main components of personal protective equipment (PPE) that are worn in the biosafety level 3 laboratory (BSL3) to protect the wearer from splashes and aerosolized Mycobacteria while manipulating cultures or specimens. The necessary PPE includes an N95 respirator, laboratory gown and disposable gloves.

2.1.1 The N95 respirator (N95R) provides the wearer with respiratory protection from airborne particles such as Mycobacteria, which do not contain oil. The 'N' means 'not oil-proof' and the 95 means at least 95% effective in filtering particles that are of 0.3 um in diameter or greater (Mycobacteria are approximately 1 um diameter). The N95 respirator consists of a 'mask' composed of filtering material. Some respirators have a one way valve to make breathing out through the filter material easier and to reduce humidity around the face. Respirators are applied over the wearer's nose and mouth and are secured to the face by elastic or rubber straps which are worn around the head. There are various designs of N95R: some are soft, some are molded, and most have a thin metal strip over the nose area so that the wearer can adjust the respirator for an air-tight fit over the bridge of the nose. N 95 respirators must be NIOSH approved. The N95R must be fit tested to the wearer and fit-checked each time they are worn. The N95R are fluid resistant and disposable.

2.1.2 Laboratory gowns must have a solid front and close in the back. They must also be long sleeved and it is preferable that the sleeves have elastic cuffs. Lab gowns must be water resistant and can be either disposable or autoclavable and reusable.

2.1.3 Gloves used in the BSL3 laboratory must be disposable. Some laboratorians can have allergies to latex and latex can also interfere with molecular reactions and cause inconsistent results. An alternative to latex is gloves made from nitrile or vinyl, these should be kept on hand and used for PCR testing and be available for laboratorians who have allergies to latex.

3.0 EQUIPMENT

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4.0 SUPPLIES

- 4.1 N95 Respirators**
- 4.2 Laboratory gowns**
- 4.3 Disposable gloves**
- 4.4 Hair covers**
- 4.5 Biohazard bags and laboratory waste containers**

5.0 SPECIAL SAFETY PRECAUTIONS

- 5.1** Staff **MUST** be fit-tested successfully before using an N95 respirator
- 5.2** Staff **MUST** always wear only that respirator model and size that they have been fit-tested for
- 5.3** Staff **MUST** perform positive and negative leak checks each time that they don a respirator
- 5.4** N95 respirators cannot be used in an atmosphere of less than 19.5% oxygen
- 5.5** Staff with facial hair cannot wear an N95 respirator because a facial seal cannot be achieved
- 5.6** Respirators must be used and maintained as per instructions
- 5.7** N95 respirators cannot be used in an atmosphere containing oil particles
- 5.8** Staff should be fit tested each year, and at any time that physical, facial changes occur such as starting to wear eyeglasses, dentures etc
- 5.9** Once a respirator has been donned and fit checked it must not be adjusted in any way that may break the seal to the face
- 5.10** Failure to correctly use N95Rs could result in exposure to infectious agents

6.0 PROCEDURE

- 6.1 Applying personal protective equipment**
 - 6.1.1** Put on the first pair of gloves, ensuring that they fit properly and there are free of holes
 - 6.1.2** Take a clean sterile lab gown in the appropriate size and slide both arms into the gown. Ensure that the cuff of the gown overlaps the first pair of gloves
 - 6.1.3** Tie or secure the gown opening in back
 - 6.1.4** Don the hair cover, pulling all hair inside the hair cover

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- 6.1.5 Put on the second pair of gloves over the first layer of gloves tucking the cuffs of the gown inside the outer gloves
- 6.1.6 Remove the N95R from the box and check that it is not damaged in any way
- 6.1.7 For models that have rubber straps, stretch the straps several times to extend.
- 6.1.8 Place the respirator in the left hand, cup side up, nose piece facing away and the straps hanging loose at the back of the hand
- 6.1.9 Cup the respirator under the chin with the nosepiece up
- 6.1.10 Pull the top strap over the head so that it rests high on the back of the head
- 6.1.11 Pull the bottom strap over the head so that it rests below the ears
- 6.1.12 Using both hands mold the nosepiece to fit the bridge of the nose. Do not pinch the metal band but smooth it on top of the nose and then down the sides of the nose
- 6.1.13 Perform fit –check as follows, each time the N95R is put on :
 - 6.1.13.1 *Positive fit-check* (for non-valve respirators). Place both hand over the N95R with the finger tips at the edge of the respirator, under the eyes. Blow out slowly through the mouth. No air should be felt escaping from the edge of the respirator
 - 6.1.13.2 *Negative fit –check*. Place both hands over the N95R and suck breath in sharply. The respirator should be felt to press back into the face.

If either fit-check fails then the respirator must be re-applied and re-checked

- 6.1.14 Pull on a second layer of gloves over the first layer, these will be the outer gloves

6.2 Removing personal protective equipment

6.2.1 Outer Gloves

- 6.2.1.1 Use great care in removing gloves, the outside of the gloves are contaminated!
- 6.2.1.2 Grasp the outside of the outer glove with the opposite hand; peel off
- 6.2.1.3 Hold the removed glove in the outer gloved hand
- 6.2.1.4 Slide finger of the inner gloved hand under remaining outer glove at the wrist
- 6.2.1.5 Peel outer glove off over first glove

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6.2.1.6 Discard gloves into biohazard waste container

6.2.1.7 Leave the inner gloves on, they will be removed last

6.2.2 Gown

6.2.2.1 The front and sleeves of the gown are contaminated!

6.2.2.2 Carefully unfasten the ties or Velcro that holds the gown closed in back

6.2.2.3 Pull the gown away from the neck and shoulders touching inside of gown only

6.2.2.4 Turn the gown inside out as it is removed

6.2.2.5 Folding the contaminated areas of the gown together fold or roll into a bundle to discard in biohazard waste container or place into a hamper to be autoclaved

6.2.3 N-95 Respirator

6.2.3.1 The front of the respirator is contaminated, do not touch!

6.2.3.2 Grasp the elastic band at the top of the back of the head

6.2.3.3 Pull off and over head

6.2.3.4 Keeping hold of the top elastic band pull it out in front of face pulling respirator away from face

6.2.3.5 While holding respirator in the position described above, grasp the lower band with the opposite hand and lift respirator straight up over head

6.2.3.6 Discard respirator into biohazard waste container

6.2.4 Hair cover

6.2.4.1 Grasp hair cover and remove from head

6.2.5 Inner Gloves

6.2.5.1 Remove inner gloves as described above, same as outer gloves and discard into biohazard waste container

6.3 Perform hand hygiene immediately after removing PPE

7.0 REFERENCES

7.1 Equipment: N95 Disposable Respirator, Pam Chedore, CPHL, Canada

7.2 Sequence For Removing Personal Protective Equipment (PPE), CDC, USA

8.0 RELATED DOCUMENTS

9.0 APPENDICES

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9.1 Job Aid: Sequence for removing Personal Protective Equipment (PPE)