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PPE Update

Current PPE not ready for Ebola threat

The mishmash of untested PPE available is not proven to guard against Ebola; here's how to get the best available PPE

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Editor's Note:

Editor's note: *The views expressed in this article are that of the authors and may not be those of the sponsor.*

Ebola is potentially a much more deadly disease than some of the global epidemics we have faced before. Certainly, the hope is that our medical and response infrastructure will contain what should be a small number of exposures and resulting confirmed instances of the disease in our country.

Yet, the news coming out of the global health surveillance is that this situation is a possible disaster that could get worse before it gets better, requiring extreme vigilance and preparedness.

Emergency responders may be some of the more likely individuals to come in contact with infected persons. Responder PPE is a truly relevant topic as there are claims that individuals wearing PPE have become infected with Ebola.

We have all seen the news footage of individuals dressed in seemingly piecemeal ensembles of various garments, face wear, and gloves. These images portray a near encapsulation of medical aid workers and others in the affected West African nations.

Experts familiar with PPE rightfully question some of these outfits and raise inquiries about what constitutes appropriate PPE for these hazards.

Hot-button issue

Specific calls on this subject have consumed a good portion of our time in recent weeks. There is considerable misinformation, misrepresentation, and unfortunately, a certain level of opportunism coming to bear in the world of PPE for biological protection.

Surprisingly, the United States is not as prepared as it should be and the reasons for the circumstance are not very compelling. Back in the late 1980s, OSHA enacted the blood-borne pathogen regulations in 29 CFR part 1910.1030.

At that time, the overriding concern was that of HIV/AIDS, followed by increasing risks for transmission of various forms of Hepatitis. With regard to PPE, the regulations defined appropriate PPE as clothing and other items that kept blood and body fluids from contacting the wearer's skin or underclothing.

OSHA did not get any more specific in setting specific test or validation criteria for establishing minimum PPE performance. However, interpretations were made that the rules covered emergency responders within the population of health care workers, to which the standard was originally intended.

Test methods

In anticipation of the OSHA rule, two standards organizations developed a standard to fill the PPE definition void created by OSHA. The American Society for Testing and Materials, now ASTM International, developed emergency test methods for assessing the penetration of protective clothing fabrics by blood/body fluids and fluids containing viruses.

These methods respectively became ASTM F 1670 (synthetic blood penetration resistance) and ASTM F 1671 (viral penetration resistance). The tests established very specific conditions for evaluating clothing performance against biological hazards and were validated through research to show correspondence with field exposures.

Concurrently, the National Fire Protection Association created a standard for protective clothing worn during emergency medical operations. That standard, NFPA 1999 became a reality in 1992 and incorporated the ASTM F 1671 test method as a principal requirement for demonstrating protection against blood-borne pathogens.

It also set criteria that clothing seams meet the same criteria for barrier performance as the material and that the overall clothing and other items offer liquid integrity (prevention of inward leakage) as well as relevant levels of strength, durability and function.

Industry's response

While NFPA 1999 has been in existence for 22 years and has gone through repeated revisions, now in a 2013 edition, the PPE industry response has been irresponsibly lackluster.

Although there are now 18 manufacturers with 51 styles of single-use examination gloves that are certified to the standard, the other types of protective clothing addressed in NFPA 1999 are poorly represented. Other than examination gloves, there are several gear manufacturers that make

reusable protective garments that have been certified to the standard. And some manufacturers offer some types of footwear for EMS applications, although usually for other purposes that have been dual certified with NFPA 1999.

There are no manufacturers that have certified other products to NFPA 1999 that are frequently used for protecting first responders against liquid-borne biological hazards, including the PPE categories of single-use protective garments, cleaning gloves, various forms of eye and face protection, and different footwear options such as full footwear and footwear covers.

Some of these manufacturers claim that the demand has not supported efforts to undertake certification. And so, the marketplace has plodded on with some forms of protective clothing that have not been properly qualified.

A different threat

Certainly, there have been decreasing concerns about HIV and Hepatitis owing to various infection-control practices that may have lessened the perceived need. And, our most recent epidemic concerns have involved air-borne pathogens, not liquid-borne pathogens that are the subject of NFPA 1999.

Yet, the case of Ebola is much different and now the nation is scrambling for the right PPE.

So what is the right PPE? After all, there are several companies positioning products and even selling kits specifically claiming their appropriateness for protecting against Ebola.

If you believe what some manufacturers have written, impervious clothing is the right choice. It would seem to make sense and so a lot of the clothing being sold is actually chemical protective clothing converted to a new purpose.

Yet that clothing may not be constructed with sealed seams, have a design that offers poor interfaces and be difficult to doff, which in itself creates a contamination hazard.

At the other extreme, there are materials being touted for Ebola that are generally particular barriers offering no holdout of liquids under any sort of normally applied pressure. Then there are the myriad of facemasks, gloves, and other paraphernalia that are needed to make up an ensemble.

What to buy

We would suggest that departments specify products compliant with NFPA 1999, but that request simply cannot be fulfilled with available product. Short of that, we recommend that organizations procure clothing constructed of materials and sealed seams that pass ASTM F 1670.

Breathability is a huge plus and will result in gear that is more comfortable and likely to be worn properly, but the range of products meeting both characteristics is limited. The clothing should have integrity, meaning flaps that cover zippers, and the ability to create interfaces with gloves, footwear and face wear. A hooded coverall is preferred.

There are several styles of NFPA 1999 compliant examination gloves available — these should be doubled up. If physical hazards are expected, select thicker (greater than 11 mm) unsupported nitrile or neoprene gloves.

The interface of the gloves with the garment is going to be a problem — gloves tucked inside the sleeve or outside the sleeve are inadequate. Unless the garments provide some mechanism for creating this interface, it is near impossible to use some form of tape.

Face, hood, feet

For face wear, most medical facemasks are not going to cut it. A full facemask with a P100 filter is best, though many organizations recommend the lesser N95. Short of that, goggles combined with a half facemask respirator and full face shield providing complete coverage of the eyes and face is the next best option.

The hood interface can be a problem and tape may be the only remedy for this deficiency. Unless, you are willing to sacrifice expensive footwear, footwear covers that also have sealed seams and adequate wear surface, so that bottom does not abrade through the first several yards on asphalt. And there must be some way to secure these to the bottom of the protective garment.

There are other options, which may or may not be available. Hopefully, portions of the unresponsive PPE industry will be shamed into developing appropriate NFPA 1999 compliant products and other choices as soon as possible. Yet, as domestic stockpiles of even inadequate clothing may be depleted quickly, organizations must still attempt to put some form of protection in place.

By the way, while there are many demonstrated methods for decontamination involving serious pathogens, the reuse of knowingly contaminated gear even if washed and sterilized, invites a great deal of uncertainty. Consequently, we recommend isolating and condemning gear unless some definitive determination can be made.

About the author

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