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**National Animal Health Emergency Management System Guidelines**

**U.S. Department of Agriculture**

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DRAFT

**Operational Guidelines**

**Personal Protective Equipment in  
Biologically Hazardous Environments**

The National Animal Health Emergency Management System Guidelines provide an operational framework for use in dealing with an animal health emergency in the United States.

The guidelines are produced by the  
Veterinary Services Unit of the Animal and Plant Health Inspection Service,  
U.S. Department of Agriculture.

These guidelines are under ongoing review. Please send questions or comments to:

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## Preface

“Personal Protective Equipment in Biologically Hazardous Environments,” a component of APHIS’ National Animal Health Emergency Management System (NAHEMS) Guidelines series, is designed for use in the event of a major animal health emergency such as an incursion of foreign animal disease or natural disaster in the United States. The NAHEMS guidelines provide information for use by any emergency animal disease eradication organization and for integration into the preparedness plans of other Federal agencies, State and local agencies, Tribal Nations, and additional groups involved in animal health emergency management activities.

Topics addressed in the NAHEMS guidelines include:

- Field investigations of animal health emergencies
- Disease control and eradication strategies and policies
- Operational procedures for disease control and eradication
- Site-specific emergency management strategies for various types of facilities
- Administrative and resource management
- Educational resources

The NAHEMS guidelines provide a foundation for coordinated national, regional, State, and local activities in an emergency situation. As such, they are meant to complement non-Federal preparedness activities. The document is being reviewed and updated on an ongoing basis, and comments and suggestions are welcome.

“Personal Protective Equipment in Biologically Hazardous Environments” provides guidelines for foreign animal disease diagnosticians (FADDs) using PPE to investigate an animal disease of (a) unknown risk, (b) low or limited zoonotic potential and human/community health risk, or (c) significant zoonotic potential and human/community health risk. The guidelines are meant for use as a practical guide rather than as a comprehensive reference resource.

The general principles provided in the resources are intended to serve as a basis for making sound decisions. However, deviations from the document may be permissible if necessary to address a given situation effectively. Also, information provided in various sections may need to be combined to meet the requirements of a particular situation.

## **Acknowledgments**

“Personal Protective Equipment in Biologically Hazardous Environments” reflects the efforts of a number of individuals, including an APHIS Veterinary Services (VS) Writing Group, additional APHIS staff members, and a wide range of reviewers. These reviewers include Federal and State Veterinarians, members of APHIS’ animal health emergency response teams, officials of other Federal agencies, representatives of industry, and additional experts.

Also acknowledged with appreciation are the efforts of USDA staff and external reviewers involved with the development of the VS animal health publications (“red books”) and similar documents that have served as information sources for the NAHEMS guidelines. The contributions of each individual are appreciated.

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## Introduction

The term “personal protective equipment” (PPE) refers to equipment used as a barrier between an individual and a hazard that could result in an injury or occupational illness. This document discusses the use of PPE and devices by foreign animal disease diagnosticians (FADDs)—veterinarians trained to diagnose animal diseases of foreign origin—and associated personnel charged with investigating reports of animal disease in biologically hazardous environments. The guidelines also describe PPE-related personnel responsibilities in support of these activities.

Special focus is placed on the FADD’s use of PPE and devices in:

- A routine investigation of an undiagnosed foreign animal disease (FAD) or emerging animal disease.
- An on-premises investigation of a clinically or laboratory-diagnosed FAD/emerging disease with low or limited zoonotic potential and human/community health risk.
- An on-premises investigation of a clinically or laboratory-diagnosed FAD/emerging disease with significant zoonotic potential (e.g., Rift Valley Fever, Q Fever, or diseases caused by the nipah, hendra, or hanta viruses) and serious human/community health risk.

In addition to describing some of the types of personal protection currently available for use in these situations, the document discusses (a) the overall responsibilities of PPE personnel, (b) general considerations in the use of PPE, including the importance of engineering and administrative controls in a hazardous environment, PPE education and training, and PPE selection, fitting, maintenance, repair, and (c) proper procedures for the use of PPE, including appropriate responses to emergency situations involving compromised PPE.

Additional information on personal protective equipment may be obtained from sources such as:

- The U.S. Code of Federal Regulations, Section 29, Part 1910, Subpart I, Personal Protective Equipment (29 CFR 1910).
- The APHIS “Safety and Health Manual”—especially Chapter 11, “Personal Protection,” and Section 1, “Personal Protective Equipment” (Appendix I of these guidelines).
- The U.S. Environmental Protection Agency Web site ([www.epa.gov](http://www.epa.gov); do a search using “personal protective equipment” as keywords).

- The U.S. Department of Health and Human Services' Centers for Disease Control Web site ([www.cdc.gov](http://www.cdc.gov); select "Publications" and "National Institute for Occupational Safety and Health" for a variety of PPE-related materials).  
(**Editor's note: Verify**)
- The U.S. Department of Labor's Occupational Safety and Health Web site ([www.osha.gov](http://www.osha.gov); select "P" in the site index and then "Personal Protective Equipment").
- The Web sites of educational institutions (e.g., the University of Chicago at [www.uchicago.edu](http://www.uchicago.edu); do a search using "personal protective equipment" as keywords).

The document is designed for use not only in emergency situations but also as a resource in animal health emergency training programs. A brief overview of key elements of such programs is provided below.

### **Emergency Response Exercises**

Well before an animal health emergency strikes, personnel likely to use PPE should use the "Personal Protective Equipment in Biologically Hazardous Environments" guidelines in emergency response exercises designed to help participants expand their knowledge of animal health emergency management. Such sessions will help participants identify likely emergency scenarios and develop detailed plans for responding to each scenario effectively.

**The First 24 Hours**—A useful assignment challenges participants to use the guidelines to create a detailed plan for the first 24 hours of an animal health emergency. Participants can use information in the guidelines to answer questions such as:

- What relationships with other key personnel, including individuals in the emergency management community, should be in place prior to the emergency?
- What key information will be needed, and how will it be obtained?
- What actions will need to be taken immediately? If these actions are not taken, what consequences will ensue?
- What obstacles may appear, and how will they be balanced?
- What conflicting pressures are likely, and how will they be overcome?
- If an initial plan fails, what are the elements of an effective alternative plan?



**Evaluation**—The evaluation phase of test exercises will provide participants with the opportunity to use the guidelines to (a) evaluate the strengths and weaknesses of their responses in the simulation exercises and (b) focus on ways to improve their response capabilities in the event of an actual animal health emergency. The exercises also will underscore the need for participants to develop and maintain strong collaborative relationships with their counterparts in the emergency management community.

### **Interagency Outreach**

If the presence of a foreign animal disease or arthropod vector or other animal health emergency is identified in the United States, the appropriate local, State, and Federal Governments and their partners in the private sector (e.g., industry and academia) must respond in a coordinated, mutually supportive manner to (a) determine the nature of the outbreak, (b) initiate an appropriate response, (c) eliminate or control the disease, and (d) help facilitate recovery (e.g., resumption of business and trade).

The NAHEMS guidelines are designed for use at any of three levels of response commensurate with the severity of the outbreak. These levels include:

- *A local/limited response.* This level of response is managed by local, State, Federal, and industry officials, with response coordination provided primarily at the State and regional levels and with national-level consultation and consequence management (e.g., of trade issues).
- *A regional response.* A regional response is managed by State, Federal, and industry agricultural officials—in some cases, with the involvement of the appropriate State emergency management agency as specified in State animal health emergency response plans. National-level crisis management, response coordination, consultation, and consequence management are required.
- *A national response.* This level of response requires the combined efforts of local, State, industry, and national agricultural authorities and other nonagricultural personnel from Government (e.g., the Federal Emergency Management Agency) and the private sector in national-level crisis management, response coordination, consultation, and consequence management.

Regardless of response level, the agricultural community must be prepared to work closely with the emergency management community to deal with an animal health emergency. The Animal Emergency Response Organization (AERO) model, a locally/State-based, nationally coordinated approach to animal emergency response, addresses this need.

The AERO model is based on the Incident Command System (ICS), the primary emergency response approach used by the emergency management community. To promote the widest possible application and implementation of guidelines content in the agricultural and emergency management communities, this publication refers to the titles of officials and groups in AERO/ICS terms.

## **HOSPITAL**

### **Responsibilities of Personal Protective Equipment Personnel**

The successful use of PPE and devices in an animal health emergency is extremely important to the health and well-being of the equipment users and to their effectiveness as emergency responders. As an integral part of the overall animal health Incident Command System, safety personnel work closely with other personnel throughout the system to ensure a smoothly functioning operation.

Overall responsibility for PPE availability, use, and effectiveness is shared by PPE personnel, including the Safety Officer, associated safety personnel, and the FADDs who use the equipment. The Safety Officer and associated personnel should be identified well before an animal health emergency occurs, as should volunteer FADDs willing and qualified to serve in high-risk situations using PPE and devices.

All personnel involved in an animal health emergency should study the procedures discussed in these guidelines and in other appropriate information sources such as those mentioned in the previous section. They also should participate in educational sessions and emergency response exercises designed to help them expand their knowledge of and expertise in PPE and devices.

### **The Safety Officer**

The Safety Officer, who is based at the Incident Command Center and reports to the Incident Commander, has overall responsibility for the successful use of PPE and devices. Accordingly, the Safety Officer:

- Ensures that up-to-date contact information is maintained on FADDs who are willing and qualified to serve as volunteer personnel using PPE and devices in high-risk situations. Complete contact information should include names; postal, express mail, and e-mail addresses; cell, office, and home telephone numbers; and fax numbers.
- In consultation with appropriate authorities, assesses the risk posed by a call for an FADD investigation or an emergency situation and decides whether the use of PPE and devices is indicated. Once the decision to use PPE and devices is made, the Safety Officer selects the appropriate, PPE, and devices accordingly.

- Serves as a technical resource for information on current methods and procedures for the use of PPE and devices.
- Determines the PPE and devices required for use by FADDs and makes recommendations concerning these requirements to Incident Command Center officials.
- Dispatches PPE and devices to various premises, informing premises owners and animal health emergency personnel as well as premises owners of expected times of delivery and providing additional information as needed.
- With the assistance (as needed) of associated safety personnel, works with animal health emergency personnel to ensure the availability and correct use of PPE and devices.
- Ensures that FADDs are well trained in the proper selection of appropriate PPE and devices.
- Ensures that PPE is fitted correctly to the workers who will use it.
- Ensures that all FADDs and safety personnel understand the hazards against which PPE and devices are intended to protect as well as the consequences of the poor performance or failure of PPE and devices and the consequences of unprotected exposure.
- Ensures that personnel understand proper methods of cleaning, maintaining, and repairing PPE and devices.
- Ensures that personnel can identify PPE that is damaged beyond repair and must be replaced.
- Arranges for frequent inspection of PEE and devices, including backup systems, and promptly replaces unusable items.
- **Trains personnel to inspect, fit-test, don, remove, (do we also want to include clean and maintain?) PPE.**
- Explains the benefits of PPE and device use to personnel.
- Trains personnel to recognize improperly functioning PPE and **devices (OK instead of equipment?)**.
- **Emphasizes the importance of the “buddy system” in the safe, effective use of PPE and devices.**

- Explains the limitations of PPE and devices, particularly in emergency situations (e.g., in an immediately life-threatening environment such as one involving insufficient air to breathe).
- Verifies the accuracy and completeness of all required reports and submits them promptly to the APHIS Emergency Management Response System (EMRS) or a similar acceptable reporting system.
- Identifies personnel training requirements related to PPE and devices and is responsible for (a) orienting employees to on-the-job hazards and ways to avoid them and (b) training personnel in the use of safe, efficient methods of use.
- Cooperates with appropriate animal health emergency groups.
- Coordinates PPE-related activities with the activities of other operations, ensuring that PPE and devices are supplied and used as required.
- Works with the Environmental Impact Unit Leader and other environmental personnel (e.g., fire officials or Environmental Protection Agency officials) to ensure that activities are safe and to minimize any adverse environmental implications they may have.
- Participates with the Contracts and Leases/Finance Section in the issuance of contracts and leases pertaining to equipment or personnel needed for PPE-related activities.

### **Use of Volunteers for High-Risk Situations**

Because of the life-threatening nature of many high-risk situations in which PPE and devices will be used, personnel should be carefully selected from a pool of qualified, thoroughly trained volunteers. Workers who volunteer for high-risk assignments and thus put themselves in harm's way should be encouraged to attend to various personal matters (e.g., signing an updated will, checking on life insurance coverage, and leaving final instructions on other important matters) as appropriate.

### **Background Assumptions**

**FADDs** who use PPE and devices must:

- Understand why they need PPE (i.e., appreciate the importance of PPE in preventing occupational injuries and diseases).
- Understand why PPE and devices are being used as a substitute for—or as an adjunct to—other hazard control methods.

- Understand the consequences of unprotected exposure and thus the rationale for compliance with proper procedures for the use of PPE and devices.
- Learn to recognize when equipment is not functioning properly so that it can be repaired or replaced as needed.
- Be able to inspect, fit-test, don, remove, clean, replace as necessary, and maintain PPE and devices.
- Appreciate the importance of the “buddy system” in using PPE and devices safely and effectively.
- Understand the limitations of PPE, particularly in emergency situations.

### **Hazard Communication**

Before any work involving PPE and devices is initiated, FADDs should be briefed fully by the a representative from the Training Unit (see the NAHEMS “Roles and Responsibilities” Guidelines, in progress) as to the nature of the disease with which they are dealing. All specific safety precautions or hygiene requirements should be explained before personnel enter the premises. This is particularly important if a zoonotic disease is involved.

Respirators should be supplied if the personnel are at risk from a disease organism, if significant amounts of dust are generated, or upon individual request. (For further information on respirators, see the APHIS Respirator Program Guidelines in APHIS’ “Safety and Health Manual,” Chapter 11, Section 3.)

### **Initial Owner Interview**

Before visiting a premises, the FADD should interview the premises owner or manager by telephone about the animal health situation for which the FADD is being consulted. The FADD should inquire not only about the health of the premises animals but also about the health of the owner’s family and other human premises residents. Such an interview can yield important clues as to the possibility of the existence of a zoonotic disease on the premises as well as other epidemiological clues. Will help you figure if this is routine or serious. What you have heard from your neighbors? If they have identified it, then maybe it’s on your farm.

### **Consultation with APHIS Management re PPE**

If the telephone interview suggests the possibility of the presence of a zoonotic illness on the premises, the FADD should consult with (NVSL and/or EP?) as to whether use of PPE is indicated for the premises visit.

## Biosecurity Measures

Observation of strict biosecurity and rigorous cleaning and disinfecting measures is essential to prevent the spread of pathogens—on, off, and between premises. A brief summary of personal and vehicular biosecurity measures is provided below, though equipment biosecurity measures also are very important. It is strongly recommended that readers refer to the NAHEMS “Biosecurity” and “Cleaning and Disinfection” guidelines (in progress) and the “Biosecurity: DOs and DON’Ts” factsheet (Appendix III) for further information on these topics.

**Entrance**—Upon arrival at the entrance to a premises, animal health emergency personnel should park their vehicle(s) away from site production facilities. Team members should ensure that the vehicle’s tires and wheel wells have been cleaned — preferably with soapy water—so they are free of dirt and debris and/or that their vehicle has been taken through a pressure car wash. A “clean” area should be designated in the vehicle—usually the passenger compartment—which should be kept separate from the “dirty” area—usually the trunk or cargo area.

**CHANGE to PPE (refer to Chapter 4):** Team members must put on protective outer clothing (e.g., clean disposable or reusable coveralls, hats, and gloves and clean disposable or rubber boots) and also must follow other procedures outlined in the NAHEMS “Biosecurity” and “Cleaning and Disinfection” guidelines and “Biosecurity: DOs and DON’Ts” factsheet.

**Departure**—Upon their departure from the premises, animal health emergency personnel should remove their outer protective clothing, including boots, hats, and gloves and seal it securely in a plastic garbage bag for disposal or cleaning and disinfection. Again, the team should follow the biosecurity principles outlined in the NAHEMS “Biosecurity” and “Cleaning and Disinfection” guidelines and in “Biosecurity: DOs and DON’Ts.”

Team members also must clean and disinfect their vehicle’s tires and wheel wells— preferably with soapy water—so they are free of dirt and debris and/or take the vehicle through a pressure car wash.

The Vector Control Unit Leader should provide animal health emergency personnel with guidance on any necessary pest control measures related to vehicle biosecurity. For further information on the role of the Vector Control Branch Director, see the NAHEMS “Roles and Responsibilities” guidelines, in progress.)

Following the day's final visit to an infected or exposed premises, each animal health emergency worker should take a complete shower, including a shampoo, and change to freshly laundered clothing. Personnel also should clean under their fingernails and clear their respiratory passages by blowing their noses, clearing their throats, and expectorating into a sink with running water. This should be done immediately after leaving the infected or exposed area and before visiting public places such as restaurants or theaters.

For at least 12 hrs after their last visit to an infected or exposed premises, animal health emergency personnel must not have any contact with animals except on other infected or exposed premises. (*Note:* The minimum waiting period of 12 hrs applies only to official animal health emergency response personnel who follow biosecurity guidelines on their premises visits. For other premises visitors, the minimum waiting period is 5 days.) Further information is provided in the NAHEMS "Biosecurity" and "Cleaning and Disinfection" guidelines (in progress).

### **Personnel Orientation Factsheets**

Certain sections of this document may be especially relevant to the responsibilities of individual animal health emergency personnel. Accordingly, the Safety Officer may wish to distribute one- or two-page laminated factsheets on various responsibilities or tasks to these individuals. For a sample factsheet, see "Personal Protective Equipment: DOs and DON'Ts" (Appendix I).

### **Recordkeeping and Reporting**

Careful recordkeeping, reporting, and documentation are critical to a successfully managed personal protection program. The Safety Officer should document all PPE-oriented training provided to personnel, including hazard communication and training in the selection, use, and maintenance of PPE and devices. Such documentation may prove useful in the event of any legal proceedings later.

In addition, the Safety Officer should obtain basic information about each premises visited by workers using PPE and devices and forward it to the EMRS or a similar acceptable reporting system for inclusion in the system database. Essential information includes the owner's name, the address of the premises, the purpose of the visit, the results of the initial interview with the owner (e.g. any recent illnesses of family members or signs observed in the animals), the type of PPE and devices used, and any accidents or other unusual incidents occurring during the visits.

The APHIS EMRS is used by VS personnel and other animal health emergency response officials to manage and investigate animal health emergencies in the United States. The EMRS is accessible at <http://www.aphis.usda.gov/vs> (select "Emergency Programs" and "EMRS").



**Assessing Needs**

Needs for PPE-related volunteer personnel, vehicles, equipment, and supplies will be determined at the time of an animal health emergency by the Safety Officer in consultation with the appropriate Section Chiefs and Incident Command officials. The Safety Officer will work with State emergency management agencies to identify team members with required expertise from multiple Government and private sources.

The Safety Officer should advise the Incident Commander of any personnel requirements that cannot be satisfied locally so that arrangements for additional personnel can be made. The Safety Officer also will work with appropriate officials to issue contracts and leases regarding equipment or volunteer personnel for the PPE operation.

## **Personal Protective Equipment: General Considerations**

Although PPE and devices are essential to a hazard control strategy, they constitute only one component of a comprehensive worker safety program. This section discusses key elements of such a program, including administrative and engineering controls and employee training in hazard exposure reduction as well as other considerations such as cost-benefit analysis, hazard assessment, and PPE education and training. Also considered is the importance of managers' and workers' commitment to the overall success of a PPE program.

### **Worker Safety**

Although elimination of all risk in a hazardous situation is impossible, a quality worker safety program can make a significant difference in the success or failure of the management of a hazardous situation. Given the ever-present possibility of human error, worker safety goals that rely solely on human behavior modification may be difficult to achieve.

More easily achieved, however, is protection that is built into the process—via engineering and administrative controls as well as employee hazard-exposure reduction training—in order to control the hazard at its source. Careful training of key employees in PPE—including mastery of the details of PPE use and commitment its proper use—also is essential to reducing risk.

Thus, although PPE and devices usually are indispensable to a quality worker safety program, they are positioned fourth—after full implementation of engineering, administrative, and training controls—in the hierarchy of methods used to limit exposure to potential hazards in the workplace. As the APHIS “Safety and Health Manual” states, “PPE will be required only after other methods of eliminating the hazard, such as engineering controls, administrative procedures, and training, have been found unfeasible” (11-1-1).

**Engineering Controls**—Engineering controls are measures that contain or remove a hazard by isolation, enclosure, ventilation, substitution, or other process changes. The hazard thus is isolated from the environment (in this context, the environment includes the worker). An example of an engineering control is seen in a system such as local exhaust ventilation that controls worker exposure to the hazardous substance (exhaust) at the source and operates effectively without direct worker involvement.

**Administrative Controls**—Administrative controls refer to administratively initiated policies, directives, or other measures that regulate workers' exposure to a hazard. An example of an administrative control is seen in a manager's limitation of a worker's time at risk for hazard exposure to no more than 2 hrs.

**Hazard Exposure Reduction Training**—A third method of reducing worker hazard exposure is achieved by providing workers with training in hazard exposure reduction methods. An essential element of such a program might focus on training workers to recognize when their presence is needed in a hazardous environment and when it is not. In a chemically or radiologically hazardous situation, for example, the Federal Emergency Management Agency and/or the appropriate State Emergency Management Agencies—rather than agricultural personnel—typically would provide emergency response leadership. Although agricultural personnel might serve as invaluable resources—especially if the situation involved animal care or other aspects of agriculture—their role would be advisory, and their exposure to the chemical or radiological hazard thus may be nonexistent or minimal.

### **Cost-Benefit Analysis**

A cost-benefit analysis can help managers determine whether introduction of PEE and devices are a sound investment as a means of hazard control. It is very important to recognize that the initial cost of PPE program start-up represents only a fraction of the total expense of continuing PPE program operation over time.

An example of such expense is seen in the fixed costs of equipment maintenance, repair, and replacement. These expenditures, often significant, are essential to maintaining the effectiveness of the operation. In most cases, however, the time, effort, and expense involved in administering an effective and comprehensive PPE program are amply justified.

### **Hazard Assessment**

The risk of occupational exposure to biological hazards includes potential contact with a range of foreign animal disease agents. If PPE is to provide an effective solution to the problem of such exposure in any given situation, the nature of the health risk and its relationship to the work environment must be considered. The hazard assessment (sometimes referred to as a risk assessment or hazard evaluation) is helpful in fulfilling this aim.

**APHIS Employees**—If volunteer FADDs are APHIS employees, a hazard assessment—appropriately documented—is mandatory. As the APHIS “Safety and Health Manual” (see Appendix I) states:

In accordance with 29 Code of Federal Regulations, Part 1910, Subpart I, Personal Protective Equipment, facilities are required to perform job hazard assessments to identify those work practices for areas which require personal protective equipment. The assessments must be documented (11-1-1).

The Manual provides a Hazard Assessment Form (see Appendix III of these guidelines) to “assist managers and supervisors in documenting the assessments.”

**Other Employing Institutions**—The Safety Officer should acquire a working knowledge of the PPE-related policies of the employing institutions of other potential volunteer FADDs and ensure compliance with such policies.

While the need for a hazard assessment may seem obvious, some (**evaluators?**) may be tempted to take short cuts in conducting a risk assessment. Distracted by the multitude of types of commercially available PPE and lulled by the apparent simplicity of many protective devices, managers or workers may select inappropriate PPE for a given situation.

The deleterious consequences of providing PPE unsuited to the hazards of a given work environment may include (a) wearer reluctance or refusal to use the improper PPE, (b) impaired job performance, and (c) risk of worker injury or death. Thus, it is important to make a proper match between the type and degree of risk and the selection of a given protective measure. The first step in making this match is to conduct a thorough risk assessment.

An effective risk assessment establishes:

- The composition and magnitude (concentration) of the biological and/or physical hazard.
- The length of time the equipment or device will be expected to perform at a known level of protection.
- The exertion level and extent of the physical work to be performed while using the equipment.

Based on the information yielded by the risk assessment, the Safety Officer can select the proper PPE and devices. The range of risk and corresponding PPE to be used are illustrated by examples in the discussion below.

### **PPE Education and Training**

Thorough training of administrators and workers in the use of PPE will help further reduce worker hazard exposure. Training programs should seek to orient learners to correct use of PPE via an optimal mix of cognitive (information-based), affective (attitudinal), and applied (laboratory practice) approaches.

As has been noted, the proper use of PPE requires human behavior modification. This statement points up the special traits a worker needs in order to use PPE and devices successfully in a risky, high-stress situation. Workers must be sufficiently knowledgeable and confident in the use of PPE that even in stressful situations (e.g., involving compromised PPE) their training will stand them in good stead.

Some PPE is of simple design, and its use is easy to learn. The apparent design simplicity of some PPE, however, may result in an attitude of complacency regarding training in its use. Personal protective equipment is effective only when it is actually taken out of the box or storage container and worn or used properly!

To be successful, a PPE safety education program must have the full participation and commitment of the managers who administer it and the personnel it is designed to protect. A comprehensive PPE safety education program should include coverage of the following topics:

- The role of PPE as one among several hazard-control methods (e.g., in addition to engineering and administrative methods of control).
- The benefits of PPE use in a hazardous situation and the consequences of unprotected exposure to a hazard.
- The limitations of PPE, particularly in emergency situations, and possible ways to overcome these limitations.
- Selection of appropriate PPE and devices appropriate for various hazardous situations, with clear explanations of how the PPE and devices protect against these hazards.
- The importance of properly fitting PPE and the basic criteria for a proper fit.
- Techniques for donning and wearing PPE properly (e.g., ensuring a tight seal between sleeve and glove by wrapping **(Editor's note: What kind of)** tape around each wrist three times and tucking the end of the tape between the last "wrap" and the wrist) and for taking off PPE.
- The consequences of the poor performance or failure of PPE and ways to deal with situations in which this occurs.
- Use of the buddy system in cooperative completion of tasks (e.g., putting on and taking off PPE, conducting an on-premises animal health investigation, and dealing swiftly and effectively with emergency situations involving compromised PPE).
- Criteria for recognizing damaged PPE and the importance of keeping backup PPE available.
- Techniques for safely cleaning, storing, and maintaining and repairing, or is that someone else's responsibility PPE.

- Ways to detect improperly functioning or damaged PPE and devices as well as methods of minimizing adverse consequences of PPE failure (e.g., keeping backup PPE and devices available or patching tears quickly with duct tape).
- Local health facilities with the personnel and equipment required to evaluate exposure to and illness from zoonotic diseases effectively.
- Stress management techniques that will help the worker to remain calm, focused, and analytical under high-risk and/or emergency conditions.

Education programs must aim for relevance and interest in order to keep workers focused on the training tasks and to promote learning.

**Deciding Whether to Use PPE**—Determinations as to whether the use of PPE is warranted should be made by the Safety Officer together with APHIS management officials. As the APHIS “Safety and Health Manual” states,

PPE should be acquired, maintained, and used by APHIS for all recognized hazardous jobs involving APHIS employees....It is the responsibility of management to determine when PPE is required.... Supervisors will ensure that employees wear PPE when required by policy. If there is no PPE policy for a particular job, it is the responsibility of the supervisor/manager in coordination with the Collateral Duty Safety and Health Officer (CDSHO) to analyze the hazards of the job and determine if PPE is necessary... (11-1-1).

The Manual further emphasizes the responsibility of employees to comply with managerial decisions, stating, “PPE should be acquired, maintained, and used by APHIS for all recognized hazardous jobs involving APHIS employees.... Employees are required to use PPE when policy requires it for the job or when it is determined by the supervisor after a hazard assessment” (11-1-1).

### **Selection of PPE and Devices**

The selection of PPE and devices to protect workers in any given hazard situation should be based on consideration of at least three factors:

- Information (yielded by the hazard assessment) on the nature and magnitude of the hazard.
- Performance data on the PPE and/or device under consideration. Such data (e.g., protection factors for respirators or attenuation factors for hearing protectors), available from manufacturers, can be used to compare the relative degrees of protection afforded by various types and brands of PPE and devices.

- The estimated level of residual risk resulting from the quantity or concentration of the hazardous agent(s) to which the worker will be exposed while the PPE and/or device is in use and a determination as to whether this level of risk is acceptable.

It should be recognized that PPE cannot eliminate all risks of exposure completely and that absolute removal of all hazards is impossible.

**Respiratory Protection**—Selection criteria for respiratory protection are stipulated in published guides such as “Respirator Decision Logic” from the National Institute for Occupational Safety and Health ([www.osha-slc.gov](http://www.osha-slc.gov)). The logic used to select respiratory protection may be applicable to selecting other types of PPE as well.

### **Achieving Proper Fit**

For PPE and devices to provide the degree of protection for which they were designed, they must be fitted to the wearer correctly. Proper fit (a) is essential to protection that meets the expectations of the wearer and (b) promotes acceptance of the equipment and motivation to use it. Many PPE and device manufacturers offer their products in a range of sizes and designs to accommodate a range of worker sizes and proportions.

Ill-fitting or uncomfortable PPE is unlikely to be used as intended. Indeed, poorly fitting equipment could create additional hazards by:

- Decreasing the worker’s manual dexterity.
- Reducing the worker’s agility.
- Interfering with the worker’s visual acuity.
- Diminishing the worker’s stamina.

Such additional hazards, encumbering a worker working in an already hazardous environment (e.g., among unpredictable livestock, with sharp cutting tools and near machinery with moving parts), could prove deadly.

Specific requirements for the fitting of respiratory protection are included in respiratory protection standards such as those of the U.S. Occupational Safety and Health Administration ([www.osha-slc.gov](http://www.osha-slc.gov)).

The general principle of the importance of ensuring proper fit applies over the full range of protective equipment and devices, even in the absence of a specific standard for a particular item.

## Maintenance and Repair

PPE and devices wear out—sometimes quickly, because of irreparable accidental damage, or gradually, through normal use over time. Excessive use and wear of PPE in extreme conditions can result in premature failure. Sometimes PPE can fail catastrophically, resulting in the injury or death of the wearer. To avoid such risks to personnel, all PPE and devices must be kept in top condition.

**Disposable vs. Reusable Items**—Program managers should consider whether to use single-service (disposable) or reusable PPE and devices and clothing. Such decisions should take the following recommendations into account:

- Disposable gloves, disposable respirators, and other disposable equipment and devices are to be used once and then discarded.
- Previously worn, potentially contaminated protective cloth suits or reusable utility gloves should be decontaminated thoroughly before they are worn again.
- Reasonable estimates must be made as to the length of service that can be expected before equipment replacement is necessary.

The decision to reuse or discard a degraded or contaminated protective device with a high replacement cost is not to be made lightly. However, it is prudent to err on the side of caution and safety by discarding questionable PPE and devices so as not to risk worker exposure as a consequence of continued use of poorly functioning or contaminated equipment.

**Decisionmaking Mechanisms**—Programs of PPE maintenance and repair must be designed to include mechanisms for making decisions as to reusing or discarding PPE and devices.

**Costs**—The costs of equipment maintenance and repair must be borne by the employer. The ongoing expenses of program implementation must be assessed fully and realistically in the initial design and establishment of any PPE program.

## Importance of Commitment

For a **worker safety** program to function successfully, managers and workers alike must be committed to maintaining excellence in program administration and implementation. As discussed in Section 2, managers must be trained in the proper selection of appropriate PPE and devices and must ensure that the equipment is fitted correctly to the workers who will use it.

Managers also must be cognizant of the hazards the equipment is designed to protect workers against and must be prepared to take quick action in the event of an accident or



other incident in which worker safety is jeopardized. Managers are responsible for seeing that PPE is cleaned, maintained, and repaired properly; for deciding when PPE is damaged beyond repair; and for ensuring that PPE items are replaced as appropriate.

Workers, on their part, must be committed to supporting management's efforts on behalf of an effective worker safety program. They can do this by learning as much as possible about PPE and its selection, fitting, maintenance, repair, and use. As PPE and device users, workers may be in a good position to detect damaged or improperly functioning PPE. They should be sure to call managers' attention to any problems promptly.

In summary, protective equipment and devices are essential parts of a hazard control strategy. They can be used effectively, provided that their appropriate place in the hierarchy of controls is recognized. The use of PPE must be supported by a worker safety program that ensures that the PPE and devices actually perform as intended and that the people who require protection use it effectively in their work.

## **Personal Protective Equipment in Biologically Hazardous Environments**

FADDs make 300-500 routine field calls in the United States each year to investigate the possibility of the presence of an FAD on various premises. Typically, each case represents an “unknown situation” for which incomplete and/or variable background information is available.

Upon clinical and laboratory evaluation, an investigation may result in a diagnosis of:

- An FAD/emerging animal disease with little or no human or community health risk.
- A serious zoonotic illness with limited human and/or community health risk.
- A very serious zoonotic illness with significant human and community health risk. The latter category includes most of the Office International des Epizooties’ (OIE) List A and B diseases.

This section provides a brief overview of the types of PPE and devices suggested for use in each of these situations, i.e.:

The guidelines discuss the FADD’s use of PPE and devices in:

- A routine investigation of an undiagnosed foreign animal disease (FAD) or emerging animal disease.
- An on-premises investigation of a clinically or laboratory-diagnosed FAD/emerging disease with low or limited zoonotic potential and human/community health risk.
- An on-premises investigation of a clinically or laboratory-diagnosed FAD/emerging disease with significant zoonotic potential (e.g., Rift Valley Fever, Q Fever, or diseases caused by the nipah, hendra, or hanta virus), thus posing a serious human/community health risk.

### **PPE for Routine Field Investigations**

Recommended PPE for routine field investigations includes coveralls; a cooling vest, an apron; gloves; boots; eye protection; respiratory protection; and head and hearing protection. If disposable equipment is used, it should not be re-used.

**Coveralls**—Acceptable coveralls for use in a routine field call include (a) clean, washable, reusable long-sleeved one-piece cloth coverall suits or (b) clean, disposable, long-sleeved one-piece Tyvek® coverall suits (see Figure 1). Either type of coverall may be worn over street clothes, though warm, humid weather conditions may result in some discomfort for the worker wearing long-sleeved coveralls, especially over street clothes. Either white or colored Tyvek® suits are acceptable.

**Cooling Vest**—If the weather is warm, a cooling vest (see Figure 2) may be used under the coveralls. Cold weather operations may require additional insulated underclothing.

**Apron**—The FADD should have a waterproof, cut-resistant, full-length apron available for use in conducting a field necropsy (see Figure 3).

**Gloves**—Appropriate gloves should be considered standard PPE for routine FAD calls. Standard disposable latex gloves are recommended for clinical use in the field.

Gloves made from other materials may be substituted for latex gloves under certain conditions. Such materials include nitrile, butyl, polyvinyl chloride (PVC), and neoprene, which are available commercially.

Cut-resistant gloves made of materials such as steel mesh, Kevlar®, and Surgipath® are essential PPE for personnel who are conducting necropsies and collecting and cutting tissue specimens in the field. These gloves should be worn as essential PPE on both hands over the latex or other waterproof gloves. (see Figure 4).

**Boots**—For field use, high pull-on boots worn over stocking feet are far preferable to overshoes or overboots, neither of which are recommended.

To permit thorough cleaning and decontamination, the boots should be of rubber or plastic waterproof material with shallow treads to permit thorough cleaning (see Figure 6). Safety boots with flexible steel toes and midsoles, which provide extra protection from puncture wounds and events involving crushing, are especially recommended for wear in the field.

**Eye Protection**—Acceptable eye protection in the form of unbreakable, splashproof goggles (see Figure 5) or glasses should be worn during a routine clinical FAD call. A full-face shield may be substituted (see Figures 7 and 8).

Similarly, the use of unbreakable, splashproof eye goggles or glasses or a full-face shield is required for conducting field necropsies or for the cutting and collection of tissue samples.

**Respiratory Protection**—A disposable molded N-95® respirator should be considered essential PPE on routine FAD calls. This respirator bears a superficial resemblance to the molded surgical masks with which the public is familiar from dental and medical office visits (see Figure 9).

Advantages of N-95® respirators include their:

- Relatively low cost
- Comfort
- Disposability
- Facilitation of easy breathing
- Filtration of exhaled air, ensuring that most animal pathogens that the user may have acquired in the pharynx (e.g., the FMD virus) will not be exhaled into the environment.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor requires that N-95® users be enrolled in a respiratory protection program that includes pulmonary function testing; medical clearance; respirator fitting and testing; initial and periodic respiratory protection care-and-use training; and medical surveillance. The user must be clean-shaven.

**Head and Hearing Protection**—Under certain circumstances, a hard hat and hearing protection (see Figure 11) may be recommended.

**(Insert Figure 11 about here. Caption: Hearing protection)**

**Dressing Down**—If upon initial investigation the FADD determines that the disease on the premises is routine, endemic, and without zoonotic potential, he may conduct a personal risk assessment and decide to “dress down” (e.g., remove eye protection and respirator). The remainder of the PPE (and devices?) should remain in place.

### **PPE in Settings With Limited Human/Community Health Risk**

Recommended PPE in situations involving limited human and/or community health risk is the same as that discussed previously for routine field investigations (see above). However, “dressing down” is not recommended in situations involving limited health risk.

Individuals visiting a premises to engage in disease eradication activities should adapt the list of PPE items required for a routine FAD investigation to their needs. Although

certain items (e.g., equipment for conducting field necropsies) may not be needed, other items may need to be added (e.g., equipment for individual disease eradication activities).

### **PPE in Settings With Significant Human/Community Health Risk**

As mentioned, an FADD investigation—typically involving both clinical and laboratory evaluation—may result in a diagnosis of zoonotic illness on a premises. In some cases, the potential this diseases poses for human and/or community health risk is significant.

As mentioned, examples of diseases of significant human and/or community health risk include the hanta, hendra, and nipah viruses; Q fever; and Rift Valley fever. Below is a brief overview of the types of PPE and devices suggested for use in situations on premises on which diseases such as these have been diagnosed.

Recommended PPE for visits to settings with significant human and/or community health risk includes coveralls; a cooling vest (**optional?**); **an apron?**; gloves; boots; respiratory and eye protection; (**and head and hearing protection?**). If disposable equipment is used, it should not be re-used.

**Coveralls**—A clean, disposable, long-sleeved, one-piece Tyvek® coverall suit (see Figure 1) is recommended for this setting. The visitor should remove all street clothing (both outerwear and underwear, including socks) before putting on the coveralls. If the weather is warm, a cooling vest (see Figure 2) may be used under the coveralls. Cold weather operations may required use of additional insulated underclothing that is dedicated to use for this purpose. Dedicated socks also should be donned.

To ensure complete, thorough personal decontamination, all garments—including coveralls, cooling vest or insulated underwear, (**scrubs?**), and socks—all should be removed at the end of the investigation or visit.

**Apron**—A full-length, waterproof, cut-resistant apron (see Figure 3) should be available if needed for field necropsies or for collecting and cutting tissues potentially contaminated with a disease agent of serious zoonotic risk.

**Gloves**—Double sets of gloves are essential PPE in situations involving disease agents in this risk category.

**Double-Gloving**—The first pair of gloves that is donned may be nitrile disposable gloves, followed by a pair of cut-resistant gloves (e.g., steel mesh, Kevlar®, or Surgipath®). As an alternative, two pair of latex gloves may be donned, followed by cut-resistant gloves.

**Taping Cuffs**—To prevent the visitor’s exposure to the disease agent of concern, a tight seal must be made between the cuffs of the coveralls and the cuffs of the gloves. The cuffs of the coverall sleeves should be placed over the cuffs of outer gloves and taped in place with masking or duct tape (see Figure 12).

On both sleeves, the tape should be placed so that it extends equal distances over the coverall cuff and the cuff of the glove. One to three turns then should be made with the tape around the wrists to secure the coverall sleeves to the glove cuffs. One turn is sufficient with wide tape (3-4 in or 7.6-10 cm in width), whereas two or even three turns are required with narrow tape (1-2 inch or 2.5-5 cm in width)

**Boots**—pull-on boots worn over stocking feet are recommended in this risk category. The use of overshoes or overboots is not recommended.

To permit thorough cleaning and decontamination, the boots should be of rubber or plastic waterproof material with shallow treads to permit thorough cleaning (see Figure 6). Safety boots with flexible steel toes and midsoles, which provide extra protection from puncture wounds and events involving crushing, are especially recommended for wear in the field.

**Respiratory and Eye Protection**—For this risk category, the use of a protective hood with a face shield in conjunction with a battery powered air-purifying respirator (PAPR) is essential.

Desirable attributes for a hood with a face shield include wearer comfort, resistance to shifting during strenuous use, ease of cleaning and disinfection, a reasonable initial cost and shelf life, and commercial availability.

Several hood configurations and styles are compatible with a PAPR (see Figures 13-15).

One option is the USAMRIID Aeromedical Isolation Team hood, worn with a waterproof protective suit. Another option is one of the commercially available clear bubble-type hoods.

Use of a PAPR has many advantages, including:

- Comfort.
- Greater encapsulation from the outside environment than other respirators.
- Some limited body cooling effect during hot and/or humid weather.
- Wearability by individuals with beards or mustaches.

The disadvantages of a PAPR include:

- Initial cost of purchase.
- The need for maintenance (e.g., battery recharging and filter replacement).

- Potential difficulty in disinfecting the blower units completely.
- Difficulty of user in communicating verbally with others.
- Possible adverse perception by the farming public of an FADD wearing a PAPR.

At minimum, the PAPR should be equipped with an N-99 or N-100 HEPA® filter. If needed, the PAPR also should be equipped with additional activated charcoal filters for organic vapor removal. The PAPR blowers should be to deliver at least 6 cu ft per min and should be flow-checked before use.

**Dressing Down**—Dressing down is *not* recommended in this risk category.

**Suiting Up**—PPE Recommended steps in donning PPE for settings involving significant zoonotic risk to human and/or health are as follows:

1. Lay out all of the required parts of the PPE and devices in order of use, including:
  - Brown tape (4-inch width)
  - A pair of scissors
  - Backpack respirator
  - Communication radios and headsets (if applicable)
  - \_\_\_ pair of gloves. The latex pair should be in the wearer's size, and the cut-resistant pair should be ½ size larger.
  - A two-piece blue and white scrub suit or other appropriate garment.
  - A Tyvek® suit that has been (a) removed from the cellophane wrapping, (b) inspected for usability (e.g., checked for tears, rips, or other imperfections), and (c) unzipped.
  - Two black security bands for each wrist
  - A pair of stockings long enough to fit under the pantlegs of the scrub suit. No undergarments should be worn.
  - A sweatband or surgical hat (optional).
2. Measure and cut a supply of \_\_\_-inch pieces of the brown tape for ankles, wrists, and zipper. (Cut several extra pieces in case one or pieces of tape accidentally are bunched against themselves and become unusable.)
3. Test the backpack respirator per standard operational procedures.
4. Attach the hood to the respirator.
5. Perform a communications check on the communication headsets and radios.
6. Put on the first pair of latex gloves. Pull the cuffs on the scrub garments over the gloves and tape the sleeves to the gloves. A tight seal must be made between the cuffs of the coveralls and the cuffs of the gloves. The tape should be placed so that it extends

equal distances over the coverall cuff and the cuff of the glove. Then, one to three turns should be made with the tape around the wrists to secure the coverall sleeves to the glove cuffs. Although one turn is sufficient with wide tape (3-4 in or 7.6-10 cm in width), two or even three turns are required with narrow tape (1-2 inch or 2.5-5 cm in width).

7. Put on the coveralls and close or zip halfway up.
8. Put on the second pair of gloves. Pull the cuffs of the suit over the cuffs of the gloves and secure with a black security band followed by the brown tape.
9. Pull the legs of the suit over the boot tops and seal them securely with the brown tape around the ankle area and heel to prevent the boots from sagging.
10. Turn on the respirator unit and put on respirator (this must be done as a buddy effort).
11. Put the hood over the head, and tuck the inner mantle of the hood into the suit. Ensure that it is smooth, as this is the only way air enters the suit from the hood
12. Zip up the suit completely, and seal the whole length of the zipper with brown tape.
13. Fasten the respirator belt and tighten. Secure the hood in a functional position by placing two pieces of brown tape on the end of the hood flap in the front and taping the hood to the suit.

### **Other Hazardous Environments**

Although these guidelines focus on PPE in biologically hazardous environments, it is recognized that animal health emergencies involving chemically and radiologically hazardous situations also may occur. In such cases, emergency plans have designated nonagricultural groups such as the Federal Emergency Management Agency and the appropriate State Emergency Management Agencies as the lead agencies for emergency response. Thus, agricultural personnel (e.g., FADDs and Incident Command System personnel) would be likely to serve in an advisory capacity in such situations.



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**Acronyms**

**AERO**—Animal Emergency Response Organization.

**APHIS**—Animal and Plant Health Inspection Service ([www.aphis.usda.gov](http://www.aphis.usda.gov)). An agency of the U.S. Department of Agriculture.

**CFR**—Code of Federal Regulations. A U.S. Government publication that contains current regulations defining ways in which various agencies will enforce the laws passed by Congress.

**EMRS**—Emergency Management Response System

**FAD**—Foreign animal disease.

**FADD**—Foreign animal disease diagnostician

**FSA**—Farm Service Agency. An agency of the U.S. Department of Agriculture.

**IES**—Investigation and Enforcement Services. A unit of APHIS.

**MRPBS**—Marketing and Regulatory Programs Business Services. A unit of the Animal and Plant Health Inspection Service.

**NAHEMS**—National Animal Health Emergency Management System

**PPE**—Personal protective equipment.

**TDD**—Telecommunications device for the deaf

**USDA**—United States Department of Agriculture

**VS**—Veterinary Services. A unit of the Animal and Plant Health Inspection Service.

## Glossary

**Animal Emergency Response Organization (AERO)**—A locally/State-based, nationally coordinated model, based on the Incident Command System, for responding to animal health emergencies.

**Animals**—Livestock, poultry, and all other members of the animal kingdom, including birds whether domesticated or wild, but not including man (9 CFR 53.1).

**Appraisal**—The assignment of a value for a specific animal arrived at by looking at the animal and considering all of its attributes (e.g., blood lines, age, proofs, body condition, health) and the current value of similar animals.

**Arthropod vectors**—Certain members of the phylum *Arthropoda* (e.g., insects, ticks, and mites) that can transmit an infective agent biologically or mechanically from one host animal to another.

**Enzootic disease**—A disease that is particular to or constantly present in a location.

**Foreign Animal Disease Diagnostician**—A veterinarian who has been trained at USDA's Foreign Animal Disease Diagnostic Laboratory, Plum Island Animal Disease Center, Plum Island, New York, to diagnose animal diseases of foreign origin.

**Materials**—Parts of barns or other structures, straw, hay, and other feed for animals, farm products or equipment, clothing, and articles stored in or adjacent to barns or other structures (9 CFR 53.1).

**Mortgage**—Any mortgage, lien, or other security or beneficial interest held by any person other than the one claiming indemnity.

**Personal protective equipment**—equipment used as a barrier between an individual and a hazard that could result in an injury or occupational illness.

**Poultry**—Chickens, ducks, geese, swans, turkeys, pigeons, doves, pheasants, grouse, partridges, quail, guinea fowl, and pea fowl (9 CFR 53.1).

**Zoonotic disease**—An infectious disease that is common to humans and animals.