Guidelines for Personnel Protection in Animal Facilities

PURPOSE

The intent of this guideline is to provide a basis for understanding the potential hazards when working in an animal facility and the specific protective measures to reduce the risk, with an emphasis on personnel protective equipment (PPE). Two principles serve as the basis for selecting appropriate protective measures: 1) protection of personnel from such hazards as allergens, infectious/zoonotic disease, and physical hazards (e.g., bites, noise, burns, chemical hazards, etc.), and 2) protection of animals from the introduction of disease. It is essential to recognize that a variety of factors (e.g., personnel/animal disease status, immunocompetence, procedure/activity, use of hazardous agents, chemicals/radiation, physical factors such as facility design and function, etc.) influence the selection of appropriate PPE. For that reason definitive guidelines are not provided and this guideline outlines basic best practices to which exceptions may be warranted.

For a protective program to be effective, a job hazard analysis should be conducted by a representative of the animal program staff working with their designated Division of Occupational Health and Safety (DOHS) occupational safety and health specialist to identify the potential hazards. This analysis will establish the framework in developing a comprehensive preventive strategy by incorporating the three principles of industrial hygiene, engineering controls, administrative controls and the use of personal protective equipment. Personnel with questions regarding any research related safety concern or who may have a specific health concern, should contact the DOHS, the Division of Radiation Safety (DRS), or the Occupational Medical Service (OMS).

In addition to the protection provided by PPE, hand washing is an important adjunct to the use of gloves for prevention of the spread of infectious organisms, or other contaminants, to both personnel and animals. While the use of moisture impermeable gloves will greatly decrease the spread of contaminants from a person's hands, they will not completely eliminate this transfer due to micro-breaks in the glove materials, regardless of type (latex, vinyl or nitrile). For effective hand washing, soaps coupled with copious rinsing with free flowing water are important. In situations where hand washing is impractical, or as a supplement to hand washing, alcohol-based hand sanitizing agents are recommended for use. In all situations hands should be washed when exiting any animal facility.

The following pages provide a list of definitions, species summaries of potential hazards, tables of select zoonotic organisms, and tables providing best practices for protective clothing. The summaries and tables are organized according to six main categories: nonhuman primates, rodents/rabbits, carnivores, ungulates, fish/frogs and cage wash.

Note: The first line of defense against personnel injuries or exposures in the laboratory or animal care setting is minimizing any exposure of skin on the limbs or trunk of the body. This includes the foot which should be fully enclosed in the shoe. The covering of exposed skin

becomes even more important in an environment where there is a potential for animal bites, scratches, and/or exposure to dangerous splashes, droplets, or aerosols. (For further information see NIH Exposure Control Program for Non-Hospital Personnel.)

DEFINITIONS

Animal facility. Any and all buildings, rooms, areas, enclosures, or vehicles, including satellite facilities, used for animal confinement, transport, maintenance, breeding, or experiments inclusive of surgical manipulation.

Burn protection. Aprons and heat resistant gloves are used for protection against burns in cage wash areas.

Chemical protection. Chemical resistant aprons and gloves are used for protection against burns in cage wash areas.

DOHS. Division of Occupational Health and Safety.

Face mask/Surgical mask. Used for allergen reduction and/or protection against oral and nasal discharge.

Gloves.

- **Arm length bite resistant gloves**. Heavy, reinforced gloves, usually of leather or similar material. The sleeves of these gloves should extend up to or over the elbows offering protection of the hands and forearms. These gloves do not necessarily prevent an animal from biting or causing injury; however, they usually prevent the bite from breaking the skin. A disadvantage of these gloves is that they greatly reduce tactile ability and mobility of the user.
- **Bite resistant gloves**. Gloves made from materials resistant to punctures, such as Kevlar and stainless steel mesh, which are worn either over impermeable gloves or under other protective gloves to reduce bite punctures.
- **Moisture impermeable glove.** Vinyl, latex or nitrile gloves which greatly decrease contamination of skin by wet or dirty surfaces.

Hand sanitization. The use of alcohol-based hand rubs to reduce skin pathogens. **Note:** hand sanitization is not a substitution for hand washing.

Hand washing. The use of soap coupled with copious rinsing with free flowing water**.**

Hearing protection. Equipment worn to protect the ear when exposed to >85 decibels (e.g., foam plugs, ear muffs).

Mucous membrane protection. A device or combination of devices, which protect the mouth, nose and eyes from splash or droplet, such as DOHS recommended full face shield; DOHS recommended safety glasses/protective glasses plus surgical face mask; DOHS recommended

surgical face mask and eye shield combination; form fitting goggles plus a surgical face mask; Powered Air Purifying Respirator (PAPR).

OMS. Occupational Medical Service, Building 10 Clinical Center 6th Floor, Room 6C306. http://www.ors.od.nih.gov/sr/dohs/OccupationalMedical/Pages/oms_contact.aspx

PAPR. Powered Air Purifying Respirator – used for splash, mucous membrane protection and aerosols. http://www.ors.od.nih.gov/sr/dohs/Documents/Respiratoryprotecttionprogram.pdf

Respiratory protection. A device or combination of devices which protects the mouth, nose, eyes, upper-airways, bronchi~~al~~ and lungs from splashes, droplets and aerosols; DOHS approved full face shield plus a fitted N95 face mask or other approved respirator; form fitting goggles plus a fitted N95 face mask or other approved respirator; Powered Air Purifying Respirator (PAPR).

Shoe covering. Stretch booties, usually made of paper or plastic, worn over street shoes that may protect them from contamination. These should not be worn outside the animal facility. Dedicated facility footwear may be substituted for shoe coverings. If dedicated foot wear is worn, shoe coverings may be used to cover them when exiting the animal facility.

Safety/Steel toed shoes. Work shoes reinforced with steel over the toes.

Street clothes covering. A garment such as a lab coat or coveralls, worn to protect street clothes from contamination. This garment should not be worn outside the animal facility.

Uniform. A dedicated facility uniform may be substituted for a covering garment. If uniforms are dedicated for the facility, they should be covered when exiting the facility.

REFERENCES

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Approved by ARAC – 11/09/92
Reapproved – 05/08/96, 02/10/99
Revised – 03/27/02, 03/09/05, 12/18/07, 01/09/13, 02/10/16

NONHUMAN PRIMATES

HAZARDS TO PERSONNEL

Zoonotic Diseases: Nonhuman primates (NHP) and humans are similar enough to share many of the same diseases, and dissimilar enough that agents relatively asymptomatic in one species can devastate the other. Macacine herpesvirus-1 (B Virus), tuberculosis, and various enteric infections are some of the more common zoonosis associated with old world nonhuman primates. While all nonhuman primates used for research at NIH undergo extensive quarantine testing and monitoring, many originate from free ranging, outdoor housing areas, and can still harbor certain zoonotic diseases. Non-fixed tissues from nonhuman primates, especially neural, ocular and oral tissue can be infectious for pathogens, including B Virus, and require extra care when handling. **Table 1** lists some relevant pathogens that are transmissible from monkeys to humans that can be of concern.

Wounds: All animal procedures should be performed by properly trained personnel, with a vigilant approach to the prevention of bites, scratches, and splashes both for the minimization of physical injury and the prevention of disease transmission, especially Macacine herpesvirus-1 (B Virus) for macaque species. Proper sleeves, mucous membrane protection and appropriate gloves should be worn when scratches, bites, and splashes are possible. All facilities should have appropriate standard operating procedures for first aid of wounds and mucous membrane splashes. All wounds and splashes, even injuries resulting from the handling of non-fixed nonhuman primate tissue or equipment potentially contaminated with the animal's saliva or other bodily fluids must be reported to OMS.

PROTECTIVE MEASURES

Table 2 outlines recommendations for specific activities associated with different risks of exposure. The guidelines assume that nonhuman primates have passed through an appropriate quarantine. See https://oma1.od.nih.gov/manualchapters/intramural/3044-2/.

RODENT AND RABBIT SPECIES

HAZARDS TO PERSONNEL

Zoonotic Disease: Zoonotic disease associated with NIH's rodent and rabbit research holding facilities is infrequent in incidence due to the current use of Specific Pathogen Free animals, sentinel health monitoring programs, approved vendor procurements, and adherence to local policies for the importation of rodents and rodent products. Most zoonotic threats from rodents would come from wild caught species used for research (which would necessitate special PPE requirements), the use of contaminated rodent products or rarely from feral

rodents gaining access to research animals. **Table 3** lists some relevant pathogens that are transmissible from rodent and rabbit species to humans that can be of concern.

Allergy: Allergic skin and respiratory reactions are quite common in personnel working with laboratory animals. Hypersensitivity reactions to animal allergens are serious occupational health problems that develop in many individuals after repeated exposure. Hypersensitivity reactions include nasal congestion, rhinorrhea (runny nose), sneezing, itching of the eyes, asthma and a variety of skin manifestations such as redness, localized itching and flaking skin, and hives. Of the species used in biomedical research, the guinea pig, rabbit, mouse and rat appear to be the most allergenic. Urinary and salivary proteins from the animal's fur, bedding, and caging are known sources of allergens.

Methods of prevention as based on the DOHS Lab Animal Allergy Prevention Program (LAAPP) involve using engineering controls, administrative controls, and PPE. In practice this will include reduction of direct animal contact time, use of biological safety cabinets, filter tops on animal cages, ventilated caging rack systems, HEPA filtered bedding dump stations, and protective clothing, masks, or respirators when working with these species. Individual concerns should be discussed with OMS or a personal physician.

Wounds: Training in proper handling and restraint of rabbits and rodents is the single most effective measure in protecting personnel from bites and scratches from these species. Bite protection gloves can be helpful when working with fractious rodent species, and wearing long sleeves while handling rabbits can help in avoiding scratches. Injuries should be reported to OMS.

PROTECTIVE MEASURES

Table 4 outlines recommendations for specific activities associated with different risks of exposure from rodent and rabbit species.

CARNIVORE SPECIES

HAZARDS TO PERSONNEL

Zoonotic Disease: The most commonly used carnivores in the laboratory are dogs, cats and ferrets. Rabies is the most significant zoonotic disease associated with carnivores and is typically transmitted through bites and scratches. Carnivores used for research at NIH are all purpose bred and housed in facilities that minimize the risk of exposure to rabies. Carnivores can carry enteric pathogens that pose a zoonotic potential for humans.

Personnel who work with carnivores must be aware that they can serve as vectors for the transmission of infectious agents between their own dogs, cats, ferrets, etc., and the same or

similar species that they support at NIH. **Table 5** lists some relevant pathogens transmissible from carnivores to humans that can be of concern.

Allergies: Allergies to dogs and cats can occur and may sensitize workers to other lab species such as mice and rats. Allergies are most commonly thought of in regards to cats whose major allergy proteins are in the sebaceous glands of the skin that coat oil on the hair shaft and in their saliva. Allergic reactions to cats can come from contact with the fur or inhalation of the proteins. Dogs also carry a protein in their saliva that can result in allergic reactions. Methods of prevention include reduction in contact with the fur of cats (i.e. avoidance, or full coverage of arms and hands), and possibly the use of a surgical mask if splash or spray contact is a potential (i.e. spraying down cages or runs).

Wounds: Besides rabies, bites and scratches from dogs and cats are often associated with bacterial infections that can cause significant morbidity, and rarely, mortality. All facilities should have appropriate standard operating procedures for first aid of wounds. All wounds should be reported to OMS.

PROTECTIVE MEASURES

Table 6 outlines recommendations for specific activities associated with different risks of exposure from carnivore species.

UNGULATE SPECIES

HAZARDS TO PERSONNEL

Zoonotic Disease: Zoonotic disease associated with ungulate holding facilities is usually limited, when the animals are kept in closed herds with proper vaccination and herd health programs; however, if they are kept in outdoor housing areas, they can still acquire and harbor certain zoonotic diseases. Of particular concern is the rickettsial disease caused by *Coxiella burnetii*, commonly known as Q Fever. Q Fever can be found in sheep, goats and cattle, but is most prevalent in sheep with a high infection rate throughout the US. *C. burnetii* is most commonly transmitted to humans from uterine tissues/fluids from infected ewes. Animals can be tested for Q fever before being brought into the vivarium to ensure a Q fever free colony. Although prion disease is rare in the US, caution should be used when handling non-fixed neural and ocular tissue from cattle because of the possibility of exposure to prions related to Bovine Spongiform Encephalopathy. **Table 7** lists some relevant pathogens transmissible from ungulates to humans that can be of concern.

Allergies: Allergies to cattle and horses have been reported, but are less common than those to small laboratory animals.

Wounds: Because of the size of these species, injuries from being stepped on, kicked or butted can result from improper handling and restraint. Bite wounds may also occur. Training in proper use of halters, ropes and other restraint equipment is recommended. Wounds occurring when handling ungulates should receive proper, immediate disinfection, and should be reported to OMS.

PROTECTIVE MEASURES

Table 8 outlines recommendations for specific activities associated with different risks of exposure to ungulate species.

FISH AND FROG SPECIES

HAZARDS TO PERSONNEL

Zoonotic Disease: Zoonotic diseases associated with fish and frog research holding facilities is infrequent in incidence, but can occur. Mycobacteria ulcerans-like bacteria is a water borne pathogen that is endemic to tropical regions of Africa and can be transferred to humans from handling fish and frogs. **Table 9** lists some relevant pathogens transmissible from fish and frog species to humans that can be of concern.

Allergy: Aerosolized fish proteins can be a source of allergic reactions for people and symptoms can range from allergic rhinitis to asthma. There are also reports of occasional reactions to frog skin and secretions that range from cutaneous to respiratory signs.

PROTECTIVE MEASURES

Table 10 outlines recommendations for activities associated with fish and frog species.

CAGE WASH AREAS

HAZARDS TO PERSONNEL

Allergy: As discussed under the rodents and rabbits section of this guideline, rodent and rabbit salivary and urinary proteins are potential allergens. Exposure during dumping of cages should be minimized primarily through engineering mechanisms with supplemental PPE as appropriate.

Physical Hazards: Physical hazards for cage wash areas include mechanical injury (injuries and/or burns), hot water and/or steam, and chemical hazards. Cage wash involves the use of

large equipment, pressurized equipment (e.g., autoclaves), heavy containers hot water temperatures and the use of caustic chemicals. Personnel spray off equipment, prewashing racks and/or cages, dump water bottles, connect chemical drums to cage wash equipment and descale equipment.

High Noise Levels: Noise levels in cage wash areas can exceed 85 decibels and hearing protection is required.

PROTECTIVE MEASURES

Table 11 outlines recommendations for activities associated with the cage wash area.

TABLE 1 – RELEVANT ZOONOTIC DISEASES OF NONHUMAN PRIMATES

Zoonosis	Agent	Route of Transmission
Diarrhea; gram negative sepsis	Enterobacteriaceae: *Salmonella spp. Shigella spp., Campbylobacter spp., Yersinia spp.*	Fecal-oral
Protozoal Diarrhea	*Entamoeba histolytica, Giardia spp., Balantidium coli, Cryptosporidium spp.*	Fecal-oral
Tuberculosis	*Mycobacterium tuberculosis, bovis*	Splash/spray
B Virus Meningoencephalitis	*Cercopithecine herpesvirus-1*	Bite, scratch, or splash exposure of mucous membranes
Hepatitis	Hepatitis A virus, Hepatitis E virus	Fecal-oral
Measles	Rubeola virus	Splash/spray
Foamy virus	Spumavirus	Direct Blood/Tissue Contact with infected tissue or contaminated materials
Herpes simplex	*Herpes simplex*	Direct contact
Helminths	*Oesophagostomum spp. Strongyloides spp., Bertiella spp.*	Fecal-oral
Dermatomycosis (Ringworm)	*Trichophyton spp.*	Direct contact

TABLE 2 – PERSONNEL PROTECTIVE EQUIPMENT GUIDELINES FOR PERSONNEL WORKING IN NONHUMAN PRIMATE FACILITIES

Requirements: The appropriate protection for specific work depends on the degree of risk involved. In general work activities can be characterized as low, moderate, or high risk as detailed below. If a particular activity is not listed, use the example that provides the nearest match. ***Donning a street clothes covering (e.g. disposable lab coat/jumpsuit or dedicated lab coat/uniform) is required to enter a Nonhuman Primate facility at the NIH***[1]. Thorough washing of hands is recommended when exiting any animal facility or laboratory. These areas are not designated and posted as a hazardous work area[2]. The following provides a frame work for the establishment of Best Practices for PPE:

Activity Risk Level	Description
Low	• **Working Environment:** *Does not support the generation of splashes or droplets.* • **Animal Activities:** Slight risk or no risk of direct contact with a restrained, sedated, or anesthetized old world NHP or their unfixed tissues or body fluids. • **Equipment Contact:** Slight risk or no risk of contact with equipment and surfaces which have been in contact with old world NHPs or their unfixed tissues or body fluids. • **Proximity Risk:** Very Low. Personnel can stay out of the proximity (> 3 feet) of old world NHP, as well as unfixed old world NHP tissues or body fluids where very low or no splash risk exists.
Moderate	• **Working Environment:** *Supports the generation of splashes, but not aerosols. Work* in proximity (< 3 feet) of an awake old world NHP or unfixed old world NHP tissue or body fluids where a splash potential is present. • **Animal Activities:** Direct contact, proximity (< 3ft) or the possibility of direct contact with an old world NHP or their unfixed tissues or body fluids. • **Equipment Contact:** Activities may generate splashes from equipment and surfaces which have been in contact with an old world NHP or body fluids. • **Proximity Risk:** Personnel cannot always stay out of the proximity (> 3 feet) of old world NHP as well as unfixed old world NHP tissues or body fluids where a splash risk exists.
High	• **Working Environment:** *Supports the generation of aerosols.* • **Animal Activities:** Direct contact (with the potential to generate aerosols) with live or dead old world NHPs including unfixed tissues and body fluids. • **Equipment Contact:** Activities which have the potential to generate aerosols from equipment and surfaces which have been in contact with live or dead (including unfixed tissues and body fluids) old world NHPs.

1. Dedicated or Disposable Long Sleeved Uniform /Scrubs or Lab Coat; Jump Suit or Coveralls Required To Cover Exposed Skin on the Arms or Legs
2. ABSL3, ABSL4, and radioactive work environments may require additional PPE as directed by the DOHS and/or Radiation Safety; NHP work areas are considered ABSL2.

Risk Code	Suggested PPE	Protection Of	From
B	Specialized Arm Length Bite Resistant Gloves	Personnel	Bite/Scratch
G	Moisture Impermeable Gloves	Personnel	Scratch
M	Mucous Membrane Protection [Goggles + Surgical Face Mask, Face Shield]	Personnel	Splash & Droplets
R	Respiratory Protection [Respirator, N-95, PAPR (Note: Most PAPRs provide concurrent eye protection)]	Personnel	Aerosols
H	Hair Bonnet or Lab Coat Protection of Shoulder Length or Longer Hair (Required if in an animal holding room or in proximity of an awake NHP)	Personnel	Mechanical Injury
S	+/- Shoe Covers or Facility Dedicated Shoes as defined by the facility/program Standard Operating Procedures	Personnel	Soiling & Contamination
E	Eye Protection [Goggles, Approved Safety Glasses]	Personnel	Splash & Droplets

Example Activities	Street Clothes Covering plus PPE Code(s)
Facility Corridor activities	S
Entering a NHP animal room containing *new world NHPs* with no direct contact with the animals/caging (Note: Requires Face Mask For Animal Protection)	G, S
Entering a NHP animal holding room containing *old world NHPs* with no direct contact with the animals/caging	G, H, M, S
Entering a room containing a restrained, sedated or anesthetized old world NHP with no proximity contact (≥3 ft.) of an animal or equipment	Nothing Additional
Contact with an *enclosed* restraint chair holding an awake, “non-head fixed”, old world NHP	G, M
Proximity (≤3 ft.) to the *front* of an enclosed restraint chair holding an awake, “head fixed”, old world NHP	G, M
Proximity (≤3 ft.) to the *rear* of an enclosed restraint chair holding an awake, “head fixed”, old world NHP	G
Proximity (≤3 ft.) to a *non-enclosed* restraint, transfer device, or cage holding an awake macaque	G, H, M, S
Transfer of an alert macaque using a stand-off method such as pole/collar technique or transfer cage	G, H, M, S
Jumping alert macaques into clean caging or transport cages	G, H, M, S
Hand transfer of an awake new or old world primate	G, H, M, S, B
Hand transfer of an anesthetized old world primate	G, H, M, S
Hand transfer of an old world primate that is awake or lightly sedated (e.g. recovering from anesthesia, etc.)	G, H, M, S, B

Example Activities	Street Clothes Covering plus PPE Code(s)
Enclosed cart transport of an anesthetized old world primate (Note: Mucous membrane protection must be available)	G
Open cart transport of an anesthetized old world primate within an animal facility, staying out of the proximity of the animals face (Note: Mucous membrane protection should be available)	G, S
Minor procedures on a restrained or sedated animal (suture removal, venipuncture, physical exam, anesthesia monitoring, etc.) where the individual *cannot* always stay out of the proximity of the face of the old world NHP	G, M
Procedures on an anesthetized old world NHP staying away from the face (e.g. suture removal, venipuncture, physical exam, etc.)	G
Intubation of an anesthetized old world NHP	G, M
Evaluating or placing electrodes in an implant cylinder from *behind* a chaired awake macaque with its "head fixed"	G
Cleaning the cranial cylinder(s) of an awake macaque with its "head fixed" with flush solutions, etc.	G, M
Physiology or behavior lab activities conducted remotely while the animal is fully enclosed in a chair, separate room or test box	No Additional PPE Required
Operating room procedures not in proximity (≤3 ft.) of the anesthetized macaque, not touching equipment or surfaces previously in contact with the animals, a non-aerosol forming environment (Note: +/- Surgical Face Mask For Animal Protection[1])	S
Operating room or dissection procedures that that *do not produce splashes or droplets* in a macaque (Note: +/- Surgical Face Mask For Animal Protection[1])	G, S
Operating room or necropsy procedures with the *potential to produce splashes, but not aerosols* in a macaque [Note: When using an operating microscope, the scope can replace ocular splash protection at the time of use]	G, M, S
Operating room or necropsy procedures with the *potential to produce aerosols* in a macaque (i.e. striker saw, etc.)	G, E, R, S
Dental or oral surgery procedures which *do not produce aerosols*	G, M
Dental or oral surgery procedures which *do produce aerosols* (e.g. Cavitron®, high speed rotary drill, etc.)	G, E, R
Proximity contact with an infant macaque	G, M, S
Mop sanitizing of an old world NHP room/wipe down of contaminated cages or other equipment	G, M, S
Sanitizing an NHP room with a pressure washer or hose/hose down of soiled caging or other equipment	G, E, R, S
Experiments in laboratories that involve *fixed* old world NHP tissue or body fluids	G
Experiments in laboratories that involve *non-fixed old world NHP tissue or body fluids other than brain, spinal cord, or CSF*	G

Example Activities	Street Clothes Covering plus PPE Code(s)
Experiments that involve non-fixed nervous tissue or CSF from an old world NHP with the *potential to produce splashes, but not aerosols*	G, M
Experiments that involve non-fixed nervous tissue or CSF from an old world NHP that have a *potential to produce aerosols*	G, E, R

TABLE 3 – RELEVANT ZOONOTIC DISEASES OF RODENTS AND RABBITS

Zoonosis	Agent	Species	Route of Transmission
Rat Bite Fever	*Streptobacillus moniliformis, Spirillum minus*	Rodents	Bites, fecal-oral (*S. moniliformis*) Bites (*S. minus*)
Lymphocytic Choriomeningitis	LCM virus	Rodents	Aerosol, bites, direct contact, fecal-oral
Hantavirus pulmonary syndrome	Hantavirus	Rodents	Aerosol
Cheyletiellosis	*Cheyletiella parasitivorax*	Rabbit	Direct contact
Dermatophytosis (Ringworm)	*Trichophyton sp., Microsporum sp.*	Rodent, Rabbit	Direct contact
Tapeworm	*Hymenolepis nana*	Rodents	Fecal-oral
Tularemia	*Francisella tularensis*	Rabbit	Tissues

TABLE 4 – PROTECTIVE CLOTHING REQUIREMENTS FOR PERSONNEL IN RODENT AND RABBIT FACILITIES

Considerations: In rodent and rabbit facilities PPE functions to reduce staff exposure to allergens and to protect animals from infectious agents. The type of PPE needed depends on multiple factors including the use of allergen reducing equipment such as ventilated racks and biosafety cabinets, the susceptibility of the animal colony being housed and the activity being performed. ***Donning a street clothes covering (e.g. disposable lab coat/jumpsuit or dedicated lab coat/uniform) is required to enter a rodent and rabbit facility or room at the NIH.*** Thorough washing of hands is recommended when exiting any animal facility. The following provides a framework for the establishment of Best Practices for PPE:

Activity Risk Level	Description
Low Risk	Entering area with no anticipation of physical exposure to animals or soiled caging
Moderate Risk	Exposure to animals, animal allergens, or soiled non-biohazardous soiled caging
High Risk	Potential exposure to biohazardous material or zoonotic agents

Risk Code	Suggested PPE	Protection Of	From
G	Moisture Impermeable Gloves	Personnel	Animal allergens, zoonotic, biologic, and chemical agents
H	+/- Hair Bonnet/Covering as defined by facility Standard Operating Procedures	Animals, Personnel	Dust & Hair Carried Animal Pathogens, Animal allergens
R	Surgical Face Mask/Dust-Mist Face Mask/N-95	Animals, Personnel	Animal Pathogens, Animal allergens, airborne particulates
C	Respirator with appropriate cartridge	Personnel	Infectious aerosols, chemical vapors

Example Activity	Street Clothes Covering plus PPE Code(s)
Corridor activities	H
Enter animal holding room for brief visual inspection without opening a cage	H
Contact with primary enclosures rodent enclosures	H
Opening an animal cage	H, G, R (Recommended)
Direct contact with animals	H, G, R (Recommended)
Cage change in biosafety cabinet	H, G, R (Recommended)

Example Activity	Street Clothes Covering plus PPE Code(s)
Cage change on cart within a holding room	H, G, R (Dust/Mist Face Mask, Recommended)
Cage change using sterilant level disinfection (200 ppm)	H, G, C
Biohazardous & Radioactive studies	As Required By Study

*Additional mucous membrane protection may be required by individuals with known sensitivities to various species. Individuals are encouraged to consult with DOHS/OMS for further information.

Notes

- Hickman-Davis, JM, et al, found that putting on shoe covers was a potential source of contamination and that shoe covers did not significantly impact rodent health.
- Krop, EJ, et al, found allergens in the home of staff not wearing hair protection.

TABLE 5 – RELEVANT ZOONOTIC DISEASES OF CARNIVORES

Zoonosis	Agent	Species	Route of Transmission
Bite & scratch bacterial agent	*Capnocytophaga canimorsus*	Dog, Cat	Direct contact
Cat Scratch Disease (Cat Scratch Fever)	*Bartonella henselae*	Cat	Bite
Pasturellosis	*Pasteurella multocida*	Dog, Cat	Scratch
Rabies	Rabies virus (*Lyssavirus*)	All	Wound or bite Contact with saliva, brain
Dermatomycoses (Ringworm)	*Microsporum sp,. Trichophyton sp.*	Dog, Cat	Direct contact
Acariasis	*Sarcoptes scabiei*	Dog, Cat	Direct contact

TABLE 6 – PROTECTIVE CLOTHING REQUIREMENTS FOR PERSONNEL IN CARNIVORE FACILITIES

Considerations: In carnivore facilities PPE functions to reduce staff exposure to allergens, noise and to protect staff from infectious agents. ***Shoe covers or facility dedicated footwear and hearing protection is required to enter a carnivore facility at the NIH***. Thorough washing of hands is recommended when exiting any animal facility. The following provides a frame work for the establishment of Best Practices for PPE:

Activity Risk Level	Description
Low Risk	Entering area with no anticipation of physical exposure to animals or soiled caging
Moderate Risk	Exposure to animals, animal allergens, or soiled non-biohazardous soiled caging
High Risk	Potential exposure to biohazardous material or zoonotic agents

Risk Code	Suggested PPE	Protection Of	From
G	Moisture Impermeable Gloves	Personnel	Scratch
E	Eye Protection [Goggles, Approved Safety Glasses]	Personnel	Splash & Droplets
M	Mucous Membrane Protection [Goggles + Surgical Face Mask, Face Shield]	Personnel	Splash & Droplets
R	Respiratory Protection [Respirator, N-95, PAPR (Note: Most PAPRs provide concurrent eye protection)]	Personnel	Aerosols

Example Activity	Shoe Cover and Hearing Protection plus Code(s)
Entry into animal holding areas	None additional
Direct contact with animals	G
Cleaning animal holding areas (indoor or outdoor)	G, M
Contact with animals with biohazardous agent	G, M, R (when indicated)

TABLE 7 – RELEVANT ZOONOTIC DISEASES OF UNGULATES

Zoonosis	Agent	Species	Route of Transmission
Q Fever	*Coxiella burnetti*	Sheep, Cattle, Goats	Aerosol; or direct contact, especially when dealing with the products of conception
Contagious Ecthyma (ORF)	Pox virus	Sheep, Goats	Direct contact
Tuberculosis	*Mycobacterium bovis, avium* or *tuberculosis*	Swine, Sheep, Goats	Aerosol or Direct contact
Campylobacteriosis	*Campylobacter jejuni*	Swine, Sheep, Cattle	Fecal/oral
Dermatomycoses (Ringworm)	Trichophyton,*or* Microsporum spp.	Cattle, Sheep, Goats, Swine	Direct contact
Bovine Spongiform Encephalopathy	Prion	Cattle	Direct Blood/Tissue Contact with infected tissue or contaminated material (e.g. brain, spinal cord, ocular/retina, etc.)

TABLE 8 – PROTECTIVE CLOTHING REQUIREMENTS FOR PERSONNEL IN UNGULATE FACILITIES

Considerations: In ungulate facilities PPE functions to reduce staff exposure to allergens and to protect staff from infectious agents. ***Shoe covers or facility dedicated footwear and hearing protection is required to enter an ungulate facility at the NIH***. Thorough washing of hands is recommended when exiting any animal facility. Safety shoes should be worn when working with large ungulates. The following provides a frame work for the establishment of Best Practices for PPE:

Activity Risk Level	Description
Low Risk	Entering area with no anticipation of physical exposure to animals or soiled caging
Moderate Risk	Exposure to animals, animal allergens, or soiled non-biohazardous soiled caging
High Risk	Potential exposure to biohazardous material or zoonotic agents

Risk Code	Suggested PPE	Protection Of	From
G	Moisture Impermeable Gloves	Personnel	Scratch
E	Eye Protection [Goggles, Approved Safety Glasses]	Personnel	Splash & Droplets
M	Mucous Membrane Protection [Goggles + Surgical Face Mask, Face Shield]	Personnel	Splash & Droplets
R	Respiratory Protection [Respirator, N-95, PAPR (Note: Most PAPRs provide concurrent eye protection)]	Personnel	Aerosols

Example Activity	Shoe Cover and Hearing Protection plus Code(s)
Entry into indoor animal holding areas	None additional
Entry into outdoor pens, runs, stables, etc.	None additional
Direct contact with animals	G
Cleaning animal holding areas (indoor or outdoor)	G, M
Contact with pregnant sheep\goats\cattle; during parturition, their birth products, bedding and other wastes	G, M, R (when indicated in animals not tested for Q fever)
Contact with animals with biohazardous agent	G, M, R (when indicated in animals not tested for Q fever))

TABLE 9 – RELEVANT ZOONOTIC DISEASES OF FISH & FROGS

Zoonosis	Agent	Species	Route of Transmission
Mycobacteriosis	*Mycobacterium xenopi, fortuitum, marinum chelonei, ulcerans*	Fish, Frogs	Breaks in skin surface
Salmonellosis	*Salmonella spp.*	Frogs	Breaks in skin surface
Vibriosis	*Vibrio vulnificus*	Fish	Breaks in skin surface

TABLE 10 - PROTECTIVE CLOTHING REQUIREMENTS FOR PERSONNEL IN FISH & FROG FACILITIES

Considerations: In aquatic facilities, exposure to potential zoonotic agents or allergens occurs through direct contact with the fish or frogs or indirect through exposure to system water. Personnel safety includes the wearing of closed-toed shoes with non-skid soles as the work environment includes wet floors. Waterproof gloves should be worn when holding/manipulating animals. Many husbandry tasks involve exposure to water without direct contact with animals. Use of gloves can limit exposure in some of these tasks, however; many routine tasks may involve immersing the hands into system water. In these situations the gloves can trap system water against the skin causing prolonged exposure and no opportunity for the skin to dry. Thus with some husbandry tasks involving contact with system water it may be more appropriately performed without gloves. As with other animal facilities, thorough washing of hands ~~is~~ when exiting is essential. Hand wash or hand sanitation stations should be available after exiting the aquatic facility. The following provides a frame work for the establishment of Best Practices for PPE:

Activity Risk Level	Description
Low Risk	Entering area with no anticipation of physical exposure to animals or system water
Moderate Risk	Exposure to animals, system water, or dirty tanks
High Risk	Potential exposure to biohazardous or chemically hazardous material

Risk/Code	Suggested PPE	From
G	Moisture Impermeable Gloves	Zoonosis/Allergen
M	Face shield (Mucous membrane protection)	Zoonosis/Allergen

Example Activity	Suggested PPE Codes
Corridor activities	None additional
Enter animal holding room for brief visual inspection without entering exposure to system water	None additional
Contact with system water (reaching into tank, reservoir)	G/None additional
Netting fish, frogs	G
Direct contact with fish/frog (manual collection of sperm/ova)	G
Scrubbing tanks	G
Biohazardous & Chemically Hazardous studies	Based on risk assessment
Splash hazards (spraying with system water)	M

TABLE 11 – PROTECTIVE CLOTHING REQUIREMENTS FOR PERSONNEL IN CAGE WASH AREAS

Requirements: The appropriate protection for cage wash- related activities depends on the degree of risk involved. If a particular activity is not listed, use the example that provides the nearest match. ***Unless otherwise noted, a disposable street clothes covering, or facility dedicated uniforms, or a lab coat, and shoe covers, or facility specific steel toe safety shoes must be worn***. Thorough washing of hands is recommended when exiting any animal facility. The following provides a frame work for the establishment of Best Practices for PPE:

Activity Risk Level	Description
Low Risk	Entering area with no anticipation of physical exposure to caging or equipment
Moderate Risk	Procedures performed in wet areas or may involve exposure to high volumes of water; physical exposure to caging, bedding, water and equipment
High Risk	Procedures that may actively aerosolize waste/fluids or generate potentially contaminated fluids at either a high velocity/high volume; exposure to large volumes of steam; exposure to chemicals; risk to mucous membranes

Codes	Hazards	Suggested Additional PPE
B	Mechanical Injury	Safety Belt
C	Chemical	Nitrile Gloves, Respirator with Appropriate Cartridge
D	Dust	Dust Mist Face Mask
E	Eye protection	Goggles/Face Shield
G	Contamination	Gloves
G1	Heat/burn	Heat Resistant Gloves
M	Mucous membrane	Goggles & Face Mask/Face Shield/PAPR
N	Noise	Hearing Protection (i.e. ear plugs, ear muffs, etc.)
R	Respiratory	Respirator/N-95/PAPR
S	Splash	Rubber Boots, Waterproof Apron

Example Activity	Street Clothes Covering and Shoe Cover plus PPE Codes
Transporting cages/equipment to and from cage wash area	G, B
Dirty Side	
When machinery is running, all activities	N
Dumping cages	M, S, G

Example Activity	Street Clothes Covering and Shoe Cover plus PPE Codes
Dumping water bottles	S, G
Dumping acidified/chemically treated water bottles	S, G
Loading equipment on tunnel washer and/or rack washer	M, S, G
Dumping chemicals	C, S, G
Handling NHP caging/equipment	M, G
Handling dumping NHP pans	M, S
Loading autoclave before operating	M, G
Loading ABSL3 autoclave	E, R, S, G
Emptying autoclave after operating	G1, S
Emptying autoclave of large amounts of hot liquids	E, M, S
Cleaning/hosing down area	E, M, S
Routine maintenance on cage wash machines	G1, S
Visitors to dirty side ACTIVE	See functions above
Visitors to dirty side PASSIVE	--
ORF to dirty side ACTIVE	See functions above
ORF to dirty side PASSIVE	--
Clean Side	
When machinery is running, all activities	N
Offloading equipment from tunnel and/or rack washer while operational	G1, S
Removing equipment from autoclave	G1
Removing large amounts of hot liquids from autoclave	E, M, S
Automatically bedding caging	E, D
Manually bedding caging	E
Preparing acidified water	C, E, S
Preparing chemicals	C, E, S
Cleaning/hosing down area	E, M, S
Routine maintenance on cage wash machines	G1, S
Visitors to clean side ACTIVE (within 6 feet of above functions)	See functions above
Visitors to clean side PASSIVE	--
ORF to clean side ACTIVE (within 6 feet of above functions)	See functions above
ORF to clean side PASSIVE	--