



Texas A&M University Biosafety Occupational Health Program Manual

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Purpose

Texas A&M University is committed to providing a safe and healthful work and educational environment. In accordance with the [NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules](#), the [Guide for the Care and Use of Laboratory Animals \(National Research Council, 2011\)](#), as well as best practices established by the book [“Occupational Health and Safety in the Care and Use of Research Animals” \(National Research Council, 1997\)](#), and other applicable regulatory compliance requirements and best management practices, the University has established the Biosafety Occupational Health Program (BOHP) to prevent injury and illness among personnel¹ who may be at risk of occupational exposure to biohazards and animals.

Scope

The Texas A&M University Biosafety Occupational Health Program (BOHP) coordinates occupational health services for personnel who participate in activities with biohazards and/or animals that fall under the oversight of the Institutional Biosafety Committee (IBC), or Institutional Animal Care and Use Committee (IACUC), as well as those who work in university facilities where animals are treated or housed, and in studies occurring with wild species in their natural habitat. These services include risk assessment, access to pre-exposure prophylaxis and mitigations, post-exposure incident response, and access to an occupational health provider.

Contact Information

Address:

228 Blocker Hall
1186 TAMU
155 Ireland Street
College Station, TX 77843

Phone:

979-845-6649

Email Address:

bohp@tamu.edu

¹ Personnel includes faculty, staff, students, and visitors.

Responsibilities

Personnel are responsible for:

1. Enrolling in the BOHP prior to working with biohazardous materials and/or animals.
2. Responding to communications from the Occupational Health Provider regarding offers for occupational health consultations based on responses provided on the enrollment questionnaire.
3. Completing applicable training(s) and/or required risk mitigations promptly.
4. Reporting incidents involving exposure to biohazardous materials and/or injuries or illness involving animals through the [Texas A&M Origami system](#) and to the BOHP.
5. Adhering to PPE requirements, including proper decontamination and disposal of used and/or contaminated PPE.

Principal Investigators (PI)/Supervisors are responsible for:

1. Ensuring all personnel enroll in the BOHP and complete BOHP associated training requirements and required risk mitigations prior to working with biohazardous materials and/or animals.
 - For additional information, refer to the [Office of Biosafety](#) webpage and [TAMU-G-029](#) - Guidelines for Animal Protocol Participation and Handling.
2. When applicable, ensuring personnel are added to IBC permits and AUPs upon joining the lab, and ensuring they are removed when they leave the lab.
 - When applicable, ensuring that students enrolled in a course covered by a teaching permit complete enrollment in the BOHP prior to working with infectious biohazards and/or animals.
3. Informing the BOHP of the following:
 - Changes in personnel (e.g., new personnel, personnel leaving, etc.) who may be potentially exposed to infectious biohazards and/or animals.
 - Significant changes in an individual's duties that may impact the occupational health risk assessment.
4. Ensuring all personnel are provided with appropriate PPE and are compliant with PPE requirements.
5. Ensuring that all incidents involving potential exposure to biohazardous materials and/or injuries or illness involving animals are reported through the [Texas A&M Origami system](#) and to the BOHP.

BOHP staff are responsible for:

1. Assisting personnel with BOHP enrollment and associated processes.
2. Liaising directly with the university's Occupational Health Provider to ensure personnel receive occupational health services promptly.
3. Reviewing AUPS to ensure personnel are up to date on their occupational health enrollment and have been offered applicable risk mitigations (e.g., tetanus prophylaxis every 10 years).

4. Reviewing IBC protocols to ensure personnel are up to date on their occupational health enrollment, protocol specific trainings (e.g., bloodborne pathogens training) and risk mitigations (e.g., respiratory protection).
5. Engaging with the IACUC by reporting BOHP metrics during the semi-annual program review and conducting BOHP related outreach during IACUC inspections.
6. Engaging with the IBC by reporting BOHP metrics at monthly committee meetings.
7. Liasing with Environmental Health and Safety, as applicable, to ensure personnel receive occupational health services that fall under Environmental Health and Safety's purview (e.g., respiratory protection for chemical hazards).
8. Triaging reports of incidents involving biohazardous materials or animals to ensure they receive the appropriate review by the Occupational Health Provider, IBC and/or the IACUC by providing notification to the Office of Biosafety and Animal Welfare Office, respectively.
9. Developing and distributing educational information related to work with biohazardous materials and animals.
10. Overseeing respiratory protection services for personnel potentially exposed to biohazardous materials while conducting work covered by an IBC protocol or to animal allergens.

Office of Biosafety staff are responsible for:

1. Reviewing all activities involving biohazardous materials (IBC permits and AUPs involving work with biohazards in animals, potential zoonoses, etc.) to ensure all associated risks have been identified, that appropriate mitigations are in place, and that proposed experiments have been reviewed and approved by the IBC.
2. Inspecting laboratories and vivaria to ensure they meet minimum biosafety requirements set by the IBC when activities involving biohazardous materials are performed.
3. Investigating incidents involving exposure to biohazardous materials to identify a root cause and determine corrective measures to prevent recurrence.

Environmental Health and Safety staff are responsible for:

1. Reviewing AUPs that involve physical, radiological, and chemical hazards to ensure the risks have been identified, that appropriate mitigations are in place, and that any required safety protocols/licenses are in place.
2. Inspecting facilities where animals are treated or housed to identify hazards and to ensure facilities meet minimum safety requirements.
3. Overseeing respiratory protection services for personnel potentially exposed to chemical hazards.

Animal Welfare Office staff are responsible for:

1. Assigning the appropriate groups to review AUPs (BOHP, Environmental Health and Safety, Office of Biosafety).
2. Investigating incidents involving injury resulting from activities with animals to identify a root cause and determine corrective measures to prevent recurrence.

The Occupational Health Provider is responsible for:

1. Oversight of the medical practices and policies of the BOHP.
2. Review of occupational health enrollment questionnaires.
3. Directly contacting individuals that may need occupational health consultations (based on responses on the enrollment questionnaire or in response to reports of an incident involving biohazardous materials or animals).
4. Administering occupational health services (e.g., tetanus vaccination, rabies prophylaxis, respiratory protection medical clearance, fit testing, etc.).
5. Securely storing occupational health enrollment questionnaires and health records.

The Institutional Animal Care and Use Committee (IACUC) is responsible for:

1. The oversight, implementation and routine assessment of the institution's Animal Welfare Program components and facilities as per federal and institutional policy.
2. Ensuring the appropriate review of protocol-related hazards is taking place.

The Institutional Biosafety Committee (IBC) is responsible for:

1. Reviewing research involving recombinant DNA and/or biohazards conducted at or sponsored by TAMU and affiliated institutions for compliance with the current versions of *NIH Guidelines* and the 6th Edition of the CDC's *Biosafety in Microbiological and Biomedical Laboratories*, as applicable, and approving those research projects which conform with these regulatory documents.
2. Reviewing and investigating reportable incidents that involve biohazardous materials and occurred in an IBC-permitted space.

Enrolling in the BOHP

The BOHP enrollment questionnaire was developed by the Occupational Health Provider and aims to determine an individual's risk based on their general health history. The enrollment questionnaire is used with the protocol review process and routine safety inspections to determine the potential for hazard exposure and the extent and frequency of exposure. The completed enrollment questionnaire is directly submitted to the Occupational Health Provider for review. The Occupational Health Provider will directly contact individuals that may need occupational health services, or a medical evaluation based on the responses they provided on the enrollment questionnaire.

Personnel at risk of exposure to infectious biohazards or to animals during their participation in, or operational support of IBC or IACUC-permitted research, teaching, or diagnostic activities, as well as those who work in university facilities where animals are treated or housed, and in studies occurring with wild species in their natural habitat are required to enroll in the BOHP prior to participating in the aforementioned activities.

Annual enrollment is required for all personnel. Personnel that do not complete their enrollment questionnaire annually will be considered noncompliant and administratively removed from all IBC permits and Animal Use Protocols (AUPs) on which they are listed. While annual enrollment is required, personnel can decline occupational health services; however, if the service is a required risk mitigation (e.g., respiratory protection in the ABSL-3), access

to certain areas may be restricted. The individual's supervisor is notified when a required risk mitigation is declined, and the individual is ineligible to participate in the activities for which the mitigations are required. Personnel that decline occupational health services can change their mind and elect to receive services later.

Individuals who are required to enroll are identified in one of the following ways:

1. They are listed as personnel on an IBC permit or an AUP by a Principal Investigator.
 - Staff from the Office of Biosafety or the Animal Welfare Office will provide instructions for completing enrollment.
2. They are identified as research support/operations personnel during the hiring/onboarding process and directed to enroll by their supervisor or HR representative.
 - Supervisors/HR representatives will provide instructions for completing enrollment.
3. They are students enrolled in a teaching course covered by an IBC permit or an AUP.
 - Course instructors will provide instructions for completing enrollment.
4. They are identified as having a potential risk of exposure to biohazardous materials or to animals through another process (e.g., pre-hire hazard assessment, lab safety inspections, protocol review, etc.) and are given instructions to enroll.

Upon identification, individuals who have not already enrolled in the BOHP will be contacted by BOHP staff with instructions for completing the [BOHP Enrollment Questionnaire](#).

Automatic annual enrollment notification reminders are sent via email at the following intervals:

1. 30 days prior to due date
2. 14 days prior to due date
3. 7 days prior to due date
4. 1 day prior to due date
5. Day of due date

BOHP staff follow up with manual email reminders to personnel that are past due on updating their enrollment. Manual reminder notifications are sent out monthly, via email, until the individual either updates their enrollment, they are removed from the protocol(s) they are listed on, or the Supervisor informs the BOHP that the individual is no longer employed at the University.

Occupational Health Services

Occupational health services, including immunization, titers, personal health consultations and respiratory protection services are provided by University Occupational Health Partners, a board-certified occupational health provider with whom Texas A&M maintains a contract. University Occupational Health

Partners maintains a partnership with two privately owned local medical practices in College Station that provide care for incidents requiring urgent or after-hours care and has identified clinic, pharmacies and diagnostic labs across the state that can provide occupational health services to participants outside of Brazos County.

Hazards

There are inherent hazards associated with working with animals, such as the development of animal allergies and asthma, and the potential to be exposed to zoonotic diseases. Similarly, there are experimental hazards associated with animal research, such as the potential for exposure to pathogens by experimentally infected animals. To promote personnel health and safety and prevent potential occupational injury and illness, risk mitigations, such as [respiratory protection](#) and pre-exposure prophylaxis, and [trainings](#) are implemented following a comprehensive assessment of both protocol specific hazards as well as an individual's personal health status.

Zoonotic Diseases

Animals can carry harmful germs, like viruses, bacterial, parasites, and fungi, which spread to people and cause illness. These illnesses are known as zoonotic diseases (or zoonoses). The severity of illnesses caused by the germs varies from mild to serious and can even result in death. It is important to remember that even animals that seem healthy can carry germs that cause people to get sick.

Anyone can get sick from a zoonotic disease or exposure to infectious biohazards. However, certain categories of people (examples listed below) may be at higher risk for severe illness or infection and should take extra precautions to keep themselves safe.

1. Individuals that have an immune suppressing condition, such as:
 - Autoimmune diseases such as rheumatoid arthritis, lupus, inflammatory bowel disease, Crohn's disease, Multiple sclerosis, ulcerative colitis, Alopecia areata.
 - Diabetes
 - HIV/AIDS
 - Cancer
 - Liver or kidney disease
 - Pregnancy
2. Individuals that take an immune suppressing medication, such as:
 - Corticosteroids (e.g., cortisone or prednisone)
 - Methotrexate
 - TNF inhibitors or other biological medications that target the immune system
 - Inosine monophosphate dehydrogenase (IMDH) inhibitors
 - Janus kinase inhibitors
 - Mechanistic target of rapamycin (mTOR) inhibitors

3. Certain medical and surgical procedures can make an individual more susceptible to infection, either directly or indirectly.

Animal Bites and Scratches

The risk of animal bites and scratches are associated with handling animals and can be avoided by proper handling techniques and wearing appropriate PPE. Knowledge of animal behavior and how animals respond to their immediate physical environment is important in reducing risk of injury to the individual and the animal.

Even minor bites and/or scratches can result in infections and illnesses if they are not properly treated. Scrapes and injuries from contaminated equipment associated with animal care and housing, such as cages, can be as great a risk as direct animal contact and should be addressed similarly.

Most animals used in research are bred specifically for that purpose and do not have the potential for transmitting the kinds of pathogenic organisms that those in the wild do. With research animals, biological hazards are of most concern when the animals are naturally infected or if animals are infected with a bacterium, virus, or human cells (e.g., tumorigenic cell lines) as part of experimental work. Under these conditions and when doing field research with wild species, appropriate PPE and other appropriate protective measures should be used to prevent infection.

Animal Allergies and Asthma

Allergies are a chronic condition that involve the immune system's abnormal reaction to an ordinarily harmless substance called an allergen. There are several different allergens that can cause reactions.

Exposure to animals and their allergens is a common cause of occupational allergies and asthma in people who work in laboratories and animal facilities. The most common occupations at risk of exposure to animal allergies include:

1. Laboratory animal technicians
2. Researchers
3. Veterinary technicians
4. Veterinarians
5. Anyone who has prolonged, close association with animals or their secretions or excretions.
6. Workers who handle animal products or associated materials, such as animal bedding and feed. ***The highest exposures to animal allergens typically occurs in personnel who are responsible for changing cages and feeding animals.***

Individuals can request a consultation with the Occupational Health Provider , by contacting bohp@tamu.edu, if they suspect they are developing animal allergies or asthma or have questions or concerns regarding potential exposure to animals or biohazards.

Incident Response

What should be reported to the BOHP?

Incidents that involve a potential exposure to biohazardous materials in an Institutional Biosafety Committee permitted Biosafety Level 2 or Biosafety Level 3 lab.

Examples include, but are not limited to, the following:

1. Exposure of person(s) to biohazardous materials and/or recombinantly modified material.
2. Sharps injuries that result in potential exposure to biohazardous materials.
3. Splashes or sprays of biohazardous materials into the eyes, nose, mouth, or onto non-intact skin.
4. Failure to wear respiratory protection when it is required.
5. Spills of biohazardous materials outside of a biosafety cabinet or other primary containment equipment.
6. Any other incident that may result in exposure to biohazardous materials.

Incidents that may involve injury or illness caused by an animal. Examples include, but are not limited to the following:

1. Skin-piercing injuries from an animal (e.g., bites, scratches).
2. Development of animal-related allergies or asthma.
3. Exposure of mucus membranes or non-intact skin to animal waste or body fluids.
4. Potential exposure to a zoonotic pathogen.

Additional reporting requirements

Department liaisons, supervisors, or designees are required to report all work-related injuries or illnesses through the [Texas A&M Origami System](#) as soon as possible after the incident is reported or has been identified.

Additionally, incidents involving potential exposure to biohazardous materials, and any illness or injury involving animals should also be reported to the BOHP by e-mailing bohp@tamu.edu or by calling 979-862-4549. Physical injuries (e.g., slips, trips, falls) and potential chemical or radiation exposure(s) should be reported to Environmental Health and Safety by calling 979-845-2132 or emailing ehsd.occ.health@tamu.edu.

Respiratory Protection

The BOHP provides respiratory protection services to personnel at risk of exposure to infectious biohazards or to animal allergens during their participation in, or operational support of, Institutional Biosafety Committee (IBC) or Institutional Animal Care and Use Committee (IACUC) permitted research, teaching, or diagnostic activities.

Respiratory protection is a type of personal protective equipment (PPE) used to prevent an individual from inhaling harmful substances such as particulates, vapors, and gases. Ideally, engineering controls should be in place to mitigate the risk of exposure to respirable hazards, including animal allergens. When engineering controls are not feasible or insufficient, the individual should use the appropriate form of respiratory protection. Respiratory protection is a requirement in areas where certain hazards are present (e.g., excessive amounts of animal allergens, in BSL-3 laboratories) or when a risk assessment determines it is warranted.

Individuals can access additional respiratory protection information on the BOHP webpage, [Respiratory Protection](#), including information on the different types of respiratory protection, how to prepare for a fit test, respirator maintenance and storage, and what to do in the event of a respiratory protection malfunction. Respiratory protection training, medical surveillance, and respirator fit testing for chemical use is provided through Environmental Health and Safety. Individuals needing access to information on respiratory protection for chemical use should contact ehsd.occ.health@tamu.edu.

Appendices

Appendix 1. Training

The BOHP provides a variety of training online through the [TAMU TrainTraQ system](#) (for employees) and the [TAMU Gateway system](#) (for students and visitors).

Animal Allergens and Asthma Training (2113938)

The training covers various topics, including the signs and symptoms of animal allergies, common sources of animal allergens, and exposure prevention.

Bloodborne Pathogens Training for Operations Personnel (2114037)

Geared towards operations personnel, who through the course of their duties may have the potential to be exposed to bloodborne pathogens, this course covers guidelines and regulations, the TAMU Exposure Control Plan, bloodborne pathogens (including a review of the main bloodborne pathogens of concern), occupational exposure control, exposure incident response, and an official offer to receive the Hepatitis B vaccination.

Bloodborne Pathogens Training for Research Personnel (2114036)

Geared towards personnel that are participating in research under an IBC permit in a Biosafety Level 2 (BSL-2) or higher research lab, this course covers guidelines and regulations, the TAMU Exposure Control Plan, bloodborne pathogens (including a review of the main bloodborne pathogens of concern), occupational exposure control, exposure incident response, and an official offer to receive the Hepatitis B vaccination.

Researchers Who Work with Pregnant Sheep Inside Facilities Training (2111497)

This training provides an overview of the TAMU IBC policy on working with pregnant sheep inside facilities and summary on *Coxiella burnetii*, the etiologic agent of Q fever.

Powered Air Purifying Respirator (PAPR) Training (2111580)

PAPR training covers the proper use of a PAPR, donning and doffing procedures, the benefits, and limitations of using a PAPR, and general cleaning, maintenance, and storage procedures for a PAPR.

Species-specific Training

[CITI](#) is a web-based ethics-training site utilized by Texas A&M University for those individuals involved in the animal care and use program. A variety of species-specific courses, covering topics such as occupational health hazards and zoonoses, are available in CITI. Species-specific courses include, but are not limited to the following:

- Swine
- Cattle

- Horses
- Sheep and Goats
- Fish
- Wildlife Research
- Reptiles

Appendix 2. Exposure Risk Assessment

Appendix 2 provides general information regarding the potential hazards associated with vertebrate animals and infectious biohazards and includes the minimum occupational health mitigations and training requirements for personnel involved in such activities. Individuals can access additional information about the potential hazards associated with exposure to animals on the BOHP webpage, [Working with Animals](#) and through the [Species-specific Training](#) modules in CITI. Additional information on zoonotic diseases can also be found on the [Center for Disease Control and Prevention Website, Healthy Pets, Healthy People](#). Additional information on biohazards can be found on the [Biosafety Program Webpage](#), the TAMU [Biosafety Manual](#), and the 6th Edition of the CDC's [Biosafety in Microbiological and Biomedical Laboratories](#).

Species/Category	Major Source of Allergens	Potential Zoonoses	Occupational Health Mitigations ²	Other Requirements
Birds	Dander, feathers, skin, bedding	Influenza virus, <i>Chlamydia psittaci</i> , <i>Mycobacterium avium</i> , <i>Aeromonas</i> spp., <i>E. coli</i> , <i>Salmonella</i> spp., <i>Campylobacter</i> spp., <i>Erysipelothrix rhusiopathiae</i> , <i>Histoplasma capsulatum</i> , <i>Cryptococcus neoformans</i>	<ul style="list-style-type: none"> Tetanus/Tdap³ 	<ul style="list-style-type: none"> Species-specific training
Cats	Saliva, hair, skin	Rabies virus, <i>Coxiella burnetii</i> (Q-fever), <i>Bartonella henselae</i> (Cat-scratch fever), <i>Toxoplasma gondii</i> , <i>Pasteurella multocida</i> , <i>Giardia</i> spp.	<ul style="list-style-type: none"> Tetanus/Tdap Rabies⁴ 	<ul style="list-style-type: none"> Animal allergens training Species-specific training
Dogs	Saliva, hair, skin	Rabies virus, Leptospirosis, <i>Brucella</i> spp., <i>Trypanosoma cruzi</i> (Chagas disease), <i>Giardia</i> spp.	<ul style="list-style-type: none"> Tetanus/Tdap Rabies 	<ul style="list-style-type: none"> Animal allergens training Species-specific training
Freshwater fish		<i>Mycobacterium marinum</i> (Fishtank granuloma), <i>Aeromonas</i> spp., <i>Erysipelothrix rhusiopathiae</i> , <i>Streptococcus iniae</i> , <i>Vibrio</i> spp.,	<ul style="list-style-type: none"> Tetanus/Tdap 	<ul style="list-style-type: none"> Species-specific training
Guinea pigs	Dander, fur, saliva, urine, bedding	<i>Salmonella</i> spp.	<ul style="list-style-type: none"> Tetanus/Tdap 	<ul style="list-style-type: none"> Animal allergens training Species-specific training

² Initial and annual enrollment is required for all personnel. Periodic medical evaluation and additional services may be required based on risk assessment.

³ It is recommended that individuals remain current on their tetanus vaccination.

⁴ It is recommended that individuals remain current on their rabies prophylaxis (complete the initial vaccination series and routine titer checks) when working with client-owned animals or wild-caught mammals.

Species/Category	Major Source of Allergens	Potential Zoonoses	Occupational Health Mitigations	Other Requirements
Horses	Dander, saliva, skin	Rabies virus, Influenza virus, <i>Salmonella</i> spp.	<ul style="list-style-type: none"> Tetanus/Tdap 	<ul style="list-style-type: none"> Animal allergens training Species-specific training
Livestock (cattle, swine, sheep, goats exotic hoof stock) and poultry	Dander, saliva, skin	Rabies virus, Influenza virus, Orf virus, <i>Bacillus anthracis</i> , <i>Brucella</i> spp. <i>Coxiella burnetii</i> (Q-fever), <i>Salmonella</i> spp., <i>E. coli</i> , <i>Campylobacter</i> spp. <i>Erysipelothrix rhusiopathiae</i> , <i>Cryptosporidium parvum</i> , <i>Giardia</i> spp.	<ul style="list-style-type: none"> Tetanus/Tdap Baseline <i>Coxiella</i> surveillance⁵ Respiratory protection⁶ 	<ul style="list-style-type: none"> IBC approval required for working with pregnant sheep indoors Animal allergens training
Mice	Dander, fur, urine, saliva, bedding	Lymphocytic choriomeningitis in SCID and other immunodeficient mice, Hantaviruses	<ul style="list-style-type: none"> Tetanus/Tdap 	<ul style="list-style-type: none"> Animal allergens training Species specific training
Rabbits	Fur, saliva, urine, bedding	<i>Francisella tularensis</i> , <i>Pasteurella multocida</i> , <i>Cryptosporidium</i> spp.	<ul style="list-style-type: none"> Tetanus/Tdap 	<ul style="list-style-type: none"> Animal allergens training Species specific training
Rats	Dander, fur, urine, saliva, bedding	Hantaviruses, <i>Streptobacillus moniliformis</i>	<ul style="list-style-type: none"> Tetanus/Tdap 	<ul style="list-style-type: none"> Animal allergens training Species specific training
Reptiles and amphibians		<i>Aeromonas</i> spp., <i>Edwardsiella</i> spp., <i>Klebsiella</i> spp., <i>E. coli</i> , <i>Salmonella</i> spp., <i>Mycobacterium marinum</i> , <i>M. fortuitum</i> <i>M. chelonae</i> , <i>Flavobacterium meningosepticum</i>	<ul style="list-style-type: none"> Tetanus/Tdap 	<ul style="list-style-type: none"> Species specific training
Wildlife		Rabies virus, hantavirus,	<ul style="list-style-type: none"> Tetanus/Tdap Rabies 	<ul style="list-style-type: none"> IBC approval required for working with/housing bats Animal allergens training Species specific training

⁵ The TAMU IBC requires baseline *Coxiella* titers for all personnel who work with pregnant sheep indoors.

⁶ The TAMU IBC requires respiratory protection (N95 or better) for all personnel who perform surgery or necropsy on pregnant sheep indoors

Other biological hazards	Potential Routes of Exposure	Biological Source	Occupational Health Mitigations	Other Requirements
Ochratoxin A	Mucus membrane exposure (inhalation, ocular exposure, etc.,) from handling contaminated food stocks. Potential aerosol exposure to purified form of the toxin during <i>in vitro</i> activities.	<i>Aspergillus</i> spp., <i>Penicillium</i> spp.	<ul style="list-style-type: none"> • Tetanus/Tdap • Respiratory protection is required for aerosol generating activities outside primary containment 	<ul style="list-style-type: none"> • Activities involving purified toxin require IBC approval⁷
Aflatoxins		<i>Aspergillus flavus</i> , <i>A. parasiticus</i>		
Fumonisin		<i>Fusarium</i> spp.		
Tricoethenes (T-2)		<i>Fusarium</i> spp.		
Pertussis toxin	Potential exposure to purified form of the toxin during <i>in vitro</i> activities.	<i>Bordetella pertussis</i>	<ul style="list-style-type: none"> • Tetanus/Tdap • Respiratory protection is required for aerosol generating activities outside primary containment 	<ul style="list-style-type: none"> • Activities involving purified toxin require IBC approval
Diphtheria toxin	Potential exposure to <i>Corynebacterium diphtheriae</i> or isolated toxin during <i>in vitro</i> activities.	<i>Corynebacterium diphtheriae</i>		
Staphylococcal enterotoxins (subtypes A-E)	Handling contaminated food stocks or potential exposure to purified form of the toxin during <i>in vitro</i> activities.	<i>Staphylococcus aureus</i>		
Bloodborne pathogens	Exposure may result from direct contact of broken skin, or accidental parenteral inoculation with materials of human or non-human primate origin contaminated with blood or other potentially infectious material.	Human blood, human and non-human primate cell lines, human bodily fluids visibly contaminated with blood (i.e., other potentially infectious materials)	<ul style="list-style-type: none"> • Tetanus/Tdap • Hepatitis B series 	<ul style="list-style-type: none"> • IBC approval required • Annual Blood Borne Pathogen (BBP) training • BSL-2 training • Biosafety Cabinet (BSC) training

⁷ Additional training and risk mitigations may be required and are based on a protocol-specific risk assessment of experimental hazards

Other biological hazards	Potential Routes of Exposure	Biological Source	Occupational Health Mitigations	Other Requirements
Risk-group 2 biohazards	Depends on agent-specific hazards and procedural hazards. Exposure may result from direct contact of broken skin with cultures, accidental parenteral inoculation, exposure to infectious aerosols or droplets generated through laboratory procedures, and other procedures with the potential to generate splashes or spills. Bites, scratches, or other injuries incurred while handling experimentally infected animals may inherently increase the risk of exposure.	<i>Staphylococcus aureus</i> , <i>Salmonella enterica</i> , Lentiviral vectors, Adenoviral vectors, etc.	<ul style="list-style-type: none"> • Tetanus/Tdap • Respiratory protection may be required for aerosol generating activities outside primary containment 	<ul style="list-style-type: none"> • IBC approval required • BSL-2 training • BSC training • Lab and agent-specific training
Risk-group 3 biohazards	Depends on agent-specific hazards and procedural hazards. Exposure may result from direct contact of broken skin with cultures, accidental parenteral inoculation, exposure to infectious aerosols or droplets generated through laboratory procedures, and other procedures with the potential to generate splashes or spills. Bites, scratches, or other injuries incurred while handling experimentally infected animals may inherently increase the risk of exposure.	<i>Brucella melitensis</i> , <i>Mycobacterium tuberculosis</i> , Yellow Fever Virus	<ul style="list-style-type: none"> • Tetanus/Tdap • Annual medical clearance • Respiratory protection (N95 or better, depending on agent in use) • Baseline and annual serosurveillance (if available) 	<ul style="list-style-type: none"> • IBC approval required • BSL-3 training • BSC training • Lab and agent-specific training • PAPR training • Facility specific training (Entry/exit procedures, autoclave use, etc.) • Additional requirements may be in place for working with select agents