The Center for Laboratory Animal Medicine and Care and Employee Health Services
Occupational Health Policy for Employees with Animal Exposure

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I. Purpose

To promote health and prevent occupational injury and illness among individuals at The University of Texas Health Science Center at Houston (UTHealth Houston) who may have occupational exposure to animals in The Center for Laboratory Animal Medicine and Care (CLAMC) or other research facilities or laboratories operated by UTHealth Houston.

II. Scope

This policy applies to all designated visitors, students, faculty, and staff who work at UTHealth Houston or University managed facilities. Enrollment in the occupational health program is available and encouraged for all individuals 1) working within the University facilities which house animals 2) having direct contact with animals; 3) having direct contact with non-sanitized animal cages or enclosures; 4) having direct contact with non-fixed or non-sterilized animal tissues, fluids, and/or wastes; or 5) providing service or support to animal equipment, devices, and/or facilities. Each identified individual is required to complete an acknowledgement of the program and is strongly encouraged to enroll. Once enrolled, participation in the program is strongly encouraged for all individuals having animal contact. However, if an individual declines to further participate, a signed declination form is required. It is recommended the individual make this decision after consulting with their personal physician.

III. Definitions

AAALAC-International (AAALAC) - the external, non-profit organization which assesses and accredits animal care and use facilities and programs.

Allergens - any substance that is recognized by the immune system and causes an allergic reaction. Specific animal contact with hair, dander, scales, fur, feces, urine, saliva, etc. can cause an allergic reaction. Cumulative exposures may result in sensitization; whereby, an individual may develop symptoms not previously experienced with normal handling or contact with animals.

Allergy – exaggerated reaction by the body's immune system to foreign bodies, or allergens. Common allergic reactions may result from animal proteins such as; animal's urine, saliva, hair, dander, or bedding material. These allergens may also have a cumulative effect on an individual. According to National Institute for Occupational Safety and Health (NIOSH), it is estimated that approximately 33% of animal handlers exhibit some allergic symptoms.

Enrollment (Occupational Health & Safety Program and Medical Surveillance) - is defined as having a completed medical questionnaire with signature on file in UT Health Services (UTHS). Once enrolled, an individual is strongly encouraged to participate in the medical surveillance, medical exams, vaccinations, and screening if recommended for the specific animal species. All elements of the program are free of charge to the participant. Enrollment in the program is available at any time to those individuals identified in Section II. Scope who signed the acknowledgement to decline enrollment.

The Center for Laboratory Animal Medicine and Care (CLAMC) – is responsible for the health and well being of laboratory animals used for the institution's biomedical research programs, including training and professional veterinary, surgical and animal care services. CLAMC facilities accommodate a variety of species and include a modern experimental surgery suite. Its 90,000 plus square feet of vivaria are geographically dispersed throughout the Texas Medical Center.

Personal Protective Equipment (PPE) – Safety equipment such as gloves, aprons, face shield, or goggles which are required to be worn when coming into contact with animals, hazardous chemicals, toxic materials, etc.

Sensitization – The condition when exposed to an allergen or chemical, even small amounts, that produce adverse effects or symptoms not previously experienced when exposed to the same chemical dose or allergen.

Suppressed Immune System – The medical conditions or disorders that would increase an individual's susceptibility to disease or illness. Healthy immune systems are the best defense against allergens, viruses, bacteria, and other vectors commonly encountered while working with animals.

Zoonoses - All diseases and infections transmitted between animal and humans caused by agents including bacteria, viruses, parasites, or other vectors and causing disease under natural conditions. Examples include: Q-fever, rabies, enteric bacteria, toxoplasmosis, tuberculosis, and salmonella. See Appendix C.

IV. Responsibilities

Employees are responsible for:

1. Completing federally mandated animal care and use training, principal investigator training, or animal service support training as required.
2. Enrolling in the Occupational Health Program prior to working with animals.
3. Using all personal protective equipment, clothing, or other safety devices where required.
4. Being familiar with all standard operating procedures for safety, personal hygiene, and emergency situations.
5. Informing their supervisor immediately of any animal bites, scratches, illnesses, or injuries received from working with animals.
6. Completing, or periodically updating, the medical questionnaire or declination form.
7. Maintaining good hygiene practices, wearing Personal Protective Equipment (PPE), and following all safe operating procedures at all times.
8. Notifying their supervisor immediately in the event of a possible biological, radiological, chemical, or physical agent exposure.
9. Administering and scheduling appointments with UTHS.

Supervisor or PI is responsible for:

1. Ensuring all employees are offered enrollment in the Occupational Health Program prior to working with animals.
2. Confirming all employees received proper training (e.g., Animal Research Training Courses, Basic Laboratory Safety Training, etc.) for their work activities with animals.
3. Ensuring all employees are proficient and understand the standard operating procedures for each protocol.
4. Ensuring all employees receive appropriate PPE and take necessary precautions against hazards.
5. Investigating all animal bites or injuries reported by employees.
6. Communicating new procedures to employees when process, facility, or equipment changes occur.

Center for Laboratory Animal Medicine and Care Executive Director is responsible for:

1. Maintaining a working knowledge of all aspects of animal care and use that impact the health and safety of animal care staff and research staff, including species, hazardous agents, equipment, and work practices in use at UTHealth Houston.
2. Working with Environmental Health and Safety (EHS) and UTHS in the implementation and development of the Occupational Health Policy as it relates to animal contact.
3. Ensuring all CLAMC employees enroll in the Occupational Health Program upon hire.
4. Confirming that all CLAMC employees receive proper training and PPE for their work activities with animals.
5. Ensuring that all animal exposures and injuries are reported to EHS for investigation and remediation.
6. Ensuring that appropriate safety measures (PPE, engineering controls, etc.) are communicated to CLAMC employees when changes occur.

Environmental Health and Safety is responsible for:

1. Performing PPE assessments, safety training and periodic monitoring where animal contact occurs.
2. The trending and analysis of illness, injuries, and exposures encountered during research activities, daily work routine and occupational activities.
3. Assistant in identifying all employees that require enrollment into the Occupational Health Program.

Animal Welfare Committee (AWC) is responsible for:

1. Maintaining and updating this policy
2. Assuring oversight of the Occupational Health Policy as an integral component of UTHealth Houston's Animal Care Program for the humane care and use of animals, using the *Guide for the Care and Use of Laboratory Animals* and the *Occupational Health and Safety in the Care and Use of Research Animals* as a basis for evaluation.
3. Identification of personnel that require enrollment into the Occupational Health Program through the submission and screening of protocols submitted to the committee.

UT Health Services is responsible for:

1. Performing health risk assessments based on job classification.
2. To review health information with physical examination and diagnostic studies as required among enrolled animal users for their fitness for duty while working with animals, based on inherent risk, exposure, and medical history.
3. The identification of all employees with signs or symptoms, or a predisposition to illness or disease, which would require engineering or administrative controls to reduce exposure. These employees shall not be returned to their work area without further consultation between the physician, individual, and their supervisor.
4. Maintaining all employee health records in accordance with applicable standards.

V. Procedures

At the time of animal use training, all designated visitors, students, faculty, and staff are required to sign an acknowledgement to either enroll or decline enrollment in the Occupational Health Program. Those individuals who choose to enroll will complete a baseline the medical questionnaire. After completing this form, the questionnaire must be forwarded to UTHS. All occupational enrollment forms are handled in a confidential manner. Each form is electronically submitted via Smartsheet or completed in paper form in the UTHS office, on-site with a UTHS employee, or completed and sent to UTHS in a manner that is OSHA/HIPAA compliant (e.g. fax, sealed mail, or encrypted email). Completed paper forms are scanned into the Smartsheet platform, which is a HIPAA compliant product. In August 2022, Employee Health implemented EPIC, an electronic health record system that stores employee health information including immunizations and labs. In December 2022, Employee Health transitioned to the Smartsheet platform which provides an electronic option for completing occupational enrollment forms. Only UTHS employees with training have access to these records. Employees may access parts of their own record through a web-based portal.

This form will then be reviewed and based on job classification, potential risk, and/or medical history; an appointment will be scheduled with the occupational health provider when necessary. All enrolled individuals are required to have a baseline questionnaire on file prior to working with animals. UTHS may require questionnaires to be revised periodically based on current trending or a report in increased medical symptoms. *If there are changes* in an individual's medical history; especially, increased allergic reactions, a compromised immune system, pregnancy, or the intent to become pregnant, individuals should notify their supervisor or PI immediately and update their medical questionnaire.

The need for a baseline and/or the annual medical exam will be based on hazard type, type of contact, frequency of exposure, job classification, assigned work area, or changes in medical history.

The occupational health provider will review any exam results, medical testing, and screening for adverse effects or deleterious symptoms. If there are no complications, the physician will complete a fit for duty form and the employee will be authorized to continue work with hazardous substances, animals, or in designated facilities.

Should symptoms, or the indication of complications, become severe, the individual may be temporarily reassigned or removed from exposure until engineering or administrative controls can be designed and implemented.

Using the matrix below, individuals can determine the types of medical exams, screenings, and vaccines; their frequency; the types of health hazards; and the medical surveillance criteria required.

Exams, screenings, and vaccines for CLAMC personnel, or anyone working with non-human primates, are mandatory. All other personnel should reference the Animal Category below to determine the exams, screenings, and vaccines appropriate for their type of animal contact.

Table 1.

Animal Category	Exams, Screenings, & Vaccines	Frequency	Health Hazard	Medical Surveillance Criteria
CLAMC Lab Rodents – Rats, Mice Rabbits Nonhuman Primates Pigs Sheep Fish Frogs	Medical history review and physical examination (if medical history indicates a condition that may impair fitness for duty)	Initial & Annually	Zoonoses – see appendix C Allergens Bites/Scratches	Baseline Required PRIOR to work assignment or entering regulated area; Annually update & as required by Physician; Or, changes in medical history - Individual may experience an increased susceptibility to disease or illness from a Suppressed Immune System or other related health factors
	Animal allergy baseline & consultation (as required)	Initial & Annually	Allergens from hair, dander, urine, bedding, etc.	Baseline Required PRIOR to work assignment or entering regulated area Changes in medical history; or health conditions
	Tuberculin Skin Test – PPD or T-SPOT	Initial & every six months thereafter	Humans and nonhuman primates are primary source All other animals considered reservoirs	Baseline Required PRIOR to work assignment or entering regulated area Changes in medical history
	Toxoplasmosis antibodies Titer (FEMALES of child-bearing capacity)	Initial for women of childbearing age (only if working with cats).	Cats and/or their feces	Baseline or changes in medical history
	Tetanus/Diphtheria Vaccine	Initial Re-initiated every 10 years		Required PRIOR to work assignment or entering regulated area, OR Injury
	Rabies Vaccine	Available upon request or as needed based on the risk assessment		
	Measles, Mumps, Rubella (MMR) Vaccination (proof of previous vaccination acceptable)	Initial		Required prior to work with primates
Support Personnel – Facilities personnel, EHS – assigned duties that require individual to enter an animal research area	Medical history review and physical examination (if medical history indicates a condition that may impair fitness for duty)	Initial	Lab Rodents – Rats, Mice Rabbits Nonhuman Primates Pigs Sheep Fish Frogs	Evaluations will be conducted on an individual basis

	Medical history review Status of immunizations	Periodic (every 5 years)		
	Animal allergy baseline & consultation (as required)	Initial & Annually	Allergens from hair, dander, urine, bedding, etc.	Baseline Required PRIOR to work assignment or entering regulated area Changes in medical history; or health conditions
	Tuberculin Skin Test – PPD or T-SPOT	Initial & annual thereafter	Nonhuman primates are primary source All other animals considered reservoirs	Baseline Required PRIOR to work assignment or entering regulated area Changes in medical history
	Tetanus/Diphtheria Vaccine	Initial Re-initiated every 10 years		Required PRIOR to work assignment or entering regulated area, OR Injury
	Measles, Mumps, Rubella (MMR) Vaccination (proof of previous vaccination acceptable)	Initial		Required prior to access to primate areas

VI. Training

Animal use and care training is required for all individuals having contact with animals as described under Section II. Scope. PI's, Researchers, Trades, and other support groups can fulfill this requirement by attending animal care and use training classes or watching the training video for specific groups and environmental health and safety training. PIs and Supervisors are responsible for their employees or students having received animal user training prior to working with animals. For more information, contact CLAMC at 713-500-7728.

VII. Animal contact

Animal contact from any species that breaks the handler's skin, involves a splash to the mucous membranes or occurs from a percutaneous inoculation from equipment used on or in animal care should be documented through the Supervisor's First Report of Injury form. Examples of animal contact include but are not limited to bites, scratches or allergic reactions. Animals infected with biohazards might pose additional hazards and should be noted on Supervisor's First Report of Injury Form.

Rodent (all species)/Rabbit/Pig/Fish/Frog - Secure the animal in the cage or tank. Immediately begin first aid treatment by washing the wound with soap and water for fifteen minutes or flushing the mucous membranes with water or saline for fifteen minutes. Contact supervisor to report injury and fill out Supervisor's First Report of Injury form. Report to UTHS if needed.

Nonhuman Primate - Secure the animal in a cage. Obtain Macaque Exposure Kit and notify co-worker to call veterinary staff. Immediately begin first aid treatment by washing the wound with chlorhexidine scrub for fifteen minutes or flushing the mucous membranes with water or saline for fifteen minutes. If it is after-hours exposure, follow instructions in the Macaque Exposure Kit and bring information sheet provided in the kit with you when seeking medical treatment. Contact supervisor to report injury and fill out Supervisor's First Report of Injury form. During normal business hours, report to UTHS immediately for blood draw. Blood samples of both the nonhuman primate and human will be sent to the National B Virus Resource Center, Virology Immunology Center, Georgia State University, 161 Jesse Hill Jr. Drive, Atlanta, GA 30303. http://biotech.gsu.edu/virology/

VIII. Physical Hazards

Heavy Lifts – Physically moving items such as cages, cage racks, feed and bedding can cause injury to backs, upper extremities such as shoulders and arms, and lower extremities such as legs and knees. Sprains and strains are the most common injury for animal care workers. Items such as rusty casters can cause burdens on the body. Notify a supervisor to replace such items. The use of a manual lift or fork lift should be used whenever possible. Employing safe lifting practices is also advisable. Contact EH&S for evaluation and training of heavy lifts.

Ergonomics – The practice of making the job fit the employee can be implemented in many daily tasks performed by animal workers. The purchase of a motorized floor cleaner reduces the time needed to perform a task and back strains injuries. Notify EH&S for evaluation and consultation of a process which is adding undue burden to the worker.

Noise – Some animals such as pigs or dogs as well as machine processes such as cage washing can create excessive noise. Noise loss from loud environments can occur gradually over periods of years without much notice by the individual. Notify EH&S to conduct noise monitoring of work environments to see if they are outside the recommended guidelines.

Slip, Trip and Falls – Many processes involved with animal care will subject the worker to slippery surfaces such as mopping floors, maneuvering large items in small spaces, creating a trip hazard and situations where falls could occur. Slips, trips and falls are the second leading cause of injuries at UTHealth Houston. To avoid these situations always use caution, pre-plan the procedure to eliminate any last-minute hurrying and notify the supervisor if a hazardous situation develops. Wearing slip resistant footwear is recommended.

IX. Allergens

Allergens are any substance that is recognized by the immune system and causes an allergic reaction. Specific animal contact with hair, dander, scales, fur, feces, urine, saliva, etc. can cause an allergic reaction. Cumulative exposures may result in sensitization; whereby, an individual may develop symptoms not previously experienced with normal handling or contact with animals. Preventive measures include wearing gloves and a dedicated laboratory coat when handling animals or their tissues or fluids. Contact your Supervisor to fill out the Supervisor's First Report of Injury form before proceeding to UTHS for diagnosis.

X. Biological Hazards

Biological agents and materials such as viruses, bacteria, fungi, prions, recombinant and synthetic nucleic acid molecules and human cell lines are commonly used in research animals. These agents and materials can pose hazards and can sometimes be amplified or lessened in an animal system. Specific training on animal handling practices and bedding and carcass waste disposal procedures will be unique to each experiment. Hazard postings on the outer doors to the holding areas specify the hazards being used on the animals and the necessary precautions (i.e., PPE) needed to handle these animals. These hazard postings have been created and reviewed by the CLAMC veterinary staff and EH&S based on recommendations from the AWC and Institutional Biosafety Committee (IBC) protocol approvals. Notify the supervisor if any explanation is needed before work begins.

XI. Chemical Hazards

Chemical hazards such as pharmaceuticals, cleaning agents, detergents and research substances are used in research animals and in the course of animal care and husbandry. Take caution when using detergents, acidic de-scaling solutions and alcohols as they can cause burns or be toxic by inhalation, ingestion or dermal contact. Pharmaceuticals such as anesthetics, antibiotics, analgesics and research drugs can be toxic at very small concentrations. The use of controlled substances, carcinogens, reproductive hazards, and toxins are reviewed by the AWC and Chemical Safety Committee (CSC).

XII. Radiological Hazards

Non-Ionizing Radiation – Ultraviolet lights such as those used in biological safety cabinets or overhead lighting can cause burns to the eyes and skin. Please make sure that all ultraviolet sources are turned off before working in the area.

Ionizing Radiation - Radioisotope tracers, X-ray machines and lasers can cause burns and other forms of damage. Specialized training is required to use this agent.

The uses of all radiological hazards are reviewed by the AWC and Radiation Safety Committee (RSC).

XIII. Waste

Bedding – All bedding should be changed out in a laminar flow hood or biological safety cabinet. Some experiments require chemical disinfection or autoclaving of the bedding prior to disposal. CLAMC supervisors will provide training before work begins.

Carcass – Animal carcasses should be disposed of in the appropriate cold storage facility at the following locations: MSB, MSE, IMM and BBSB animal facilities. Animals will be stored and made available for three days for research purposes. After that, the remains will be cremated or picked up by waste disposal contractor. Disposal of carcasses subject to biological, chemical or radiological hazards should be consistent with the approved protocol from the respective committees.

Sharps – Sharps should be placed in a sharps disposal container filled no more than ¾ full. Contact the EH&S Hazardous Waste Line for pick up at 713.500.5837.

PPE – Personal Protective Equipment used in animal-related hazardous work should be disposed of in a biohazard box for disposal or autoclaving when prescribed by the protocol approvals. Contact the EH&S Hazardous Waste Line for pick up at 713.500.5837.

XIV. Personal Hygiene

Work scrubs are supplied for CLAMC husbandry and veterinary personnel. They should be changed as frequently as needed to maintain personal hygiene and laundered at work. Polos/jeans are supplied for CLAMC facilities maintenance personnel and all personnel receive an allowance for footwear. The use of disposable gloves, masks, head covers, coats, coveralls and shoe covers in various areas is indicated by PPE signage or during employee training. Outer garments worn inside the animal rooms should not be worn during non-animal activities. Personnel should wash hands frequently with soap and water. No eating, drinking, use of tobacco products or applying cosmetics or contact lenses in animal rooms.

XV. Pregnancy, immunocompromised, illness

Animal care handlers who are pregnant or trying to become pregnant, or are immunocompromised by illness or medications, could be more susceptible to infection from hazards and zoonotic disease than healthy individuals. Discuss your working conditions and hazards with the UTHS or your physician.

XVI. Additional Information and References

Biosafety in Microbiological and Biomedical Laboratories (BMBL). 6th ed. 2020. CDC/NIH

Occupational Health and Safety in the Care and Use of Research Animals, 1997. National Research Council, National Academy of Sciences

Guide for the Care and of Laboratory Animals, National Research Council. 8th ed. 2011

Occupational Health and Safety in the Care and Use of Nonhuman Primates, National Research Council, 2003

Public Health Service Policy on the Humane Care and Use of Laboratory Animals, National Institutes of Health, 2015

NIOSH Preventing Asthma and Allergies Alert
Preventing Asthma in Animal Handlers (1998)
https://www.cdc.gov/niosh/docs/97-116/default.html

NIOSH Latex Allergy Alert
Preventing Allergic Reactions to Natural Rubber Latex in the Workplace (1997)
https://www.cdc.gov/niosh/topics/latex/default.html

XVI. Forms

Medical Questionnaire (handled by UT Health Services)
Supervisors First Report of Injury (Appendix A)
CLAMC Risk Assessment Summary Forms (Appendix B)

Implementation Date: 04.27.2007 Revision Date: 08/28/2023	Approval: Vice President, Safety, Health, Environment and Risk Management Executive Director, CLAMC Director, Employee Health Services	Signature: Dr. Robert Emery Dr. Mary Robinson Dr. Joy Harrison

Appendix A

Supervisor's First Report of Injury Form and Packet:

https://www.uth.edu/safety/risk-management-and-insurance/supervisor%20first%20report%20packet%2006.09.20.pdf

Appendix B - CLAMC Risk Group 1 Risk Assessment

(Applies to individuals with exposure to non-human primates and other animals not including rabbits and rodents)

Risk Category and Risk Events	How likely is it that this will occur? (Probablility)				How severe will it be should it occur? (Severity or Risk of Failure)				How prepared is the University? (Preparedness)				Risk Score
	High	Med	Low	None	Life Threatening	Permanent Harm	Temporary Harm	None	Poor	Fair	Good	N/A	
Score:	3	2	1	0	3	2	1	0	3	2	1	0	
Biological													
Bacteria		2			3						1		6
Virus		2			3						1		6
Fungus		2					1				1		4
Protozoa			1				1				1		3
Rickettsia			1				1				1		3
Chemical													
Anesthetic gases	3						1				1		5
Cleaners	3						1				1		5
Disinfectants	3						1				1		5
Preservatives		2					1				1		4
Sterilants (such as ETO)		2					1				1		4
Unidentified chemical hazards		2					1				1		4
Pesticides			1				1				1		3
Physical													
Pushing, pulling, lifting	3					2					1		6
Slips, trips, and falls	3					2					1		6
Autoclave injuries	3						1				1		5
Compressed gas cylinder injury			1		3						1		5
Electric shock			1		3						1		5
Pinch/crush injuries		2				2					1		5
Scratches, Punctures, & bites		2				2					1		5
Thermal burns	3						1				1		5
Noise		2					1				1		4
High pressure washer			1				1				1		3
Hydraulic lift lines			1				1				1		3
Lasers			1				1				1		3
Radiological													
Non-ionizing		2					1				1		4
UV light		2					1				1		4
Ionizing (i.e. X-rays & isotopes)			1				1				1		3
Allergen Effects													
Asthma		2			3						1		6
Anaphylaxis			1		3						1		5
Conjunctivitis	3						1				1		5
Rhinitis	3						1				1		5
Urticaria	3						1				1		5
Hygiene Issues													
Inadequate environmental cleaning		2				2				2			6
Lack of PPE			1		3					2			6
Staffing shortage			1			2				2			5
Utilities		2					1			2			5
Training Issues													
Need recognition of allergy symptoms			1		3					2			6
Biological hazards, animal specific concerns			1		3						1		5
Chemical exposures and controls			1			2					1		4
Ineffective respirator training			1			2					1		4
Occupational injury and illness reporting process			1				1			2			4
Physical hazards			1			2					1		4
Protocol specific hazards		2					1				1		4
Radiological hazards			1			2					1		4
Animal specific behavior			1				1				1		3
Community Issues													
Physical deconditioning		2				2			3				7
Injuries		2			3						1		6
Allergies	3						1				1		5
Asthma		2				2					1		5
Vaccine preventable diseases			1		3						1		5
Tuberculosis			1			2					1		4

This risk assessment is based upon risks identified in the UTHealth Houston CLAMC Facility and documented hazards in Animal Care settings as documented in: "The Guide for the Care and Use of Laboratory Animals" (NRC 2011) and "Occupational Health and Safety in the Care and Use of Research Animals" (1997)

CLAMC Risk Group 2 Risk Assessment

(Applies to individuals with exposure to rabbits and rodents, and biological materials)

Risk Category and Risk Events	How likely is it that this will occur? (Probability)				How severe will it be should it occur? (Severity or Risk of Failure)				How prepared is the University? (Preparedness)				Risk Score
	High	Med	Low	None	Life Threatening	Permanent Harm	Temporary Harm	None	Poor	Fair	Good	N/A	
Score:	3	2	1	0	3	2	1	0	3	2	1	0	
Biological													
Bacteria		2			3						1		6
Virus		2			3						1		6
Fungus		2					1				1		4
Parasites		2					1				1		4
Rickettsia			1				1				1		3
Protozoa			1				1				1		3
Chemical													
Anesthetic gases	3						1				1		5
Cleaners	3						1				1		5
Disinfectants	3						1				1		5
Preservatives		2					1				1		4
Sterilants (such as ETO)		2					1				1		4
Unidentified chemical hazards		2					1				1		4
Pesticides			1				1				1		3
Physical													
Pushing, pulling, lifting	3					2					1		6
Slips, trips, and falls	3					2					1		6
Autoclave injuries	3						1				1		5
Compressed gas cylinder injury			1		3						1		5
Electric shock			1		3						1		5
Pinch/crush injuries		2				2					1		5
Scratches, Punctures, & bites		2				2					1		5
Thermal burns	3						1				1		5
Noise		2					1				1		4
Lasers			1				1				1		3
Radiological													
Non-ionizing		2					1				1		4
UV light		2					1				1		4
Ionizing (i.e. X-rays & isotopes)			1				1				1		3
Allergen Effects													
Asthma		2			3						1		6
Anaphylaxis			1		3						1		5
Conjunctivitis	3						1				1		5
Rhinitis	3						1				1		5
Urticaria	3						1				1		5
Hygiene Issues													
Inadequate environmental cleaning		2				2				2			6
Lack of PPE			1		3					2			6
Staffing shortage			1			2				2			5
Utilities		2					1			2			5
Training Issues													
Need recognition of allergy symptoms			1		3					2			6
Biological hazards, animal specific concerns			1		3						1		5
Chemical exposures and controls			1			2					1		4
Ineffective respirator training			1			2					1		4
Occupational injury and illness reporting process			1				1			2			4
Physical hazards			1			2					1		4
Protocol specific hazards		2					1				1		4
Radiological hazards			1			2					1		4
Animal specific behavior			1				1				1		3
Community Issues													
Physical deconditioning		2				2			3				7
Injuries		2			3						1		6
Allergies	3						1				1		5
Asthma		2				2					1		5
Vaccine preventable diseases			1		3						1		5
Tuberculosis			1			2					1		4

This risk assessment is based upon risks identified in the UTHealth Houston CLAMC Facility and documented hazards in Animal Care settings as documented in: "The Guide for the Care and Use of Laboratory Animals" (NRC 2011) and "Occupational Health and Safety in the Care and Use of Research Animals" (1997)

CLAMC Risk Group 3 Risk Assessment

(Applies to individuals with minimal animal exposure including Facilities, EHS, AWC personnel, visitors, etc.)

Risk Category and Risk Events	How likely is it that this will occur? (Probability)				How severe will it be should it occur? (Severity or Risk of Failure)				How prepared is the University? (Preparedness)				Risk Score
	High	Med	Low	None	Life Threatening	Permanent Harm	Temporary Harm	None	Poor	Fair	Good	N/A	
Score:	3	2	1	0	3	2	1	0	3	2	1	0	
Biological													
Bacteria			1		3						1		5
Virus			1		3						1		5
Fungus			1				1				1		3
Protozoa			1				1				1		3
Rickettsia			1				1				1		3
Chemical													
Unidentified chemical hazards		2					1				1		4
Cleaners			1				1				1		3
Disinfectants			1				1				1		3
Pesticides			1				1				1		3
Preservatives			1				1				1		3
Sterilants (such as ETO)			1				1				1		3
Physical													
Pinch/crush injuries	3					2					1		6
Pushing, pulling, lifting	3					2					1		6
Slips, trips, and falls	3					2					1		6
Compressed gas cylinder injury			1		3						1		5
Electric shock			1		3						1		5
Scratches, Punctures, & bites		2				2					1		5
Thermal burns	3						1				1		5
High pressure washer			1				1				1		3
Hydraulic lift lines			1				1				1		3
Lasers			1				1				1		3
Noise			1				1				1		3
Radiological													
Non-ionizing		2					1				1		4
UV light		2					1				1		4
Ionizing (i.e. X-rays & isotopes)			1				1				1		3
Allergen Effects													
Anaphylaxis			1		3						1		5
Asthma			1		3						1		5
Conjunctivitis		2					1				1		4
Rhinitis		2					1				1		4
Urticaria		2					1				1		4
Hygiene Issues													
Inadequate environmental cleaning		2				2				2			6
Lack of PPE			1		3					2			6
Staffing shortage			1			2				2			5
Utilities		2					1			2			5
Training Issues													
Need recognition of allergy symptoms		2			3					2			7
Biological hazards, animal specific concerns		2			3						1		6
Animal specific behavior	3						1				1		5
Chemical exposures and controls		2				2					1		5
Protocol specific hazards	3						1				1		5
Radiological hazards		2				2					1		5
Ineffective respirator training			1			2					1		4
Occupational injury and illness reporting process			1				1			2			4
Physical hazards			1			2					1		4
Community Issues													
Physical deconditioning		2				2			3				7
Injuries		2			3						1		6
Allergies	3						1				1		5
Asthma		2				2					1		5
Vaccine preventable diseases			1		3						1		5
Tuberculosis			1			2					1		4

This risk assessment is based upon risks identified in the UTHealth Houston CLAMC Facility and documented hazards in Animal Care settings as documented in: "The Guide for the Care and Use of Laboratory Animals" (NRC 2011) and "Occupational Health and Safety in the Care and Use of Research Animals" (1997)

Appendix C - Zoonoses

Note: This is list is intended to provide reference information for zoonoses applicable to a number of species, including those that are not currently housed at UTHealth Houston

Macacine herpesvirus 1 (B-Virus Infection)
Lymphocytic Choriomeningitis (LCM)
Hantavirus
Orf Disease (Contagious Ecthyma and Contagious Pustular Dermatitis)
Hepatitis A
Rabies
Q-Fever
Cat-Scratch Fever
Tuberculosis
Psittacosis (Ornithosis, Parrot Fever, Chlamydiosis)
Rat-Bite Fever
Brucellosis
Leptospirosis
Campylobacteriosis
Salmonellosis
Shigellosis
Toxoplasmosis
Dermatomycosis (Ring-Worm)

Zoonoses

Zoonoses are all diseases transmitted between animals and man under natural conditions. These diseases, many of which are often relatively innocuous in their normal host, may result in serious or fatal diseases in unusual hosts. With the number and range of potential zoonotic diseases, it is a reaffirmation of the validity of standard containment techniques that the number of zoonotic diseases transmitted between the laboratory research animals and the research personnel is so small.

Macacine herpesvirus 1 (B-Virus Infection)

Host Range - Herpes B-virus produces a mild clinical disease analogous to the human Herpes simplex virus in macaques. The disease in macaques is characterized by lingual or labial vesicles or ulcers and often keratoconjunctivitis or corneal ulcers, which are apparent for 1 - 2 weeks after the disease onset. As is typical of herpes viruses, a latency period follows with reactivation and expression of the virus (shedding) in monkeys during periods of physical or psychological stress. Several aberrant species, including humans, develop a severe and fatal encephalomyelitis when inoculated with the virus.

Transmission - Transmission of B-virus to man occurs primarily through bite or scratch wounds (saliva transmission) although cases of needle stick transmission, fomite (cage) transmission, and human-to-human transmission have been documented.

Clinical Signs - The incubation period varies from 2 days to 30 days with wide variation. A herpetiform vesicle may develop early at the site of inoculation. Early clinical signs include myalgia, fever, headache, and fatigue followed by a progressive neurological disease with numbness, hyperesthesia, paresthesia, ataxia, confusion convulsions, and ascending flaccid paralysis.

Treatment - Antiviral treatment with acyclovir or ganciclovir is effective in controlling the viral disease but management is controversial since discontinuance of acyclovir therapy is associated with increasing serologic titers to B-virus. Therapy may be life-long.

Early diagnosis and intervention is critical in managing potential B-virus exposures. Serological samples should be obtained from the macaque and the patient as soon as possible after the bite. The patient's wound site and the macaque's conjunctiva and buccal mucosa should be cultured for virus isolation. The wound should be thoroughly cleansed and disinfected with chlorhexidine scrub as recommended for antisepsis.

Physicians should consult the Viral Exanthemas and Herpesvirus Branch, Division of Viral Diseases, Centers for Disease Control and Prevention for assistance in case management.

Prevention - Protective clothing and equipment (face shield, mask, gloves, long-sleeved garments, etc.) when handling macaques is essential. While only serologically B-virus negative monkeys should be used to minimize potential exposure, no monkey should be considered B-virus negative. Whenever possible, macaques should be anesthetized prior to any manipulations or handling where personnel may be at risk.

Lymphocytic Choriomeningitis (LCM)

Host Range - A member of the family Arenaviridae, this virus has a predilection for many rodent species and is common in wild mice throughout the world. A wide variety of laboratory animal species including mice, hamsters, guinea pigs, nonhuman primates, swine, and dogs can be infected with LCM but the laboratory mouse and hamster are the species of greatest concern with regard to transmission to man. The disease in laboratory mice and hamsters is usually clinically silent, and in the case of immunodeficient mice, may be undetectable with standard serologic techniques.

Transmission - Large quantities of virus are present in the blood, cerebrospinal fluid, urine, nasopharyngeal secretions, feces, and tissues of infected host animals. Transmission between animals may be transplacentally, by direct contact, by contact with fomites, or via injections or tumor transplantations with infected tissues. Transmission to man is usually via inhalation or contamination of mucous membranes or broken skin with infectious tissues or fluids from infected animals.

Clinical Signs - Humans develop an influenza-like illness usually characterized by fever, myalgia, headache, and malaise after an incubation period of 1-3 weeks. Severe cases in man may present with a maculopapular rash, lymphadenopathy, meningoencephalitis, orchitis, arthritis, and epicarditis. Several deaths have resulted from central nervous system involvement. Definitive diagnosis usually involves virus isolation from the blood or cerebrospinal fluid. Antibody is detectable approximately 2 weeks after onset of the illness, limiting the usefulness of serology for diagnosis of human disease.

Treatment - Ribavirin therapy substantially reduces the mortality in patients infected with other arenavirus infections and may prove to be of value in treating LCM infections. Additional information about therapy and serological testing for LCM is available through the Special Pathogens Branch, Division of Viral and Rickettsial Diseases, CDC.

Prevention - Periodic surveillance of acquired wild-caught rodents for evidence of endemic LCM infection is essential. A risk-based assessment on the potential for cell lines/tissues to be infected with this virus should be performed and these cells/tissues should be evaluated for the presence of LCM virus prior to inoculation into animals if testing has not been previously reported. Animal Biosafety Level 2 is recommended for studies in adult mice infected with mouse-brain passage strains. Animal Biosafety Level 3 should be used for work with infected hamsters.

Hantavirus

Host Range - One of several genera in the family Bunyaviridae, Hantaviruses are widely distributed throughout nature among the rodent populations. Numerous genera of rodents including *Apodemus, Clethrionomys, Mus, Rattus, Pitimys,* and *Microtus* have been implicated in foreign outbreaks of typical Hantavirus hemorrhagic disease. In the United States, *Rattus norvegicus, Peromyscus* spp., *Microtus californicus, Tamias* spp., and *Neotoma* spp. have been implicated in the rural and urban outbreaks of hantaviral disease.

Transmission - Infected rodents shed the virus in their respiratory secretions, urine, saliva, and feces for an extended period following infection. Transmission between animals occurs by direct contact with infected secretions or via aerosols. Human infection usually is via aerosol exposure with only brief exposures required. Transmission may also occur via bite wound and contamination or by exposure of mucus membranes or compromised skin to infectious materials.

Clinical Signs - The clinical signs are related to the strain of hantavirus involved. The disease varies from "nephropathia endemica" consisting of fever, back pain, and nephritis with moderate renal dysfunction to "hemorrhagic fever and renal syndrome" consisting of fever, myalgia, headache, petechiae, and other hemorrhagic manifestations including anemia, gastrointestinal bleeding, oliguria, hematuria, electrolyte imbalance and shock.

Recent outbreaks of natural disease in the United States have presented with fever, myalgia, headache, and cough followed by rapid respiratory failure. Serologic tests are available and additional information may be obtained through the Special Pathogens Branch, Division of Viral and Rickettsial Diseases, CDC.

Treatment - Intravenous ribavirin therapy initiated early in the disease course may be of value. Hemodynamic maintenance and respiratory support are critical.

Prevention - The isolation, identification, and elimination of infected laboratory rodents or tissues prior to the exposure of laboratory personnel or animals is essential in the prevention of hantavirus infection in either the laboratory animals or the laboratory personnel. Serologic screening of rodent colonies and incoming animals is essential in minimizing laboratory personnel exposure.

Orf Disease (Contagious Ecthyma and Contagious Pustular Dermatitis)

Host Range - This poxvirus is endemic in sheep and goat herds worldwide, including the United States. All ages of animals are affected although younger animals are more severely affected clinically. In small ruminants, Orf produces proliferative, pustular, crusty lesions around the lips, nostrils and urogenital orifices.

Transmission - Transmission is via direct contact with the virus-laden secretions from the lesions. Transmission via fomites is possible and rare person to person transmission has occurred.

Clinical Signs - The disease in humans is usually characterized by a single, or rarely multiple, lesion that is initially maculopapular or pustular and progresses to a weeping proliferative nodule. Regional lymphadenitis in uncommon and progression to a systemic disease is rare.

Treatment - Treatment is supportive. Lancing of the initial lesion is contraindicated.

Prevention - Vaccination of susceptible sheep and goats effectively prevents the disease. Protective clothing and good personal hygiene are effective in preventing exposure from infected animals.

Hepatitis A

Host Range - Humans are the definitive reservoir host for Hepatitis A virus and infection of nonhuman primates occurs due to contact with infected human populations or their waste. Most nonhuman primates are susceptible and the disease is often subclinical in these species although viral propagation and spread does occur.

Transmission - Over 200 cases of human Hepatitis A virus infection have been associated with nonhuman primates. Transmission is fecal-oral.

Clinical Signs - Incubation period is about 30 days. The clinical disease in humans varies from a mild flu-like illness of 1 - 2 weeks duration to a severely debilitating disease lasting several months. Patients experience fever, malaise, anorexia, nausea, and abdominal discomfort which is usually followed in several days by the development of jaundice.

Treatment - Treatment is essentially supportive only. No effective antiviral drug is presently available.

Prevention - An approved killed-virus vaccine is now available and protective. Protective clothing and equipment along with adequate personal hygiene and sanitation minimizes the potential of disease exposure.

Hepatitis B, C, D and E

Host Range – Humans are considered the only natural host of hepatitis B, C, D and E. Various nonhuman primates, particularly chimpanzees, can be infected experimentally but only one case of natural infection has been reported.

Transmission – Transmission occurs by percutaneous and permucosal exposure to infective body fluids. Infectious body fluids include blood, saliva, semen, and vaginal fluids.

Clinical Signs - Incubation period is usually 45-180 days. The clinical disease in humans manifests as anorexia, vague abdominal discomfort, nausea and vomiting, often progressing to jaundice.

Treatment – Treatment includes alpha interferon for chronic hepatitis B patients.

Prevention – An approved rDNA inactivate vaccine is available. Protective clothing and training on the safe use of needles and other sharps to avoid inoculation.

Rabies

Host Range - Rabies is essentially distributed world-wide with the exception of a few countries that have eliminated the disease through import restrictions. All mammals are susceptible to infection with the rabies virus although dogs, cats, skunks, raccoons, bats, and other biting animals are the main reservoirs. Rabies in the wild animal population has been dramatically increasing over the past decade, increasing the likelihood of exposure in areas that have had little disease over the previous years.

Transmission - Usually via a bite wound although aerosol transmission has been documented in caves with bats. Personnel handling tissues of infected animals are potentially at risk. Most laboratory animal associated cases involve bite wounds from random source dogs and cats.

Clinical Signs - Patients initially experience apprehension followed by headache, malaise, fever and indefinite sensory changes referred to the site of the bite wound. Disease progression leads to paresis, paralysis, inability to swallow, delirium, convulsions, coma, and death due to respiratory paralysis.

Treatment - When exposure is documented, active immunization with rabies vaccine often prevents disease development. Treatment after the development of symptoms is futile.

Prevention - Acquisition only of animals with documented clinical health histories and vaccination to rabies virus. Animal vaccination is the most critical asset in rabies prevention. Pre-exposure vaccination for personnel at risk for exposure is strongly recommended.

Q-Fever

Host Range - Coxiella burnetti, the etiologic agent of Q-fever, has a worldwide distribution with widespread infection in a variety of domestic and wild animals including sheep, goats, cattle, cats, dogs, and domestic fowl. While sheep are the primary laboratory animal associated with human cases of Q-fever, an outbreak of Q-fever in a human cohort exposed to a post-parturient cat and her litter along with document cases of Q-fever following exposure to rabbits emphasizes the role of other laboratory animals.

Transmission - Humans usually acquire this infection following exposure to infectious aerosols although infection following ingestion has been documented. The organism is shed in the urine, feces, milk, and especially the birth products of domestic animals which are generally asymptomatic. An infective dose of as little as one organism can produce Q-fever.

Clinical Signs - The disease in humans varies widely from asymptomatic to a variety of flu-like symptoms. Usually the disease has an abrupt onset with fever, chills, retrobulbar headache, weakness, malaise, and profuse sweating. Pneumonitis with chest pain, acute pericarditis, and hepatitis may occur. Endocarditis on native or prosthetic cardiac valves may extend relapses of the disease over years. Most cases resolve within 2 weeks of clinical signs. Serological methods are available for diagnosis of the human disease. Virus isolation poses a severe risk to the laboratory personnel and is generally not attempted.

Treatment - Tetracyclines are effective in treatment although prolonged therapy may be required.

Prevention - Exposure to post-parturient fetal membranes and fluids represents the greatest potential for infection and should be avoided. Whenever possible, only male or non-pregnant female sheep should be utilized. Physical barriers and appropriate laboratory clothing and protective equipment minimizes exposure. The organism is resistant to many disinfectants although sodium hypochlorite is effective.

For personnel at high risk, an investigational Phase 1 Q-fever vaccine is available from the Special Immunizations Program, US Army Medical Research Institute for Infectious Disease, Fort Detrick, Maryland.

Cat-Scratch Fever

Host Range - Bartonella henselae, the rickettsial agent responsible for cat-scratch fever, is associated with cats most frequently although dogs, monkeys, and porcupines have also been implicated in disease transmission. Transmission between cats, and presumably between other species, by the domestic flea has been documented. *Transmission* - Transmission to humans generally occurs after a cat scratch incident.

Clinical Signs - A small erythematous papule arises at the inoculation site within several days of exposure followed by a vesicle and scab formation with resolution in several days. Several weeks later regional lymphadenopathy appears in the draining lymph nodes which may persist for months. Lymph nodes may suppurate. Fever, malaise, anorexia, headache, and splenomegaly may occur. Rarely, central nervous system signs, osteolytic lesions, granulomatous hepatitis, and pneumonia may occur. Isolation of the organism from the blood, a cutaneous lesion, or biopsy material is required for definitive diagnosis. Serology is available and positive for most patients.

Prevention - Proper cat-handling techniques and protective clothing minimizes exposure. Flea control may minimize disease exposure between cats and personnel.

Tuberculosis

Host Range - Tuberculosis of animals and humans is caused by a members of the genus *Mycobacterium*, including *M. tuberculosis, M. avium-intracellulare, M. bovis, M. kansasii, M. simiae, M. marinum, and M. chelonae*. While cattle, birds, and humans serve as the main reservoirs for these organisms, numerous laboratory animals are susceptible including nonhuman primates, swine, sheep, goats, rabbits, zebrafish, cats, dogs, and ferrets. Nonhuman primates, however, represent the primary laboratory animal associated with transmission to humans.

Transmission - While infection can occur by direct entry into the body or ingestion, inhalation of infective aerosols is the primary means of human exposure. Infective aerosols can be generated by high-pressure hoses, tissue manipulations at necropsy, improper sample handling in a clinical laboratory, or via coughing of the infective animal.

Clinical Signs - The incubation period for the development of a primary lesion and tuberculin skin test conversion is 4 - 12 weeks. The usual clinical signs are pulmonary due to the usual site of entry and consist of cough, sputum production, and progressive pulmonary disease. The disease may become latent with recrudescence over the lifetime of the infected person. Extra-pulmonary spread and systemic disease is possible with clinical signs directly related to the organ(s) infected. General symptoms include weight loss, fatigue, lassitude, fever, chills, and cachexia.

Diagnosis relies primarily on the intradermal tuberculin test in both humans and animals. Chest radiography and sputum smears and cultures are also used for definitive diagnosis.

M. marinum infection in humans presents as a nodular granulomatous disease that can spread along with the distribution of the lymphatic system and is usually limited to the skin and soft tissues in immunocompetent persons. Disseminated infection is possible in highly immunocompromised patients.

Treatment - The appearance of multiply antibiotic resistant *Mycobacterium* has made treatment difficult or impossible in some rare cases. Appropriate antibiotics as determined by the occupational health provider should be used in treatment regimens. Organism sensitivity should guide the treatment regimen.

Prevention - Routine surveillance of nonhuman primates for tuberculosis using the intradermal tuberculin test is critical in identifying and eliminating exposed animals. Laboratory personnel should also be screened via the intradermal tuberculin test on a routine basis. Vaccination on nonhuman primates with BCG is not recommended since it converts the tuberculin skin test to positive and does not prevent infection but only suppresses proliferation of the organism and clinical disease in the vaccinated animal.

Psittacosis (Ornithosis, Parrot Fever, Chlamydiosis)

Host Range - Only *Chlamydia psittaci* is widely distributed in animals, both avians and mammals, and recognized as a zoonotic pathogen. Many laboratory animal species including birds, mice, guinea pigs, rabbits, ruminants, swine, cats, ferrets, muskrats, and frogs have been documented to be infected with *C. psittaci*.

Transmission - Spread to humans is via direct contact or aerosol exposure to the organism in exudates, secretions, or desiccated fecal material.

Clinical Disease - Avian strains appear to be more pathogenic for humans than mammalian strains of *C. psittaci*. The clinical disease may vary from conjunctivitis to a systemic disease with fever, headache, myalgia, chills,and upper and lower respiratory tract disease. More serious manifestations include extensive pneumonia, hepatitis, myocarditis, thrombophlebitis, and encephalitis. Relapses occur is untreated infections. Serology and organism isolation are used for diagnosis

Treatment - Tetracyclines are effective in treatment.

Prevention - Limit acquisition of birds to only those from disease-free colonies. If required, wild or questionable birds may be treated with chlortetracycline to minimize disease spread potential exposure of personnel. Personal protective equipment, especially respiratory protection, and appropriate laboratory clothing can minimize transmission.

Rat-Bite Fever

Etiology and Host Range - Rat-bite fever is caused by either *Streptobacillus moniliformis* or *Spirillum minor*, two bacteria that are normally present in the oral cavities of rodents, especially rats. The organisms are distributed worldwide although most commercial laboratory animal suppliers have eliminated the organisms from their production colonies. *Streptobacillus moniliformis* is the usual cause of rat-bite fever in the United States while *Spirillum minor* predominates in Asia and the far-east.

Transmission - The vast majority of human cases result from bite wounds (usually rat) contaminated with nasopharyngeal secretions. Transmission may occur by direct inoculation with blood from infected animals and some cases have occurred without bites or direct contact.

Clinical Signs - The clinical disease produced by *Streptobacillus moniliformis* (Streptobacillary Rat-Bite Fever, Haverhill Fever) and *Spirillum minor* (Spirillar Rat-Bite Fever, Sodoku) differs. Both, however, produce a systemic disease with bacteremia and organism localization throughout the body.

Streptobacillary Rat-Bite Fever has an incubation period that ranges from 1 to 22 days although the vast majority of cases have an incubation period of under 10 days. The onset of the disease is abrupt with fever, rigor, chills, headache, nausea, vomiting, arthralgia, and myalgia. The site of the rat bite is not involved and has generally healed by the time the patient becomes ill. Regional lymphadenopathy, characteristic of Spirillar Rat-Bite Fever, is usually not seen in Streptobacillary Rat-Bite Fever. Within several days of the disease onset, the patient develops a macular, maculopapular, or petechial rash that is most prominent on the extremities and may involve the palms and soles. Septic polyarticular arthritis develops in approximately one-half the patients. Untreated, complications include endocarditis, myocarditis, pericarditis, pneumonia, meningitis, and focal abscesses, with a mortality rate of 10-12%.

Spirillar Rat-Bite Fever has an incubation period of 1 to 3 weeks with the majority of the cases having an incubation period of over 10 days. While the rat bite may have healed during this period, the area will become swollen, indurated, and tender as the systemic phase of the disease begins. Fever, chills, headache, malaise, and regional lymphadenopathy characterize the clinical disease but the arthritis common in Streptobacillary Rat-Bite Fever does not occur. The initial clinical disease subsides after 3 to 5 days although relapses are common. Untreated Spirillar Rat-Bite Fever has a mortality rate of 5 - 10%.

Treatment - A variety of antibiotics may be used to treat both Streptobacillary and Spirillar Rat-Bite Fever. Procaine penicillin G appears to be generally effective against both organisms.

Prevention - Proper handling of laboratory rodents, especially rats is critical in reducing the potential for rodent bites and rat-bite fever. Personnel handling laboratory rodents should be familiar with the procedures or seek assistance from personnel with such experience.

Brucellosis

Host Range - Brucella melitensis, Brucella abortus, Brucella suis, and *Brucella canis* are all potential human pathogens associated primarily with goats, cattle, swine, and dogs respectively. Of these, only *Brucella canis* is widely distributed in laboratory animals, infecting 1 - 6% of the dog population in dog-production colonies. *Brucella abortus* is prevalent in wild populations of bison and elk and may result in the exposure of personnel working with these animals.

Transmission - Most human cases of *Brucella canis* are associated with contact with aborting bitches and the placental tissues which are typically rich in infective organisms. The organism is also shed for a prolonged period in infective dogs. Direct skin or mucous membrane contact with the organism as well as inhalation of infectious aerosol is responsible for transmission.

Clinical Signs - Brucella canis produces a milder clinical disease in humans than any of the other pathogenic *Brucella* spp., varying from subclinical or inapparent infection to a disease characterized by fever, headache, chills, myalgia, nausea, and weight loss. These flu-like symptoms are difficult to distinguish from many other diseases and the majority of human cases of brucellosis go undiagnosed. While septicemia and systemic disease may rarely occur, the disease is usually self-limiting. Chronic brucellosis, clinical disease lasting over 1 year, is relatively rare with *Brucella canis* in comparison to the other *Brucella* spp. pathogens of humans.

Diagnosis is primarily via serologic techniques, primarily serum agglutination. Isolation and cultivation of the organism is possible from the blood, bone marrow, or other tissues.

Treatment - A number of antimicrobial therapies are available for the treatment of brucellosis with the primary emphasis on the use of bacteriocidal combinations with a prolonged treatment course to minimize relapses. Combinations of tetracyclines (doxycycline or minocycline) and aminoglycosides (streptomycin or gentamicin) for 4 - 6 weeks are the primary treatment course.

Prevention - Prevention is primarily aimed at the exclusion of infected animals from the laboratory setting. All dogs should be screened for serologic reaction with *Brucella canis* prior to acquisition. Appropriate laboratory clothing and hygiene practices will reduce exposure.

Leptospirosis

Host Range - Leptospirosis has a worldwide distribution in a variety of domestic and wild animals including rats, mice, field moles, hedgehogs, squirrels, gerbils, hamsters, rabbits, dogs, domestic livestock, other mammals, amphibians, and reptiles.

Transmission - Leptospiras are shed in the urine of infected animals, which often remain asymptomatic. Animals may be infected and shed the organism in their urine for life without clinical disease. Transmission occurs through direct contact of infected material with abraded skin or mucous membranes.

Clinical Signs - Early clinical disease is often quite diverse making early diagnosis nearly impossible. Disease severity may range from inapparent to a severe systemic illness with a sudden onset of fever, an intense often intractable headache, severe myalgia especially involving the calf muscles, chills, and conjunctival suffusion. Lymphocytic meningitis with a neutrophilia in the peripheral blood should arouse suspicion. Proteinuria and cylindruria usually accompany the early mild disease and blood urea nitrogen and creatinine are usually elevated. Elevated hepatic enzymes and a mild to moderate thrombocytopenia frequently occurs. Definitive diagnosis may be made by cultivation of the organism from the blood or urine (growth may take 30 or more days) or by either darkfield examination of urine or serology.

Treatment - A variety of antibiotics are useful in treatment including penicillin G, erythromycin, and doxycycline. While antibiotic therapy is effective at eliminating the organism, the lesions and tissue damage may require additional supportive treatment.

Prevention - Exclusion of infected animals from laboratory environments and vaccination of animals is the primary method of prevention. Appropriate laboratory clothing and protective equipment, especially gloves, minimizes exposure.

Campylobacteriosis

Host Range - A wide variety of animals are susceptible to infection with members of the genus *Campylobacter* and the organism has been recognized as a leading cause of diarrhea in humans. Distribution is worldwide.

Transmission - Transmission is fecal-oral. The organism is shed in the feces of infected animals and may be shed for prolonged periods following recovery from clinical disease. Younger animals are more likely to shed organisms than older animals.

Clinical Signs - The incubation period averages between 3 and 5 days with a range of 1 - 10 days. The disease in humans is usually self-limiting and brief with a gastrointestinal illness characterized by watery diarrhea often with blood, mucus, and leukocytes. Abdominal cramps, nausea, vomiting, and fever are not unusual. Systemic disease and other complications are rare. Diagnosis requires cultivation of the organism from the feces.

Treatment - Supportive fluid therapy is recommended with antibiotics only used in severe cases or those with immunosuppressive conditions. Erythromycin and ciprofloxacin are effective.

Prevention - Proper laboratory clothing and protective equipment should reduce to potential exposure to infective fecal materials. Proper personal hygiene is essential.

Salmonellosis

Host Range - Salmonellosis is distributed worldwide in a wide variety of animal species. While laboratory rodents are usually free of the disease, the potential for exposure through contaminated food and bedding sources remains. Wild rodents, amphibians, reptiles, avians, nonhuman primates, and dogs represent potential sources of zoonotic salmonellosis.

Transmission - Transmission is fecal-oral.

Clinical Signs - Salmonellosis is characterized by fever, abdominal pain and an acute enterocolitis with a watery diarrhea that often contains blood, mucus, and leukocytes. The incubation period is short, usually 8 - 48 hours, and the disease generally resolves within 5 days of onset although some patients may maintain diarrhea for as long as 2 weeks. Systemic spread of the disease is not typical but may occur with focal infections localized in nearly any body organ with resulting clinical disease. Definitive diagnosis requires isolation and culture of the organism from feces.

Treatment - The primary emphasis of treatment is on fluid and electrolyte replacement and balance. A variety of antibiotics can be used in cases where systemic spread of the bacteria occurs but the choices must be based upon culture and sensitivity tests since antibiotic resistance is common. Antibiotics are not recommended for uncomplicated enteric salmonellosis.

Prevention - Protective clothing and equipment, personal hygiene and sanitation are the primary means of prevention in the laboratory environment.

Shigellosis

Host Range - Shigellosis is a primate pathogen and nonhuman primates are the only animals that can transmit the disease to man in any but unusual circumstances.

Transmission - Transmission is fecal-oral.

Clinical Signs - The incubation period is 24 - 72 hours and the disease begins abruptly with an acute diarrhea accompanied by fever, nausea, and occasionally vomiting. The diarrhea is initially watery containing blood, mucus, and numerous leukocytes. In contrast to salmonellosis, systemic invasion is very rare. Definitive diagnosis requires cultivation of the organism.

Treatment - Supportive care with fluid and electrolyte replacement.

Prevention - Protective clothing and equipment, personal hygiene and sanitation are the primary means of prevention in the laboratory environment.

Toxoplasmosis

Host Range - The coccidian parasite, *Toxoplasma gondii*, is distributed worldwide in a wide variety of animals. Only domestic and wild felines, however, can serve as the definitive host and pass infective oocytes in their feces.

Transmission - The primary method of transmission is via ingestion of infectious oocysts from sources contaminated with feline feces. Ingestion of undercooked or uncooked meat from a variety of animals may also transmit the disease.

Clinical Signs - Toxoplasmosis is generally an asymptomatic or mild infection with flu-like symptoms including fever, myalgia, lymphadenopathy, and hepatitis. In pregnant women, however, the disease can have severe effects on the fetus ranging from death to delayed manifestations of infection following parturition. Primary infections in immunosuppressed humans can result in a maculopapular rash, pneumonia, skeletal myopathy, myocarditis, encephalitis, and death. Diagnosis is generally via serology.

Treatment - Pyrimethamine and sulfonamides are active against the tachyzoite forms while only the antimalarial agent atovaquone and the azalide azithromycin have activity against the tachyzoite and the tissue cysts.

Prevention - Protective clothing, protective equipment, sanitation, and personal hygiene are all important in minimizing exposure to the infective oocyst. Pregnant women without evidence of a toxoplasma titer and immunosuppressed personnel should be excluded from working with potentially infected cats whenever possible.

Dermatomycosis (Ring-Worm)

Host Range - Dermatophytes have a worldwide distribution although geographical concentrations of certain dermatophytes may occur. *Microsporum canis* is most prevalent in dogs, cats, and nonhuman primates and human infections are most likely associated with these species. *Trichophyton mentagrophytes* is more commonly associated with rodents and rabbits and human infections are generally related to these animals.

Transmission - Either via direct contact with the infected animal or via contact with contaminated equipment or materials. Dermatophyte spores are widely distributed and persistent in the environment.

Clinical Signs - Humans usually develop a solitary nodule on the hand or extremity. Ulceration and drainage of the lesions can occur. Deep visceral infections are rare.

Treatment - A number of antifungal drugs are available for treatment which may consist of topical treatment, systemic treatment (primarily peroral), or a combination of both. Griseofulvin, ketoconazole, fluconazole, and itraconazole may all be used. Amphotericin B is generally reserved for parenteral treatment of systemic mycosis.

Prevention - Protective clothing and equipment, personal hygiene, and sanitation are the primary means of prevention in the laboratory environment. Disinfection if the most effective means of prevention.