

SAFETY AND HEALTH HAZARDS OF PERSONNEL USING LABORATORY ANIMALS WASHINGTON UNIVERSITY

I. INTRODUCTION

- A. Safety is an important objective of the University. Safety is promoted and achieved through good facilities and equipment, the establishment and enforcement of safety rules, informed and trained personnel, and the use of appropriate protective equipment.
- B. General Safety Principles:
- Each individual is responsible for safety
 - Don't take unnecessary chances
 - Read posted signs and information manuals
 - Obey safety precautions
 - Ask questions, if you are not sure
 - Don't hurry
 - Use common sense at all times
- C. Health Hazards of Personnel Working with Laboratory Animals
1. As a rule, the incidence of human zoonosis (i.e. diseases of animals transmissible to man) is very low among personnel handling laboratory animals, and a complete listing of these diseases is apt to produce a distorted impression of the actual danger. Some of the more common and serious diseases will be highlighted later in this document (Section VIII). In general, health and safety matters relate to the species with which you work and the frequency and type of contact.
 2. Some animals in research facilities may be inoculated with biohazardous agents such as infectious agents and toxic or radioactive chemicals. When such agents are used, the room and cages are clearly marked and employees are given instruction on the appropriate and safe methods of handling animals, bedding, and cages. Use of biohazards in animals is reviewed and approved by University committees to minimize risk to personnel.
 3. Visits to animal facilities by outside personnel, guests and relatives of University staff pose a special problem, due to their unknown health status. Of special concern are zoonoses involved with children and certain species of nonhuman primates. Authorized visitors shall be accompanied by a facility staff or faculty member and wear appropriate protective garments to minimize health hazards while in the facility.

- D. For personnel monitoring procedures, refer to the document in Tab 1, *Occupational Health and Safety Program for Personnel with Animal Contact*, and the summary table in Tab 4.

II. HAZARDS ASSOCIATED WITH ANIMALS

A. Rodents and Rabbits

Practically all of the smaller laboratory animals (e.g. mice, rats, rabbits, hamsters, guinea pigs, etc.) are procured from vendors having animal colonies free of human and most animal pathogens (disease causing organisms). Thus the chance of contracting an infectious disease from a laboratory bred rodent or rabbit is small. The most significant hazard associated with these animals is the possibility of developing or exacerbating an allergy or being bitten (see discussion of laboratory animal allergies, bites and scratches, Section VIII.A).

B. Dogs and Cats

These animals are generally obtained from colonies bred for research purposes. Their health status and history are known and exposure to serious zoonotic diseases, including rabies, is minimized. However, care and discretion must be exercised around these animals. Cats can transmit toxoplasmosis which can cause birth defects if a pregnant woman is infected early in gestation. The most frequent injuries associated with dogs and cats are bites, scratches and allergies.

C. Farm Animals

Animals such as swine, goats, sheep, and poultry, are purchased from varied sources, usually without complete information on their health and immunization history. This dictates the need for care in handling these animals and taking appropriate measures such as quarantine and isolation to control and identify diseases, especially those transmissible to man. The most common laboratory-acquired infection associated with these species is Q-fever. Q-fever is most commonly associated with sheep and is a particular problem when working with pregnant sheep and newborn lambs. This disease will be discussed in more detail later. Care must be exercised when working with farm animals to avoid bites, scratches, kicks and strains.

D. Nonhuman Primates

Nonhuman primates can harbor and transmit a number of serious human diseases. The most important of these will be discussed later. In addition, monkeys are wild, strong, unpredictable, and all are considered dangerous. Rooms housing monkeys should always be locked and access restricted to trained personnel.

E. Feral Animals and Unusual Species

Non-traditional laboratory animals are frequently used in biomedical research. It is not unusual to have ferrets, bats, pigeons, amphibians and reptiles in our facilities. Most of these species will be maintained in an isolated, restricted setting with specific safety instructions, as indicated.

F. Summary

Though laboratory animals are capable of carrying zoonotic diseases, all can be used safely if there is awareness of the potential risks and hazards and adherence to certain procedures. The purpose of this document is to describe appropriate procedures for working with animals in a safe manner. It describes procedures for human and animal health maintenance and some of the common zoonotic diseases of animals used in research at Washington University.

III. PERSONAL HYGIENE

- A. Personnel are advised and encouraged to wear a uniform, scrubs or a full length laboratory coat in animal holding rooms or when working with animals. These should not be worn in public areas and should never be taken home.
- B. Wear disposable gloves when handling animals or related equipment. Sinks, soap, and hand towels should be available in all animal rooms. Wash your hands before leaving the room.
- C. When hands, arms, neck, face, or head become accidentally or unavoidably contaminated with animal blood, urine, feces, or hair, remove contamination as quickly as possible by washing thoroughly with water and soap. When such contamination enters the mouth or eyes, remove quickly by washing and rinsing with generous amounts of water. Note locations of eye wash stations for use in such an emergency.
- D. Any person entering a monkey room for any reason must wear a gown or coveralls, disposable nose-mouth mask, and disposable plastic gloves.
- E. Many animal rooms at the University are dedicated to a special purpose or project such as pathogen-free rabbits or biohazardous material use. Special instructions for entering rooms are posted on room doors. For your health, the health of the animals, and the success of the project, follow all instructions exactly.
- F. Do not smoke, eat, drink, or apply cosmetics in rooms or areas where laboratory animals are housed and/or used.

IV. SAFETY RELATED TO SANITATION

- A. Floors, walls, sinks, and all fixed equipment should be kept uncluttered and clean. Countertops should be disinfected after each use involving animals.
- B. Movable equipment should be properly stabilized when in use or stored.
- C. Animal carcasses, soiled bedding and other biological wastes are best disposed by incineration. Carcasses and other wastes should be carefully sealed in plastic bags and placed in the assigned refrigerated storage area.

V. GENERAL SAFETY RULES

- A. **WEAR** protective clothing and use proper animal restraint techniques and equipment as instructed by a supervisor.
- B. **REPORT** immediately all bites, scratches, and other injuries inflicted on you by any animal. Your supervisor or the divisional or departmental office should have information on reporting animal-related injuries.
- C. **KEEP** your work area uncluttered and allow sufficient aisle space between cage racks and work tables to provide comfortable work space.
- D. **DO NOT** smoke, eat, drink, or apply cosmetics in animal use or housing areas.
- E. **SET** damaged or defective cages and racks aside and notify a supervisor so the equipment can be repaired.
- F. **DO NOT** overload carts, obscure vision, or exceed weight capacity of transport carriers. This often requires the use of good judgment and common sense.
- G. **DO NOT** recap or otherwise manipulate by hand any used needle, scalpel or disposable instrument. Dispose of all sharps (scalpels or blades), needles and syringes; glassware (pipettes, microscope slides and broken glass); and disposable instruments in a puncture resistant container. Broken glassware should be swept up with a brush and dust pan, being careful not to cut yourself on shards of glass. **DO NOT put any of these items in the trash.**
- H. **DO NOT** handle animal species that you have not been taught to handle. This is for your safety as well as that of the animal.

VI. BIOHAZARDOUS PROJECTS

- A. Special containment rooms, designed for projects involving known hazardous agents, are available. Check with the Division of Comparative Medicine (DCM) office (362-3700) for locations.
- B. Projects involving hazardous agents or materials will have very strict requirements for clothing and procedures. Containment procedures are for the protection of personnel and other animals. Specific standard operating procedures will be posted. Check with DCM office for more information.

VII. RESPONSE TO INJURIES

- A. When an employee is injured while at work, he/she should always report the injury to a supervisor or the division or departmental office.
 - 1. WUMS Employees: On the job injuries that occur during the day and are directly animal-related (bites, scratches, cuts, needlesticks) should be treated at Washington University Medical School Employee Health Service, (3910 Old Children's Hospital, 362-3528) if they take place on the Medical Center campus.
 - 2. Hilltop personnel: The two principal facilities authorized to provide initial treatment are the Barnes-Jewish Hospital South Emergency Room for acute or traumatic injuries requiring immediate emergency medical treatment, and for other injuries, BarnesCare Corporate Health Services. Injuries will be handled by the Barnes-Jewish South Emergency Room (362-9123).

On-the-job injuries that are not animal-related are to be referred to the Barnes Emergency Room, for immediate emergency medical treatment, and for other injuries to BarnesCare Corporate Health Services, 5000 Manchester, which is located one-quarter mile west of the Manchester/South Kingshighway intersection.

- B. The employee should thoroughly and immediately wash the affected site with a disinfectant soap and water before seeking treatment.
- C. A "Washington University Report of Injury or Illness" should then be filled out, keeping a copy for the department file, and brought with the employee to Employee Health Services. The "Washington University Animal Exposure Report" should be filled out and sent to the Associate Vice-Chancellor for Animal Affairs, Box 8025.

- D. Any bites or scratches from bats, dogs, cats, feral or nontraditional species, or nonhuman primates **MUST** be examined by the EHS physician. In addition, these incidents should be reported to a veterinarian so that a decision can be made regarding euthanasia or quarantine of the animal for rabies diagnosis.
- E. Bites or scratches from nonhuman primates of the genus *Macaca* (rhesus, pigtail, cynomolgus monkeys) or from anything that may be contaminated by their secretions require special attention and adherence to strict protocol because of the risk of herpes B virus infection. A Washington University School of Medicine protocol for dealing with these injuries should be posted in all facilities where contact with nonhuman primates occurs. For specific instructions, refer to the Standard Operating Procedures for Case Management of Employees Potentially Exposed to *HERPES VIRUS SIMIAE (B VIRUS)*, located in Tab 2. **THIS PROTOCOL MUST BE FOLLOWED.**
- F. Personnel health monitoring procedures for animal-related injuries will be initiated and managed by Employee Health Services, as appropriate for the exposure to specific infectious disease agents. For more information, refer to the document in Tab 1, *Occupational Health and Safety Program for Personnel with Animal Contact*.

VIII. ZOONOSES ASSOCIATED WITH LABORATORY ANIMALS

A. General Considerations for Exposure to All Species

1. **Laboratory Animal Allergies:** A common health hazard associated with rodents and rabbits, but which can occur with any animal, is the development of allergies. The symptoms of allergic reactions can be mild (runny nose, watery eyes, sneezing), especially during the first few exposures. With repetitive exposures, however, the allergy can progress to asthma that may require hospitalization. Direct contact with animal hair or skin may result in hives, wheals, or more serious skin rashes. Symptoms may be delayed for hours after the exposure. A history of allergies to animals increases the chances that a severe reaction will develop. Diagnosis of lab animal allergy is based on patient history, physical examination, and skin testing. The use of masks, gloves, and protective clothing, working in well-ventilated areas, and housing animals in filter-top cages will help minimize exposure to animal allergens. Antihistamines taken prior to animal contact may prevent symptoms from developing. In some cases allergy shots may be necessary to desensitize an individual. Symptoms of allergic reaction should be treated by a physician.
2. **Bites and Scratches:** Bites and scratches pose a significant hazard to personnel working with laboratory animals. Effects of bites and scratches can include pain, anxiety, wound disfigurement, wound infection, and disease transmission. Wound infections can be caused

by a number of pathogenic bacteria which are indigenous in animals. These include *Pasteurella multocida*, *Clostridium tetani*, *Staphylococcus aureus*, and *Streptococcus* spp. Infection is common following animal bites especially from rats, cats, dogs, and monkeys. Most zoonotic diseases of importance in laboratory animal science are transmitted via animal bites or scratches. These are discussed below. All animal bites and scratches should be reported to the supervisor, or the department/division office, and an incident report completed. All wounds require meticulous cleansing with soap and water or a povidone-iodine solution. In addition, bites or scratches from cats, dogs, bats, feral or nontraditional species and nonhuman primates require special attention and **MUST** be seen by the EHS physician or nurse or the ER when the incident occurs after hours.

3. **Gastrointestinal Tract Disease:** Animals are capable of asymptotically carrying a number of agents which can cause gastrointestinal disease in man. These include: the bacterial pathogens, *Salmonella*, *Shigella*, *Yersinia*, *Campylobacter*, and *E. histolytica*, the protozoal pathogen which causes amebiasis. Symptoms of gastro-intestinal disease usually include diarrhea with or without vomiting, abdominal cramps, and general malaise. Preventive measures include protective clothing and proper personal hygiene.
4. **Dermatomycoses (Ringworm):** Infection of laboratory animals with numerous species of dermatophytic fungi is common. These infections are often asymptomatic and can go unrecognized until personnel become infected. Transmission occurs via direct or indirect contact with infected carrier animals or spore-contaminated animal bedding, equipment, etc. Ringworm in humans is often unnoticed but is generally characterized by one or more circular red scaled lesions. Occasionally pruritic vesicles may be present. Personnel can prevent ringworm infections with protective clothing and proper personal hygiene.
5. **Leptospirosis:** This is a spirochete that infects a number of different animal species. In the U.S. the most common sources of infection are dogs, livestock, rodents, wild mammals, and cats. Infection usually occurs after contact with the urine of infected animals or from aerosol exposure during cage cleaning. The organisms may penetrate skin abrasions or mucous membranes. Infection may be asymptomatic, but most patients will develop an illness characterized by flu-like symptoms which may resolve. This may be followed by a more severe illness with kidney, liver, and central nervous system involvement.
6. **Preventive measures:**
 - Use high quality animals from reputable vendors
 - Vaccinate random-source animals when indicated
 - Strict attention to personal hygiene
 - Avoid urine and potentially contaminated water
 - Monitor animals for infection

B. Rodents, Rabbits and Farm Animals (Category 1 or 2 Exposure)

Category 1 includes mice, rats, guinea pigs, hamsters, gerbils, and rabbits. In general these animals are obtained from vendors who maintain animal colonies free of animal and human pathogens. Therefore the risk of contracting a disease from these animals is small. Category 2 includes farm animals which are capable of carrying Q-fever. The specific diseases to consider are:

1. LCM or lymphocytic choriomeningitis: This is a latent viral disease of mice and, to a lesser extent, hamsters, which can infect man. This disease can also be seen in guinea pigs, chinchillas, rats, dogs, and monkeys. The infection has been eliminated from most reputable domestic colonies and vendors. However, it is endemic in the wild mouse population in this country and in many laboratory mice obtained from foreign sources. The virus may also be present in experimental mouse tumors which can serve as a source of infection for humans and animals alike. LCM infections in man range from a flu-like syndrome in most patients (fever, headache, muscle aches, fatigue), to signs and symptoms of meningitis (severe headache, fever) and encephalitis (headache, psychosis, coma). Prevention is based on obtaining high quality, virus-free mice and hamsters from reliable vendors, and the use of disposable gloves, and careful hand washing.
2. Q-Fever: This is a disease caused by the rickettsial organism *Coxiella burnetti*. Q-fever is found around the world, and can naturally infect a variety of animals. Livestock, especially sheep, are the most common source of infection to man. These animals generally do not have clinical disease. The organism is shed in the urine, feces, and milk. In addition, large numbers of infective organisms are shed in the placental membranes and amniotic fluid of infected animals. (Personnel involved in protocols utilizing parturient sheep, or the products of parturition, are at high risk to develop this disease). The principal mode of transmission to man is by inhalation of infective aerosols. The symptoms of Q-fever develop after a 14 to 28 day incubation period, and consist of fever, headache, and chills. A cough may be present. Most patients will have a self-limited illness of about 2 weeks, but patients can develop liver disease (hepatitis), or disease of the heart valves (valvular endocarditis). The latter infection is of special concern to people who have undergone valvular replacement surgery. Q-fever is diagnosed by measuring serum antibody levels (serology). Prevention could be accomplished by utilizing only animals known to be free of Q-fever infection; unfortunately Q-fever-free flocks of animals, especially sheep, are rare.

The most practical approach to avoid Q-fever involves some of the following:

- Use only male animals (sheep, goats, cattle) when possible.
- Avoid the products of parturition.
- Wear protective clothing, including face masks, shoe covers, and disposable gloves when working with any potentially infected animals.

- Isolate any potentially infected animals.
- Transport potentially infected animals in filtered cages.

C. Dogs, Cats, Nontraditional and Feral Species (Category 3 Exposure)

Animals in this group (dogs, cats, and any animals which are feral or not traditionally considered to be laboratory animals) are usually not obtained from sources which can provide full immunization and health records. For this reason, and because these animals can transmit a number of diseases to man, extra care must be taken around members of this group. Specific diseases to consider are:

1. Rabies: This is one of the oldest, and deadliest diseases known to man. It is caused by the rabies virus, a member of the rhabdovirus family. Most mammals are susceptible to the virus, and most mammals can transmit it to man. Animal reservoirs include skunks, raccoons, foxes, coyotes, and bats. Any wild or random source animal must be considered a potential source of rabies infection. Rodents and rabbits are not known to be infected in nature. Rabies is generally transmitted by the saliva of an infected animal, usually introduced by a bite, or scratch. Infection has also occurred by contact with tissue from a rabid animal, and through inhalation of aerosolized virus. The signs and symptoms of rabies can develop weeks, months or even years after the initial infection. They usually begin with vague complaints, such as fatigue, malaise, and headache, then progress to increasing irritability, nervousness, and insomnia. In about half the patients numbness or tingling at the bite or scratch site may be the first sign. Patients then progress to obvious signs of central nervous system disease, including paralysis, and coma. Death usually occurs within 7 days in untreated patients, and within months in almost all patients. Fewer than 10 survivors of rabies have been reported. The only way to deal with rabies is to prevent it. This is accomplished by:
 - a. Considering any large mammal, especially wild or random source animals as potentially infected with rabies.
 - b. Vaccination with the human diploid cell vaccine (HDCV) for all personnel whose work places them at risk for rabies infection (all personnel working with category 3 animals).
 - c. Immediate reporting of any bites or scratches from potentially rabid animals to a supervisor or PI, the EHS physician, and the attending veterinarian who should be notified so that arrangements can be made for diagnostic evaluation of the suspect animal.
 - d. Exercising extreme care in the handling of these animals.

- e. Wearing appropriate protective clothing when working with any of these animals.
2. Toxoplasmosis: This disease is caused by the protozoan parasite, *Toxoplasma gondii*. The organism infects almost all mammals. Many people have been infected by ingesting improperly cooked meat (lamb, pork, or beef) contaminated with *Toxoplasma* cysts. The disease can be transmitted to a fetus by an infected mother (if she becomes infected while pregnant) and result in congenital toxoplasmosis. In the immunocompetent host toxoplasmosis is most often an asymptomatic infection; in immunocompromised patients, especially those with AIDS, it can cause a fatal central nervous system infection. The definitive host for this organism is the cat, which commonly sheds *Toxoplasma* oocysts (eggs) in its feces. These oocysts do not become infective for 1-5 days. The true occupational risk is for pregnant women, or personnel who are severely immunosuppressed. Those who are immunosuppressed should avoid contact with cats, and especially their feces. Testing for previous infection with *Toxoplasma* should be performed on all women of childbearing age who anticipate contact with cats. If immunity to the disease is absent or questionable, contact with cats and/or their feces is contraindicated during pregnancy. In addition, nonimmune pregnant women should avoid ingestion of raw meat. Prevention of infection is based on stringent sanitation of cat litter pans (daily changing prevents eggs from becoming infective), rigorous attention to personal hygiene, and the wearing of gloves when handling cats.
3. Cat Scratch Disease: As the name suggests this is a bacterial infection that is almost always associated with a history of cat contact, bites, or most commonly, scratches. The disease presents as fever, or malaise, associated with a swollen lymph node(s), usually proximal to the initial injury. The disease is generally self-limiting, and complications are rare. The bacterium is postulated to be part of the normal oral flora of cats and is transmitted to the claws while grooming. For this reason the disease is quite difficult to prevent. Declawing of cats, protective clothing, and care in the proper handling of cats, are the best preventive measures. Cat scratches should be reported to a supervisor, and examined by an EHS physician (see "Bites and Scratches" above).

D. Nonhuman Primates (Category 4 Exposure)

A number of potentially serious zoonoses are associated with nonhuman primates. In addition, these species can contract diseases from man, and, in turn, transmit them to susceptible personnel. Finally, the strength, and unpredictability of these animals makes them a constant danger to personnel. Extreme caution should be exercised at all times, and handling of these animals should be restricted to well-trained personnel. Some handling/manipulations of nonhuman primates should be done while the animal is anesthetized. Small primates such as squirrel monkeys may be handled by trained personnel using proper protective gloving. In cases where a conscious primate weighing more than 2 kg must be manipulated, a pole and collar or other similar approved system of rigid control should be used. The transportation of nonhuman primates outside of animal facilities

should be done only in filtered transport caging. Because of the zoonotic risks and physical dangers **it is mandatory that protective measures be adopted whenever entering an animal room housing nonhuman primates. This includes the wearing of surgical facemasks; eye protection when indicated (e.g., changing cages); and protective clothing (no bare skin exposed).**

Specific diseases to consider are:

1. *Herpesvirus simiae* (B virus): This virus causes a latent infection in all species of the macaque family of monkeys. The most commonly infected macaque is the rhesus, but all macaque species (including pigtailed, cynomolgus, and stump-tailed) should be considered infected. The disease in monkeys resembles herpes simplex disease in man, with vesicles and ulcers (fever blisters) appearing on the face, especially on the mouth and tongue, and on the genitals. Monkeys with such lesions should be immediately isolated and not handled until the lesions have healed. **The virus can, however, be shed by all macaques WITHOUT SHOWING ANY SIGNS of disease; hence any macaque should be considered potentially infectious.** The disease is usually transmitted to man by contact with contaminated saliva, either by the bite or scratch of an infected monkey. Contaminated caging, infected tissue and macaque waste have also been implicated in transmission.

The disease in man differs greatly from the disease in monkeys. The manifestations are those of a severe central nervous system infection (encephalitis), often with associated paralysis. Death occurred in 18 of the 27 reported cases of herpes B virus infection. The early signs of infection include blister lesions, pain, numbness or itching at the wound site, headaches lasting more than 24 hours, and fatigue. Symptoms usually occur within 30 days of the exposure. Because of the severity of this disease, a special SOP for dealing with wounds from macaques or contaminated equipment has been designed by the Employee Health Service and the Division of Comparative Medicine. It emphasizes the need for immediate first aid for the wound, culturing the wound for virus, culturing the monkey for viral shedding, serology on the macaque and the patient, and the need for meticulous follow up testing, counseling, and treatment if indicated. It can be found on page 7 of the "WU Occupational Health and Safety Program Manual".

The best preventive measures are those outlined above. The most important aspect of personnel protection involves proper training in the handling of these animals and constant awareness of the potential of these animals. This minimizes the chance of a bite or scratch occurring.

2. Tuberculosis: This is a bacterial disease which nonhuman primates may contract from human carriers in this country or in their country of origin. Spread of the mycobacterial organisms occurs most commonly via the aerosol route. The disease in nonhuman primates is generally progressive and fatal and is characterized by fever, weight loss, cough, and

sputum production. All nonhuman primates are screened via skin testing during quarantine and biannually. The disease in man is similar to that in monkeys but generally less severe and very treatable. Surveillance of all personnel working with nonhuman primates is accomplished by a pre-employment skin test and annual retesting. The wearing of a face mask greatly reduces the chance of contracting or transmitting the disease.

3. Ebola-like Virus: This virus has been found to be carried by imported cynomolgus macaques (*M. fascicularis*), African green monkeys (*C. aethiops*), and rhesus monkeys (*M. mulatta*). Thus far no human illnesses have occurred as a result of this virus although antibodies have been detected in animal handlers. The virus belongs to a family of filoviruses, members of which have caused severe hemorrhagic fevers in man. Symptoms of hemorrhagic fever include headache, fever, and bleeding tendencies. Prevention of transmission of this virus is based on previously mentioned protection practices.
4. Rubeola (measles): This is most commonly a disease of man, but nonhuman primates can contract the disease, and in turn, infect man. Measles can be a fatal disease, and is highly communicable. For this reason all personnel working with nonhuman primates should provide evidence of immunity to measles (evidence of vaccination, serological evidence of prior infection, or date of birth before 1957). All other personnel without evidence of prior infection or vaccination should receive the MMR vaccine, unless a contraindication to receiving a live virus vaccine exists (see the document in Tab 1, ***Occupational Health and Safety Program for Personnel with Animal Contact***).

E. Special Considerations

1. Immunosuppressed Individuals: These individuals should be particularly aware of the potential of animals to transmit diseases to humans. In addition to the aforementioned zoonotic diseases, animals can be a reservoir of many agents which can infect immunosuppressed persons. These include *Pneumocystis carinii*, the agents causing cryptosporidiosis, giardiasis, balantidiasis and numerous other bacterial and viral agents.
2. Tick-borne Illnesses: There are a number of human pathogens which are carried by different members of the tick family. These include the rickettsial organisms of Rocky Mountain spotted fever, rickettsialpox, murine typhus, and erlichiosis. The agent of Lyme disease, *Borrelia burgdorferi*, is also carried by these parasites. Symptoms of these diseases include fever, chills, headache, muscle aches, and possibly a rash. All of these diseases are very treatable.

Ticks are very common in the St. Louis area and wild or random-source animals are often laden with the parasites. All random-source and wild animals to be used in research protocols at Washington University are treated for external parasites during the conditioning period and should be clean when they arrive on campus.

IX. CONCLUSIONS

The safety of the members of the Washington University community is of critical importance to us all. Working with laboratory animals poses a number of special health risks which cannot be ignored or trivialized. The key to creating a safe environment in which to work, and to minimizing the individual's risk of contracting a disease or sustaining an injury, lies in cooperation among all members of the University. Personnel should be provided with the necessary education and training to enable them to safely handle the animal species with which they will work.

They should be enrolled in the Washington University Occupational Health Program to insure they have received the appropriate vaccinations to prevent disease, and the appropriate screening procedures to detect any diseases that pre-date their contact with animals, or which develop during their contact with animals. Illnesses and injuries should be dealt with promptly when they occur. **The most important component of the program lies with the individual. Almost all of the diseases we have listed can be prevented by adherence to personal hygiene regulations, the use of protective clothing, and common sense.** Strict attention to each of these preventive measures will help reduce the risks associated with handling laboratory animals.

References/Acknowledgments

The guidelines listed are based in large part on the documents entitled:

1. The Safe Handling of Laboratory Animals, St. Louis University
2. Animal Exposure Surveillance Program, National Institutes of Health, October, 1988
3. Occupational Health Program, The Albany Medical College of Union University.
4. Guide for the Care and Use of Laboratory Animals, National Research Council, 1996.
5. Biosafety in Microbiological and Biomedical Laboratories, CDC/NIH Publication 84-8395. 1984
6. Laboratory Animal Medicine; Fox, Cohen, Loew (eds.), Academic Press, Inc. 1984.

References on specific diseases include:

1. Mandell, G. et al. 1985 The Principles and Practice of Infectious Diseases. John Wiley and Sons, New York.

2. Pike, R.M. Laboratory Associated Infections: Incidence, Fatalities, Causes, and Prevention. Ann. Rev. Microb. 33:41, 1979.
3. Zoonotic Diseases in the Veterinary Clinics of North America, Small Animal Practice, W.B. Saunders Co., 1987.
4. Guidelines for Prevention of *Herpesvirus simiae* (B-Virus) Infection in Monkey Handlers, Laboratory Animal Science 37:709 1987.
5. Zoonosis Updates; periodically printed in JAVMA.