ENVIRONMENTAL BIOLOGICAL HAZARDS AT FERMILAB

INTRODUCTION

Hazards associated with plants, animals, and microorganisms are usually neglected since the risks are deemed acceptable and the exposures are considered non-industrial. However, poison ivy is the major cause of occupational dermatitis and bee and wasp stings are common and potentially life threatening. Microorganisms causing tetanus and legionnaire's disease are also found in the environment. This chapter describes procedures for coping with biological hazards at Fermilab.

PROCEDURES

Medical screening is conducted routinely prior to employment, periodically as prescribed by the Occupational Medical Office, and upon internal transfer. Persons at significant risk of exposure to biological hazards shall be screened by the Occupational Medicine Office for special sensitivities (allergies) and shall receive appropriate guidance in the recognition, control, and amelioration of these hazards. Guidance in hazard control should include formal training but shall, as a minimum, include precautionary instructions from supervisors.

Pets, other than guide dogs, are not permitted in the interior of buildings. Specific exception may be made on a case-by-case basis for other buildings by the division/section head responsible for the building. At their discretion, division/section heads may also exclude pets from certain outdoor areas in order to protect property or equipment under their management. Pets are permitted in other areas but must be kept under control so as not to interfere with people or endanger wildlife. Questions about pets in the on-site housing should be addressed to the Housing Office.

A. PROMINENT BIOLOGICAL HAZARDS FOUND AT FERMILAB

1. Flora

a. Poison Ivy: Poison Ivy is a woody perennial that reproduces by seed and rootstocks. The plant may be either a low shrub or a vine or shrub growing high into trees. Leaves are trifoliate consisting of 3 large shiny leaflets each 2 to 4 inches long, pointed at the tip. Leaflet edges may be either smooth or irregularly toothed. The flowers are small, green, 5-petaled, borne in a head of 1 to 3 inches long. Berries are small, white, round, and hard. Poison Ivy is found throughout Fermilab in open woods, fencerows, thickets, orchards, shrub beds and along buildings. All parts of this plant contain a poisonous material that may cause blistering of the skin. The plant changes from a bright green to a red or reddish-yellow in fall coloration. This is a variable species, not only in habit of growth, but also in leaflet shape, rooting habit, pubescence on leaves, petioles and fruit.

Ingestion may cause serious stomach upset; inflammation of the mucous and alimentary canal membranes and death. Burning any part of the plant will result in the dispersion of droplets of toxin in the smoke, exposing lungs, eyes, and skin.

Contact dermatitis may be observed by those exposed to the oils in the plant during any season. The dermatitis is manifested as reddened itchy skin, which sometimes blisters. Re-exposure through contact with contaminated clothing or work implements is a hazard. The plant toxin (3-h-pentadecylcatchol) combines with skin proteins immediately; washing will not prevent the reaction but can reduce the potential for re-exposure by removing residual amounts of surface toxin. Protective clothing should cover potentially exposed skin area. Persons experiencing a skin rash or itching due to poison ivy exposure should report to Medical.

2. Fauna

a. Bees, Wasps & Hornets: Bees, wasps, and hornets may be found throughout Fermilab. Their nests may be found in or on buildings, structures, trees, shrubs and in the ground. All are attracted by scented cosmetics, soaps, shampoos and detergents. Fruit odors, sweets and alcohol also attract these species. This can be particularly dangerous

because a bee or hornet may enter a can of beer or soda and be ingested by an unobservant drinker (Farivar, 1981).

Wasps and hornets also need protein for sustenance and are therefore, attracted by odors of meat and grease. The odor of meat or grease on a person's lips or fingers from eating a meat sandwich or fried chicken outdoors can provoke an attack.

These insects are also attracted by brightly colored clothing. When agitated, the insects react by inflicting a painful sting. Persons not threatening the nest are typically not harmed, but it should be noted that conditions that constitute a threat stimulus to bees and wasps might not be readily apparent to humans. Typical response to the sting is a localized painful welt. Persons sufficiently sensitized (previously stung) may experience a potentially fatal whole-body allergic reaction.

If bee, wasp or hornet nests need to be controlled contact the Buildings Services Department, ext. 3824. They have a pest control subcontractor under contract to handle these problems. To control individual insects FNAL #1950-1010 Bee/Wasp Insecticide is available from the FNAL stockroom. Follow the manufacturer's instructions when using this product. It is a violation of Federal Law not to use insecticide according to the label instructions.

b. Mosquitoes: Several mosquito species are known or suspected to transmit a group of viruses that can cause encephalitis in animals and humans. These viruses attack the central nervous system causing inflammation of the brain, alteration in consciousness, personality changes, seizures, and destruction of the nervous system. Although outbreaks of encephalitis are uncommon, some caution should be exercised by outdoor workers to minimize the risk of contracting the virus.

Employees working in or near mosquito breeding areas; habitats such as swamps, ditches, culverts, temporary pools or other sources of standing water, should apply mosquito repellent to open skin and clothing, as recommended by the repellent manufacturer. Currently, the stock system carries mosquito repellent under stock #1950-0500.

All unusual skin/nerve reactions to mosquito bites should be brought to the attention of the medical staff.

c. Mites, Chiggers, & Ticks: Mites, chiggers, and ticks are parasites that commonly attach to persons working in tall grasses or wooded areas. The bite is typically at points of clothing restriction. The bite may be innocuous or may cause itching. In most cases, secondary infection occurs. Ticks warrant special note. If the tick is not removed completely, or is left feeding for several days, tick paralysis may occur due to a neurotoxin injected by the tick. This toxin acts upon the spinal cord, causing incoordination and paralysis. In the event of any tick bite, report to Medical (immediately) to rule out Lyme Disease or Rocky Mountain Spotted Fever.

d. Brown Recluse Spider: The Brown Recluse Spider (also called the Fiddle-Back Spider) is a spider having a violin shaped mark on the dorsal surface of the cephalothorax. They are reclusive, highly territorial, and inhabit warm areas (in heated buildings or beam lines). The venom is a neurotoxin that produces a degenerating necrotic lesion. These spiders are easily recognized and should be avoided.

e. Deer: The deer present on site present a potential hazard to motor vehicle traffic when they cross roadways. This hazard to drivers can be avoided by careful observation of the roadway edges. Deer may carry parasites such as ticks.

f. Geese: Geese are capable of inflicting painful bites. Geese should not be closely approached.

g. Snakes: Snakes are present and mobile on site during the spring, summer, and fall months. Though venomous varieties have not been identified, a variety of water snakes (Natrix), ribbon/garter snakes, Hognose, Fox and Ringneck snakes find habitat in this area. Snakebites can be extremely painful. Snakes should be avoided.

h. Pigeons: Pigeons and their nests are found on and around Wilson Hall and other buildings at Fermilab. Among the diseases which pigeons are known to carry and may transmit to humans are: encephalitis, Newcastle disease, pigeon ornithosis, toxoplasmosis, salmonella food poisoning and several other diseases. The ectoparasites of pigeons include various species of mites, fleas, ticks, and bugs that will readily bite people.

B. AGENTS THAT MAY EXIST UNDER CERTAIN CONDITIONS

1. Rabies: Rabies is a viral disease transmitted to man by rabid domestic or wild mammals. Exposure (as defined by the Center for Disease Control; MMWR 1980; 29:552,553) occurs as the result of contamination of scratches, abrasions, open wounds, or mucous membranes with infectious saliva. Effective post exposure prophylaxis is available. If untreated, after a variable incubation period, symptoms begin with headache, anorexia, nausea, and fever. Later, the disease progresses to exaggerated sympathetic responses and drooling, leading to convulsions or coma, and finally death. The reservoir for rabies includes skunks, foxes, bats, and raccoons. Domestic animals (i.e., cats and dogs), in particular those of unknown origin, represent modes of transmission from the (wild) animal reservoir to man. Contact with wild animals and domestic animals should be avoided. Any animals behaving suspiciously or found dead should be reported promptly to Roads and Grounds Ext. 3303 for investigation. All domestic animals (pet mammals) should be immunized against rabies.

2. Rocky Mountain Spotted Fever: Rocky Mountain Spotted Fever is a rickettsial disease, transmitted to man by the bite of infected ticks. Despite the region implied by its name, Rocky Mountain Spotted Fever is widespread throughout the United States. Sudden onset of persistent fever, headache, chills, and myalgia (muscle aches) are characteristic symptoms. If treated promptly, death is uncommon, but 20 percent of untreated cases are fatal. The disease is best prevented by avoidance of tick-infested areas, careful removal of the tick prior to attachment, and the use of repellents.

3. Tetanus: Tetanus is a disease caused by toxins produced in the body by Clostridium tetanii. Entrance into the body occurs through penetrating or crush wounds, contaminated by animal or soil material, or items which have been in contact with animal or soil material. The toxins generated by the bacteria affect the nervous system and may lead to death. Untreated, the tetanus mortality rate is 70 percent in adults. Effective immunization and post exposure treatment is available. To minimize this risk, workers should seek medical attention whenever the skin is punctured, lacerated or abraded. Contaminated clothing should be changed daily.

4. Tularemia: Tularemia is a disease of rodents, especially rabbits, which may be transmitted to man by handling infected animals where material, from lesions on the infected animal, contacts cuts or scratches on the person's skin. Transmission can also be the result of bites by infected flies, fleas, ticks, and lice. In humans, Tularemia causes headache, myalgia, chills, enlarged regional

lymph nodes and elevated temperature. Infection is best prevented by avoidance of direct contact with (potentially infected) animals, avoidance, and the use of repellents for flies, mosquitoes, and ticks.

5. Histoplasmosis: Histoplasmosis is a pulmonary fungal infection (causative organism; Histoplasma capsulatum). The fungus grows on soils enriched by bat or bird excrement. This infection produces inflammation of lymph glands, pneumonia, and meningitis. Prevention is best effected by disinfecting, or fixing the dust of bird or bat feces contaminated surfaces, or by the use of an appropriate mask to prevent ingestion or inhalation of infective particles.

6. Legionnaire's Disease: Legionnaire's disease is associated with specific forms of bacteria (Legionella pneumophila) sometimes found in stagnant water. The sources of the bacterium, and means of contamination, are as yet not fully understood. Legionellosis (Legionnaires' disease) is a sometimes-fatal illness, the symptoms of which are pneumonia and/or febrile illness.

   Outbreaks of the disease have been linked to exposures to industrial source waters: cooling towers, condenser tubing, air washers, refrigeration units, humidifiers, etc. Where inhalation of misted source waters is likely, employees should wear appropriate personal protection equipment: disposable dust/mist or high efficiency respirators, waterproof coveralls (Tyvek). Workers should minimize water blasting when cleaning water-holding units. Stagnant waters, air conditioner cooling towers, and infiltrations of potable water sources have been implicated in past outbreaks of Legionellosis. Stagnant water and air conditioner cooling tower water should, when possible, be avoided. Outbreaks of febrile illness and pneumonia should be promptly investigated and should be brought to the attention of the medical staff.

7. Equine Encephalitis: Equine encephalitis is also a concern at the Lab because of the domestic horse population boarded at the horse barn. Horses are required to be vaccinated against this virus as part of Fermilab's horse boarding requirements.

8. Anthrax: Anthrax is an infectious disease, primarily of animals from which man may be secondarily infected. The causal microorganism is Bacillus anthracis, a spore-forming bacterium. The disease is pathogenic to herbivores, such as cattle and horses. Infection in man occurs most frequently from contact with sick animals or infected animal products. The route of infection may be by skin contact, inhalation of dust-containing spores, or ingestion of infected meat.

9. Lyme disease: Lyme disease can be caused by the bite of a tick carrying the Lyme bacteria. In the northeastern and central states, the deer tick carries the disease while using the white-tailed and white-footed mouse as its host. Symptoms usually appear within a few weeks after the bite and may include a red bull's-eye shaped rash, fatigue, stiff neck or flu-like symptoms such as fever, chills, and muscle aches. Additional symptom may include abnormal heart rhythms, headaches, facial paralysis, and others symptoms resembling arthritis. Lyme disease is often difficult to diagnosis because not all the symptoms will appear in every case. A blood test can confirm the diagnosis of Lyme disease; results are reliable six weeks after infection. Antibiotics are the usual prescribed treatment for Lyme disease. Prevention is the best medicine against Lyme disease. Commercial bug repellents containing at least 20% DEET (N-diethyl-metatoluamide) are effective against ticks.