Zoonotic Diseases of Non-Human Primates (NHPs)

*Macacine herpesvirus 1* (formerly *Cercopithecine herpesvirus 1* [CHV-1], *Herpesvirus simiae*, monkey B virus)

This disease is extremely rare despite its high prevalence in the host species. Most macaques are asymptomatic carriers or display only mild oral lesions that are difficult to detect. Therefore, all macaques should be presumed to be shedding “B-virus”.

- Reservoir/source of infection to people: Macaques are the major source of infection; although other old world primates may be infected.
- Transmission: Transmission occurs via bites, scratches, splashes (any body fluid or secretion, feces) needlesticks, and other contact of mucous membranes or broken skin with infected body fluids from macaques or with wet, unfixed tissues or primary cell culture tissue material. Contaminated husbandry or research equipment can potentially spread B virus.
- Incubation period: Variable, but typically it is about 2-3 weeks.
- Disease in people: Early stage symptoms reported: unexplained febrile disease: fever, chills, nausea, vomiting, dizziness, and persistent headache. Occasionally, fluid filled vesicles can form near the skin wound. Symptoms of disease progression may include symptoms attributable to central nervous system infection, such as ascending encephalomyelitis, diplopia, seizures, and respiratory failure. Fatality rate is 46%. The fatality rate exceeds 80% when the exposure is not evaluated and treatment is not received.

**INJURIES OR MUCOUS MEMBRANE EXPOSURE REQUIRE IMMEDIATE FIRST AID! FOLLOW INSTRUCTIONS IN THE SCRUB KIT.**

*Campylobacter*

Campylobacter is often called “campy.” It is a family of bacteria that infects the intestines. The disease is called campylobacteriosis.

- Reservoir/source of infection to people: humans, domesticated pets, farm animals and laboratory animals.
- Transmission: Fecal/oral
- Incubation period: One to seven days. Most people get better in two to five days, even without treatment. Some people can take up to ten days to get better. The bacteria are gone after two to three weeks if your illness is treated. If you do not treat your infection, the bacteria can stay in your body waste for up to three months. You can get sick again, and you can also infect other people.
- Disease in people: Mild to severe diarrhea, or bloody diarrhea, nausea and vomiting, stomach pain/cramping, fever, headache, and general malaise.
**Shigellosis**

Shigella is a significant cause of diarrhea in NHPs, and is a significant zoonotic disease that has frequently been transmitted from NHPs to man.

- Reservoir/source of infection to people: Humans are the main reservoir of disease, but infected monkeys can be a source of infection. Any NHP may harbor *Shigella* bacteria, and clinical signs may not be apparent.
- Transmission: Fecal/oral. The organism is shed from clinically ill as well as asymptomatic humans and NHP. Only minimal contact is necessary for transmission.
- Disease in people: Signs range from none to a severe diarrhea may be accompanied with blood or mucus. More commonly a mild diarrhea.

**Salmonella**

*S. typhimurium* & *S. enteritidis* have been associated most commonly with lab animal colony infections.

- Reservoir/source to people: Intestinal tract of NHPs
- Transmission: Fecal/oral
- Disease in people: Acute gastroenteritis with sudden onset of abdominal pain, diarrhea, nausea, and fever.

**Cryptosporidium**

Protozoal organism that is common in mammals, particularly younger animals.

- Reservoir/source of infection: Many mammals
- Transmission: Fecal/oral, contaminated water
- Disease in people: Self-limiting diarrhea except in immune compromised people where it can be quite severe. No treatment.

**Giardia**

This protozoan is found in many mammals.

- Reservoir/source: NHPs and other mammals
- Transmission of giardia: Fecal/oral, contaminated water
- Disease in people: Chronic intermittent diarrhea +/- other systemic signs such as malaise, anorexia, severe cramping and nausea/vomiting.

**Amebiasis**

- Reservoir and Incidence: Reported incidence of 0-31% in the feces of clinically normal rhesus monkeys and up to 30% in other NHP.
• Transmission: By ingestion of infective cysts. Laboratory animal personnel are usually infected from fecal matter transferred to the skin or clothing.

• Incubation period: Usually 2-6 weeks

• Disease in people: Most humans have few or no detectable symptoms. Mild watery diarrhea to acute fulminating bloody or mucoid dysentery with fever and chills. Disease may have periods of remission and exacerbation over months to years.

**Balantidiasis**

• Reservoir and Incidence: Distributed worldwide. Incidence in NHP colonies is 0 to 63%. Usually asymptomatic, but may see diarrhea.

• Transmission: Ingestion of cysts or trophozoites from infected animal or human feces. Cyst is the infectious form.

• Disease in man: Symptoms can include: ulcerative colitis, diarrhea, dysentery, nausea, vomiting, or abdominal pain. Severe cases may see blood &/or mucus in stool. Often see asymptomatic infections in humans.

**Tuberculosis**

Acquired from humans and then passed between NHPs. Secondary spread back to humans has been documented.

• Transmission: Primarily though the aerosol route. Exposure to dusty bedding of infected animals, coughing of infected animals, and aerosolization of the organism during sanitation procedures may also be sources of the disease in the lab environment. Contact with body fluids during necropsy may be a major mode of transmission to humans.

• Incubation period: About 2-10 weeks from exposure to skin-test positivity.

• Disease in people: Chronic cough, fatigue, fever, weight loss, and hemoptysis.

**Simian Retroviruses**

Simian Retroviruses include Simian Foamy Virus (SFV), Simian T-lymphotropic Virus (STLV), Simian Type D Retrovirus (SRV), and Simian Immunodeficiency Virus (SIV)

A subclinical latent disease is most common with these retroviruses in primates although SRV and SIV may cause subclinical to fatal immunosuppressive disease. Additionally STLV can cause a rare lymphoproliferative disease or a rare T-cell lymphoma. No disease is associated with SFV infection. Transmission of these agents occurs through saliva (bites) or blood (needlesticks). In the case of SRV the virus can be transmitted by fomites. No human disease has been identified with these viruses, but some humans have developed antibodies to them, suggesting there could be replication in humans.

**Zika Virus**
The Zika virus is naturally transmitted by *Aedes* spp. mosquitoes or by sexual contact. Symptoms of Zika in adults are mild and limiting including fever, rash, joint pain, and conjunctivitis, however Zika can cause birth defects including microcephaly. While not commonly occurring in the US, Zika could be transmitted by blood products such as a blood transfusion. Transmission occurs via percutaneous (needlestick) or mucous membrane routes; it has not been found to be spread through inhalation of the virus. Persons with Direct contact (with agent or animals) must contact the Employee Health clinic for consultation (206-685-1026).

**Methicillin-Resistant *Staphylococcus aureus* (MRSA)**

MRSA is a multi-drug resistant strain of *Staphylococcus aureus* that can cause severe disease in cases of immunosuppression or when there are breaks or damage to the skin. It can colonize healthy skin nasal cavities of human, primates, and many other domestic animals. MRSA skin infections in people from the bite of a MRSA-colonized primate have occurred although these are rare. MRSA can live on surfaces for an extended period of time, and can be transmitted indirectly. Therefore, it is essential to decontaminate any equipment used after working with animals that are colonized with MRSA.

**Coccidioidomycosis (Valley Fever) and Trypanosomiasis (Chagas’ disease)**

Coccidioides, a dimorphic saprophytic fungus that can cause pneumonia, dermatitis, and systemic disease in people (Valley Fever), and trypanosomes (such as *Trypanosoma cruzi*, protozoal parasites causing Chagas’ disease in people), are both carried by some primates at WaNPRC. However the conditions indoors (in the vivaria) do not exist for either of these agents to infect people. Valley fever is infective only in its hyphae form that exists in the soil of dryer areas such as the southwest US. Chagas’ disease is transmitted by the kissing bug, which lives across the southern United States, among other areas.