Herpes Simplex Virus Exposure/Injury Protocol

Organism or Agent: Herpes Simplex Virus (HSV)
Exposure Risk: Herpes viruses
UCSF Occupational Health Services: 415/885-7580 (Available during work hours)
UCSF Exposure Hotline: 415/353-7842 (Available 24 hours)
Office of Environment, Health & Safety: 415/476-1300 (Main number; available during work hours) or 9-911 (Available 24 hours)
EH&S Public Health Office: 415/514-3531
Biosafety Officer: 415/514-2824

PROTOCOL SUMMARY

In the event of an accidental exposure or injury, the protocol is as follows:

1. Modes of Transmission:
   a. Skin puncture or injection
   b. Ingestion
   c. Contact with mucous membranes (eyes, nose, mouth)
   d. Contact with non-intact skin

2. First Aid:
   a. Skin Exposure (non-intact), immediately go to the sink and thoroughly wash the skin with water and soap for at least 15 minutes.
   b. Skin Wound, immediately go to the sink and thoroughly wash the wound with soap and water and pat dry.
   c. Splash to Eye(s), Nose or Mouth, immediately flush the area with running water for at least 15 minutes.
   d. Splash Affecting Garments, spray with 10% bleach for minor spills and splashes. For large spills, remove garments that may have become soiled or contaminated and place them in a red plastic bag.

3. Treatment:
   a. In the event of exposure, with or without an injury requiring immediate medical care, call the Exposure Hotline in order to get access to medical care specific to the exposure. The exposure hotline responder will provide guidance to the injured individual on necessary medical treatment and post exposure follow-up.
   b. In the event of an acute injury resulting from a laboratory incident which requires immediate medical care, the injured worker should report to the emergency department for medical treatment. The injured individual must take a copy of this entire exposure protocol document to the Emergency Department, including information regarding the specific strain associated with exposure.

4. Follow up is needed in the event of any Laboratory Exposure:
   a. After first aid has been administered, immediately inform your supervisor of the exposure.
   b. In the event of a large spill, contact the emergency response team (9-911) for clean-up.
   c. Contact Occupational Health Services, after first aid is complete, for follow-up care.
ROLES & RESPONSIBILITIES
AFTER ACCIDENTAL EXPOSURE TO HERPES SIMPLEX VIRUS

1. WORKER’S RESPONSIBILITIES (Employee/Student Initial Self-Care)
   a. First Aid: Perform the recommended first aid and decontamination according to the posted instructions.
   b. Treatment: i) In the event of an acute injury resulting from a laboratory incident which requires immediate medical care, the injured individual should report to the Emergency Department for acute medical treatment. ii) In the event of an exposure, with or without such an injury, call the Exposure Hotline in order to get access to medical care for the exposure and evaluation for possible post exposure prophylaxis.
   c. Access to the Exposure Hotline: Call the Exposure Hotline in order to get access to medical care for the exposure. Dial 415/353-7842 and provide your name and contact information to the operator. If there is no call back in 15 minutes, call again. If there is no call back the second time, proceed to the nearest Emergency Department with a copy of this protocol.
   d. Reporting: Inform your laboratory supervisor / principal investigator of the exposure. Complete an Employee Incident Report Form [Link].
   e. Secure the laboratory: Identify the equipment involved in the exposure and the mechanism of exposure. Make sure that the laboratory area has been secured and that notification of contamination has been posted to prevent other individuals from entering the area.
   f. Follow up: Workers should contact Occupational Health Services (OHS) at 415/885-7580 for any needed follow up care.

2. SUPERVISOR’S/PI’S RESPONSIBILITIES
   a. First Aid and Decontamination: Verify that the worker has washed and decontaminated himself/herself. Ensure that appropriate medical treatment has been received.
   b. Secure the laboratory: Confirm that the laboratory area has been secured and that notification of contamination has been posted to prevent other individuals from entering the area.
   c. Laboratory clean-up (as needed): Contact the Office of Environment, Health & Safety (OEH&S) through the UC Police Department Emergency Dispatch (from a campus telephone 9-911, from a non-campus phone 415/476-1414).
   d. Report the exposure: Call the Public Health and Biosafety Officer during regular hours to discuss the exposure. Prepare a written report for the Biosafety Officer and the Biosafety Committee.
   e. Follow Up: Confirm that the worker has called for an appointment at the UCSF Occupational Health Clinic.
SECTION I – Infectious Agent
Name: Herpes simplex virus
Synonym or Cross Reference: HSV-1, HSV-2, HHV-1, HHV-2, Human herpes virus 1, Human herpes virus 2, cold sores, fever blisters
Characteristics: HSV virus, types 1 and 2, belong to the sub family Alphaherpesviridae in the family Herpesviridae, genus Simplexvirus. They are 120-300 nm in diameter and consist of a linear, double stranded DNA genome (152 Kb for HSV-1 and 155 Kb for HSV-2) enclosed within an icosahedral capsid, surrounded by a phospholipid rich envelope. The lipid envelope is derived from the nuclear envelope of the infected cell.
Reservoir: Humans
Zoonosis: None
Vector: None

SECTION II – Recommended Precautions
Risk group classification: Risk Group 2.
Containment requirements: Containment Level 2 facilities, equipment, and operational practices for work involving infectious or potentially infectious materials, animals, or cultures.
Protective clothing: Lab coat and gloves. Surgical mask and eye protection must also be worn to protect the mucous membrane.
Other precautions: All procedures that may produce aerosols, or involve high concentrations or large volumes should be conducted in a biological safety cabinet (BSC). The use of needles, syringes, and other sharp objects should be strictly limited. Additional precautions should be considered with work involving animals or large scale activities. Wash hands frequently.

SECTION III - Handling and Storage
Spills: Allow aerosols to settle and, wearing protective clothing, gently cover spills with paper towels and apply 10% bleach (0.5% sodium hypochlorite), starting at the perimeter and working towards the center. Allow 30 minutes of contact time before clean-up.
Disposal: Dispose all waste that contain or have come in contact with HSV as biohazardous waste, which will be picked up by UCSF Office of Environment, Health & Safety and will be autoclaved by an outside vendor.
Storage: The infectious agent should be stored in leak-proof containers that are labeled biohazardous.

SECTION IV – Health Hazards
Pathogenicity/toxicity: Although both HSV-1 and HSV-2 may infect any area, HSV-1 is associated mainly with “above the waist” infections involving the mouth, pharynx, face, eye, and central nervous system (CNS), whereas, HSV-2 is associated mainly with “below the waist” infections of the genital region.

- **Herpes labialis/cold sores**: Caused mainly by HSV-1, there have been reported cases caused by HSV-2. Primary infections with HSV-1 are acquired usually in childhood and may be asymptomatic or subclinical. Symptomatic primary infections present mainly as gingivostomatitis, with fever, sore throat, fetor oris, anorexia, cervical adenopathy, and mucosal edema and vesicular and ulcerative painful lesions involving the buccal mucosa, tongue, gums, and pharynx. Ulcers heal without scarring within 2-3 weeks. Recurrent infections have generally milder symptoms and clinical course. Recurrent lesions due to HSV-1 occur mainly on a specific area of the lip (vermillion border of the lip), and are called “cold sores” or “fever blisters”. The lesions heal in approximately 8-10 days.
- **Herpetic whitlow**: Characterized by formation of painful vesicular lesions on the nail or finger area.
• **Infections of the eye:** Characteristic dendritic ulceration occurs on conjunctiva, and cornea. HSV infection may cause other ocular diseases, including blepharitis/dermatitis, conjunctivitis, dendritic epithelial keratitis, and corneal ulceration.

• **Encephalitis:** Serious infections of the CNS, affecting both children and adolescents. It may occur due to primary or latent infection with HSV-1 virus. HSV encephalitis affects one temporal lobe, leading to focal neurologic signs and edema. The disease can be fatal (mortality rate of 70%), if left untreated.

• **Genital herpes:** It is a sexually transmitted disease. Genital herpes is caused mainly by HSV-2, although HSV-1 has become as common as HSV-2 in primary genital infections in developed countries. Primary genital herpes is characterized by formation of multiple, bilateral, painful, and extensive genital ulcers, which heal without scarring within 12 days. Patients also present with tender enlarged lymph nodes, fever, malaise, and myalgia. Rarely, the disease may also cause aseptic meningitis with neck rigidity and severe headache. Recurrent genital herpes disease is of shorter duration, is milder and does not have systemic symptoms. The main manifestation of the disease is prodromal paresthesia in the perineum, genitalia or buttocks, followed by formation of grouped lesions on the external genital area. The lesions heal without scarring in 2-5 days.

• **Neonatal Herpes:** Neonatal herpes is an extremely severe disease with a very high mortality rate. Neurological complications may occur in infants who survive the infection. Clinical manifestations of the disease are variable and can be classified into three groups: disseminated disease, involving multiple visceral organs, such as lung, liver, adrenal glands, skin, eye, and the brain (25%); CNS disease with listlessness and seizures (~ 30% of total cases; including 60 to 75% of those cases displaying disseminated disease); and disease limited to the skin, eyes, and/or mouth (SEM) (45%).

**Epidemiology:** Worldwide. HSV infections occur worldwide without any specific seasonal distribution. The prevalence of HSV-1 infection is greater than HSV-2 infection in most geographic areas. HSV-1 causes mainly oral infections in children and has a seroprevalence in adults of 70% in developed countries and 100% in developing countries. Oropharyngeal herpes has an infection rate of approximately 33% in developing countries and 20% in developed countries. Genital herpes, caused mainly by HSV-2, is the main cause of genital ulcers worldwide. Neonatal herpes is an uncommon but serious complication of genital herpes with occurrence rates ranging from 1/3,000 to 1/20,000 live births, resulting in an estimated incidence of 1,500 new cases of neonatal HSV infection annually in the United States. Corneal diseases due to HSV infection are an important cause of blindness, and account for an estimated 500,000 cases annually in the United States. Herpes simplex encephalitis (HSE), caused by HSV infection, is one of the most severe CNS infections, accounting for approximately 10–20% of all encephalitic viral infections of the CNS, in the United States.

**Host range:** Humans, but non-human primates in captivity can be accidentally infected. Rabbits and rodents can be infected experimentally.

**Mode of transmission:** Direct contact with infected secretions or mucous membranes/skin with lesions from an asymptomatic or symptomatic patients shedding the virus, is the main mode of transmission of HSV. Transmission of HSV-1 can also occur by respiratory droplet. Genital herpes is transmitted sexually. Neonatal herpes can be acquired at different times: intrapartum (in utero) in 5% of the cases, peripartum (perinatal) in 85% of the cases, and postpartum (postnatal) in 10% of the cases.

**Incubation period:** After initial infection, the incubation period generally ranges from 1-7 days during which the virus is delivered to the peripheral neuron cell bodies. New lesions may appear after 19 or more days when the virus is no longer latent but replicates and travels to the skin. From these sites, the virus can shed by close personal contact.

**Communicability:** HSV viruses are passed through close personal contact and mainly oral-genital or genital-genital contact. Vertical transmission can also occur in symptomatic and asymptomatic women. Transfer may be in utero, intrapartum, or postnatal.

**FOR THE USE OF THE EXPOSURE HOTLINE**

**SECTION V – Viability**

**Drug susceptibility:** Antiviral drugs like acyclovir, foscarnet valacyclovir, famciclovir, and penciclovir can inhibit viral replication. Foscarnet is used for acyclovir-resistant HSV cases.

**Drug resistance:** Acyclovir resistant strains have been isolated from immunocompromised patients, particularly AIDS patients with persistent/recurrent lesions.

**Susceptibility to disinfectants:** HSV virus is easily inactivated by lipid solvent. It can be inactivated by using...
10% bleach (0.5% sodium hypochlorite).
**Survival outside host:** HSV virus survives for short periods of time outside the host. It can survive on dry inanimate surfaces (survival ranges from few hours to 8 weeks). They survive longer at lower humidity.

**SECTION VI - First Aid / Medical**

**Surveillance:** Monitor for symptoms, including lesions in or around the oral cavity. Viral culture or PCR is used to detect presence of viral infection. Culture in cells can show multinucleated giant cells, desquamated epithelial cells with intranuclear inclusions. Direct examination of virus in clinical samples can also be done using fluorescent antibody (DFA) test to detect viral antigens present within a tissue or smear specimen, Tzanck test, Enzyme immunoassay (EIA). PCR can be used to detect viral DNA in cerebrospinal fluid in the case of encephalitis or in blood in cases of neonatal HSV infection. **Note:** All diagnostic methods are not necessarily available in all countries.

**First aid/treatment:**
- **Genital herpes:** Treated with antiviral drugs such as acyclovir, valacyclovir, famciclovir, and penciclovir. Valacyclovir, famciclovir are approved for chronic suppression of genital herpes.
- **Herpes labialis:** Primary infection in children is treated with oral acyclovir. N-docosanol, a non-prescription topical medication, or topical acyclovir reduces time to healing and duration of pain by approximately half a day. Oral acyclovir and valacyclovir can be used for recurrent infections.
- **Herpesviral encephalitis (HSE):** Treated with Acyclovir.
- **Neonatal HSV infection:** Treated with intravenous acyclovir for 21 days for disseminated infection or CNS infection, and 14 days for SEM infection.
  Eye infections associated with HSV infection can be treated either with topical trifluridine, idoxuridine, and vidarabine; or with oral acyclovir, valacyclovir, famciclovir.

**Immunization:** None

**Prophylaxis:** Acyclovir can be used as a prophylactic drug to prevent reactivation of herpes labialis after exposure to ultraviolet radiation, facial surgery, or exposure to sun and wind during skiing. Prophylaxis with oral acyclovir is recommended to suppress genital HSV recurrences near the end of pregnancy. Suppressive therapy with Valcyclovir may be used to prevent frequent recurrences of genital herpes.

**SECTION VII - Laboratory Hazard**

**Laboratory-acquired infections:** No infections reported

**Source/specimens:** Virus is shed from saliva, cervix, and urethra.

**Primary hazards:** Direct contact with clinical material or viral isolates, inhalation of concentrated aerosolized materials, droplet exposure of mucous membranes of the eyes, nose, or mouth, ingestion, accidental parenteral inoculation are the primary hazards associated with herpes viruses including HSV 1 and 2.

**Special hazards:** None

**Source:** Pathogen Regulation Directorate, Public Health Agency of Canada, September 2011