UNIVERSITY OF CALIFORNIA, SAN FRANCISCO
ENVIRONMENT HEALTH AND SAFETY/BIOSAFETY

POLIOVIRUS EXPOSURE/INJURY RESPONSE PROTOCOL

Organism or Agent: Polioviruses/Recombinant Poliovirus Vectors
Exposure Risk: Polio
UCSF Occupational Health Services: 415/885-7580 (Available during work hours)
Exposure Hotline: 415/353-7842 (STIC) (Available 24 hours)
Office of Environment Health & Safety: 415/476-1300 (Main number; available during work hours)
415/476-1414 or 9-911 (In case of emergency, via the UCSF Police Department; available 24 hours)
EH&S Public Health Officer: 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, injection or contact with non-intact skin
   b. Ingestion
   c. Contact with mucous membranes (eyes, nose, mouth)

2. First Aid:
   a. Intact Skin Exposure, immediately go to the sink and thoroughly wash the skin with soap and water. Decontaminate any exposed skin surfaces with an antiseptic scrub solution.
   b. Open 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 5-10 minutes.
   d. Splash Affecting Garments, remove garments that may have become soiled or contaminated and place them in a double red plastic bag.

3. Emergency Treatment:
   a. In the event of an acute injury resulting from a laboratory incident which requires immediate medical care, the injured employee/student should report to the emergency department for acute medical treatment. The injured individual must take a copy of the entire protocol document to the Emergency Department.

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 a follow-up appointment. In case of a student exposure, contact Student Health Services for follow-up care.
ROLES & RESPONSIBILITIES
AFTER ACCIDENTAL EXPOSURE TO POLIO

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 an injury, call the Exposure Hotline for access to medical care for the exposure.
   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.
   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.

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 (EH&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 Biosafety officer during regular hours to discuss the exposure.
   e. Follow Up: Confirm that the worker has called for an appointment at the UCSF Occupational Health Clinic for evaluation on the next weekday the clinic is open.
INFECTIONOUS SUBSTANCE DATA SHEET FOR POLIO VIRUS

SECTION I – Infectious Agent
Organism or Agent: POLIO VIRUS
Characteristics: An enterovirus, family Picornaviridae—non-encapsulated single stranded RNA virus, 30 nm diameter

SECTION II – Recommended Precautions
Containment Requirements: Biosafety level 2 practices, containment equipment and facilities for all activities involving the manipulation of the virus; primary containment devices and biological safety cabinets are required.
Manipulations of Polio Virus: Should be performed within a biosafety cabinet, and the use of sharps including needles, blades and glassware should be minimized. Ideally, safety engineered devices will be used.
UCSF Required Personal Protective Equipment: gloves, safety goggles, lab coat
Other Precautions: Evidence of immunity to polio virus for staff working with polio virus.

SECTION III – Handling Information
Spills: Allow aerosols to settle; wear protective clothing, gently cover spill with paper towel and apply 1% sodium hypochlorite, starting at perimeter and working towards the center; allow sufficient contact time before clean-up (30 min).
Biohazardous Waste: Collect in double red bags and transport in a rigid container.
Approved Disinfectants for Polio Virus: 0.5% Sodium Hypochlorite (1:10 bleach/water); allow 10 minutes of contact time
Disposal: Decontaminate before disposal; steam sterilization, incineration, chemical disinfection
Storage: Store in sealed containers that are appropriately labeled.

SECTION IV – Health Hazards
Pathogenicity: Polio
Epidemiology: Polio vaccination is required before starting to work with the virus.
Infectious Dose:
Modes of Transmission: Virus may be transmitted in the following ways: 1) a skin puncture or injection, 2) ingestion, 3) contact with mucous membranes (eyes, nose, or mouth), 4) contact with non-intact skin, and 5) bite from an infected animal.
Incubation Period: 7-14 days for paralytic cases, with a reported range of 3 to possibly 35 days.
Communicability: Communicable to unvaccinated contacts.
FOR USE BY THE EXPOSURE HOTLINE RESPONDER

SECTION V – Viability
Drug Susceptibility: Not Applicable
Susceptibility to Disinfectants: Susceptible to .5% sodium hypochlorite,
Physical Inactivation: Heat-labile

SECTION VI – Medical
Surveillance: N/A
First Aid/Treatment: N/A
Immunization: Polio Vaccine is indicated for laboratory workers directly involved with Polio and Polio virus recombinants.
Prophylaxis: N/A

SECTION VII – Laboratory Hazards
Laboratory-Acquired Infections: At least 12 documented laboratory acquired infections from 1941-1976
Sources/Specimens: Upper respiratory secretions and feces from infected animals.
Primary Hazards: Ingestion, parenteral inoculation, droplet or aerosol exposure of mucous membranes or broken skin with infectious fluids or tissues.
Special Hazards: Infection a vaccine strain may cause paralytic poliomyelitis. All potentially exposed individuals should have received a booster dose of inactivated polio vaccine.

FOR THE USE OF THE EMERGENCY DEPARTMENT

SECTION VIII – Emergency Medical Treatment
Treatment Indications: Emergency Department treatment will be required for any wounds requiring immediate treatment.
Decontamination: Ensure that the exposed area/wound has been adequately decontaminated using soap and water. If possible, hospital approved disinfectant scrubs should be used such as povidone.
I. Risks in Laboratory Workers/clinical summary

- As a result of the introduction of inactivated poliovirus vaccine (IPV) in the 1950s, followed by oral poliovirus vaccine (OPV) in the 1960s, poliomyelitis control has been achieved in numerous countries worldwide, and may soon be eliminated worldwide.

- Poliomyelitis is a highly contagious infectious disease caused by poliovirus, an enterovirus. Many infections are asymptomatic. Symptomatic cases are characterized by two phases—first a non-specific febrile illness followed by (in a small percentage of cases) aseptic meningitis or paralytic disease. The ratio of cases of inapparent infection to paralytic disease ranges from 100:1 to 1,000:1. After infection, the virus replicates in the oropharynx and intestinal tract. Viremia follows, which can result in infection of the CNS. Post-Polio syndrome may occur in 25-40% of individuals 30-40 years after contracting paralytic polio.

- Polio is caused by three serotypes of poliovirus—types 1, 2, and 3.

- The virus is transmitted from person to person primarily by the direct fecal-oral contact, but may also be transmitted by indirect contact with infectious saliva or feces, or by contaminated sewage or water.

- The first paralytic manifestations usually occur 7-21 days from initial infection. The period of communicability begins after the virus replicates and is excreted in oral secretions and feces. The period ends with the termination of viral replication and excretion, usually 4-6 weeks after infection. Poliovirus infection results in lifelong immunity specific to the infecting viral serotype.

- Humans are the only reservoir.

- Risk factors for paralytic disease include larger inocula of poliovirus, increasing age, pregnancy, strenuous exercise, tonsillectomy and IM injections administered while the patient is infected with poliovirus.

- Compared with IPV, OPV induces a more efficacious immune response. OPV induces superior immunity of the GI tract that provides a substantial degree of resistance to reinfection with poliovirus.

- Vaccine-Associated Paralytic Poliomyelitis (VAPP) is a rare squeal of immunization with OPV. In order to decrease VAPP, implementation of sequential IPV-OPV vaccination was initiated in the 1990s. ACIP subsequently recommended transition to an all IPV immunization schedule in the United States.

- ACIP recommends IPV vaccination of adults for individuals who are at greater risk for exposure to polioviruses than the general population:
  - Travelers to areas or countries where polio is epidemic or endemic
  - Members of communities or specific population groups with disease caused by wild polioviruses
  - Laboratory workers who handle specimens that might contain polioviruses
  - Health-care workers who have close contact with patients who might be excreting wild polioviruses
  - Unvaccinated adults whose children will be receiving OPV.
• Since 2000, OPV is no longer available in the United States due to concerns about potential adverse side effects. OPV is still used in other countries at present. All polio immunizations given in the United States use IPV.
• Individuals who are not immune to Polio, and have an inapparent infection from laboratory exposure, may spread the infection to susceptible individuals outside the laboratory setting.

Adapted directly from the CDC MMWR dated May 19, 2000/Vol. 49/No. RR-5

II. CDC/NIH RECOMMENDATIONS FOR LIMITING EXPOSURE TO POLIOVIRUS

• Ingestion or parenteral inoculation of infectious tissues or fluids by non-immunized personnel are the primary risks of infection in the laboratory. The importance of aerosol exposure is not known and it has not been reported as a hazard.
• Transgenic mice expressing the human receptor for polioviruses can be infected by virulent polioviruses and may be a potential source of human infection.
• All persons entering a laboratory where wild poliovirus must be fully immunized against polio.
• The World Health Organization (WHO) has issued guidance documents related to work with wild poliovirus in the near and long-term future. Starting in 1999, BSL-2/polio laboratories should be established for all workers wishing to manipulate wild poliovirus. BSL-2/polio follows traditional BSL-2 requirements for facilities, practices, and procedures, with the following additions:
  • All poliovirus stocks and potentially infectious materials are disposed of when there are not programmatic or research needs for retention.
  • All persons entering the laboratory are fully immunized against polio
  • Access to the laboratory is restricted
  • All wild poliovirus retained in the laboratory are inventoried and stored in a separate area with limited access
  • Only viruses that are readily identifiable by molecular methods are used if wild virus reference strains or working stocks are required
  • Institutions/laboratories in the United States that currently retain wild poliovirus infectious or potential infectious material should be on the United States National Inventory maintained by CDC.
  • Appropriate sterilization and/or incineration is used to dispose of wild polioviruses, infectious materials, and potentially infectious materials.
  • Once poliovirus infection has been globally eliminated, additional restrictions will be imposed.

Adapted directly from CDC/NIH Biosafety in Microbiological and Biomedical Laboratories, 4th and 5th editions.


• Chlorine bleach (0.5%) is the recommended disinfectant for laboratories working with polioviruses. Under stable laboratory conditions, poliovirus in clinical or environmental specimens may survive at freezing temperatures for many years, under refrigeration for many months, and at room temperatures for days or weeks.
• For purposes of containment, all polioviruses are considered wild except those strains currently approved by national control authorities for use as OPV.
• Wild poliovirus infectious materials are defined as:
• Clinical materials from confirmed wild poliovirus (including VDPV) infections, environmental sewage from water samples in which such viruses are present, and replication products of such viruses, including:
  • Cell culture isolates, reference strains, seeds for inactivated vaccines;
  • Infected animals or samples from such animals, including PVR transgenic mice;
  • Derivatives produced in the laboratory that have capsid sequences from wild polioviruses;
  • Full-length RNA or cDNA that include capsid sequences derived from wild poliovirus;
  • Cells persistently infected with poliovirus strains whose capsid sequences are derived from wild poliovirus.

• BL-2/polio includes the following precautions specifically for laboratories holding wild poliovirus materials.
  • Operational practices: Access to laboratories is restricted. All persons entering the laboratories, including support staff (cleaners, maintenance personnel, etc.) are immunized with IPV or OPV, depending on national policy. Accurate records on wild poliovirus stocks are maintained. All manipulations with open wild poliovirus infectious or potential infectious materials are performed using a certified class I or II biological safety cabinet.
  • Storage: Wild poliovirus materials are stored in secure areas to which access is limited. Freezers are locked and there is limited access to the key mechanism. It is desirable that such freezers be located within the BSL-2/polio laboratory or an equivalent facility.
  • Transfer of materials: All materials are transferred to and from the freezer in leak-proof, unbreakable secondary containers. Standard operating procedures (SOP) are established and regular training provided on responses to all spills, breakage of virus-containing vessels, and accidents where virus may have been released.

Adapted directly from WHO global action plan for laboratory containment of wild polioviruses, second edition, Vaccines and Biologicals World Health Organization, January 2004.

IV. ADULT IMMUNIZATION RECOMMENDATIONS

• Immunize all potentially exposed employees in accordance with CDC/ACIP guidelines or document immunity to all 3 strains:
  • Unvaccinated adults who are at increased risk should receive a primary vaccination series with IPV. Adults without documentation of vaccination status should be considered unvaccinated. Two doses of IPV should be administered at intervals of 4-8 weeks; a third dose should be administered 6-12 months after the second. If three doses of IPV cannot be administered within the recommended intervals before protection is needed, the following alternatives are recommended:
    • If more than 8 weeks are available before protection is needed, three doses of IPV should be administered at least 4 weeks apart.
    • If fewer than 8 weeks but more than 4 weeks are available before protection is needed, two doses of IMV should be administered at least 4 weeks apart.
    • If fewer than 4 weeks are available before protection is needed, a single dose of IPV is recommended.
  • The remaining doses of vaccine should be administered later, at the recommended intervals, if the person remains at increased risk for exposure to poliovirus.Adults who have had a primary series of OPV or IPV and who are at increased risk can receive another dose of IPV. Available data do not indicate the need for more than a single lifetime booster dose with IPV for adults.
V. REFERENCES:

UCSF Polio Immunization Policy for the Research Laboratory Setting
http://www.occupationalhealthprogram.ucsf.edu/ohpClin.asp#Vac

WHO recommendations:
http://www.who.int/topics/poliomyelitis/en/

Advisory Committee on Immunization Practices (ACIP) Polio recommendations:
http://www.cdc.gov/mmwr/PDF/rr/rr4905.pdf

Update on Vaccine derived Polioviruses
http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5540a3.htm?s_cid=mm5540a3_e

_Biosafety in Microbiological and Biomedical Laboratories, 4th Edition, CDC, May 1999:_

_Biosafety in Microbiological and Biomedical Laboratories, 5th Edition, CDC, February 2007:_
Notice:

Nationwide Survey of Biomedical Laboratories for Containment of Wild Polioviruses

October 1, 2002

“The United States is fully committed to...the containment of any laboratory material that may harbor specimens of wild poliovirus”

Tommy Thompson, Secretary for Health and Human Services

Purpose of National Survey
- Alert laboratories to the impending eradication of polio
- Encourage the disposition of all unneeded wild poliovirus materials
- Establish a national inventory of laboratories retaining poliovirus infectious and potential infectious materials

Purpose of National Inventory
- Maintain a current list of laboratories in which wild poliovirus may be present
- Keep laboratories informed of biosafety developments
- Notify laboratories of polio eradication progress and when to implement containment requirements

Poliovirus Laboratory Containment Preparedness

http://www.cdc.gov/od/nvpo/polio