

Cercopithecine herpesvirus 1 (B Virus) Infection Resulting from Ocular Exposure

Key Points

- Mucocutaneous exposure to biological fluid from macaque monkeys can result in infection with *Cercopithecine herpesvirus 1*, commonly known as B virus.
- Eye splashes appear to be common in the primate industry.
- Dendritic corneal lesions characteristic of other ocular herpes virus infections may not be present.
- All personnel who work with macaques should wear eyewear conforming to established standards for eye and splash protection.
- If exposure prevention fails, the adequacy and timeliness of wound or exposure decontamination procedures are critical factors in determining the risk for infection.

Description of Hazard

On October 29, 1997, a 22-year-old researcher at a primate-center field station was assisting with a routine group capture of rhesus macaques (*Macaca mulatta*) in a free-ranging corral. Personnel conducting the capture wore uniforms, disposable latex gloves, and surgical masks. Eye protection was not worn. During the transfer of an unidentified macaque into a squeeze cage, undetermined liquid from the animal entered the researcher's eye. The worker wiped her eye at the time of exposure. Approximately 45 minutes later she flushed her eye with tap water for 2–3 minutes. There was no medical treatment or consultation at the time of the exposure. The researcher subsequently developed a *Cercopithecine herpesvirus 1* (B virus) infection; despite intensive antiviral therapy, she died on December 10, 1997. This incident is the first documented case of a B virus infection resulting from an ocular exposure to macaque secretions.

On November 8, 1997, the researcher sought medical attention for the first time because the exposed eye was red and swollen. At this time, the emergency department physician specifically looked for dendritic lesions of the cornea that are characteristic of ocular herpes infections. Although dendritic corneal lesions were reported in a previous fatal B virus infection, they were not seen in the present case. On the basis of the reported circumstances of the contact, it was initially concluded that B virus infection was unlikely. This case is reported in the following:

CDC (Centers for Disease Control and Prevention) [1998]. **Fatal *Cercopithecine herpesvirus 1* (B Virus) Infection Following a Mucocutaneous Exposure and Interim Recommendations for Worker Protection.** Morbidity and Mortality Weekly Report (MMWR) 47(49):1073–1076,1083; December 18, 1998.

About B Virus

B virus infects $\geq 70\%$ of surveyed captive adult macaques, but not other nonhuman primates (NHPs). Like humans infected with *Herpesvirus simplex* virus, monkeys infected with B virus have a lifelong infection, with intermittent reactivation and shedding of the virus in saliva, conjunctival fluid, or urogenital secretions. Although virus shedding is more frequent during the mating season (roughly March to June) and when an animal is ill, under stress, or immunosuppressed, there are often no signs of shedding. Macaques should always be regarded as potentially infectious.

There have been approximately 40 known cases of fatal human B virus infection described in the English language literature. Previously reported human infections usually have been attributed to macaque bites or scratches, injuries from needles used near a macaque's mucous membranes or central nervous system, or contact with infectious products from the macaques. Incubation periods may be as short as 2 days, but more commonly they are 2 to 5 weeks. Most documented infections have occurred among biomedical research employees who worked with macaques. Laboratory workers handling only infected central nervous system or primary monkey kidney cell lines have also been exposed and, in at least one instance, infected. One case of person-to-person transmission has been reported.

Recommendations for Preventing B Virus Infections

Published recommendations for the prevention and treatment of B virus infections in exposed persons include the following:

CDC (Centers for Disease Control and Prevention) [1987]. **Guidelines for the Prevention of *Herpesvirus simiae* (B Virus) Infection in Monkey Handlers.** Morbidity and Mortality Weekly Report (MMWR) 36(41):680–683, 687–689; October 23, 1987.

Holmes GP, et al. [1995]. **Guidelines for the Prevention and Treatment of B-Virus Infections in Exposed Persons.** Clinical Infectious Diseases 20:421–439.

Protective eyewear criteria have been established by the American National Standards Institute (ANSI):

ANSI [1989]. **Practice for Occupational and Educational Eye and Face Protection, Z87.1–1989.** American Society of Safety Engineers, Des Plaines, IL.

Actions You Should Take

Preventing worker exposure to biohazardous material is the best protection against infection. All organizations that work with macaques or other NHPs should obtain the documents cited in this report (as well as other guidelines and educational materials) and review the occupational health hazards associated with working with NHPs. Employers should ensure that worker protection programs, policies, and procedures are in place to control infection risks from NHPs. Employers should conduct training and periodic assessments to ensure that worker protection programs are effective. In particular, all employees who come into contact with macaques or macaque tissues should be trained about the risks of B virus and other infections and the importance of preventive measures.

Each institution working with NHPs should develop a written, comprehensive personal protective equipment (PPE) program that clearly identifies the PPE required for each specific task or working area of the facility and addresses training, inspection and maintenance, and periodic assessment of program effectiveness. Mandatory PPE should be selected based on a thorough worksite hazard assessment that considers all work procedures and associated hazards (including biohazards), potential routes of exposure, and potential adverse health outcomes.

Reviews of injuries and biohazard exposures among workers exposed to NHPs suggest that mucocutaneous contact with NHP body fluids is common; in one survey, 16 of 17 contacts with primate body fluids involved ocular exposure. Although the 1987 Centers for Disease Control and Prevention (CDC) *Guidelines for the Prevention of Herpesvirus simiae (B virus) Infection in Monkey Handlers* discourages handling fully awake macaques, macaque handlers should be protected with appropriate eye protection when it is necessary to remove physically active animals from cages. The incident described in this report indicates that proper eye protection should also be mandatory during activities such as entering areas containing macaques, conducting captures, and transporting caged macaques. Other activities that require eye protection should be determined by the hazard assessment. Appropriate protective eyewear selection should be based on a number of factors, including the nature and extent of the hazard, nature of the work, associated degree of risk, and requirements of the individual user. Protective eyewear should meet or exceed the criteria established by ANSI. Eye protection must be comfortable, accommodate the need for corrective lenses (eyeglasses), and be adjustable to ensure a secure fit. It may be necessary to provide several different types, styles, and sizes. Personal eyeglasses are not PPE.

Protective goggles designed for splash protection (available with antifog lenses for humid environments and in models that preserve peripheral vision) should be worn to protect the eyes against splash hazards in combination with a mask designed to protect other mucous membranes. Faceshields are commonly considered secondary eye protectors that are worn in combination with protective goggles. Although previous guidelines for the prevention of B virus indicate that faceshields may be sufficient, ocular exposures have occurred to workers wearing faceshields. In one incident, an animal technician was splashed in the eye with an unknown fluid while wearing a combination surgical mask/faceshield during the transfer of a monkey within cages. The “faceshield” worn during this exposure, a surgical mask with attached plastic eye shield, did not provide adequate protection. To minimize the potential for mucous membrane exposure, faceshields must prevent droplet splashes to the head from running down into the eyes and prevent mucous membrane exposure around the edges (sides, top, and bottom to below the chin). Decisions to use faceshields as the sole means for preventing ocular exposure should be made only after full consideration of both the limitations of faceshields and Occupational Safety and Health Administration (OSHA) regulations.

If exposure prevention fails, the adequacy and timeliness of wound or exposure decontamination procedures are critical factors determining the risk of infection. Institutions that house or conduct procedures involving macaques or potentially contaminated tissues should develop institution-specific postexposure procedures. Such procedures will ensure appropriate diagnostic testing and infection control. First, animal handlers should be instructed to immediately and thoroughly cleanse all bites, scratches, and/or mucosal surfaces or abraded skin exposed to macaque biologic materials and to report these exposures immediately. Following an eye exposure, existing guidelines recommend immediately flushing the eye for at least 15 minutes. Existing guidelines should also be followed for cleansing bites, scratches, or other wounds. Second, postexposure procedures should provide potentially exposed workers with direct and rapid access to local physicians knowledgeable about the infectious risks of exposure to NHPs, hazards of B virus infection, signs and symptoms, and treatment, as well as other biohazards associated with NHPs. These physicians should be available on an on-call basis in the event of an exposure. The employer should ensure that direct access to the knowledgeable consultant is available immediately following exposures and at any time the worker is concerned that potential occupational exposure to B virus may be relevant to worker symptoms. When possible, a veterinarian should assess the clinical

and virologic status of the source animal. Postexposure procedures should also include routing diagnostic specimens to the B Virus Research and Resource Laboratory (at Georgia State University in Atlanta).

Medical personnel who evaluate primate handlers with conjunctivitis after an eye exposure to potentially infectious material should be aware that the absence of dendritic lesions of the cornea, like the absence of herpetic skin vesicles, does not reliably rule out B virus infection.

These recommendations will be reviewed and may be revised or augmented following additional consideration by a working group to be convened by the CDC Office of Health and Safety.

For More Information

Additional information about B virus and preventive measures can be obtained from the following:

National Institute for Occupational Safety and Health (NIOSH) at **1-800-356-4674**, or visit the NIOSH Homepage on the World Wide Web at <http://www.cdc.gov/niosh>

B Virus Research and Resource Laboratory, Georgia State University, P.O. Box 4118, Atlanta, GA 30302-4118; **404-651-0808**

Centers for Disease Control and Prevention, 1600 Clifton Road, Atlanta, GA 30333; **404-639-2888**
(Callers should indicate the need for additional information about B virus.)

Acknowledgments

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