

Rabies

Mark Burnett, MD

ABSTRACT

Rabies has been a scourge of mankind since antiquity. The name itself, “rabies” is derived from the ancient Sanskrit *rabhas* meaning “to do violence” and has been found described in medical writings several thousand years old. The rabies virus is an RNA virus of the family *Rhabdoviridae* (Greek for “rod-shaped virus”), genus *Lyssavirus* (Lyssa being the Greek God of frenzy and rage). Rabies infections have a worldwide spread, with only a few, mostly island nations laying claim to being “rabies free.”

Clinical

A rabies infection results from inoculation of infected saliva; the virus may also possibly be inhaled from infected bats. Local replication occurs in the damaged muscle, and then the virus transits to the peripheral nerves en route to the central nervous system. The speed of transmission from the peripheral nerves can be variable, from days to years after the initial infection. Intense pruritus at the site of the infection is typically followed by paresis, fevers, and mood swings. In “furious rabies,” the midbrain and medulla are the areas most significantly involved, and death occurs within days after the appearance of symptoms. In “dumb rabies,” the spinal cord is the predominant area of infection, and the patient may live a month or longer before dying.

Diagnosis

Rabies can be rapidly diagnosed by immunofluorescent examination of skin and brain biopsy samples. The virus itself can be isolated from saliva, cerebrospinal fluid, and urine but not from the blood.

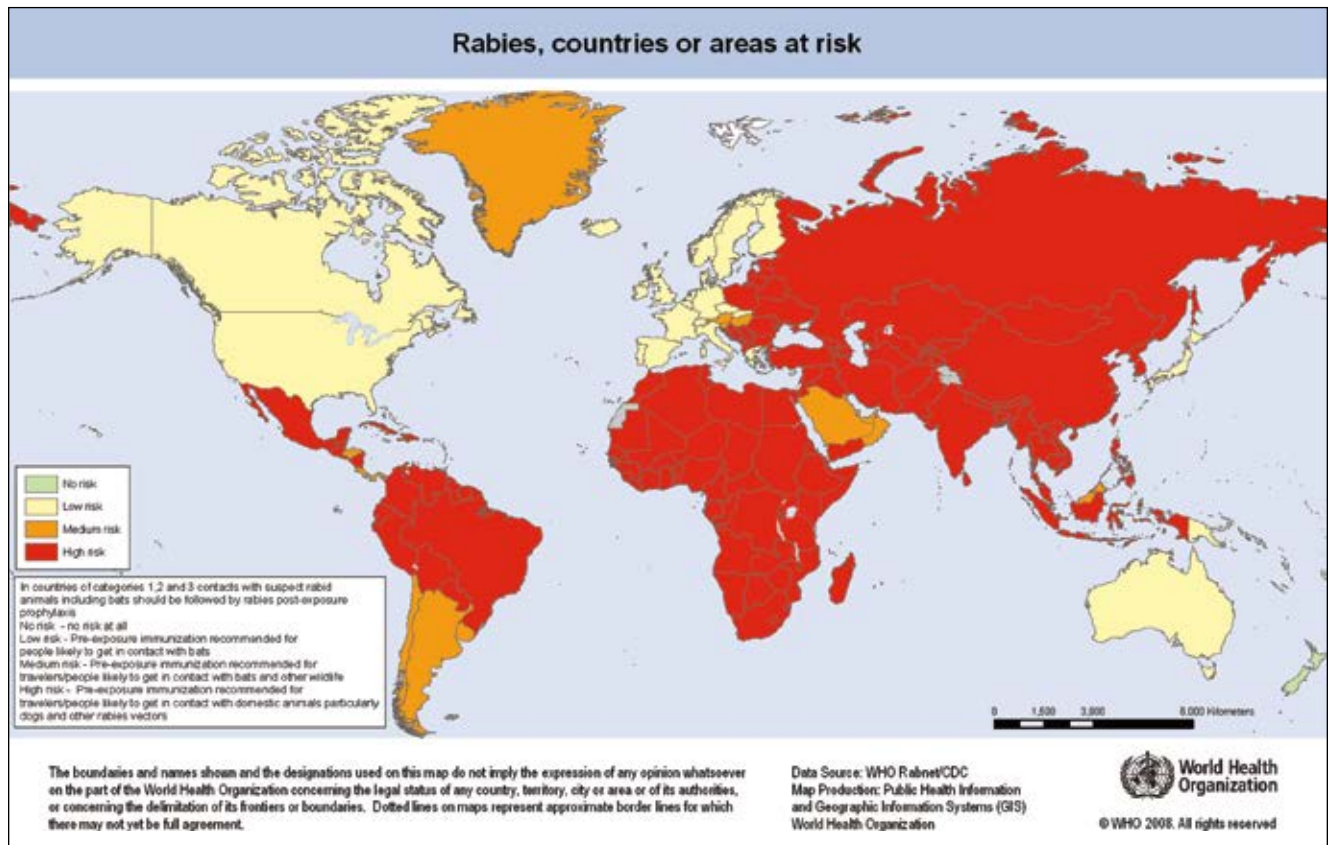
Treatment and Vaccination

Due to the almost universally fatal nature of rabies, prevention is key. Immediately after the bite or exposure, washing the wound out with soap and water or with povidone-iodine is critical to reduce the viral load

of the injury. In the patient who has not received pre-exposure prophylaxis vaccinations, human rabies immunoglobulin (HRIG) at a dose of 20 IU/kg should be infiltrated around the injury site. If the wound is large, the World Health Organization recommends diluting the HRIG with normal saline before infiltration. If any HRIG remains after the area around the wound site has been infiltrated, the remainder should be administered intramuscularly at a nongluteal site that is distant from the vaccination site. HRIG should be administered in a separate syringe from the rabies vaccine. HRIG is expensive and is often difficult to find in the developing world (Figure 1). Equine rabies immunoglobulin (ERIG) was previously available in the developing world but has become increasingly hard to find in recent years. If there is a delay in obtaining HRIG, it can be administered through the seventh day after the first of the postexposure prophylaxis vaccination series has been given. For those who have not been previously vaccinated, both the rabies vaccine series and HRIG should be started regardless of the time elapsed between exposure and initiation of treatment. The postexposure rabies vaccine series consists of four vaccinations, with the first given as soon as possible after the injury and the remaining three doses given on days 3, 7, and 14. Vaccinations should be given in the deltoid of adults and the thigh of children and should never be administered in the gluteal region. Tetanus boosters should be updated when treating the patient at the time of the injury. High-risk injuries that have failed postexposure prophylaxis in the past include narrow fang bites of the toes, finger, and face and wounds that were prematurely surgically closed, inadequately irrigated, or had HRIG improperly administered.

To avoid the search for HRIG in the developing world, a preexposure rabies series has been approved to eliminate the need for postexposure prophylaxis with this often difficult to find passive immunization therapy. When a rabies preexposure vaccine series is given on days 0, 7, and 21 or 28, the need for HRIG in the postbite setting is eliminated. Care of the patient who has received

Figure 1 Countries and areas at risk of rabies. (Source: World Health Organization.)



a bite injury and has received preexposure prophylaxis consists of a thorough washing of the wound, rabies vaccines on days 0 and 3, and a tetanus booster if indicated. After receiving the 3-dose preexposure series, booster doses are indicated every 2 years if traveling into high-risk areas. If the preexposure series has not been entirely completed before the exposure, the injured patient should be treated as if he has not been administered any of the preexposure series.

Until 2004, there had been no recorded case in human history of an unvaccinated patient surviving and recovering from a rabies infection once they had become symptomatic. Dubbed the “Milwaukee Protocol” after the location where it was first used, a treatment protocol has been developed that involves putting the patient into a chemically induced coma, administering antiviral drugs, and letting the body develop antibodies to the infection. This treatment is very labor intensive, and its success has been difficult to replicate.

Importance in a Deployed Setting

The World Health Organization estimates worldwide deaths from rabies infections to be more than 55,000 annually—with 95% of the deaths occurring in Asia and

Africa (Figure 2). In the United States, more than 90% of all rabid animals were wild (raccoons, bats, skunks, and foxes). Due to widespread vaccination, rabid dogs usually make up only 1% to 2% of the total cases. Overseas, the vast majority of rabies infections result after contact with rabid dogs.

In August 2011, a member of the U.S. military died after an exposure to rabies at a combat outpost in Afghanistan—the first rabies death of a soldier since the Vietnam

Figure 2 The “Animal Bite Center” at the Lamitan District Hospital on the island of Basilan in the southern Philippines. Like most of the clinics and rural hospitals of the developing world, HRIG was not offered as therapy to bite victims.



Conflict. This tragic death, along with numerous other high-profile, large-scale postexposure treatments of Servicemembers exposed to infected “mascots,” highlights the dangers of keeping pets on deployment.

Disclaimer

The views expressed in this publication are those of the author and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the Government.

Disclosure

The author has nothing to disclose.

Bibliography

American Academy of Pediatrics. Dengue. In: Pickering LK, Baker CJ, Kimberlin DW, Long SS, eds. *Red Book: 2012 Report of the Committee on Infectious Diseases*. Elk Grove Village, IL: American Academy of Pediatrics; 2012: 600–607.

Warrell MJ, Warrell DA. In: Magill AJ, Ryan ET, Hill DR, Solomon T, eds. *Hunter's Tropical Medicine and Emerging Infectious Diseases*. London, UK: Saunders Elsevier; 2013:344–348.

Recommended Internet Links

<http://www.cdc.gov/rabies/>
<http://www.who.int/rabies/en/>

COL Burnett is the chief of Pediatric Infectious Disease and Travel Medicine at Tripler Army Medical Center in Hawaii. A congenital Green Bay Packers fan, he has served overseas in Korea, Germany, Kosovo, Iraq, and Afghanistan and, most recently, as the JSOTF-P surgeon in the Philippines. He is a graduate of the University of Wisconsin-Madison and the Medical College of Wisconsin. E-mail: mark.w.burnett.mil@mail.mil.