

RABIES AS A THREAT TO THE TRAVELER

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- Vaccine for treatment of rabies continues to be scarce around the world. Supplies are so low that prophylactic use in the United States is almost non-existent.
- Rabies is still expanding its domain. Three Pacific islands (Flores, Ambon and Bali in Indonesia), previously rabies free, have now been invaded by this virus which is currently circulating among dogs.

While any mammal can be infected by rabies, the virus is usually transmitted through bites from dogs, cats, raccoons, skunks or bats. The rabies virus first multiplies at the bite site, invades a local skin nerve, advancing through peripheral nerves to the spinal cord, and eventually proceeds to the brain. The mortality rate of untreated rabies is near 100%, with only two humans ever known to have recovered fully from the disease without treatment. Both victims were young and developed antibodies in their blood



Rabid dog with furious rabies.

The other form is paralytic rabies which may not be readily diagnosed on appearance only.

and spinal fluid at the onset of illness. It is thought that their immune responses were instrumental in overcoming the disease. With more than 55,000 human deaths

worldwide each year, this disease causes more deaths than polio, Japanese encephalitis, meningitis, SARS or Avian Flu. The high incidence rate and low survival rate make rabies prevention vital.

The first step in prevention of rabies is vaccination. Louis Pasteur created the first rabies vaccine in the late 1800's from infected sheep brain tissue. Until recently, this vaccine was still in use in many developing countries. Modern and more effective vaccines created from actual rabies viruses came into use in the mid-1990's and are now commonly used. These vaccines, human diploid cell (HDCV), purified chick embryo cell (PCEC), and purified vero cell (PVRV), are among the most efficient and safest in use today. Both HDCV and PCEC are approved by the U.S. Food and Drug Administration (FDA), while PVRV is approved by the World Health Organization (WHO) and widely used in Europe, South America, Africa and Asia.

If bitten by an animal in a rabies endemic region, the bite wound should be immediately washed with soap, flowing water and antiseptic solution. Medical attention should be immediately acquired. For people who have had contact with rabies, there is a post-exposure vaccine course available. This regimen consists of one intramuscular injection on days 0, 3, 7, 14 and 28 after exposure. Many countries now also use a reduced dose of intradermal regimen for people exposed to the rabies virus. This is much less expensive, but not FDA approved.



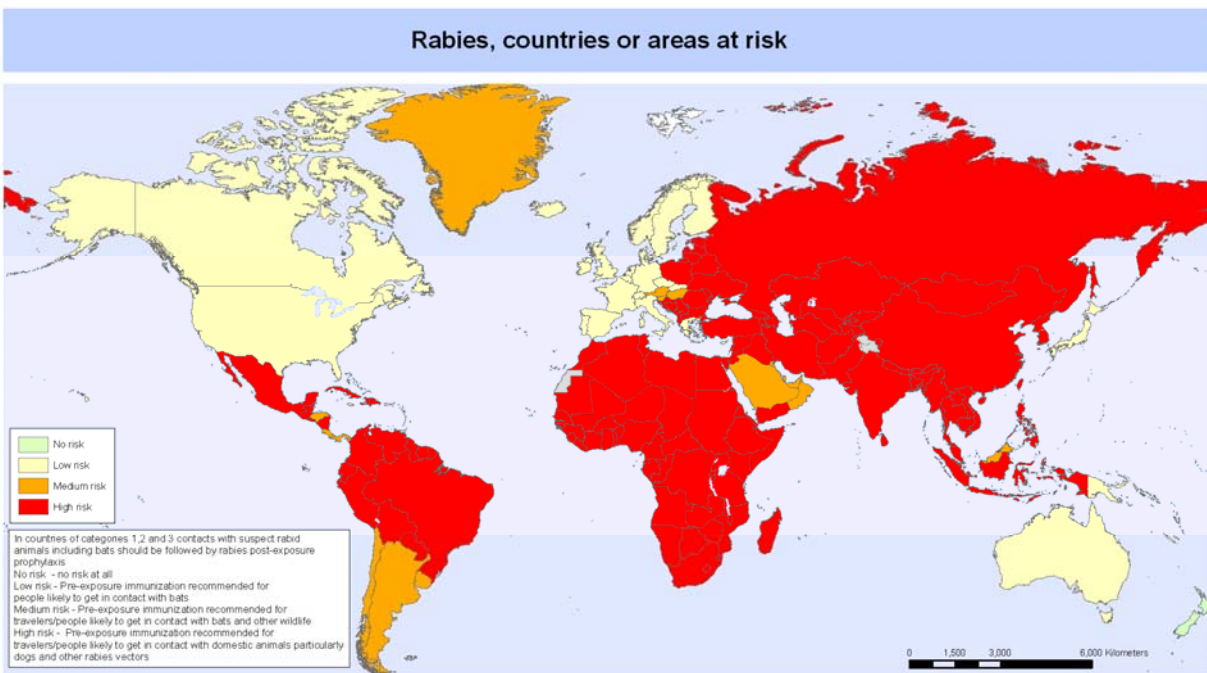
Child with dog bites. Only back of head is shown. He was badly mauled on the face and survived after appropriate post-exposure treatment and plastic surgery.

Approximately 50% of all rabies deaths worldwide are in children.

Vaccines require approximately 10 days for the human immune system to produce enough antibodies to neutralize the virus in a bite wound. It may require more time if the bite is in a nerve-rich area such as the hand, face or head. Furthermore, it is believed that the nerve endings provide an immune-protected environment in which the virus can travel to the central nervous system. Because of this, the WHO and the Centers for Disease Control and Prevention recommend the use of a rabies immunoglobulin that is injected into and around the bite wound to immediately kill virus. Such immunoglobulin is made from human serum from donors that have been hyperimmunized. Human Rabies Immunoglobulin (HRIG) is extremely expensive and in short supply, most often where it is needed the most. In Thailand, for example, it would cost about \$500 to use it in an average adult, or the equivalent of two months' salary for an entry-level Thai schoolteacher.

Because of the cost of producing human rabies immunoglobulin, other methods of production have been explored. Antisera made by hyperimmunizing horses were manufactured in Europe and the Americas before World War II. This treatment frequently caused allergic reactions, some of which were severe. The late 1950s brought highly purified immunoglobulin derived from horse serum (Equine Rabies Immunoglobulin, or ERIG). Unfortunately, these still caused serum sickness reactions in about 2% of recipients. ERIG is inexpensive and effective, and is manufactured in France, Thailand, India and China. ERIG is ideal in the event that HRIG is not available or affordable. Either serum should be taken immediately following a bite. In addition to vaccinations and serums, technology to make pure rabies antibodies in tissue culture is now available. It is expected that, in the future, this will almost certainly replace both HRIG and ERIG.

Today's public health professionals have the knowledge and the ability to attempt an eradication of the rabies virus; unfortunately, some concerns must first be addressed before a true eradication effort can begin. Cultural attitudes in many countries hinder dog population control, and many governments lack the will and/or funding to implement effective ongoing efforts. Japan, Korea, Taiwan, Singapore and Malaysia have already done so, showing that such control is possible, yet the prevalence of human rabies is increasing in China, Pakistan and most of the independent former Soviet republics. While quality information is difficult to obtain for Africa, the disease appears to be rampant in most countries.



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Data Source: WHO Rabnet/CDC
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 **World Health Organization**
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World map of rabies. Adapted from WHO reports.

Rabies is a serious threat for travelers in some parts of the world, and adequate care may not be available in many poor and unstable regions. Persons at potential risk can

receive pre-exposure rabies vaccinations, which are readily available from public health departments and travel clinics.

This vaccine is a four week regimen, so it is important to plan ahead. Recent studies have shown that one course results in up to 20 years of immune memory and therefore only two booster injections are needed if a recipient is exposed to the disease. All the new tissue culture vaccines are safe and very effective. Any adverse reactions are usually only local and minor. Even more importantly, a vaccinated traveler, if bitten by an animal in a rabies endemic country, will not need immunoglobulin.

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