Rabies

Traveler Summary

Key Points

- Rabies is an acute, fatal, viral infection of the brain occurring worldwide, transmitted via saliva through penetrating bites, licks, or scratches or contact with infectious nervous tissue from infected dogs, bats, and other mammals.
- Risk is low for travelers but becomes significant after a potential bite exposure.
- Symptoms are initially mild and include tingling at the site of the bite, fever, muscle aches, anxiety, depression, irritability, and sometimes respiratory or gastrointestinal symptoms.
- Consequences of infection are paralysis and coma, which is always fatal once the rabies virus reaches the brain from the site of the bite or wound.
- Prevention includes avoiding any contact with dogs and other biting mammals (including bats and wildlife) in countries with a high risk of rabies.
- Rabies vaccine for prevention prior to any exposure or potential bite is given in 2 doses: 1 each on days 0 and 7; either a titer check (vaccine response test) at 1 to 3 years followed by a booster dose (if necessary) or, alternatively, an empiric booster (third dose; no laboratory testing) given 21 days to 3 years afterward is recommended. Following a potential rabies exposure, persons not previously vaccinated need 4 doses of vaccine (on days 0, 3, 7, and 14) plus rabies immune globulin on the first day (or within 7 days of the first dose of vaccine), whereas previously vaccinated persons need only vaccine (2 doses on days 0 and 3).
- Vaccine side effects are most commonly injection-site reactions and fever, headache, dizziness, insomnia, and abdominal pain.
- Duration of vaccine protection following a completed series is limited to the time interval until any subsequent rabies exposure, at which time postexposure vaccination will be required. Travelers do not require routine boosters.

Introduction

Rabies is an acute, progressive, and fatal viral infection of the brain and spinal cord, transmitted via saliva through penetrating bites, licks, or scratches, or via contact with infectious nervous tissue from rabid animals. Almost all rabies deaths are due to dog or bat bites. Tens of millions of human exposures and tens of thousands of deaths may occur globally each year due to rabies.

Risk Areas

Rabies is found on all continents except Antarctica; most deaths due to rabies occur in Africa and Asia. Canine rabies (responsible for about 99% of human cases) occurs in parts of Africa, Asia, and to a much lesser extent in Central and South America. Bat rabies occurs worldwide, except in Japan, New Zealand, and several islands where bats are not present.

In the US, bats that feed on insects (notably silver-haired bats) are the most common cause of human rabies cases. In Central and South America, rabies transmitted by vampire bats causes significant death in cattle and occasional outbreaks in humans. Rabies virus can also be found in coyotes, foxes, raccoons, and skunks in the US; in foxes in the Americas, Europe, and southern Africa; in mongooses on the Caribbean islands and in southern Africa; in kudu and jackals mainly in southern Africa; and in ferret badgers in northeast Asia.

From 1990 through 2019, most cases of rabies infection in international travelers were acquired in Asia, notably in India and the Philippines; Central America and the Caribbean islands, notably Mexico; and in North Africa, notably Morocco and Algeria. Imported cases have also been reported in the US after international travel; most cases occurred after dog exposures although bat exposures were also identified. In the US, approximately 0 to 4 cases occur every year.

Transmission

Rabies is mainly transmitted to humans via saliva through penetrating bites of infected animals that may not exhibit features of the disease (especially carnivores and bats). Rabies virus is introduced through intact skin (e.g., by a bite or scratch) or licked onto preexisting nonintact skin or mucous tissue via saliva or contact with infected nervous tissue, where it then travels through the nerves to the brain. All mammals are susceptible, but dogs and other canines (foxes, wolves, jackals, and coyotes) are the most important vectors because they bite readily and may have daily contact with humans. Monkeys are a potential but uncertain

source; nevertheless, monkey bites must be treated as a potential rabies risk. Bat rabies is transmitted by bat bites or scratches (which may not be noticed) or, more rarely, by inhalation of aerosolized bat saliva in caves where bats congregate. Bites from livestock, small and large rodents (beavers, gerbils, guinea pigs, hamsters, mice, rats, and woodchucks) and lagomorphs (hares, rabbits) do not usually transmit rabies. Rabies is not transmitted via exposure to blood, urine, or feces of infected animals and no human cases resulting from consumption of raw meat or raw milk from an infected animal have been reported. Human-to-human transmission has never been reported; rare routes of transmission include corneal grafting and tissue and organ transplantation.

Risk Factors

Risk is low for travelers and, although rare, rabies is a high-impact disease. Children are at higher risk because of their inquisitive nature, attraction to and inability to recognize behavioral signals from animals (especially dogs), small stature, and the possibility that they may not report an exposure. A bite, scratch, or lick from a dog or other mammal in a rabies-endemic country or a bite or scratch from a bat anywhere in the world presents a risk of rabies to an unvaccinated traveler.

Risk of developing rabies increases with severity (number and depth) of bites and proximity to the head. Vaccination is protective when given in a timely manner before and/or after exposure. Bites to the face carry an especially high risk and require more urgent initiation of treatment to neutralize the rabies virus before it reaches the brain.

Symptoms

Symptoms most commonly develop 20 to 60 days (but could occur 5 days to several years) after exposure (depending on the severity and site of the bite) and include tingling (at the site of the bite) followed by fever, headache, muscle aches, anxiety, depression, irritability, and sometimes respiratory or gastrointestinal symptoms.

Consequences of Infection

Patients with furious rabies, which is common after dog bites, are terrified of water and develop severe spasms of the breathing muscles, which may lead to suffocation, generalized convulsions, coma, and death (in approximately 5 days). Patients with paralytic rabies, which is common after bat bites, become lethargic, dribble saliva, and develop loss of muscle tone and paralysis (starting at the site of the bite or scratch), leading to coma and death in about 13 days.

Need for Medical Assistance

A traveler who has been bitten, scratched, or licked by a mammal in a rabies-endemic country or by a bat anywhere in the world should urgently seek medical advice on receiving a postexposure vaccination series. Any potential rabies exposure, even from months earlier, requires appropriate medical evaluation.

National, state, or local health authorities should be consulted by the traveler or medical provider for recent information on rabies risk according to the particular exposure.

Prevention

Nonvaccine

Preexposure

Travelers should:

- Avoid contact with all dogs (including puppies) in countries with canine rabies. Pets in some countries may not be vaccinated against rabies.
- Avoid contact with all animals, including wild mammals, free-roaming animals, and pets that are potential reservoirs (especially an animal that is behaving abnormally), in countries with rabies in wild mammals (e.g., mongooses, raccoons, or skunks).
- Avoid provoking domestic animals
- Avoid touching or feeding monkeys, especially those in temples and national parks, because they often show little fear of humans.
- Use protective measures to avoid bat exposure if planning to visit bat-infested caves.

- Be especially vigilant with children because they are at high risk for exposure and may not report bites, scratches, or other incidents that might occur.
- Avoid bringing animals home as pets; dogs and cats may be infected with rabies, but symptom onset may be delayed for several days or months.

Postexposure

Travelers should:

- Immediately cleanse all wounds thoroughly with copious amounts of soap and water (under a running tap if possible) for a minimum of 15 minutes and urgently seek care.
- Use a virucidal agent (such as povidone-iodine) if available to irrigate the wounds and destroy the virus.
- Have deep wounds explored, cleaned, and irrigated in a hospital (under an anesthetic if necessary) prior to wound closure or suturing.
- Check tetanus vaccination status and receive Tdap booster if indicated.

Vaccine and Rabies Immune Globulin

Preexposure

Rabies vaccine can be given before travel to travelers going to any country with rabies (especially canine rabies) to simplify the postexposure vaccine schedule (to only 2 doses) and eliminate the need for rabies immune globulin (RIG), which is often very difficult to obtain abroad. Preexposure vaccination may also provide some protection if postexposure vaccination after a bite is delayed or if an unapparent exposure to rabies occurs.

Preexposure prophylaxis (PrEP) is recommended for:

- Long-stay travelers (1 month or longer) going to high-risk destinations
- Travelers with likelihood of repeat travel to risk areas
- Shorter-stay travelers in high-risk destinations if more than 24 hours from a reliable source of modern cell-culture rabies vaccine and RIG
- Travelers with extensive outdoor exposure (occupational or adventure) in high-risk destinations where immediate access to appropriate medical care may be limited, regardless of length of stay
- Risk-averse travelers going to high-risk destinations, especially those engaging in high-risk activities

Postexposure

Vaccine ***without*** RIG is given to persons who have previously completed a primary PrEP series at any time.

Vaccine ***with*** RIG is given to persons without a complete PrEP series (2 doses of rabies vaccine; see below). Human rabies immune globulin (HRIG) provides rapid, passive, short-term immunity.

Postexposure prophylaxis (PEP), with or without RIG (depending on PrEP status; see below), is recommended for:

- Bite exposures that include any penetration of the skin by the teeth of a potentially rabid animal
- Nonbite exposures, including scratches or contamination of open wounds, abrasions, or mucous membranes with saliva from animal licks or other potentially infectious material
- Bat exposures (even if unsure whether exposure did or did not occur) from anywhere in the world (all bats should be considered potentially rabid)

PEP is not recommended for indirect contact and certain activities (e.g., petting or handling an animal, contact with blood, urine or feces, and contact of saliva with intact skin) because these do not constitute exposures.

Side Effects

The most common vaccine side effects are mild local reactions, which can include pain, redness, swelling, or itching at the injection site. Fever, headache, dizziness, abdominal pain, insomnia, and gastrointestinal symptoms may also occur. Neurological complications have been reported, albeit rarely.

Persons with underlying medical conditions or who have concerns about the vaccines should speak to their health care provider before vaccine administration.

Timing

Preexposure vaccination consists of 2 doses, 1 each on days 0 and 7. Either a titer check (vaccine response laboratory test) 1 to 3 years after series completion with a booster (third dose) given only if necessary) or, alternatively, an empiric booster (third dose; no laboratory testing) given 21 days to 3 years after series completion is recommended for travelers. Some authorities may consider persons who only received 2 PrEP doses (versus the previously authorized 3-dose series) as unimmunized for purposes of determining the following postexposure strategy.

Duration of vaccine protection is limited to the time interval until any subsequent rabies exposure, at which time postexposure vaccination will be required. Regular boosters are recommended only for persons at continuous or frequent risk (e.g., occupational exposures to rabies virus, animals, or bats), but not for travelers.

Postexposure vaccination, with or without RIG (depending on preexposure vaccination status; see below), is recommended for:

- ***Persons who have received the complete preexposure vaccine series or a prior postexposure series:*** Rabies vaccine only; 2 doses, 1 each on days 0 and 3.

Persons who have not received the complete preexposure vaccine series or a prior postexposure series: Rabies vaccine plus RIG; 4 doses of rabies vaccine, 1 each on days 0, 3, 7, and 14, plus 1 dose of RIG (within 7 days of the first vaccine dose; preferably on the first day of vaccine administration). RIG is injected into and around the bite or exposure site to ensure as much contact with areas of saliva contamination as possible. The remaining RIG is injected intramuscularly at a site distant from the wound. Persons with a weakened immune system should receive 5 doses of rabies vaccine plus RIG, but may be offered a titer check after the fourth dose to determine if additional doses (including the fifth dose) are necessary. Travelers in resource-limited situations where RIG may be unavailable may receive a fifth dose of vaccine on day 28.Preexposure and postexposure regimens can also be administered intradermally (ID), which differs from the more common route of intramuscular administration. Returned travelers may have been started on one of these ID regimens in the exposure country, but public health agencies in the traveler's home country may not recognize these regimens and may recommend restarting a full standard postexposure series.
