

# Rift Valley Fever (RVF)

Rift Valley fever (RVF) is an acute, fever-causing viral disease most commonly observed in domesticated animals (such as cattle, buffalo, sheep, goats, and camels), with the ability to infect and cause illness in humans. The disease is caused by RVF virus, a member of the genus *Phlebovirus* in the family *Bunyaviridae*. It was first reported in livestock by veterinary officers in Kenya's Rift Valley in the early 1910s.

RVF is generally found in regions of eastern and southern Africa where sheep and cattle are raised, but the virus exists in most of sub-Saharan Africa, including west Africa and Madagascar. In September 2000, a RVF outbreak was reported in Saudi Arabia and subsequently, Yemen. This outbreak represents the first cases of Rift Valley fever identified outside Africa.

Outbreaks of RVF can have major societal impacts, including significant economic losses and trade reductions. The virus most commonly affects livestock, causing disease and abortion in domesticated animals, an important income source for many. Outbreaks of disease in animal populations are called "epizootics." The most notable RVF epizootic occurred in Kenya in 1950-1951, resulting in the death of an estimated 100,000 sheep.

Additionally, epizootic outbreaks of RVF increase the likelihood of contact between diseased animals and humans, which can lead to epidemics of RVF in humans. One example occurred in 1977 when the virus was detected in Egypt (possibly imported from infected domestic animals from Sudan) and caused a large outbreak of RVF among both animals and humans resulting in over 600 human deaths. Another example of RVF spillover into human populations occurred in west Africa in 1987, and was linked to construction of the Senegal River Project. The project caused flooding in the lower Senegal River area, altering ecological conditions and interactions between animals and humans. As a result, a large RVF outbreak occurred in animals and humans.

## Transmission

Humans can be infected with RVF from bites of infected mosquitoes and, rarely, from other biting insects that have virus-contaminated mouthparts. More commonly, humans are infected after exposure to blood, body fluids, or tissues of RVF-infected animals. This direct exposure to infected animals can occur during slaughter or through veterinary and obstetric procedures. Infection through aerosol transmission of RVF virus has occurred in the laboratory environment. No human-to-human transmission has been documented.

Several species of mosquitoes are vectors for RVF virus. The dominant species varies by region, affecting the common transmission cycles in that region. In general, the environment, particularly rainfall, seems to be an important risk factor for outbreaks: epizootic events and outbreaks in humans have been observed during years in which unusually heavy rainfall and localized flooding occur.

Several factors help explain this process:

- RVF virus can be transmitted from female mosquitos to offspring via the egg (vertical transmission).
- In the egg, the virus remains viable (infectious) for several years during dry conditions.
- Excessive rainfall enables more mosquito eggs, commonly of the genus *Aedes*, to hatch.
- As mosquito populations increase, the potential for virus to spread to the animals, including humans, on which they feed also increases
- In epizootic events, there is increased handling of infected animals that then increases risk of exposure for humans.

## Signs and Symptoms

RVF virus has an incubation period of 2-6 days following infection and can cause several different disease syndromes. Most commonly, people with RVF have either no symptoms or a mild illness associated with fever and liver abnormalities. Patients who become ill usually experience fever, generalized weakness, back pain, and dizziness at the onset of the illness. Typically, patients recover within two days to one week after onset of illness.

However, a small percentage (less than 8%) of people infected with RVF develops much more severe symptoms, including:

- Ocular disease (diseases affecting the eye), which sometimes accompanies the mild symptoms described above. Lesions on the eyes may occur 1-3 weeks after onset of initial symptoms with patients reporting blurred and decreased vision. For many patients, lesions disappear after 10-12 weeks; however, for those with lesions occurring in the macula, approximately 50% of patients will have permanent vision loss.
- Encephalitis, or inflammation of the brain, which can lead to headaches, coma, or seizures. This occurs in less than 1% of patients and presents 1-4 weeks after first symptoms appear. Though death from this is rare, neurological deficits, sometimes severe, may persist.
- Hemorrhagic fever, which occurs in less than 1% of overall RVF patients, but fatality for those who do develop these symptoms, is around 50%. Symptoms of hemorrhaging may begin with jaundice and other signs of liver impairment, followed by vomiting blood, bloody stool, or bleeding from gums, skin, nose, and injection sites. These symptoms appear 2-4 days and death usually occurs 3-6 days after.

## Risk of Exposure

Approximately 1% of humans infected with RVF die of the disease. Case-fatality proportions for infected animals, on the other hand, are significantly higher. The most severe impact is observed in pregnant livestock infected with RVF, which results in abortion of virtually 100% of fetuses.

For humans, studies have shown that spending time in rural areas and sleeping outdoors at night in regions where outbreaks occur could be a risk factor for exposure to mosquito and other insect vectors. Animal herdsman, abattoir workers, veterinarians, and other individuals who work with potentially-infected animals in RVF-endemic areas (areas where the virus is present) have an increased risk for infection. International travelers increase their chances of getting the disease when they visit RVF-endemic locations during periods when sporadic cases or epidemics are occurring.

## Diagnosis

During the early phase of illness in the blood and in postmortem tissue, the virus may be detected using virus isolation, antigen-detection ELISA, and molecular techniques (PCR). Antibody testing using enzyme-linked immunoassay (ELISA) can be used to confirm presence of IgM antibodies, which appear as an early, transient response, and IgG antibodies, which persist for several years. Both IgM and IgG antibodies are specific to RVF virus.

## Treatment

Because most human cases of RVF are mild and self-limiting, a specific treatment for RVF has not been established. The rare, but serious, cases are generally limited to supportive care.

The most common complication associated with RVF is inflammation of the retina (a structure connecting the nerves of the eye to the brain). As a result, approximately 1% - 10% of affected patients may have permanent vision loss.

## Prevention

A person's chances of becoming infected can be reduced by taking measures to decrease contact with blood, body fluids, or tissues of infected animals and protecting themselves against mosquitoes and other bloodsucking insects. Use of mosquito repellents and bednets are two effective methods. For persons working with animals in RVF-endemic areas, wearing protective equipment to avoid any exposure to blood or tissues of animals that may potentially be infected is an important protective measure.

A number of questions and challenges remain in the control and prevention of RVF. Knowledge regarding virus maintenance and transmission within different mosquito species and the risk factors associated with severe cases of RVF in humans are still under investigation. Potentially, establishing environmental monitoring and case surveillance systems may aid in the prediction and control of future RVF outbreaks.

No vaccines are currently available for human vaccination.

Different types of vaccines for veterinary use are available. The killed vaccines are not practical in routine animal field vaccination because of the need of multiple injections. Live vaccines require a single injection but are known to cause birth defects and abortions in sheep and induce only low-level protection in cattle. The live-attenuated vaccine, MP-12, has demonstrated promising results in laboratory trials in domesticated animals, but more research is needed before the vaccine can be used in the field. The live-attenuated clone 13 vaccine was recently registered and used in South Africa. Alternative vaccines using molecular recombinant constructs are in development and show promising results.

In addition, surveillance (close monitoring for RVF infection in animal and human populations) is essential to learning more about how RVF virus infection is transmitted and to formulate effective measures for reducing the number of infections.

## Resources

- [MMWR Rift Valley Fever Outbreak --- Kenya, November 2006--January 2007](#)
- [MMWR Rift Valley Fever -- East Africa, 1997-1998](#)
- [Viral Special Pathogens Branch Outbreaks](#)
- [WHO disease outbreak news](#)
- Distribution Map

### Additional Resources

- [An Outbreak of Rift Valley Fever in Northeastern Kenya, 1997-98](#)  
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