

# Rabbit Hemorrhagic Disease Virus

## Overview

*What is rabbit hemorrhagic disease virus?*

Rabbit hemorrhagic disease virus (RHDV) is a highly infectious, fatal viral liver disease affecting lagomorphs (rabbits, hares and pikas), including the European rabbit (*Oryctolagus cuniculus*). A calicivirus causes rabbit hemorrhagic disease (RHD). The two most important virus strains include the classical rabbit hemorrhagic disease virus, commonly called RHDV1, and a more recently described strain, RHDV2.

*What is the difference between RHDV1 and RHDV2?*

Scientists first reported rabbit hemorrhagic disease virus type 1 in 1984. RHDV-1 has occurred regularly across much of Europe, Asia, Africa, Australia, New Zealand, Mexico and Cuba since then. Outbreaks also have occurred among domestic rabbits in the Middle East, and single cases of RHD have appeared intermittently in the US and Canada. The disease is restricted to wild and domestic European rabbits, a species widespread in Europe and from which the domestic rabbit is descended. Illness and death primarily occur in adult rabbits. Baby rabbits under 10 weeks of age often naturally resist infection thanks to maternal protection.

Rabbit hemorrhagic disease virus type 2 was first seen in France in 2010. Since then, RHDV2 has become the major virus strain worldwide. The first case of RHDV2 reported in North America was seen in Quebec in 2016. The first confirmed case seen in the US was in 2018. Since 2018, RHDV2 outbreaks have been seen sporadically in domestic rabbit populations throughout the US and Canada. In contrast to RHDV1, RHDV2 infects more animals besides the domestic pet rabbit, and these animals include many species of wild rabbits, hares, and pikas. RHDV2 also causes disease and death in animals as young as 15 to 20 days old.

## Transmission

*How is RHDV spread?*

Rabbit hemorrhagic disease virus is easily spread through direct rabbit-to-rabbit contact of bodily fluids (urine, feces, respiratory secretions) and hair. The virus can also be spread through contact with objects or materials that can carry the virus, such as food, water, bedding, and toys, as well as the clothing and shoes of caretakers who have been in contact with infected animals. The virus can even be spread by insects, animal scavengers or predators that feed on infected dead wild rabbit bodies.

*Who is at risk?*

Rabbits kept for 4-H, for exhibiting at rabbit shows, and meat for personal use may have a higher risk for infection.

*How quickly do signs of disease develop after contact with the virus?*

Rabbit hemorrhagic disease virus type 2 can develop within the rabbit's body for 3-9 days after contact before illness is seen.

*How well does this virus survive outside the body?*

Rabbit hemorrhagic disease virus is stable and can survive in the environment. Under ideal conditions, the virus can remain infectious for 12 weeks or longer. The virus can be found on caging, in bedding, or floor material such as hay, food, toys, and the clothing and shoes of caretakers exposed to an infected animal.

The virus can also survive in decaying rabbit bodies and freezing conditions for long periods. The virus can also persist in frozen infected meat for months. The importation of rabbit meat and by-products may play an important role in introducing RHDV to new geographic regions.

### *Am I or my other pets at risk?*

Rabbit hemorrhagic disease virus cannot spread to humans or other domestic animals. The virus has been found in wild mice living near RHDV2 outbreaks, but these mice did not develop signs of disease.

## **Signs of disease**

There are three potential forms of the disease: acute (sudden), subacute, and chronic (long-term).

- In the acute form of the disease, physical signs of disease begin rapidly and quickly worsen. Infected rabbits rapidly develop a fever followed by a wide range of progressive clinical signs, including depression, lethargy, loss of appetite, bleeding from the eyes, nose, mouth, and rectum, difficulty breathing, neurological symptoms like seizure or loss of balance, blood in or with stools, and jaundice (yellowing of the skin and whites of the eyes) secondary to anemia and defects in blood clotting. Affected rabbits can die within 12-36 hours after clinical signs appear. There is a high death rate in adult and juvenile rabbits affected with the acute form of disease. Infected wild rabbits, hares, and pikas are typically found dead.
- The same clinical signs characterize the subacute form of RHD but they are less severe, with a possibility of survival in adult rabbits.

## **Diagnosis**

A presumptive diagnosis of RHDV is often based on history, risk review, and clinical signs. There are also laboratory tests that can find the presence of the virus such as reverse transcription polymerase chain reaction (RT-PCR) and enzyme-linked immunosorbent assay (ELISA) tests. Test results typically take 1-5 business days, but unfortunately, many animals may have died from the infection during this time. Therefore, testing helps care for other animals at risk of contact, and preventing viral spread.

Diagnosis is often obtained at autopsy by seeing consistent signs such as a pale liver and bleeding in tissues. Fresh or frozen samples of tissue from dead rabbits can also be submitted for testing.

## **Treatment**

There is no treatment for RHDV. Despite the high rate of death, supportive care in rabbits infected with the subacute form can be rewarding, as some adult rabbits survive.

## **Prevention**

Prevention and control of RHDV is best achieved by these means.

- Separation and isolation of infected rabbits
  - Rabbits that survive RHDV infection can carry the virus for up to 2 months. Carriage of virus combined with the virus's high resistance to environmental conditions means separating and isolating rabbits who have survived infection along with thorough disinfection is critical.
- Preventive vaccination of vulnerable rabbits and high-risk populations (*see below*)

- Protect domestic rabbits from infection by using detailed step-by-step biosecurity plans.

Biosecurity refers to everything you can do to keep disease away from your rabbit, including hand washing, changing clothes between rabbit groups, and not sharing equipment with other facilities or owners. Biosecurity recommendations for RHDV include:

- DO wash hands with warm soapy water before entering your rabbit area, after removing protective clothing and before leaving the rabbit area.
- DO keep new rabbits separated from your existing rabbits for at least 30 days. Use separate equipment for newly acquired or sick rabbits to avoid spreading disease. Physical examination by a veterinarian is recommended before ending quarantine.
- DO sanitize all equipment and cages on or off premises before they are returned to the rabbitry. Disinfect with 0.5% household bleach solution (sodium hypochlorite), 1-stroke Environ® (Vestal Lab Inc., St. Louis, MO, USA), or 4-10% sodium hydroxide. All these disinfectants have been shown to inactivate the virus effectively.
- DO establish a working relationship with a veterinarian to review your biosecurity practices.
- DO NOT allow pet or wild rabbits have contact with your rabbits or gain entry to the facility or home.
- DO NOT release pet rabbits into the wild.
- DO NOT allow visitors in rabbitries or let them handle pet rabbits without protective clothing (including coveralls, shoe covers, hair covering, and gloves).
- DO NOT introduce new rabbits from unknown or untrusted sources. Do not add rabbits to your rabbitry from animal shelters or other rescue operations.
- DO NOT feed hay grown or stored outdoors in areas where wild rabbits are affected by RHD.
- DO NOT touch dead wild rabbits.
- DO report multiple dead wild rabbits to state wildlife officials.

## Vaccination

In many countries where RHDV circulates, vaccinations have been given to pet rabbits for many years. In 2021, with RHDV affecting US pet rabbit populations, the US Department of Agriculture authorized the emergency use of the Medgene RHDV2 vaccine (Medgene Labs, Brookings, SD, USA). The inactivated vaccine containing dead virus particles is given by injection as a two-dose treatment plan, 21 days apart. The vaccine is safe for rabbits 4 weeks of age and older. Possible side effects associated with vaccination include a small swelling at the injection site, fever, or lethargy lasting up to 48 hours after administration. RHDV2 vaccines provide no cross-protection against RHDV1.

## References

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