



RHDV Frequently Asked Questions

This document was developed by a multi-agency working group chaired by members of the National Assembly of State Animal Health Officials. It has been customized to the needs of Vermont and was last updated on July 29, 2020. Further updates will be made as needed to remain pertinent during this evolving situation.

Rabbit Hemorrhagic Disease - Overview

What is rabbit hemorrhagic disease (RHD)?

RHD is a highly contagious, fatal viral disease in rabbits caused by multiple virus strains. It is an internationally reportable disease to the world organization for animal health (OIE).

Veterinarians and laboratory officials are required to report findings of RHD to the Vermont Agency of Agriculture. Rabbit owners and handlers are also encouraged to report findings of rapid and unexplained rabbit death or detection of signs that could be consistent with this disease to their veterinarian or to the Vermont Agency of Agriculture by calling (802)828-2421.

What are the differences between the different RHD virus types?

Rabbit hemorrhagic disease is caused by rabbit hemorrhagic disease virus (RHDV), a member of the genus Lagovirus and family Caliciviridae. There are many strains of RHDV, and three major viral subtypes: RHDV (“classical RHDV”); the antigenic variant RHDVa; and the recently emerged virus RHDV2 (also called RHDVb). Related lagoviruses, called rabbit caliciviruses, circulate in healthy rabbits. These viruses can confer varying degrees of cross-protection to RHDV.

While most rabbit caliciviruses do not appear to cause any illness, two potentially pathogenic strains have been reported. One virus identified in the U.S. (proposed name “Michigan rabbit calicivirus”) was isolated from an outbreak that resembled rabbit hemorrhagic disease, although an attempt to reproduce the disease in experimentally infected rabbits resulted in little or no illness. A related strain, the Ashington strain of rabbit calicivirus, was recovered from dead wild rabbits during an outbreak in Europe.

What are the differences between the different RHDV1 and RHDV2 virus types?

There are many strains of the RHD virus, but three are of most concern. RHD Type 1 has two forms, RHDV and RHDVa. RHD Type 2 has just one form, RHDV2. The two forms of Type 1 are similar and their vaccines are cross-protective. They tend to not affect young bunnies but have a very high mortality rate for adult rabbits. RHDV2, on the other hand, seems less deadly than the Type 1 strains but affects all ages of rabbits. The RHDV2 vaccine only protects against that

type. All RHD virus types are in the viral family Caliciviridae and genus Lagovirus. These viruses are not related to coronaviruses, including the coronavirus strain that causes COVID-19.

How can I tell if my rabbit has RHD?

Only laboratory tests utilizing samples collected post-mortem can confirm a diagnosis of RHD. However, RHD should be suspected if a rabbitry experiences illness in most/all rabbits, high fevers, poor appetites, depression, inactivity, bloody discharges, seizures, and/or sudden death. Call your veterinarian right away if you have any concerns about your rabbit's health. Usually RHDV2 is associated with mass morbidity (illness) and mortality (death) in a colony or herd.

What should I do if I suspect my rabbits have died from RHD?

First, contact your veterinarian to report your concerns. Your veterinarian will contact the Vermont state or federal veterinarian. If you do not have a veterinarian, contact the VT state veterinarian directly at (802)828-2421. Second, preserve at least one rabbit (if a large colony die-off) for testing by double bagging the carcass and refrigerating it. Do not freeze the carcass as this will render it unavailable for diagnostic testing. Liver samples are required for PCR testing, and there is no antemortem test available at this time.

How is RHD transmitted?

Rabbit hemorrhagic disease spreads between rabbits mostly by ingestion and inhalation of the virus. The virus is present in urine and feces from infected rabbits, so contaminated bedding, food or forage can be a source of infection. The virus can also be moved from place to place by mechanical vectors and fomites (flies, predators, scavengers, feral domestic and wild rabbits, vehicle tires, clothing, footwear, cages, equipment, and wind and water movement).

Can humans, dogs or other animals contract RHD?

RHD is not a zoonotic disease, is unrelated to coronavirus, and there is no public health significance. However, consuming the meat of an infected rabbit is not recommended due to the potential to spread the virus to other susceptible rabbits during processing. RHD is specific to rabbits. Dogs, cats, and other pets cannot contract the disease but can transport the virus just like vehicles, shoes, and equipment can.

Can rabbits that have been exposed and recover or never become ill carry the virus?

Exposure to the virus does not necessarily mean a rabbit is infected with the virus. Some rabbits will just be exposed; others will be exposed and become infected and either die or recover. Recovering rabbits will develop antibodies to the virus and become resistant to related calicivirus strains for an unknown period. Infected rabbits can "carry" or shed the virus for over a month, perhaps up to four months (when experimentally infected); they are not believed to be infected and shed for life.

Where did the virus come from?

The RHD virus was first identified in China in the early 1980s. Outbreaks occur periodically throughout the world and continually in some countries but have been quite rare in North America. Since 2019 RHDV2 has been an emerging disease issue in North America; British

Columbia experienced outbreaks of RHDV2 in 2018-2019, primarily on Vancouver Island. Isolated cases were reported in OH in 2018 and NY in 2020. WA had an outbreak in 2019-2020. A multistate outbreak in NM, AZ, CA, CO, TX, NV and UT started in 2020 and is ongoing. Mexico has also confirmed detection of RHDV2 virus in 6 northern states. The source of the recent RHDV2 outbreaks has not been identified.

Will the virus be here from now on?

The presence of RHDV2 in feral domestic and multiple wild lagomorph species (including jack rabbits and cottontails) complicates disease control and eradication efforts. It is difficult to control and eliminate diseases that can be spread and maintained in wildlife populations and the disease will likely become endemic in some US states. Perhaps RHD will manifest as periodic die offs of feral domestic and wild rabbit populations. Those who own rabbits and live in states with infected feral domestic and wild populations should plan on enacting recommended biosecurity practices from here on and consider vaccinating once an unregulated domestic vaccine becomes available.

Are all RHDV2 viruses the same?

Viruses in general do an excellent job of mutating, and the RHDV2 viruses in the North American outbreak are phylogenetically different. The NVSL Foreign Animal Disease Diagnostic Laboratory completed full genome sequencing and analysis of RHDV2 isolates detected in the United States from 2018 through 2020, including from the ongoing outbreak in the southwestern United States.

The phylogenetic analysis indicates isolates cluster by geographical region (NY, OH, and WA are all different from SW states). The most recent southwestern isolates form a single genetic cluster suggesting that the outbreak of RHD in these states was caused by the introduction of a single genetic isolate into the region; this virus is responsible for the disease in both wild rabbits and hares and domestic rabbits.

Are wild rabbits susceptible to the RHDV2 strain of virus?

RHDV2 has a wide host range and can infect wild rabbit species. The Southwest U.S. outbreak of RHDV2 has affected native North American rabbits and hares including black-tailed jackrabbits, desert cottontail rabbits, mountain cottontail rabbits, and antelope jackrabbits. Eastern cottontail rabbits have been shown to be susceptible in experimental studies. As the disease spreads, RHDV2 may be confirmed in additional North American lagomorph species.

How long can RHDV persist in the environment?

The virus can survive for long periods outside the host. Environmental temperature, humidity, and protection by organic material are important factors in virus survival. Viable virus has been detected for as long as 105 days on a fomite at room temperature and in decaying tissue of infected carcasses for up to 90 days. The virus also persists in chilled or frozen rabbit meat. The virus can remain viable for 22-35 days at 72°F. It survives freeze-thaw cycles.

Response and Disease Containment

Has RHD been confirmed in Vermont?

There have been no cases of RHD confirmed in Vermont. The Vermont Agency of Agriculture will follow up on cases of unexplained domestic rabbit morbidity and mortality reported by owners or veterinarians. The method of follow up will depend on the circumstances associated with the illness or death. Find the most recent information about detection of RHDV2 in other parts of the U.S. on this interactive map: <https://usda-aphis.maps.arcgis.com/apps/webappviewer/index.html?id=37791da88ef04cd08404a5794aaf0be3>

What will happen to my rabbit colony if RHDV2 is confirmed? Is euthanasia required?

The rabbits on the property will be quarantined from 30-120 days, depending on the biosecurity practices on the premises and other variables. The two additional options for management of infected domestic premises include euthanasia with an observed fallow period prior to restocking or no euthanasia with an observed quarantine period prior to restocking. Both options require premises quarantine, proper disposal, strict cleaning and disinfection protocols and biosecurity implementation. If your rabbits become infected with RHDV2, the Vermont State Veterinarian will work with you to customize the best plan for your premises based on your individual facility, biosecurity plan and identified risk factors.

Decisions around colony euthanasia will vary based on risk (indoor vs outdoor, location of the infected premises, biosecurity risk factors, etc.). Neither Vermont nor USDA have funding for indemnity to reimburse rabbit owners for their losses.

Disposal Questions

What should I do if one of my domestic rabbits dies?

If your rabbit dies and RHD could be the cause, contact your veterinarian immediately. Death due to RHD should be considered if multiple other rabbits in the colony are sick, dying or dead; if recent additions to the colony have been made originating from affected areas of the U.S.; and/or if your veterinarian concludes that RHD is a possible cause of death based on the history and clinical signs. To remain eligible for RHD testing, the deceased rabbit should be double bagged and refrigerated while you await further instruction. Disinfect the outside of the bag with 10% bleach. Do not freeze the carcass. Contact the Vermont state veterinarian's office at (802)828-2421 for more information.

Always wear disposable gloves when handling a dead animal; dispose of them when done and wash your hands. Rabbits that do not qualify for testing should be double bagged and disposed of via deep burial to prevent scavenging.

Can I use a rabbit that has died of RHDV for human or animal consumption?

No. Although there is no public health concern with RHDV, the virus can persist for long periods of time and could infect or reinfect a premises. Viable virus has been detected in the tissue of infected carcasses for up to 90 days. It persists in chilled or frozen rabbit meat for

years. Meat from wild or domestic rabbits that died from RDHV during an outbreak should not be processed, transported or sold. If you have rabbits that have later been confirmed with RHDV, you should clean out your freezer and dispose of carcasses of animals that likely died of RHDV.

How do I dispose of a dead rabbit?

Double bagging with deep burial is the preferred method of disposal since Vermont prohibits organic material from entering the landfill stream. Burial must be deep enough to discourage scavenging by wildlife. Disposal methods must always comply with local ordinances and state laws. The carcasses of rabbits suspected of dying from RHD should not be disposed of without first contacting your veterinarian or the Vermont State Veterinarian.

Vaccination Questions

Is a vaccine available?

A vaccine is not currently available in Vermont. Commercial RHD vaccines are manufactured in Europe. Limited production capacity and supply of the vaccine restricts vaccine use to rabbits at immediate risk, in or near a quarantine area, or where wild rabbits are infected and maintain the virus. In situations such as the current outbreak in the southwestern United States, the USDA may issue a license to veterinarians to import the vaccine under a special permit if these veterinarians complete a federal application process. The permit does not allow widespread use of the vaccine in unaffected areas. The available vaccine requires an annual booster. It is possible that a domestic unregulated vaccine product will be available by the end of this calendar year.

Why is the vaccine so difficult to obtain?

The USDA's Animal and Plant Health Inspection Service (APHIS) classifies RHD as a foreign animal disease (FAD), a serious animal disease present in other countries but not the United States. State Animal Health Officials work together, with departments of fish and wildlife, and with federal partners to identify and prevent FADs, including RHD, from spreading to animals in the U.S.

The vaccine is unapproved and unlicensed in the U.S. and must be imported from Europe. The importation of vaccine requires special permits, port brokers and people to maintain the vaccine in the cold supply chain to ensure efficacy. In addition, the vaccine companies that manufacture those vaccines have limited production capacity and cannot keep up with U.S. demand.

The production process that is necessary to manufacture the killed vaccines includes the use of live rabbits. However, Filavac and Eravac are the only viable vaccine options we have at this time. The USDA Center for Veterinary Biologics (CVB) will only approve the use of these killed vaccines for conditional use in the United States as a tool in the face of an outbreak. The Nobivac Myxo-RHD Plus vaccine product includes myxomatosis, another serious and fatal

disease of rabbits. USDA CVB will not authorize the importation of any vaccines that include myxomatosis, because those vaccines are live, recombinant viruses and environmental laws prohibit release without extensive testing and risk assessment in the United States.

Will we ever have an approved vaccine in the US?

Currently, a U.S. manufacturer is working with a university to develop a domestic, FDA approved, new-generation vaccine for RHDV. The vaccine would not require the use of live rabbits for vaccine production and could be scaled up much more easily. Once the product is approved, veterinarians will be able to access the vaccine without special federal or state permission. A domestic vaccine may be available by the end of this calendar year.

Are vaccinated rabbits considered “infected” and shedding virus for life?

The RHDV vaccine is a killed vaccine; it will not cause the disease and rabbits will not shed live vaccine virus after vaccination. It should stimulate vaccinated animals to produce protective antibodies against the RHDV2, thereby preventing illness. If vaccinated rabbits are tested for antibodies by the ELISA laboratory test, antibodies to the vaccine will be detected. A test is available to distinguish antibodies resulting from vaccination vs. infection. In the U.S., the only test available to detect the RHD virus is PCR. The PCR test is not performed for live animals. This test is only available at the Foreign Animal Disease Diagnostic Laboratory on Plum Island, NY, because RHD is a foreign animal disease.

Can vaccinated rabbits infect other rabbits after vaccination through their saliva?

No. Killed vaccines are inactivated, so there is no chance of the vaccine causing disease spread to other rabbits via saliva, feces, hair, etc. However, vaccinated or unvaccinated rabbits can passively carry the virus on their feet, hair, whiskers, etc. and move it that way, just as with human feet, car tires, shovels, etc.

What are the benefits of vaccination?

Vaccination is a tool to protect domestic rabbits in high risk areas. Vaccination does not prevent infection; it boosts the immune system so most rabbits do not die if exposed. Vaccinations are like insurance--one's use of them reflects one's willingness to accept risk. Because of the seriousness of this disease and how contagious it is, it would be best for all owned rabbits to be vaccinated where infected domestic, infected feral domestics or infected wild rabbits have been detected. However, the vaccine is not 100% effective, must be given every year, and may be too expensive for some owners. In that case, rabbit owners must rely on stringent biosecurity to reduce risk (see the biosecurity guidance document).

Do I have to vaccinate my rabbits if I live in an area with infected rabbits?

No, but ALL rabbit owners should implement biosecurity measures to reduce risk to their rabbits.

Where can I get my rabbits vaccinated?

Only veterinarians who apply to import the vaccine through the USDA can obtain the vaccine, and Vermont currently is ineligible to use the European vaccine products. If Vermont qualifies

as a high-risk state eligible for imported vaccine use in the future, the Vermont State Veterinarian will notify practicing veterinarians of the process they would need to use to obtain doses of the vaccine. Once a domestic vaccine product becomes available, access to vaccine products will be easier.

Biosecurity

Please refer to the document entitled *Rabbit Hemorrhagic Disease (RHDV2) Biosecurity Guidance* for rabbit biosecurity recommendations.

Shows and Exhibitions

Please refer to the document entitled *Rabbit Hemorrhagic Disease (RHDV2) Shows and Exhibitions Guidance Document* for recommendations on how to keep rabbits safe at commingling events.

Resources and Information on RHD

How can I keep updated on RHD information in Vermont?

Contact the Vermont state veterinarian at Kristin.haas@vermont.gov to be added to the Vermont rabbit industry distribution list to receive updates on this topic. You will then receive prompt notification of RHD-related news or events. Please also check our website frequently for updated guidance materials and other recommendations:

<https://agriculture.vermont.gov/animal-health/rabbit-hemorrhagic-disease>

Where can I get more information on RHD?

Sources of more information intended for various audiences include:

- http://www.cfsph.iastate.edu/Factsheets/pdfs/rabbit_hemorrhagic_disease.pdf
- https://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/RHD.pdf
- https://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/3.06.02_RHD.pdf
- https://www.aphis.usda.gov/animal_health/emergency_management/downloads/sop/sop_rhd_e-e.pdf
- https://www.aphis.usda.gov/animal_health/downloads/Rabbit-Hemorrhagic-Disease_062018.pdf
- https://www.aphis.usda.gov/animal_health/downloads/emerging-risk-notice-rabbit.pdf
- https://www.aphis.usda.gov/animal_health/emergency_management/downloads/disinfection-options-for-rabbit-hemorrhagic-disease.pdf

USDA APHIS Resources

- Rabbit Hemorrhagic Disease in the United States (April 2020)
- Rabbit Hemorrhagic Disease Factsheet
- General Guidance for Cleaning and Disinfection of Rabbit Hemorrhagic Disease
- RHDV2 Vaccine Frequently Asked Questions (FAQs)

USGS National Wildlife Health Center Resources

Wildlife Health Bulletins regarding RHDV2 available at
https://www.usgs.gov/centers/nwhc/science/wildlife-health-bulletins?qt-science_center_objects=0#qt-science_center_objects

Non-Government Organizational Resources

American Rabbit Breeder's Association <https://arba.net/announcements/>
House Rabbit Society <https://rabbit.org/rhdv/>