

Rabbit Hemorrhagic Disease Standard Operating Procedure

Background

The IWRC mission statement is “We provide evidence-based education and resources on wildlife rehabilitation to move the field of wildlife rehabilitation forward; to promote wildlife conservation and welfare; and to mitigate human-wildlife conflicts worldwide, through the better understanding of wild animal ecology, behavior and welfare.”

- The welfare of wild rabbits, and supporting their survival globally, falls within the scope of our mission
- The release of non-indigenous animals of any species but in this situation, domestic rabbits, into the wild is prohibitive to the survival of the natural species and can contribute to spreading the deadly virus RHDV2
- Poor agricultural habitats and practices for processing rabbit meat and Angora wool can also contribute to the spread of RHDV2

The RHDV Disease

RHDV is caused by a virus in the calicivirus family and is most often fatal to rabbits who contract the disease. However, there are three types of the virus: RHDV and RHDVa, which belong to the same serotype, and RHDV2 (sometimes referred to as RHDVb), which belongs to a different serotype. It is the latter that is not only deadly to the European rabbit, (*Oryctolagus cuniculus*), be they wild, domestic, feral (domestic rabbits released into/established in the wild), but also to some wild European hares (*Lepus spp*), and North American hares (*Lepus spp*), and rabbits (*Sylvilagus spp*). This virus is not considered a zoonotic disease in that it is not transmittable to the human population.

Geographic Distribution

There are three major viral subtypes of Rabbit Hemorrhagic Disease RHDV/RHDVa and RHDV2.

First diagnosed in Angora rabbits imported to China in 1984, the RHDV virus resulted in 14 million domestic rabbit fatalities worldwide within nine months of being identified.

In New Zealand and Australia, the virus was introduced as a “natural” method to manage out of control rabbit populations. By the late 1990’s, forty countries had been affected by the virus. RHDV first appeared in domestic rabbits in the US in 2000. The disease caused by the RHDV2 was first

identified in France in 2010. It subsequently spread widely among domesticated and wild rabbits in Europe, where it caused significant losses. Its presence in Australia was also noted. In March 2018, RHDV2 was reported in domestic rabbits and feral rabbits in southwestern British Columbia (not far from the Canada/US border), and again, in 2019 in domestic rabbits in WA state. However, aside from several documented cases, affecting domestic rabbits, the United States was unaffected, until now. In fact, it was originally thought that the North American wild rabbit population was not susceptible to the virus. This has now been confirmed as untrue, because for the first time, there are [confirmed cases](#) in the US of jackrabbits and cottontails with the disease. This has resulted in risk advisories to be published in AZ, NM, TX, CO and CA in 2020.

Transmission of the Disease

- Direct contact with infected rabbits through oral, nasal or conjunctival routes (The WA State Division of Agriculture is one source that states that the virus can be transmitted directly through inhalation)
- It is highly resistant to cold and hot temperature
- It can survive up to three months without a host
- It is strongly suspected that scavenging birds can carry the disease (Per the Wiley Online Library, the virus spreads at a minimum speed of 15 – 60km/week and can cross 20 – 100km of water via birds or insects)
- It can be carried by flies and other insects (virus can last up to nine days in flies)
- Predators (mammals) and scavengers feeding on infected carcasses can carry the virus and/or release it in their feces in another location
- Access to shared bedding, feed and water, feces and other bodily fluids of infected rabbits
- Infected carcass exposure
- Fomites indirectly spread the virus through transport of contaminated materials (bedding, human clothing, hands, vehicles, pet carriers, forage) from one area to another
- Importation of infected rabbit meat and Angora wool

Clinical Symptoms

Once infected, signs of the disease appear in 1-9 days. The symptoms vary and can occur within hours of onset of the disease in an apparently healthy rabbit (peracute disease), or persist for several weeks before ultimate death (chronic disease). Rabbits can develop a fever and die suddenly within hours with the only clinical sign being terminal squeals followed by almost immediate collapse and death (peracute disease). Other rabbits (acute disease), will survive longer with clinical signs of dullness, apathy, anorexia, behavioral changes, congestion and conjunctiva, and/or prostration. In addition, neurological signs may be present resulting in lack of coordination, flipping in the cage, convulsions, mania and paddling, etc. At the time of death, a bloody nasal discharge may be noted.

Later signs related to organ failure include jaundice, respiratory failure, diarrhea, weight loss and bloating.

Reported incubation period in experimentally infected rabbits

RHDV/RHDVa – 1 to 3 days

RHDV2 – 3 to 9 days

While all ages of rabbits can be infected, there are differences between RHDV/RHDVa and RHDV2. In RHDV/RHDVa the symptoms are subclinical in young rabbits (younger than 4 - 8 weeks of age) meaning they are usually nearly or completely asymptomatic. In older rabbits, peracute and acute disease is more common.

RHDV2 causes disease and mortality in young rabbits as well as older rabbits. It has been diagnosed and reported in rabbit kits as young as 11 days of age. Experimentally, peracute and acute cases were less common with RHDV2.

Vaccinations

There are three vaccines produced and available in Europe which offer protection against different strains of the RHD virus. A fourth vaccine is not yet commercially available in Europe.

Two of the vaccines offer additional protection against myxomatosis, a rabbit poxvirus infection, spread from wild rabbits (sometimes as asymptomatic carriers), to domestic rabbits via biting insects (mosquitoes, fleas, black flies and fur mites). Myxomatosis can be spread directly from an infected rabbit to a healthy rabbit, and indirectly by handling an infected rabbit and handling a healthy rabbit afterwards. The disease is almost always fatal, and symptoms include swollen eyelids, lips and genitals, a high fever and lethargy, progressing to respiratory distress and ultimately death.

The British Small Animal Veterinary Association (BSAVA) recommends annual vaccinations of domestic rabbits for all three diseases, RHDV/RHDVa, RHDV2 and Myxomatosis in areas of elevated risk. Until the Nobivac Myxo-RHD Plus is commercially available, this requires a combination of vaccines. As recommended by the BSAVA, owners should “always work in partnership with their veterinarian when evaluating risk factors for their rabbit which may influence the type and frequency of vaccination recommended. These factors could include geographical location and local risk, indoor or outdoor housing regime and contact with other rabbits whether at shows, when boarding or by other means.”

- 1) [Filavac](#) which is effective against both the original variant of RHD and RHDV2, is widely used for pet rabbits (per Dr. Tom Donnelly, a research professor in exotics at the National Veterinary School at Alfort, Maisons-Alfort, France)
- 2) [Eravac](#) which is effective only against RHDV2, is preferred by the rabbit meat farming industry in Europe (per Dr. Tom Donnelly, a research professor in exotics at the National Veterinary School at Alfort, Maisons-Alfort, France)
- 3) [Nobivac Myxo-RHD](#), which is effective against RHDV1 and myxomatosis, In the past few years, anecdotally the Rabbit Welfare Association and Fund (RWF) has observed an increasing number of reports of rabbits vaccinated with Nobivac myxo-rhd contracting serious cases of myxomatosis, with more than would be expected dying as a result – additional research is required
- 4) [Nobivac Myxo-RHD Plus](#), Launched May 1, 2020, MSD Animal Health, a division of Merck & Co., Inc., Kenilworth, N.J., USA, introduced the NOBIVAC® Myxo-RHD PLUS vaccine which has been approved for use in Europe. It is effective against classical RHDV and RHDV2 and myxomatosis with a single injection that must be renewed annually.

Currently, vaccinations have been approved for use in the United States (TX, AZ, NM, WA), for controlling RHDV2 and there are several other states working on importing the vaccine. As the RHDV2 virus becomes more common in the United States, there are an increasing number of rabbit breeders, agricultural farmers, rescue groups and pet owners calling for a vaccine readily available in the US. Prior to the 2020 outbreak, veterinarians in Canada and the US had limited success with importation of one of the vaccines.

- Dr. Adrian Walton owns a companion animal hospital in Vancouver, British Columbia, with a special focus on exotic animals, especially rabbits. When news of the RHDV2 virus hit affecting domestic and feral rabbits, he reached out to Filavie (makers of Filavac) and to the proper authorities to import Filavac. He selected this vaccine because the commercial rabbitries were not interested in vaccinating for RHD. Dr. Walton received a conditional use permit for use at his clinic only.
- However, Dr. Jane Pritchard, British Columbia's former Chief Veterinary Officer stepped in and ordered the vaccine through the province's animal health center and made it available to veterinarians in the affected areas.
- Dr. Alicia McLaughlin at the Center for Bird and Exotic Animal Medicine (CBEAM) is the first veterinarian in the US known to have successfully imported RHDV vaccines. The Filavac vaccine, specifically developed for use against RHD2 and proven safe and

effective in protecting rabbits from the disease, is only licensed overseas, and effective for at least one year for 90% of vaccine recipients, although some rabbits had immunity for 18 months (Morin et al, 2015 in Journées de la Recherche Cunicole). The issue with the vaccine is that it is extremely difficult to import into the United States. There is an available request form, but the legal assistance and time involved to import the vaccine has made it cost prohibitive. Currently, Dr. McLaughlin is assisting Dr. Joel Cuthbert in WA and Dr. Todd Driggers in AZ. with the US importation process.

- Dr. Ralph Zimmerman, State veterinarian for New Mexico, is working with the USDA to authorize veterinarians in his state to import and use one of the vaccines.

Biosecurity

Sterilization – how to inactivate RHDV (Top Three Disinfectants Bolded)

The virus cannot be degraded by trypsin, chloroform, ether, or quaternary ammonium compounds

Remove ALL organic debris prior to disinfecting or the disinfectants listed will not work effectively

Adhere to proper contact times or the disinfectants will not be effective

Wash the surface first, then use:

- **Potassium Peroxymonosulfate (Virkon)**
- **0.5% sodium hypochlorite (as solution of 1:10 household bleach to water) – once diluted, bleach loses efficacy after 24 hours**
- **Accelerated hydrogen peroxide (Prevail, Accel, Rescue wipes/solution and Peroxigard)**
- 10% sodium hydroxide mixed with water
- 1-2% formalin
- 2% One-stroke Environ® disinfectant
- Parvoviricide disinfectant

Speak with state officials or a veterinarian about obtaining these disinfectants. Be sure that no animals are in the vicinity when the disinfectants are used. Contact times vary by chemical content and testing by manufacturer. Be sure to read the label prior to using the disinfectant to maximize efficacy. Per Disinfection Digest...Focus on Science (The Importance of Contact Times for Disinfectants (Omidbakhsh, N. CJIC 2008; 23:49)), “Accelerated Hydrogen Peroxide was the only chemistry that was able to achieve disinfection using the drying time regardless of contact time. Facilities that do not achieve the appropriate contact time for disinfectants in accordance to the approved label contact time may not be achieving the level of kill required. Education is paramount to ensuring products are used appropriately. If staff using cleaning and disinfecting products do not have the basic understanding of best practices for cleaning within a healthcare facility there is a

significant risk that the level of kill needed is not occurring. Furthermore, facilities that want to ensure that disinfection is in fact occurring should look at chemistries that have proven cleaning efficacy, the ability to kill in short contact times and also the ability to kill within the length of time the product takes to dry.”

Carcass Removal

- Handling the remains should be determined by state and/or federal authorities. Most often, incineration or burial is recommended. A study found in the Cambridge University Press suggests that RHDV in animal tissues such as rabbit carcasses can survive for at least 3 months in the field, while virus exposed directly to environmental conditions, such as dried excreted virus, is viable for a period of less than one month. Survival of RHDV in the tissues of dead animals could, therefore, provide a persistent reservoir of virus, which could initiate new outbreaks of disease after extended delays.

Intake

- Now more than ever it is imperative that there is a concerted effort to reunite and leave rabbit kits in the wild whenever possible. In affected areas, every wild rabbit that is accepted into a rehabilitation facility poses a threat to the rabbits already being rehabilitated. The decision to accept new rabbits into a rehabilitation facility will be up to the individual facility if state officials allow rabbits to be accepted into a rehabilitation facility. It is critical that the finder is vetted as to the area the orphaned/injured/ill rabbits are from (specific address and contact information of finder), as well as what exactly happened to cause them to require assistance. Every opportunity must be exhausted to reunite the young with their mother and keep them in the wild. If they are cat caught, dog caught, mower accident, the rehabilitator must be cautious. They must determine answers to questions such as: were the babies well fed or has the mother not been present for a while? Was the mother possibly taken by a predator or disease like RHDV2? Each intake represents risk in affected areas. Transporter and third-party involvement should be discouraged because too many details are lost in the exchange when there are more than two individuals involved.

Quarantine

- **All rabbits regardless of reason for intake should be quarantined for a minimum of 10 days.** Clinical signs of the disease usually appear within 1 – 9 days after exposure.

Clinic Set Up

- Rehabilitation facilities accepting rabbits must implement and adhere to strict protocols. Since the virus will usually show itself within 3 – 9 days in a rabbit, it is imperative that each new litter or singleton accepted into the facility has a separate space.
- **Cages cannot be side by side or facing each other, as transmission of the disease can happen nasally, conjunctively and orally. Cages should be at a minimum 3 – 4 feet apart, more if possible.** Each facility will have to assess the maximum number of cages that can be used while keeping cages properly separated. There should be one room for intake/quarantine and a separate room for healthy rehabilitating rabbits, and potentially a third room for compromised rabbits (degloved, head trauma, etc.). Placing a lightweight covering over each cage a few feet apart, is not enough for maintaining an airborne transmission free zone because cage coverings are removed for cleaning. The act of cleaning itself can disturb contents and cause the spread of the disease. Every cage should have separate equipment. This means that what is usually set up per room must now be set up per cage. There must not be any overlap with syringes, **feeding tubes**, bowls, hay, substrate, cleaning tools, medications. For most facilities, this will require a drastic decrease in rabbits admitted.

Personal Protective Equipment

- The use of PPE cannot be over emphasized to prevent transmitting the disease between rabbits. For every cage of rabbits, a new set of PPEs (gloves, gown, goggles, mask, hair net) should be used. There is a specific order to donning and doffing personal protective equipment. For more information visit https://www.cdc.gov/vhf/ebola/hcp/ppe-training/n95respirator_gown/doffing_08.html. Jewelry should be removed or kept to a minimum as it can potentially become a carrier for disease. Mandatory access to hand washing and disinfectants that the virus is not resistant to is vital. Hands should be thoroughly washed prior to and after handling a cage of rabbits. Booties should be worn over shoes and fastened with rubber bands. Foot baths are strongly advised, when the disinfectant is changed daily and more often, when necessary, determined by traffic in the area. See disinfectants to use above.

Proper Disposal Protocols

- There may be new protocols established in various states in the context of RHDV2. Rehabilitators should consult with their individual state's health department and wildlife agency for guidance on how to handle the daily substrate cleaning and carcass removal. States may prefer incineration, burying the contents, double bagging and

disposal, or other special requirements. The rehabilitation facility's veterinarian should be kept apprised of any changes, such as sudden deaths in the center. Any items or surfaces that were exposed to potentially ill rabbits must be thoroughly cleaned and disinfected. It's important to remember that the virus can remain dormant for up to three months and is easily transferred from one rabbit to another directly and indirectly.

Feed

- Foraging in the yard or garden is not advised in affected areas. The disease can easily be transported on greens that an ill rabbit defecated on or nibbled on, even if that rabbit is not present in the area. In rabbit habitat, it is best not to move outdoor caging around to give rabbits exposure to new greens. Any hays, weeds, greens, garbage around the caging areas should be removed or securely stored. **Feeding quarantined animals should be done last.**
- Per Micah Kohles, DVM, MPA and VP of Technical Services and Research for Oxbow Animal Health, current hay being shipped to consumers is from 2019, well before the outbreak. Going forward, they will closely monitor the areas of concern; where the hay is grown, how it is stored and for how long since the virus can remain dormant for up to three months.

Donations

- Caging, food, and other items are often welcome in rehabilitation facilities operating on very tight budgets. However, caging from other rehabilitators and items from well-meaning donors should not be accepted unless there is firm confirmation of the safe origin of the donations.

Enrichment

- Branches, logs, pinecones from the outdoors should be eliminated if collected from known or near known infected areas. Even when taken from above ground level, birds and insects may have infected the available natural elements. Cage hideaways must be discarded if there was exposure to an infected or potentially infected rabbit, unless that hideaway is not porous material (cardboard, wood) and can withstand the disinfection process.

Transfers Between Rehabilitators

- Once rabbit(s) are accepted into a facility; transfers should be kept to a minimum. In the event that a rabbit is infected, transferring that animal to another facility will only increase the potential for contamination, infection and death.

Release

- Normally release occurs within 3 – 4 weeks of intake. However, with the RHDV2 virus this may change. If the rehab facility is in an affected area, the rehabilitator needs to communicate with state officials from the appropriate health and wildlife agencies/ departments to confirm release sites unaffected by the disease. If there is no suitable release area nearby, there may be protocols implemented to allow rehabilitated rabbits to stay at rehabilitation facilities for extended periods of time to protect them from the disease. Per the RAAF, “A four-month figure has been proposed in the UK and is widely used, probably consisting of three months plus a month for the delay from infection to death, and a safety margin on top. If confirmed that the area is unaffected by the disease, release should follow normal protocols. This requires a sanctuary setting because rabbits are highly stressed as a species. This would not work for most at home rehabilitators.

Messaging for Prevention of the Disease in Domestic Rabbit Homes, Shelters, and Rescues

- Never release domestic rabbits into the wild
- Rabbits should be housed indoors
- Maintain a closed rabbitry
- Do not allow dogs (cats, chickens or other pets) near rabbit areas – clean pet paws prior to their re-entering rehabilitator’s home
- Avoid taking rabbits to shows and fairs
- Do not allow pet, feral or wild rabbits to have contact with rehabilitating rabbits or enter your facility
- Wash hands thoroughly before and after handling any rabbits
- New rabbits should be quarantined for a minimum of 10 days; symptomatic and infected rabbits require longer quarantine - rabbits can shed up to a month and reportedly 15 weeks after being ill so the longest quarantine period would be 4 months; where applicable, follow government recommendations on quarantine period
- If you have been in contact with other rabbits, wash clothes prior to wearing them around your rabbits
- If you volunteer at a shelter/rescue, have special clothes that are worn only at the facility and removed prior to leaving the shelter/rescue

- Put plastic bags over shoes and secure the bags with rubber bands – remove the bags and dispose them prior to getting into your vehicle
- Do not allow visitors into rabbitries unless they are wearing PPE (coveralls, shoe covers, hair coverings and gloves)
- Adopt a no-shoes in the house policy so nothing can be transmitted from the outdoors
- If foot bath is used to enter and leave facility, disinfectants must be changed at minimum daily, possibly more based on foot traffic
- Recommend one-way in and one-way out for rabbitry, if possible
- No contaminated items can be brought back into facility without being properly disinfected
- No transfer of cecotropes from one rabbit to another
- Minimize insects in the home (flies, mosquitos) – install screens and windows
- Disinfect objects and contaminated shoes (effective disinfectants are listed above)
- Institute regular cleanings of facility during designated times during the day. If volunteers are feeding, they should disinfect area prior to and after feeding
- Know your sources of hay and feed and ensure they are not near an infected area
- Use monthly flea treatment (Revolution and Advantage are safe products for rabbits); for rabbits, cats, and dogs, in the area of an outbreak, and especially if any pets go outdoors

Messaging for Prevention of the Disease in Rehabilitation Facilities

- Institute safeguards for domestic rabbits when applicable (domestic rabbits reside in the home and wild rabbits are rehabilitated in a separate place)
- Do not house cages of rabbits next to one another (at least six feet apart and not stacked)
- Use separate sterilized equipment for each cage of rabbits
- Do not forage outside for greens, especially in areas frequented by wild rabbits or other animals as food; many animals can transport the disease
- Do not use foraged branches, etc., for substrate, bedding or enrichment
- Practice good biosecurity; do not share equipment with other rehabilitators, wash hands before and after being with rabbits, wear PPE when applicable
- Feed quarantined rabbits last
- Exclude wild rabbits and, unless they can be excluded from the garden, consider stopping the practice of moving pens around the garden
- Consider a double fence around rabbit runs and exclude birds, too, because they can be carriers of the disease. This is why housing your rabbits inside or enclosing your rabbitry so that no other animals can penetrate the habitat are so essential to preventing the spread of the disease
- Manage/minimize insect populations in the home/facility (flies, mosquitoes, and sand fleas) as they can be virus carriers; install screens and windows

- No transfer of cecotropes from one rabbit to another
- Multiple species facilities must take extra precautions as other species may be carriers of RHDV2 through fur, feet, feces and mouths
- Avoid transferring rabbits to other rehabilitators as much as possible
- Intake sheet should include specific address where found in the event the area of origin is considered contaminated
- Contact your local veterinarian, state and federal animal health officials to learn whether RHDV has been detected in your area
- If rabbits die suddenly, contact a veterinarian or health official for proper protocols in your area
- Remove or tightly secure anything outside (garbage, feed) that could attract rodents, rabbits, other animals and insects (flies)
- Remove and bury or dispose of deceased rabbits promptly after consulting with your state officials on the proper method of disposal
- Submit carcasses for testing when applicable
- Contact your veterinarian should sick or dead rabbits be observed
- Do not transport rabbits into or out of RHD quarantined areas
- Remove brush, grass, weeds, trash and debris from rabbitry area
- Clean and disinfect all equipment and tools often and prior to use with another rabbit
- Know your sources of hay, feed and greens and whether they are near an infected area

Important Considerations for Rehabilitators

- When/if the facility should close to future intakes
- How to ensure that intake sheet is accurate for every rabbit intake
- How to systematically ensure that finder communicates directly with rehabilitator since transporters should not be relied upon to collect case history since information is lost with third party intervention
- How to reduce/eliminate transfers from rehabilitator to rehabilitator
- When/where to release rabbits that are ready for re-entry into the wild (this should involve your state officials for disease free zones)
- Number of rabbits that your facility can rehabilitate given new protocols—new rabbits are quarantined, and caging cannot be side by side—this creates spatial constraints
- Singletons and rehabilitation protocols, to integrate or not to integrate
- Timeline for quarantine
- Planning for and getting protocols in place for the event where a RHDV rabbit comes into the rehabilitation facility or succumbs to RHDV; protocols to protect the other rabbits
- Biohazard concerns; establishing appropriate method(s) to dispose of the carcasses

- Finding out State's protocols for sick and deceased rabbits—burial, incineration, double bag and garbage
- How to ensure every litter has separate caging, utensils, hideaways, fleece
- Preparing sanitation and sterilization practices
- For those rehabilitators with pet rabbits, wild rabbits must be able to enter your facility without exposing the domestic rabbits to the disease
- Contact your state officials to confirm how data should be recorded should the disease enter your area or facility

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