USDA
United States Department of Agriculture

Emerging Risk Notice—Animal Health

Rabbit Hemorrhagic Disease in
British Columbia, Canada

June 2018

Event Summary

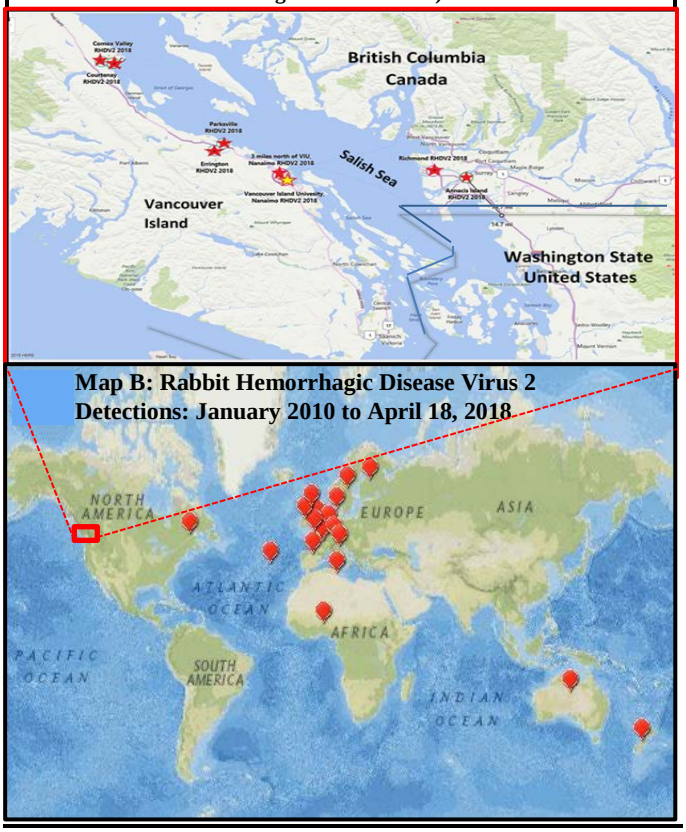
From mid-February to April 7, 2018, 10 outbreaks of RHDV2 (noted with stars on Map A) were detected in feral rabbit populations in British Columbia, Canada, and reported to the World Organization for Animal Health (OIE). The virus was first detected in a large colony of feral rabbits experiencing sudden high mortality (over 90 percent) on the grounds of Vancouver Island University in Nanaimo with more than 300 dead rabbits noted (yellow star with red outline on Map A) and also at a location three miles away. Five more outbreaks were detected on Vancouver Island [Comox Valley (n=1), Courtenay (n=2), Parksville (n=1), and Errington (n=1)]. Three additional outbreaks occurred across the Salish Sea in Metro Vancouver: one on Annacis Island in Delta and two in Richmond, including an animal rescue facility (Map A).[1] This is the second detection of RHDV2 in North America; the first was in Québec, Canada, on two hobby farms in July and August 2016.[1, 3] As of April 17, 2018, Canada declared the event cannot be considered resolved, but the situation is sufficiently stable. Information about this disease will be included in Canada's next OIE six-monthly reports.[1]

Whole genome sequencing indicates the RHDV2 virus is the same virus in the 10 locations and most closely matched (93 percent identity) a RHDV2 isolate from an outbreak in a rabbit farm in Navarra, Spain, in 2011.[1] However, this RHDV2 virus is not the same as the RHDV2 virus in the previous incursion in North America, recorded in July and August 2016 in Québec, Canada. The origin of the current outbreak is unknown.[1]

Key Points

- RHDV2 is a foreign animal disease that has NOT been detected in domestic, feral, or wild rabbits in the United States to date.

Map A. Ten Rabbit Hemorrhagic Disease Virus 2 (RHDV2) outbreaks (stars) occurred in British Columbia, Canada, with onset dates from mid-February to April 7, 2018: seven on Vancouver Island and, across the Salish Sea, three in the Metro-Vancouver Area [two in Richmond and one on Annacis Island in Delta (less than 20 miles from Washington State border).[1]



- RHDV2 was confirmed in British Columbia, Canada, on Vancouver Island just north of the Washington State border on February 28, 2018. Over 300 feral rabbits (domestic rabbits that escaped or were abandoned) were found dead on the first outbreak location at Vancouver Island University.[1, 2] (Map A)
- Rabbits at risk in the United States include feral and possibly native North American wild rabbits, especially due to the proximity, in Washington State and in shelters or wildlife rescue facilities receiving feral rabbits.[3]
- While there is no threat to humans, the public is advised not to release domestic rabbits into the wild at any time.
- The USDA APHIS FAD PReP Rabbit Hemorrhagic Disease Standard Operating Procedures: "Overview of Etiology and Ecology" Draft October 2013, is available and provides responders and stakeholders with a common understanding of the disease agent.[4] All

RHDV viruses are reportable to the World Organization for Animal Health (OIE).[5]

- In North America, when multiple cases of sudden death occur in a rabbit or in rabbits in the wild and hepatic necrosis and hemorrhages are seen at necropsy, consider RHDV viruses among your differential diagnoses. Samples to collect include fresh liver, spleen, blood, and formalin fixed liver, spleen, and other organs.[1, 5].
- Diagnostics include virus detection ELISA, and classic RHDV (a.k.a. RHDV1/RHDVa) and RHDV2-specific RT-PCR. [1, 5]
- Transmission routes include direct contact with live or dead infected rabbits, meat, or fur; mechanical vectors (e.g., wild carnivores and raptors); or by contaminated fomites (e.g., food, bedding and water) through oral, respiratory, or conjunctival routes and skin trauma. The virus is present in all secretions and excretions. The virus survives freezing; inactivation is by 10 percent bleach solution.[5, 8]
- The incubation period for RHDV2 is 1 to 5 days.[5] Clinical signs are similar to RHDV and RHDVa, sudden collapse and death with possibly blood-tinged nostrils, but typically no other signs. Mortalities in the current outbreak exceed 90 percent among feral domestic European rabbit colonies. Neurological or respiratory signs and severe jaundice are noted. With longer survival, signs may include dullness and anorexia in survivors.[5] Disease caused by RHDV2 may also infect rabbits as young as 15 days of age.[5, 6, 7]
- Strict biosecurity measures are essential to prevent introduction of the virus to rabbitries, laboratories, wildlife shelters, and private residences.
- RHDV2 seems to have a wider host range than RHDV, which only affects domestic European rabbits. RHDV2 has also affected some hares[1] in Italian outbreaks: the Sardinian cape hare and the Italian hare.[9, 10]
- APHIS has determined that experimental infection by RHDV2 can be lethal in eastern cottontail rabbits.
- Inactivated RHDV2 vaccines exist[5] but are not licensed in the United States. Canada has imported RHDV2 vaccines for specified local use, due to virus circulation in feral rabbits.[11]

Background

Rabbit hemorrhagic disease (RHD) is caused by a non-enveloped, single-stranded RNA virus in the family: Calicivirus; genus: Lagovirus, with three recognized pathogenic groups: RHDV (aka RHDV1), RHDVa (considered a subtype of the classic RHDV), and RHDV2. [4, 5, 6]

RHDV was first identified in Jiangsu Province, China, in 1983 and characterized in 1984 in commercially-bred Angora rabbits imported from Germany. The virus is now widely distributed and endemic in Europe, Australia, New Zealand, Cuba, Asia, and Africa. RHDV is considered to only affect domestic European rabbits.[4, 6, 8]

A number of sporadic outbreaks of RHDV in domestic European rabbits have occurred in North America between 1980 and 2018; U.S. outbreaks of RHDV were in 2000, 2001, 2005, 2008, and 2010. Mexico was endemic from 1988 to 1992, eventually eradicating the disease.[4] Two previous Canadian outbreaks have occurred: RHDV (Manitoba: March 2011) and RHDV2 (Québec: August 2016).[1]

RHDV2 first emerged in France in 2010 and then was detected in Europe, as well as in Australia, New Zealand, Tunisia, Benin, and the Azores (Portugal), causing high morbidity and mortality in feral and domestic rabbits (Map B). Wild rabbits have been proposed as significant contributors to the widespread distribution of RHDV2 in Europe. The evolution of RHDV2 from RHDV is unlikely. The potential causes of RHDV2 emergence in Europe include: 1) the evolution from a pre-existing non-pathogenic calicivirus or 2) a species jump from a reservoir host to rabbits.[2, 5, 6, 9, 10, 12, 13, 14]

Although it has been well established that RHDV and RHDVa only affect domestic European rabbits,[4, 8] it appears that RHDV2 has a wider host range, including some types of hares.[5, 9, 10] In 2011, RHDV2 was identified in Sardinian Cape hares (*Lepus capensis mediterraneus*) in Sardinia, Italy,[10]

and in 2012, RHDV2 was identified in Italian hares (*Lepus corsicanus*) in Sicily, Italy.[9]

Hares such as jackrabbits inhabit the United States. These include the black-tailed jackrabbit (*L. californicus*), snowshoe hare (*L. americanus*), and others, as well as cottontails (*Sylvilepus spp.*).[15] APHIS has determined that experimental infection by RHDV2 can be lethal in eastern cottontail rabbits.

Vaccines for RHDV2 are currently registered in Spain and France and used in RHDV2-infected countries. Vaccines are only recommended for use where the disease is widespread in wildlife.[4] Vaccines for RHDV1/RHDVa, and RHDV2 are poorly cross-protective.[5]

U.S. Economic Impact

Using methodologies from the 2002 USDA APHIS CEAH "U.S. Rabbit Industry Profile"[16] and 2016-2017 official and pet industry data including the USDA Agriculture Census 2012, the U.S. rabbit industry is estimated to be worth between $2.2 billion and $2.3 billion.[16, 17, 18] From 80 to 90 percent of these estimates are represented by the value of pet supplies and care of over 6.7 million pet rabbits (primarily domestic European rabbits) in approximately 2.9 million households.[19]

An introduction of RHDV2 into the U.S. domestic rabbit industry or into the wild rabbit populations would potentially impact the pet rabbit industry; 4-H, FFA, and other hobby groups; exhibitions; laboratories; and the meat, pelt, and hunting sectors.

U.S. Animal Health Concerns

- The virus causing the current RHDV2 outbreak in British Columbia, Canada, represents an introduction of a new virus in a new geographic location less than 20 miles from the border of Washington State.
- RHDV2 has spread rapidly and widely within Europe, Australia, and New Zealand since its first detection in France in 2010, which elevates the risk to the United States for RHDV2 introduction from Canada.
- It is easily spread via infected live animals, carcasses, meat, fomites, and mechanical vectors. Any of these transmission routes may be a possible pathway for disease introduction from Canada.
- In Europe, RHDV2 has been found to infect European rabbits and wild rabbits: hares. APHIS has determined that experimental infection by RHDV2 can be lethal in eastern cottontail rabbits.

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