PESTSMART

Using RHDV for rabbit control

Introduction: Rabbit haemorrhagic disease (RHD), previously known as calicivirus or rabbit calicivirus disease (RCD), has been highly effective in reducing rabbit populations across most of Australia. The virus that causes RHD (called rabbit haemorrhagic disease virus or RHDV) is spread through rabbit-to-rabbit contact and by insect carriers (eg flies and mosquitoes).

In arid and semi-arid areas of Australia where natural RHDV outbreaks usually occur in spring, RHD has kept rabbit populations low[1,2]. However, the disease has not had the same effect on populations in higher rainfall and some coastal areas[3]. One of the reasons for this is that natural outbreaks do not always coincide with times when rabbits are most susceptible to the disease[4]. Other likely causes include rising genetic resistance in wild rabbits to RHDV, and the presence of a benign (non-lethal) calicivirus that provides rabbits in cool, high rainfall areas with immunity against RHDV[4].

In an effort to overcome some of these hurdles, registration of RHDV as a biological control agent by the Australian Pesticides and Veterinary Medicines Authority (APVMA) allows lethal virus outbreaks to be initiated in suitable areas when the window of opportunity presents itself[5].

> “Combining bait-delivered RHDV with traditional control methods can effectively reduce rabbit numbers”

RHDV products

RHDV suspension: RHDV suspension comes in liquid form and can be delivered via bait or injection. The Rabbit Calicivirus Injection was first registered by the APVMA in 1996 to control rabbits in Australia. Registration allowed this product to be manufactured and used via injection only. Rabbits were required to be captured live, injected with the virus and then released at the point of capture. The registration of this product was cancelled in 2006 as it was replaced by an equivalent product, the Rabbit Haemorrhagic Disease Virus Suspension, in 2005. The RHDV suspension is permitted to be distributed on bait material, offering a relatively cheap and effective means of rabbit control — provided it is introduced when populations are most susceptible (ie when rabbits are older than 12 weeks)[5]. Delivery by injection is still permitted with this product, but is now a less preferred option because of the extra labour and welfare issues associated with the handling and release of wild rabbits[6].

Vial of liquid RHDV suspension. Image: John Kovaliski

RHDV-infected bait must be prepared by an authorised officer in accordance with the product’s label instructions. A total of 100 ml diluted RHDV suspension (10 ml vial of product diluted in 90 ml of sterile, distilled water) is enough to treat either 6 kg of oats or 15 kg of diced carrot. The treated feed is mixed in a closed drum mixer that meets the standard requirement for 1080 toxic bait mixing. As with other forms of baiting, the correct amount of virus-infected bait needed is determined by applying at least two free feeds over two nights (if using carrots), or three free feeds over three nights (if using oats), in the target area. Once pre-feeding is complete, RHDV-infected bait should be distributed at approximately 10% of the rate applied on the final night of free feeding.

An operator prepares a mix of RHDV-infected carrots. Image: Craig Simcox (courtesy of the Alexander Turnbull Library, Wellington, New Zealand)

Freeze-dried RHDV: Although spreading RHDV via bait is more practical than catching wild rabbits and injecting them, the current RHDV liquid suspension has its drawbacks. These include the need to be stored at very cold temperatures (-70°C), meaning it must be transported on dry ice. Dry ice is classified as a dangerous good, which makes it expensive to transport. The liquid suspension also deteriorates quickly after thawing, which can happen if its arrival is delayed. Thawing reduces its effectiveness in the field and might have contributed to the failure of some RHDV baiting programs in the past.

The Invasive Animals Cooperative Research Centre in conjunction with NSW Department of Primary Industries is currently developing freeze-dried stock of RHDV that can be easily and safely stored, transported and used anywhere in Australia[7]. Some of the advantages of freeze-dried RHDV over the liquid suspension form are that it:

- can be transported without the need for dry ice
- is cheaper to transport and store
- has an increased kill efficacy due to virus stability
- has a longer shelf life
- can be stored safely
- is ready to use as required.

Freeze-dried RHDV is expected to be available in 2012.

Effectiveness of RHDV on bait: Experimental releases of RHDV on bait have shown that this method is highly effective at reducing rabbit numbers. In a recent trial in South Australia, RHD spread quickly through a susceptible rabbit population following the release of RHDV on bait, even spreading to rabbits that were not directly exposed to the bait[8]. The virus continued to spread over the next 2-6 weeks through nearby unbaited areas, reaching rabbits up to 4 km away. Future releases of RHDV are not likely to control rabbits in areas where there is already a naturally occurring non-pathogenic (ie does not cause disease) calicivirus. However, there might be some higher-rainfall sites that remain highly susceptible and could benefit from RHDV baiting. Further research will help to determine if there are times when non-pathogenic caliciviruses are less active, and when rabbits are most vulnerable to RHDV bait[8].

Legal considerations: RHDV suspension is a restricted chemical product under Section 93 of the Agricultural and Veterinary Chemicals Code, which controls its preparation and supply[3]. Individual state and territory agencies are responsible for the authorising and use of RHDV suspension (see Table 1). The requirements for a person to be 'authorised' to use RHDV may vary in each state and territory. In New South Wales, the Pesticide Control (Rabbit Haemorrhagic Disease) Order 2006 states that only authorised control officers or other persons in the presence of an authorised control officer are permitted to use the RHDV suspension product, which includes the preparation of baits and delivery via injection. However, RHDV-infected bait can be supplied by an authorised public authority (eg Livestock Health and Pest Authority) to a person who is an owner, occupier, manager or authorised agent of the land, property or holding where the RHDV-infected bait is to be used. Further information can be obtained from the authorities listed in the table.

Effects on non-target species: RHDV has not been known to infect or cause death to any mammal or bird species in Australia except for its target species, the European rabbit (*Oryctolagus cuniculus*). The virus affects both wild and domestic breeds of rabbits, including farmed and pet breeds. Vaccinations are available from vets for domestic breeds only.

State and territory agencies responsible for pest animal control and restricted chemical product usage

Agency responsible	Area	Website
Livestock Health and Pest Authorities (LHPA), part of the NSW Department of Primary Industries (NSW DPI)	NSW	http://www.lhpa.org.au http://www.dpi.nsw.gov.au
Victorian Department of Primary Industries (DPI)	Vic	http://www.dpi.vic.gov.au
Regional Natural Resource Management (NRM) Boards, part of the South Australian Department of Environment and Natural Resources (DENR)	SA	http://www.nrm.sa.gov.au http://www.environment.sa.gov.au
Department of Agriculture and Food Western Australia (DAFWA)	WA	http://www.agric.wa.gov.au
Queensland Department of Employment, Economic Development and Innovation (DEEDI)	Qld	http://www.deedi.qld.gov.au
Department of Primary Industries, Parks, Water and Environment (DPIPWE)	Tas	http://www.dpipwe.tas.gov.au
Natural Resources, Environment, The Arts and Sport (NRETAS)	NT	http://www.nt.gov.au/nreta
Territory and Municipal Services (TAMS)	ACT	http://www.tams.act.gov.au

Summary: RHDV is a management tool best used in conjunction with other methods to reduce rabbit populations and help minimise the impacts of rabbits in Australia. RHDV is a fatal, highly contagious disease that affects wild and domestic rabbits. Best-practice release of RHDV using either the suspension or the freeze-dried product soon to be available requires proper handling and preparation by an authorised officer. The use of field-released RHDV on bait has been shown to be highly effective at reducing rabbit numbers in areas where they are susceptible to the disease. However, users need to be aware that there is no guarantee that deliberate release of this virus will result in the spread of the disease to susceptible rabbits. Strategic release of RHDV should take into account the size and health of the rabbit population (including the level of existing immunity and the presence of young rabbits), any naturally-occurring viruses and insect activity. Follow-up control (eg poison baiting) of remaining rabbits is recommended to ensure effective, long-term results.

A ranger distributes RHDV-infected carrots on Macquarie Island. The release of RHDV on the island was designed to reduce rabbit numbers before aerial baiting. It also lowered the risk of secondary poisoning to non-target wildlife, as RHD-killed rabbit carcasses are harmless to other species. Image: Ivor Harris, Australian Antarctic Division

Quick RHDV facts:

Where does it come from and who can use it?

The Elizabeth Macarthur Agricultural Institute (EMAI), part of the NSW Department of Primary Industries, is the sole supplier of RHDV for Australia and New Zealand. EMAI can supply the RHDV suspension to persons who are authorised by their respective state or territory agency (eg in New South Wales, a Livestock Health and Pest Authority officer). Certain landholders can then be supplied with correctly prepared RHDV-infected bait by an authorised officer.

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How is it used?

Authorised persons (including authorised control officers or other persons in the presence of an authorised control officer) must follow the instructions on the product label. RHDV can be applied directly to bait material (oats or carrots) or administered via intramuscular injection (see standard operating procedure[6]).

When is it used?

Late spring/early summer or autumn is the best time to release RHDV. To increase death rates, avoid times when juvenile rabbits are present. Release is not recommended in extreme climates or weather (eg the peak of summer or during rain).

Further information:

1. Mutze G, Bird P, Cooke B and Henzell R (2008). Geographic and seasonal variation in the impact of rabbit haemorrhagic disease on European rabbits, *Oryctolagus cuniculus*, and rabbit damage in Australia. In: PC Alves, N Ferrand and K Hackländer (Eds), *Lagomorph Biology: Evolution, Ecology and Conservation*. Springer-Verlag, Berlin, Heidelberg. Pp 279-293.
2. Cooke BD (2003). *Making the Most of Rabbit Haemorrhagic Disease*. Bureau of Rural Sciences and CSIRO, Canberra.
3. Sinclair R and Mutze G (2005). Bait delivery of rabbit haemorrhagic disease virus (RHDV) to improve the effectiveness of RHD outbreaks. In: *Proceedings of the 13th Australasian Vertebrate Pest Conference, Wellington, New Zealand 2-6 May 2005*. Manaaki Whenua Landcare Research, New Zealand.
4. Strive T, Wright JD and Robinson AJ (2008). Identification and partial characterisation of a new lagovirus in Australian wild rabbits. *Virology 384:97-105*.
5. Australian Pesticides and Veterinary Medicines Authority (APVMA, 2005). *Rabbit Haemorrhagic Disease Virus Suspension for Control of Pest Rabbits in Australia*. APVMA, Canberra. See http://www.apvma.gov.au/products/restricted.php
6. Sharp T and Saunders G (2005). *RAB001 Inoculation of Rabbits with Rabbit Haemorrhagic Disease Virus (RHDV)*. NSW Department of Primary Industries, Orange, NSW.
7. Invasive Animals Cooperative Research Centre (2011). *Freeze-Dried RHD Bait*. Invasive Animals Cooperative Research Centre, Canberra.
8. Mutze G, Sinclair R, Peacock D, Kovaliski J and Capucci L (2010). Does a benign calicivirus reduce the effectiveness of rabbit haemorrhagic disease virus (RHDV) in Australia? Experimental evidence from field releases of RHDV on bait. *Wildlife Research 37:311-319*.

Laying a trail of RHDV-infected carrots. Image: Brian Lukins