

Rabbit Calicivirus Disease: Magic Bullet or Pandora's Box? A Case Study on Biological Controls

by

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Dana Porter fiddled with her pencil as she listened to the speaker draw his final conclusions. As a pathologist at Victoria University, she had sat through her share of lengthy committee meetings, but today's discussion was too important to let her mind wander for long. She and the others had recently formed a subcommittee of the Rabbit Biocontrol Advisory Group to reach a final recommendation that could be presented to the Ministry of Agriculture and Forestry. European rabbits had long inflicted massive damage to large areas of New Zealand, and there appeared to be broad public support for any reasonable measure that might reduce rabbit numbers and bring much needed relief to both sheep farmers and the indigenous wildlife. She refocused her attention as the leader of the committee, virologist Matthew Heyde, reviewed the advantages of releasing a live rabbit calicivirus in New Zealand.

“So based on the recent release of the rabbit calicivirus in Australia, we can conclude that this pathogen will provide us with a lethal measure of control without threatening non-target species.” As a long time member of the advisory group, Matt was confident that he would be able to persuade the committee to endorse a viral control program. He was annoyed when Dana chimed back in to challenge his recommendation. “But Matt, how do we know that the virus won't mutate and ultimately kill native species in addition to the introduced rabbits? The high mutation rate of RNA viruses makes this a dangerous gamble at best.”

Janai Hurd, a commissioner with the National Resource Task Force, agreed. “I think Dana is right, the virus will be difficult to control and poses too much risk for release into the wild. We've been too quick to discard other possible methods of control, such as the introduction of North American mink. Other mustelid introductions have worked to reduce rabbit numbers. It's already been established that mink readily prey on rabbits, and their dispersal should be far easier to control in the long run.” Janai's prior problems controlling wildlife disease made her hesitant to intentionally release pathogens into nature.

Matt was not about to let the discussion turn back to the release of vertebrate predators. “Look, Janai, there's no point in returning to this issue. It hasn't worked in the past and there's no reason to believe it will work now. The release of mink, or other large predators, opens a Pandora's box of trouble. Mink are far more likely to attack non-target prey items than a virus that has evolved for a single species of host. Furthermore, you can't really predict whether these animals will introduce new diseases to wildlife or livestock. They might even compete with our local predators, introducing a whole new kind of problem, so let's drop the idea of predator control right now.” Matt also took exception to the notion that the rapid mutation rate of the virus was problematic. “And Dana you must realize that a high rate of mutation is a plus among biological control agents, not a problem. The high mutation rate should insure that the virus can keep evolutionary pace with its rabbit host and remain effective for the indefinite future.”

Melynda Davis, a public relations expert from the Ministry of Agriculture, weighed in next. “I think we're all forgetting about the importance of public perception. You may recall the nasty public backlash Australia received years ago after the myxoma virus was released to control rabbits. Rabbit breeding associations from around the globe congratulated us for our decision to ban the virus and the inhumane deaths produced by myxomatosis. Rabbits may be a problem in New Zealand, but they still have rights, including the right to humane control measures. I'm not sure we're ready for a viral release. The myxoma virus didn't really impact rabbit numbers anyway, did it? Mink will be perceived as a more 'natural' control and will be more palatable to the public. And why should we worry about competition between mink and natural predators in the first place if rabbits are overabundant?”

Dana still wasn't sure if releasing the rabbit calicivirus was a good idea, but she couldn't let Melynda's claims go unchallenged. "Melynda, while rabbit populations did eventually rebound after the introduction of myxoma, its initial release was extremely successful in Australia, eliminating over 95% of the rabbits. Many biologists feel that it would have provided long term control if the release had been accompanied by a more comprehensive control plan, including poisoning and burrow destruction. Furthermore, the calicivirus is entirely different from the myxoma virus released earlier. It's an RNA virus, not a DNA virus, and it kills quickly by producing blood clots. Your comparison isn't really valid. Moreover, mink may be cute but we're not even sure they can disperse to the areas where they're needed or reproduce fast enough once they get there. Shouldn't we be selecting the most effective control measure rather than the most attractive one? Perhaps we'd be better off if we introduced *both* methods simultaneously."

Dawitt Blackridge, a gruff, older member of the community, was present as an advocate for the Sportsmen's Club. He had remained silent up to this point but finally added his own opinion to the mix. "With all due respect to the learned members of this committee, there's one course of action that can avoid all the problems of mutation, evolution, competition, and what have you. S'posing we all leave well enough alone?"

Dana pondered the options before the committee. There were still two weeks before the panel would make their recommendation to the Ministry. She wondered if any consensus was possible.

Learning Issues

1. Why might large rabbit populations be problematic? In other words, exactly what problems do they create for other wildlife and livestock?
2. In what ways might mink interact with indigenous New Zealand wildlife? One obvious answer is "as a predator," but what are other forms of interaction, both direct and indirect?
3. Why does it matter whether we use an RNA virus or a DNA virus? How do they differ?
4. Why did the myxoma virus fail as a control agent? Is the calicivirus any more likely to succeed? Why?
5. Describe Dana's concerns about the evolution of the calicivirus, whether these concerns are reasonable, and the likelihood that the virus will infect animals besides rabbits.
6. How do biologists determine whether a potential biological control agent will attack non-target species?
7. In addition to biological controls, what other options are available for control of European rabbits? How effective are these options?