

Foundation Patron - Associate Professor Brian Cooke BSc MSc PhD OAM

Myxomatosis

I first saw a rabbit affected by myxomatosis in 1951 when visiting a local farm as a seven-year-old. That was just a year after the myxoma virus spread from CSIRO field trials in the New South Wales Riverina. Asking my parents what was wrong with the rabbit, they explained that it was a disease deliberately introduced to get rid of them. Living in West Geelong, only 40 kilometres from Barwon Park where Thomas Austin released the first imported wild rabbits, I already knew something about the pests that had proved so disastrous for Australia's pastoral industries, agriculture, and ecological diversity.

As with most Australians at the time, I was probably more familiar with the idea of biological control and its effectiveness than many Australians are today. Rabbit was only occasionally included on the home menu after myxomatosis spread, although my older sister recalls eating rabbit more frequently in the immediate aftermath of World War II.

I was always intrigued by the natural world, and throughout my primary and secondary school years, I was always collecting insects, frogs, and lizards in the bush. This led me naturally to a BSc at Melbourne University, majoring in biology and zoology.

On graduating I applied for post-graduate research at the then new Monash University with Tim Ealy and Professor Jock Marshall as supervisors. Marshall had just published *The Great Extermination. A guide to Anglo-Australian Cupidity, Wickedness and Waste*, one of the first books to discuss the loss of many of Australia's unique native mammals and which made a great impression on his earnest students. Nonetheless, I finally settled for a job in Adelaide with the Vermin Control Branch of the Department of Lands. Things were different in those days and at only 22 years I had a good operating budget, a large laboratory and two field assistants to help me work out the best ways of managing the rabbits that were becoming increasingly resistant to myxomatosis.

The Chief of the Vermin Control Branch, John Bromell, organized for me to spend three months in Canberra at CSIRO's Division of Wildlife Research. There in 1966 I met with many of the researchers who had been involved with the original release and assessment of myxomatosis: Francis Ratcliffe, Ken Myers, Bill Poole and Bernard (Bunny) Fennessy as well as newer members of the 'rabbit group' including Peter Fullagar, Jon Dunsmore, Bruce Parker, and Ian Parer. I visited many of the rabbit study sites Ken Myers had set up, in localities as varied as the Snowy Mountains, Mitchell in sub-tropical Queensland and Calindary in arid western New South Wales. That 'did the trick' and I realized that I could make a significant contribution to both the farming industry and wildlife conservation by finding new ways to control rabbits.

Returning to Adelaide, I not only assessed the effectiveness of the different ways of controlling rabbits (poisoning, warren destruction, fumigation) but also set up study sites in several areas of South Australia ranging from the cool, temperate south-east to the hot, dry inland. Studying the roles of climatic variables gave us insights into the best strategies for controlling rabbits. For example, strategic control during the summer should be more effective because rabbits were fewer in number and short of high-quality food making them more likely to take poisoned baits. Ripping up rabbit warrens in summer made more sense too. Warrens collapsed more readily if the soil was dry, and rabbits deprived of deep cool warrens were less able to survive summer heat and predators.

Some of my experimental sites also became key localities when I took up further academic studies at the Adelaide University. I completed an external MSc in 1970 and subsequently took three years leave to complete a PhD, both degrees centred on rabbit biology.

Pam and I married during my time as a PhD student and after my thesis was submitted we travelled overseas, first to a conference in Moscow (behind the 'iron curtain') and then visiting several pest control laboratories in Britain and Scandinavia.

Rabbit fleas

Later, my South Australian study sites proved invaluable when I joined forces with CSIRO's Bill Sobey to assess European rabbit fleas, *Spilopsyllus cuniculi*, as vectors of myxomatosis. There we collected data on rabbit breeding and population dynamics over several years before and after fleas were released, showing that the fleas made an enormous difference to the spread of myxomatosis and enhanced its effectiveness. However, a critical result was that European rabbit fleas could not persist in arid inland Australia. This in turn led to the idea that 'arid-adapted' fleas might be found on rabbits in Spain and these might be used as alternative myxoma virus vectors in dry areas.

I spent two years in Spain in the late 1980s, based in Seville, and investigating several species of fleas as potential 'arid-adapted' vectors of myxomatosis. Pam and our two daughters, Natalie and Julia, accompanied me for part of that time. Dr Ramon Soriguer of the Spanish Consejo Superior de Investigaciones Cientificas (CSIC) generously provided laboratory space and field support. I selected an arid-adapted flea (*Xenopsylla cunicularis*) living only on rabbits as the most suitable vector. On importation into Australia, it became known as the 'Spanish rabbit flea' to distinguish it from the European rabbit flea introduced earlier by Bill Sobey.

RHDV

During my studies on rabbit fleas in arid south-eastern Spain in late 1988, highly lethal rabbit haemorrhagic disease (RHD) suddenly appeared in the wild rabbit population. The causative virus is now thought to have evolved from closely related non-pathogenic viruses in rabbits and it severely disrupted plans for assessing and releasing Spanish rabbit fleas. Nonetheless, as it was specific to rabbits, I quickly realized its potential as a new biological control agent and strongly campaigned for its assessment and eventual release among Australian rabbits.

Further investigations of the epidemiology of RHD in Spain followed. I worked with Dr Luis Leon-Vizcaino of the University of Murcia Veterinary School to understand how this new rabbit disease spread, while also supervising necessary on-going work on the Spanish rabbit fleas, maintained in a quarantine insectary in Adelaide. Apart from the challenge of safely importing disease-free rabbit fleas, we had also to demonstrate that the fleas would parasitize only rabbits. Much of this work was ably carried out by Faerlie Bartholomaeus. After approval the fleas were widely released in the early 1990s enabling me to transfer to CSIRO in Canberra in 1995 to take part in the field assessment of RHD.

During the final stages of the program to introduce Spanish rabbit fleas, the RHD virus was carefully assessed under strict quarantine at the Australian Animal Health Laboratory in Geelong and again shown to cause disease only in rabbits. All other domestic animals and native species remained healthy and uninfected following experimental challenge. Although officially working at CSIRO in Canberra, I spent most of the following year on Wardang Island off the coast of South Australia assessing the ability of the virus to spread in the field. There would be little point in releasing it widely unless it spread naturally from rabbit to rabbit.

Nicholas Newland led the 'Rabbit Calicivirus Program' and resolved many of the critical problems associated with working on an island. For example, he arranged for the local Aboriginal Community at Point Pearce to equip large pontoons so that vehicles and fencing materials could be towed to the island by local fishing boats. William Morgan, the inaugural Executive Officer of RFA, was one of two pilots who regularly ferried food supplies to the team working on the island. There was ready

collaboration and voluntary assistance between State and Federal government employees, funding bodies including Meat and Livestock Australia, the Point Pearce Aboriginal Community, and the then fledgling Anti-Rabbit Research Foundation, later to become Rabbit Free Australia.

First experiments during the winter months to assess the spread of RHD showed mixed results. Sometimes the virus spread among the rabbits but on other occasions it failed to spread beyond those rabbits that were initially inoculated. But in the spring this pattern changed. The virus spread between separate pens where rabbits were held, then appeared outside the main double-fenced quarantine enclosure and finally reached the mainland three kilometres away. In retrospect, it seems clear that the virus was carried by carrion-feeding blow flies that fed on dead rabbits and subsequently spread the virus well beyond the experimental sites. Nonetheless, the escape of the virus was a constant topic on national news for some weeks and had major political consequences, even though the rapid spread of the virus and the high mortality of rabbits showed that it was going to be a highly effective means of controlling rabbits.

Over the following seven years, epidemiological studies continued. For example, Dr Tony Robinson in CSIRO not only quantified important relationships between rabbit age and disease susceptibility but also helped to build a close collaboration with Italian researcher Dr Lorenzo Capucci whose methods of assaying antibodies in rabbit blood samples revolutionized our understanding of RHD. This led to the hypothesis that in some areas of Australia a naturally circulating, non-pathogenic RHD-like virus might be immunizing rabbits against RHD and so reducing the effectiveness of this new biological control agent.

Importantly, Dr Tanja Strive in CSIRO was able to isolate this virus and show that infection with it lessened the chance of rabbits developing acute RHD. Along with Dr June Liu they showed that the distribution of this non-pathogenic virus across the Australian continent corresponded with areas where RHD had reduced potency as a biological control agent.

I had always imagined that, if I found a way to enhance rabbit control in Australia, it would mean that funding would naturally flow for further work on rabbit management. This was far from reality, however. The release of RHDV occurred at a time when Australia's wool industry was in serious trouble. Competition with synthetic fibres and ill-founded attempts to maintain wool prices through a Wool Deficiency Payments Scheme followed by a Minimum Reserve Price Scheme had not worked. Australian Wool Innovation, and later Meat and Livestock Australia, had been the major funders of rabbit control research but now had limited capacity to support research. Without industry funding, CSIRO's Division of Wildlife and Ecology was in financial trouble and unable to support people like me who had been recently recruited for specific programs.

I saw the writing on the wall and resigned from CSIRO. Some of my colleagues who remained were badly hurt when the Division of Wildlife and Ecology was disbanded. Having obtained the status of a full Division in the heady days after myxomatosis was released, and wool prices were high, the Division's demise was just as clearly associated with the collapse of industry support.

Fortunately, my time in Spain had given me language skills that I turned to advantage. I took up a position at the Charles Darwin Research Station in the Galapagos Islands. Pam and I spent two years there. I worked at the Station, again developing ways of eradicating introduced pest species, while Pam volunteered at the local pre-school in Puerto Ayora and as a sonographer at the local hospital. It was an adventurous time, and after we left the islands we travelled extensively in South America for several months, including time in central Chile with local pest controllers working to solve problems caused by introduced European rabbits.

When we returned to Canberra, it was apparent that Australian Wool Innovation were concerned that rabbits were increasing once again, just as they had after the initial highly effective outbreaks of myxomatosis in the late 1950s. I was subsequently employed to rejuvenate interest in rabbit control among state agencies and I became a Research Associate at the University of Canberra within the Institute for Applied Ecology.

This gave me an opportunity for new research and time to write up results from research that had not been published or had taken on a new perspective in the light of later publications. Freed from work at the laboratory bench, I have written or co-authored over 40 scientific papers on different aspects of rabbit control while associated with the University. Some of these resulted from continuing work with colleagues in BiosecuritySA, including epidemiological studies on RHD and our efforts to determine the impact of rabbits on arid-zone vegetation.

I was also able to spend more time with Professor Frank Fenner who had been involved in the original research on myxomatosis. Frank was a former Patron of RFA, and even before my sojourn in the Galapagos Islands we had regularly met at the Australian National University and collaborated in several ways. We had been co-authors on a scientific paper on RHD published in *Wildlife Research* and I provided information on the field trials on RHD for Frank to summarize in a book entitled 'Biological control of vertebrate pests' that he co-authored with Bernadino Fantini a Swiss medical historian.

After Frank Fenner passed away in 2010, aged 95, I was approached by Nicholas Newland who asked if I would become Patron of RFA. It took me a while to decide to accept especially because previous patrons had been the Governor General of Australia, the Honourable Bill Hayden and of course Professor Fenner who I had seen as my mentor and a great role model. In the end, however, I was happy to accept, and it has proved a very productive partnership.



Dr Ramon Soriguer (left) from the Spanish CSIC and game guard Antonio Gil (centre) with author (right) in Almeria, Spain, collecting rabbit fleas from recently shot rabbits. The photo was taken in 1988 when RHDV was first recorded in the province (Photo: Ernesto Garcia Marquez).

Brian Cooke, 2022
Edited by Bruce Munday