

PROTECTING DOMESTIC RABBITS AGAINST MYXOMATOSIS IN AUSTRALIA AND THE  
PROBLEMS ASSOCIATED WITH IT PAST AND PRESENT

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## SUMMARY

A brief history of the introduction of Shope's fibroma virus into the Australian rabbit scene, outlining some of the emotions generated and some of their causes is given. Immunisation of rabbits against myxomatosis using Shope's fibroma is still banned in Australia except in approved scientific institutions. The arguments leading to this ban are examined and rejected. Options for future protection of domestic rabbits against myxomatosis are considered.

## INTRODUCTION

A paper on protecting rabbits against myxomatosis must appear strange at a conference on nutrition. However, in context with the previous speaker and bearing in mind that the rabbit in Australia, like sport in the world today, cannot be divorced from politics, it makes some sense. To some of the older landholders and many of those in senior positions of authority in the various State bodies concerned with rabbit control "rabbit" is an emotive word (rather like "communist" if one is applying for a visa to the USA). If one looks at the history of the rabbit in Australia this attitude is hardly surprising. Prior to the release of myxomatosis in 1950 rabbits constituted an enormous economic burden to Australian agriculture. Some idea of the economic loss due to rabbits may be gauged in the findings of Reid (1953) after myxomatosis had substantially reduced rabbit numbers. Australia's wool clip reached a record in 1953 of which 30,000,000 kg valued at about \$48,000,000 was attributed to the reduction in rabbit numbers. A further \$20,000,000 due to extra lambs & sheep slaughtered may be added to this (see Fenner & Ratcliffe 1965). Rabbit control also was costing the country millions of dollars annually. Barrier fences were built in an attempt to stop rabbits invading the farming areas of Western Australia, and from crossing New South Wales into Queensland; some of these were thousands of miles long and took years to erect, often crossing desert and uninhabited country. Apart from these landholders erected millions of miles of netting rabbit proof fences to protect their properties against rabbits. Added to the fencing costs were those for digging out warrens, fumigating and poisoning. Those properties which did achieve the status of "rabbit free" by dint of considerable effort had to be constantly vigilant; boundary fences were ridden and inspected at least once a week and any sign of a rabbit was treated as an emergency.

Rabbits were (and still are) a conservationist's nightmare. Unchecked they tend to breed to the limit of the available food and cause devastation to the vegetation. In marginal country, this, in conjunction with sheep grazing, can result in the permanent loss of even tree species (Crisp & Lange 1976) and serious erosion problems.

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It is no wonder then that some of those in authority and having such a background should approach matters concerning rabbit control with an almost evangelical zeal. Such a concern arose following the release of myxomatosis and the great reduction in rabbit numbers when commercial exploitation of the Australian wild rabbit almost ceased. In the late 1950's energetic attempts were made to start a domestic rabbit industry. This industry flourished initially but soon ran into vigorous opposition from rabbit control authorities and landholder interests from the former because of a fear that the new industry might adversely affect rabbit control, and from the latter because of that fear and possibly an added one of the potential threat of competition from producers of rabbit meat.

#### Problems of the past

Rabbit breeders sought a vaccine to protect their valuable animals from myxomatosis and found one in Shope's fibroma virus (Shope 1932) which was produced commercially. This virus occurs naturally in Sylvilagus rabbits in the eastern U.S.A. and offers a degree of cross protection to myxomatosis in domestic and wild European rabbits (Oryctolagus cuniculus) causing only a small localised tumour. The fact that fibroma spread among American rabbits in the field evoked fears in some Australian rabbit control authorities that fibroma might equally well spread in Australian wild rabbits and nullify the ongoing usefulness of myxomatosis by widespread immunisation. The general opinion of Australian scientists was that fibroma did not pose a threat to rabbit control in Australia, and that if there were any risk at all it was very small. This opinion was given by men who would certainly not have jeopardised the usefulness of myxomatosis. Any threat to myxomatosis, however small, was too much for some of the rabbit control authorities and Dame Jean Macnamara who had promoted the release of myxomatosis with great vigour. As a result of pressure from the sources an invitation was made to Dr R.E. Shope by CSIRO and the New South Wales and Victorian governments to visit Australia and report on the use of fibroma virus in commercial rabbitries. Shope spent four weeks in Australia and submitted a report in April 1962. His opinion was that 'fibroma virus, as presently used to protect domestic rabbits in commercial rabbitries against myxomatosis, constitutes a definite hazard of unknown magnitude'.

As a result of Shope's report the use of fibroma virus was banned, except in approved scientific institutions, in all States. In New South Wales permission was given for commercial production of the virus and for its sale to registered rabbit breeders covered by strict licensing procedures. The rabbit industry, except for a few breeders who provided rabbits to scientific establishments, collapsed. In all probability it would have collapsed anyway as it was largely over capitalised and based on the high prices being paid for breeding stock which could not have been sustained. Ironically as a result of the ban CSIRO was prevented from running a field experiment in 1972 at Urana to assess the continuing usefulness of myxomatosis.

Facts and arauments

Fibroma virus is a pox virus (Family Poxviridae) of vertebrates (sub-family Chordopoxvirinae) of the Myxoma sub group (Genera Leporipoxvirus). It reacts serologically with the members of the subgroup, namely Hare fibroma, Squirrel fibroma and Myxoma virus. Fibroma virus was first isolated by Shope (Shope 1932) and shown by him (Shope 1936, 1938) to confer on domestic rabbits (Oryctolagus cuniculus) a high degree of protection against myxomatosis. The strain of fibroma virus used in Australia was the Boerlage strain. The natural host of fibroma is Silvilagus floridanus from the eastern U.S.A. In Sylvilagus fibroma tumours become infectious to mosquito bites about two weeks after infection and can remain infectious for long periods; transmission was demonstrated ten months after inoculation by Kilham and Dalmat (1955). In adult Oryctolagus, domestic rabbits, inoculation with fibroma will initiate a tumour but mosquito transmission from such tumours is rare. Day, Fenner, Woodroffe and McIntyre (1956) recorded five positive transfers from 1627 bites by 619 mosquitoes which had probed or fed on fibromas in Oryctolagus. Dalmat and Stanton (1959) obtained no positive transfers in tests on fibromas in 200 adult domestic rabbits and Dalmat (1959) recorded 10 positive transfers out of 'many hundreds\*' of tests. Transmission can be achieved for up to about ten days in suckling domestic rabbits.

In his report Shope stressed that transmission in domestic rabbits is likely to be greater where intradermal rather than subcutaneous inoculation is used because the tumour resulting from the former is richer in available virus. In the experiments on transmission quoted above all inoculations were intradermal. Shope suggested that it would be unwise to assume that the react-ion of fibroma in wild rabbits would be the same as that in domestic rabbits. While no comparative tests have been undertaken the many wild rabbits inoculated by workers in Australia have reacted in a similar fashion to domestic rabbits, producing tumours of similar size which regress at a similar time of 10 to 14 days. For ten years prior to Shope's visit CSIRO and Australian National University scientists working on myxomatosis research had used fibroma to protect rabbits from myxomatosis. Wild rabbit populations in outside enclosures for studies in social behaviour could be maintained only if they were immunised against myxomatosis.

In France the hunting industry was hard hit by the destruction of the rabbit population by myxomatosis. Fibroma was used, but to no avail in efforts to protect the wild rabbit populations. Domestic rabbits in France were immunised on a large scale (Fenner & Ratcliffe 1965). Soon after 1953 at the time of great epizootics up to ten million doses of fibroma vaccine were used annually. As the outbreaks of myxomatosis declined with declining wild rabbit populations this fell by 1962 to about one million doses annually. Shope argues for caution in accepting the circumstantial evidence from France on the grounds that the ecological situations in France and Australia are different and no direct comparison need be valid. The caution is valid but nevertheless there is no evidence that fibroma escaped into wild rabbit populations in France or Australia and thus protected them against myxomatosis.

Competition with myxoma viruses in the field

The virus released in Australia in 1950, Standard laboratory strain of myxomatosis, had a case mortality in excess of 99%. Within two years of release attenuated strains of virus with reduced case mortalities were recovered from the field. Fenner and Marshall (1957) developed a grading system of five (later six) grades to characterise the virulence of viruses collected from the field. Field surveys showed that medium, Grade III viruses, with a case mortality of 70% to 90% predominated, Selection favoured viruses which were available to vectors for the longest time. Virulent viruses killed too quickly and rabbits recovered from the more attenuated viruses with a reduced infective period. Middle. grade viruses were available to vectors for the longest time. It is against this background of selection that the danger of fibroma as a competitor to myxomatosis must be judged. Could it survive in the field? The probability seems remote. It is my personal opinion that one would not be able to successfully establish fibroma in a field population of wild rabbits even with considerable effort.

Present problems

There is a revival of interest in the domestic rabbit industry in Australia and the protection of these rabbits remains a vexing question. The use of fibroma virus is still restricted to scientific institutions. What are the options? Perhaps the limitation on the use of Shope's fibroma virus could be lifted. The Boerlage strain of this virus inoculated intradermally gives servicable protection provided it is repeated at six-month intervals.. (Fenner & Ratcliffe 1965, Rowe, Mansi and Hudson 1956). Another option is a highly attenuated variant of the North American Californian type myxoma virus produced by McKercher & Saito (1964). This virus was produced commercially in the U.S.A. and proved very effective in protecting domestic rabbits. On intradermal inoculation this virus produces a small tumour in domestic rabbits which begins to regress within five days of inoculation (Sobey unpublished data). The present availability of this virus or whether it could be produced commercially in this country under licence would need to be explored. It would be a useful virus for immunising domestic rabbits in Australia particularly as it is regarded by Saito et al (1964) not to be transmissible from rabbit to rabbit. Should it revert to the highly virulent North American virus this is likely to be too virulent for transmission in the field. Another attenuated virus suitable for immunising domestic rabbits' is reported by Tozzini (1980) in Italy. This virus could also be a useful vaccine. Finally adequate protection from flying vectors can be achieved in animal houses with insect screening where ecto parasites and fleas can be controlled by insecticides.

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