Emerging health issues

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Introduction

There are two health issues, tuberculosis and parasites, which have attracted international interest and concern over the last few years. Unfortunately, both issues have been politicised and used by various lobbies for their own ends and it is important to get them into perspective. Sound scientific knowledge of these issues will allow sensible debate, assessment of risk factors and the implementation of strategies to deal with these issues.

Tuberculosis (Tb)

New Zealand Situation

Deer farming started in New Zealand 25 years ago and Tb soon emerged as an important health issue. Bovine tuberculosis (*Mycobacterium bovis*) was introduced into this country probably over 100 years ago by the original European settlers when they imported infected cattle from Europe and Australia. Voluntary Tb testing of cattle was introduced in the 1950s while compulsory testing of dairy cattle began in 1961, followed by beef cattle in 1971. These schemes relied on a single intradermal skin test in the caudal fold and the slaughter of all reactors. Good progress was made until the late 1960s when some unexpected Tb "breakdowns" in tested herds were shown to be due to Tb infected possums (Australian brush-tailed phalanger, *Trichurus vulpecula*). Subsequently, areas of New Zealand have been gazetted as "endemic Tb" areas where wildlife, including possums, deer, pigs and mustelids, have become infected with Tb. It is believed that originally these animals were infected from tuberculous cattle, but now the infection cycles independently in the wildlife.

In the 1970s and early 1980s, when deer were captured from the wild, some had Tb and these brought infection onto deer farms. However, in the last 7 or 8 years the cost of live capture exceeded the market value of deer and almost all the rise in deer numbers has been due to breeding and retention of farmed deer. Outbreaks of Tb in deer have also been caused by tuberculous possums or other wildlife contaminating pasture on deer farms, especially along bush or forest margins. The third cause of Tb outbreaks is due to the movement of infected deer from one farm to another.

Testing schemes

The deer industry recognised very early on that Tb had the potential to become a serious problem if it was not contained. Joint efforts over the last 15 years by deer farmers, veterinarians, regulatory authorities and researchers resulted in the development of a voluntary Tb testing scheme in 1985 and a compulsory Tb accreditation scheme in 1990. These schemes, which depend primarily on skin testing, slaughter of reactors and movement control of infected herds, have been very effective. Despite the exponential rise in the population of farmed deer from the start in the late 1960s to 240,000 in 1983 and to around 1.1 million adults today, the Tb test reactor rate has declined from 0.61% in 1986 to 0.14% in 1991. As well the Tb incidence (no. lesion reactors plus lesion non-test deer/total deer population) has declined from 0.14% in 1989 to 0.06% in 1991. Accredited Tb free herds (three clear tests over a period of not less than two years, with no evidence of Tb) have risen from 7 in 1985 to 4,229 (66%) by September 1992, with projections of 75% by June 1993, and 90% by December 1994 (Carter, 1992). In 1992, around 4% of herds were under movement control. Cattle Tb is at a similarly low level with 0.18% reactor rate and 2.8% of total herds under movement control for the 12 months ending June 1992.

The problem facing New Zealand now is to deal with Tb in wildlife. This is a much bigger problem and is being addressed with short, medium and long term strategies primarily aimed at possum control (Livingstone, 1991).

Worldwide experiences

Our experience in New Zealand is being repeated to a greater or lesser extent and with many variations in other countries where deer farming is being established. In many cases Tb has not been diagnosed or recognised as a problem in wild deer until Tb in farmed deer draws attention to the fact. For example, it wasn't until wild deer were live captured for export to New Zealand from Hungarian parks that they were found to be infected. Unfortunately, Tb had not been detected in some earlier shipments of wild captured Hungarian deer to the UK, and these were found to have introduced Tb onto newly established deer farms (Stuart *et al.*, 1988). Tb in wild white-tailed deer in North America was first reported in 1934 (Levene, 1934) but testing and sampling of American and Canadian wild deer has been very sporadic since then. However, the present controversy about Tb in North American deer seems to be out of perspective and an irrational fear of tuberculosis is being used as an excuse to prohibit the development of deer farming. Many regulatory authorities seem to think that the only way to eliminate Tb in deer is to eliminate the whole herd where sometimes as few as a single infected individual is found, something that is rarely contemplated in cattle (or humans). Unfortunately many countries are repeating some of the mistakes that we made in New Zealand and have not learned from our experiences. Often inappropriate testing procedures are carried out and in some cases, there is no testing at all. Unfortunately some of the apparent outbreaks of Tb are used by political groups to scaremonger and a great deal of misinformation and exaggeration is used to promote the objectives of various groups. The important fact is that Tb is already present in the wildlife in many areas of the world and that well managed deer farms will not make the problem any worse. In fact, it is far easier to deal with Tb in farmed deer than in wildlife. Farmed deer can be regularly tested and infected animals eliminated.

Control of Tb

Our experiences in New Zealand have shown that in a closed herd, Tb can be eliminated using a combination of skin test and blood tests. These tests and their performance will be covered in the next paper by Dr Frank Griffin. By contrast, Tb in wild, range or zoo deer present much bigger problems, purely because of accessibility and stress.

The threat of Tb must be put into perspective. Potentially it can have devastating effects if an outbreak is allowed to run uncontrolled in a herd of farmed deer. However, sensible precautions can be taken to prevent its introduction to a herd. The most important preventative measure is to ensure that any animals brought in come from a verifiably Tb-free source; that is, they have a long history of negative whole herd Tb tests carried out in an appropriate manner, have had no clinical cases of Tb and have had a closed herd or brought in only Tb-free animals. In addition all animals should be individually tested by the most sensitive test available.

If Tb is present in a herd then repeated skin and blood testing can be used to detect infected animals which should be immediately slaughtered. If non-specificity is an issue, then reactors to the skin test can be retested with more sensitive and specific tests such as the BTB (see next paper) to clarify the situation. Regular testing of clear herds should be used to detect recent outbreaks of infection in herds in areas where spread from endemically infected wildlife is likely to occur.

Only in herds with high levels of Tb is it rational or economic to slaughter the herd to eliminate the infection.

Parasitism

Background

This is another health issue that has again been used by political lobby groups to try to undermine deer farming.

Wild deer in their natural environment are generally healthy, and life-threatening parasitic diseases are uncommon. Most deer harbour a variety of ecto- and endo- parasites but under normal circumstances the animal's immunity, grazing behaviour and interactions with the environment result in low burdens. However, man's intervention can alter this with changes in the environment, introductions of new species or alterations in population densities causing problems. Similarly, taking wild deer and putting them onto farms can also precipitate parasitic diseases. By grazing red deer entirely on pasture and increasing the stocking densities we inevitably increase their exposure to lungworm, gastro-intestinal worms, ticks, lice, liver-fluke, etc, in areas where these are present. On the other hand, farming also gives us the opportunity to either eliminate or control certain parasites.

Movement of Deer

The international and local relocation of deer has also made it important to prevent the introduction of new species or strains of parasites into areas where they do not currently

exist. This has been achieved by testing, treatment and/or use of special regimes to prevent infection occurring and/or exclusion of infected animals where no appropriate treatment exists. Unfortunately, some slip-ups do occur. For example, a few nasal bots which do not naturally occur here were inadvertently introduced into New Zealand in some elk imported from Canada in the early 1980's. Fortunately these were discovered when a deer died of misadventure shortly after importation and the bots found on necropsy. Treatment of all other imported elk with Ivermectin solved the problem.

New Diseases

In some cases new disease syndromes have arisen when deer are moved into a new environment. In the last ten years, since Canadian wapiti have been imported to New Zealand and farmed alongside red deer there have been many cases of "fading", characterised by ill-thrift and chronic weight loss, with and without scouring. We now believe this is due to chronic abomasal parasitism caused by worms which are carried by red deer without serious disease, but are pathogenic to wapiti. These parasites probably evolved in Europe and wapiti have not previously been exposed to them. Another example arose in 1991, when red deer were moved onto a farm in Arkansas and they soon developed severe disease problems ranging from abortion, crumpled and ischaemic ears, stunted velvet and CNS disturbances. It was found that they have become infected with *Eleophora* parasites which lie in the carotid artery and interfere with blood supply to the head. This parasite is normally carried by whitetailed, mule deer and sheep in these areas without causing any problems, ie, a good host-parasite relationship. However, severe problems developed in red deer because they were an abnormal host and had not adapted to the parasite. It has also previously been reported in wapiti in southern and western USA. The brain-worm, *Parelaphostrongylus tenuis* causes similar problems in northern USA and Canada. It is normally carried by white-tailed deer without problems, but can cause severe brain damage and death in other species of deer. Currently there is concern that *Elaphostrongylus cervi*, the tissue worm which is widespread but in low numbers on deer farms in New Zealand, may be introduced to Canada in deer imported from this country. However, it is clear that sensible preparation and testing regimes could be used to eliminate such risks. Again lobby groups have taken an extreme stance on the possible risks of introducing *E. cervi* to North America. In reality it is endemic throughout Europe, has a wide host range in cervids and does not cause any clinical disease, unlike *P. tenuis* which has a very narrow natural host range.

Research

The examples above highlight an important point. It is essential that we thoroughly investigate all the parasites existing in the wild deer in areas in which we wish to farm or from where we wish to source deer. Only if we know what parasites exist and understand their life-cycles, host predilection and treatment sensitivities can we hope to introduce sensible means of prevention or control. There is also a great need for further research on diagnostic tests, immune responses to infection, vaccines and treatments.

References

Livingstone P (1991). Future directions for control. *Symposium on Tuberculosis. Foundation for Continuing Education, N.Z. Vet. Ass. Publ. No. 132* pp 267-270.

Stuart FA, Manser PA, McIntosh FG (1988). Tuberculosis in imported red deer (*Cervus elaphus*). *Vet. Rec. 122*: 508-511.

Levene PP (1934). A report on tuberculosis in wild deer (*Odocoileus virginianus*). *Cornell Vet. 24*: 264-266.

Carter CE (1992). Control of tuberculosis in the New Zealand Deer Industry. Bovine Tb Epidemiology Workshop, Townsville, Australia, Nov. 1992.