An Assessment of Vaccination as a Control Tool for the Management of Johne's Disease in New Zealand

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Johne's disease (JD) or "paratuberculosis", is a sub-acute to chronic wasting disease of sheep, cattle, deer and goats. This arises from local invasion of the bowel by the organism *Mycobacterium avium* subspecies *paratuberculosis*. Most herds and flocks in NZ are infected (50% to 60% or more), but clinical cases are generally recognised in less than 10% of total herds/flocks. It appears that the deer industry has fairly recently emerged from what could be termed an "epidemic" phase of JD.

JD vaccines (live or inactivated with oil) have been in use for close to 100 years. Overall they have proved to be cost-effective with respect to reducing production losses arising from clinical disease, but not totally protecting against infection nor the establishment of all shedding. Of note is the risk of developing clinical disease is reduced after both pre-exposure and post-infection vaccination; as MAP can be widespread in the environment this "dual action" is important.

Across the world the use of these vaccines in some species has been "patchy" because of undesirable side-effects, especially interfering with the diagnosis of tuberculosis in cattle and, from both an animal welfare and a carcase quality perspective, severe tissue reaction in at the site of inoculation. However, they have played a significant role in some countries, for example controlling clinical disease in sheep in Iceland. A live vaccine (Neoparasec™) was available in New Zealand between 1987 and 2004. In sheep it appears to have been effective, but there was much concern about the amount of tissue damage and follow-on effects; e.g. fly strike.

Currently there are two JD vaccines registered in New Zealand; Gudair™ for sheep and Silirum™ for cattle and deer. Both contained inactivated MAP in oil. The use of Silirum™ is restricted to finishing deer destined for slaughter.

Gudair™ has a pivotal role in the current management of Johne's disease in sheep in Australia. Trials in New Zealand and Australia have demonstrated that Silirum™ reduces the risk of lesion development in deer and cattle. The side-effects referred to above are seen with these vaccines. Tissue damage is less than seen with Neoparasec™; most consider it acceptable but some consider there is still an animal welfare issue.

The managers of the national tuberculosis control programme (i.e. OSPRI) consider that from a technical perspective a limited number of vaccinated herds (with some expected diagnostic "complications") could now be safely handled. Vaccinated animals would have to be permanently identified.

In my opinion, there is a place for vaccination in sheep and in capital stock in deer and cattle in the JD control "tool box", especially where there is a high incidence of clinical disease. In these circumstances, test-and-management tactics (i.e. without vaccination) in deer and cattle would probably be very expensive and have uncertain outcomes. A programme which integrates testing, management and vaccination might be the best option.

There are currently a number of independent groups working on new vaccine prototypes that appear very promising. However, development of a new product for field use will take a long time, possibly as much as 8 to 10 years, and will be expensive. Many consider it important that the sheep, cattle and deer industries are involved in these developments in order to facilitate early adoption.