

## **VACCINATION AS CHOICE FOR CONTROL**

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Paratuberculosis or Johne's disease is a chronic regional inflammatory enteritis of ruminants that is generally accepted to be caused by infection with *Mycobacterium avium* subsp. *paratuberculosis* (MAP). Most of the scientific literature on paratuberculosis refers to cattle, and therefore until it was recognized as an important infection in sheep in Australia, there was limited information on the specificities of paratuberculosis in sheep. In addition to the smaller economic importance of ovine production relative to cattle, lack of research in ovine Johne's disease (OJD) might have been caused by the success of early attempts at control with vaccination in Iceland and later in other countries like France, Spain, Cyprus and New Zealand. Paratuberculosis was introduced in Iceland at the same time as maedi-visna with an import of Karakul rams that was submitted to a long quarantine and that came from a German flock that had never shown signs of paratuberculosis. After 10 years of limited success with a classical early detection and destruction of cases, successful reports of control by vaccination in cattle in France since the 20s led to a switch to vaccination that by 1951 had produced a 94% reduction of paratuberculosis prevalence. Vaccination has been carried out since then in Iceland as the only paratuberculosis control measure in Iceland.

MAP is an ubiquitous microorganism that has a worldwide distribution and that can be found in different domestic and wild species, and that has also been isolated from humans. Even though its slow growth rate and its special requirements in artificial media make it a difficult to isolate agent, it is a highly resistant bacteria that can survive long time in the environment. The pathogenesis of paratuberculosis can follow different routes and needs months to develop. After initial infection during the first weeks of life, most individuals seem to be able to control or to get rid of it, while a few will develop the characteristic enteritis either with a large burden of bacteria or with just a few of them in the affected tissues. The result is that the most affected animals suffer a progressive wasting that leads to death or culling in a few weeks after clinical onset.

Diagnosis is easy once the signs have shown up, but before it is totally impossible to specifically identify all the infected animals. This has made useless in practical terms all the control efforts based on testing and culling in cattle which is the species that has drawn more efforts at eradication. In sheep, this strategy has never been seriously attempted because of both the early failures at isolation of the ovine strains and the huge rate of diagnosis costs to individual value of the sheep. The ovine species, however, lacks the big hurdle that animal health authorities pose to cattle vaccination and that is its interference with the immunologic diagnosis tests used in TB eradication schedules.

Although this is a much exaggerated problem and paratuberculosis vaccination could even lend some limited cross-protection, the low frequency of TB in sheep makes it a nearly irrelevant problem in most regions and production systems. Therefore vaccination is currently in use in the main sheep producing countries that have recognized a paratuberculosis problem. The trouble is that, with the exception of the recent works done in Australia, the results of these field programs are not been published and therefore that there is very little knowledge outside the direct users on the advantages it can provide. In this sense, a recent meta-analysis has shown that of the 70 sheep vaccination studies analyzed 94% yielded positive results, with 68 and 90% reduction in losses, rate of infection or pathological changes. This is in agreement with a simulation study published nearly 20 years ago where it was shown that the benefit-cost ration for vaccination was 7.10, while for testing and culling it was only 0.86 after 10 years of running a control program in sheep. Recent literature shows an increase of efforts at developing an improved vaccine. However, those currently available already can make a big difference and given its low cost and excellent acceptance by farmers, should be considered as an epidemiologically efficient and economically profitable tool whenever a problem of paratuberculosis is identified in sheep by any well-organized region or country where practitioners are reliable professionals and the animal health authorities can guarantee a reasonable tracking of the vaccine and the vaccinated animals.

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