

ANIMAL HEALTH AND WELFARE

The role of vaccination in the control of ovine Johne's disease

Ovine Johne's disease (OJD) is a serious wasting disease of sheep that can result in significant economic losses on infected farms due to sheep deaths, lost production and trading restrictions. The disease is caused by a bacteria and infected animals shed the organism in their manure, contaminating pastures and water sources, spreading the infection to other susceptible sheep.

An imported OJD vaccine called Gudair® was registered in Australia in 2002. This vaccine provides producers with a valuable management tool to assist in the control of the disease. The vaccine does not prevent OJD infection entirely; however, it significantly reduces the number of sheep that die and, very importantly, decreases the amount of bacteria passed in the dung, reducing environmental contamination and providing less opportunity for disease transmission.

Due to changes in regulatory policy and the introduction of the Assurance Based Credit (ABC) Scheme for trading sheep in Australia, it is likely that vaccination will be widely used to progressively reduce the prevalence of OJD within infected flocks and to increase trading options.

Using the vaccine

The Gudair vaccine is registered for use in sheep from four weeks of age. It is an inactivated (killed) vaccine, so there is no risk that vaccination will introduce OJD into uninfected flocks. A single 1mL dose is given, most commonly at lamb marking. Booster doses are not required.

The vaccine must be injected subcutaneously (under the skin), high on the neck behind the ear. It is very important that animals are restrained adequately during vaccination. Young lambs should be restrained in a lamb marking cradle. Weaners, hoggets and adult sheep that are to be vaccinated in a race should be packed tight and have their heads held high to ensure the vaccine is delivered at the

Key points

- Vaccination of lambs against OJD can reduce deaths by up to 90%.
- Vaccination also decreases the amount of OJD bacteria passed in dung by up to 90%. This should reduce pasture contamination and provide less opportunity for disease transmission.
- Vaccination is not 100% protective. More than 10% of vaccinated sheep may develop 'sub-clinical' infection and some will develop severe 'clinical' disease and die.
- Vaccination can be used together with grazing management strategies to reduce the impact of OJD within infected flocks.
- Vaccination of flocks against OJD can be used to earn ABC Scheme credit points when trading sheep.

correct site. Vaccinated sheep must be identified with a NLIS (Sheep) tag that contains the Property Identification Code or number and the letter 'V'.

Producers should be aware that accidental self-injection with the Gudair vaccine can cause a severe and persistent reaction. Vaccinators should be trained in correct vaccination technique and safe handling of vaccination equipment. **If accidental self-injection does occur, contact a doctor as soon as possible, even if only a very small amount is injected.** For further information contact your animal health advisor or Pfizer Animal Health on 1800 814 883.

Producers should contact their local government or private veterinarian for further information on obtaining and using the vaccine. Regulations related to its use may vary between states.

Why vaccinate?

OJD infection in sheep flocks can result in significant production and trading losses. The availability of a vaccine provides an important management tool to help control the disease.

Vaccinated sheep may be used to:

- Reduce the prevalence of OJD on infected properties. Vaccination acts as a ‘circuit-breaker’ in the disease cycle, reducing the level of bacteria passed in the manure of infected mobs, decreasing pasture contamination and the risk of disease transmission to younger animals.
- Produce ‘low-risk’ or low contamination pastures to provide safer grazing for susceptible sheep, such as lambs and weaners.
- Provide a ‘management barrier’ around property perimeters to reduce the risk of disease spread from or to neighbouring properties.
- Provide low-risk replacement stock for infected properties.

Field trial results

The benefit of vaccinating lambs against OJD has been evaluated in a large field trial in NSW. Lambs vaccinated at one to four months of age were studied until they were four or five years old. Vaccination reduced deaths from the disease by about 90%. Vaccination also delayed the onset of shedding of OJD bacteria in the dung by 12 months and decreased the overall level of shedding by around 90%.

Lower levels of OJD bacteria on pasture reduces the risk of disease transmission to subsequent lamb crops. Despite these impressive results, producers should be aware that vaccination is not 100% effective in preventing infection. Over 10% of vaccinated sheep may develop ‘sub-clinical’ infection and shed bacteria in their dung without showing obvious signs of illness. Some vaccinated sheep will eventually develop severe ‘clinical’ disease and these animals usually shed very high numbers of bacteria before they die. It is therefore likely that an ongoing annual vaccination program, combined with grazing management strategies to reduce exposure of young, susceptible sheep to contaminated pastures, will be needed in most flocks to ensure death rates are maintained at low levels.

Figure 1: Deaths due to OJD

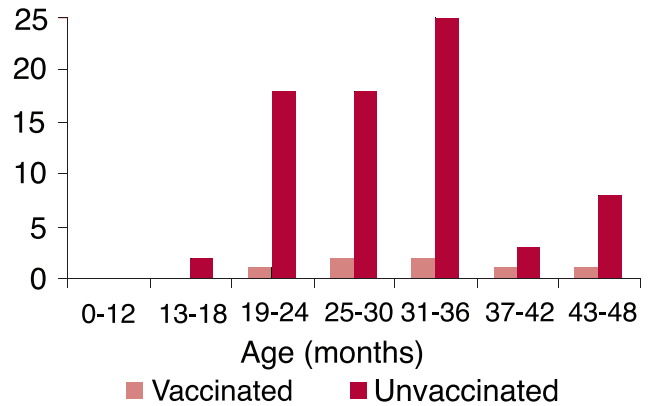


Figure 2: Percentage of sheep shedding M. a. paratuberculosis

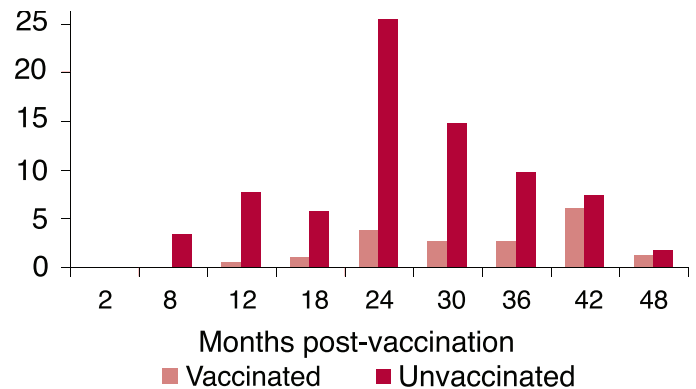


Figure 1 and Figure 2: Graphs of the most important findings from the trial, courtesy of NSW Department of Primary Industries.

Cost-effectiveness of vaccination programs

Research on 12 infected farms suggests that producers incur an average economic loss in the vicinity of \$7.70 per DSE or \$66 per hectare each year due to OJD. These figures are very conservative as they only consider losses due to premature sheep deaths and associated lost wool and lamb production. Financial losses due to reduced market and trading opportunities and variable input costs were not considered, so the real cost of the disease is likely to be considerably higher. Research also revealed substantial variation between farms, with some properties losing as much as \$244 per hectare.

A computer simulation model has been developed to assess the cost-effectiveness of vaccinating against OJD. This model predicts that annual vaccination of lambs will provide highly effective control of the disease and should prove cost-effective within 5–8 years on heavily infected properties and within 9–10 years on farms with moderate levels of infection. Sheep deaths due to the disease are predicted to fall to negligible levels after 10–15 years of vaccination, even on heavily infected farms.

Figure 3: Predicted change in annual costs associated with OJD following vaccination (Heavily infected, 2,000 ewe, self-replacing Merino flock producing 21-micron wool; annual lamb vaccination program started in Year 20 after infection first introduced into flock)

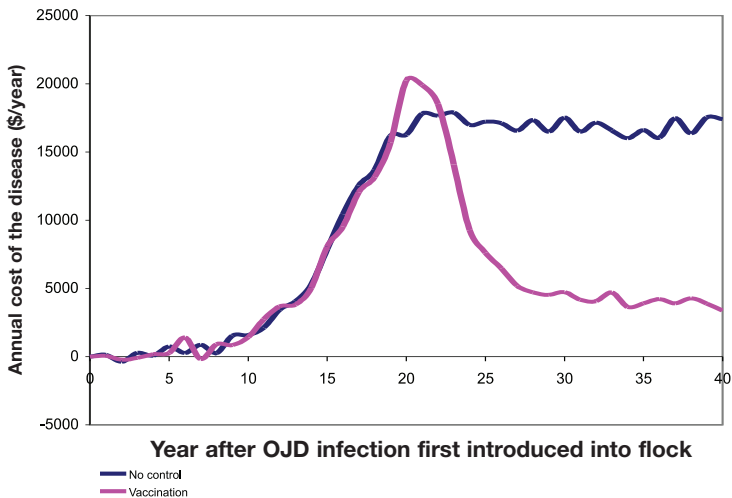


Figure 4: Predicted change in annual mortality rates following vaccination (Heavily infected flock; annual lamb vaccination program started in year 20 after infection first introduced into the flock)

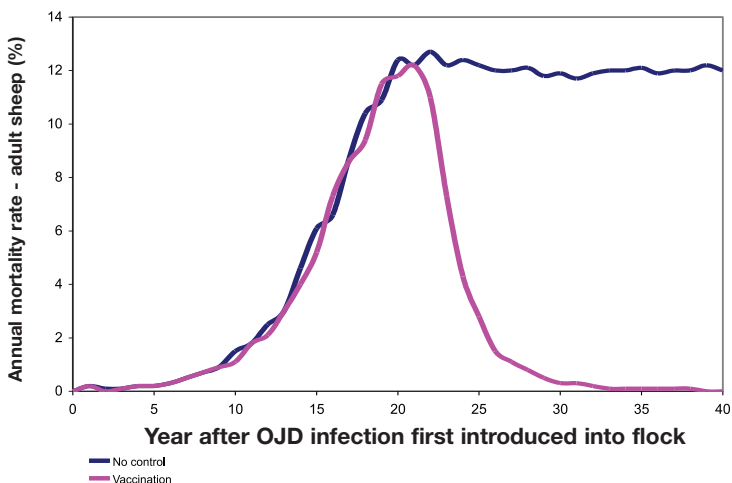


Figure 3 illustrates the expected reduction in sheep deaths following the start of an annual lamb vaccination program, while Figure 4 shows the expected reductions in direct costs associated with the disease. In this example vaccination did not start until 20 years after the infection was first introduced into the flock. If a vaccination program had started earlier it is likely that the disease would have been more easily controlled and sheep death rates would have been significantly lower.

Vaccination and the ABC Scheme

OJD commonly spreads between properties as a result of sheep movements. On 1 July 2004, a new OJD Assurance Based Credit (ABC) Scheme was introduced for trading sheep in Australia. The ABC Scheme is a nationally agreed method for assessing the risk of OJD infection in sheep at the flock or mob level. The scheme helps producers to reduce the risk of the infection entering their flock. It also provides a pathway for owners of infected flocks to improve their trading position via on-farm management of the disease.

Sheep to be moved or sold are covered by a national OJD Animal Health Statement which includes an 'ABC Score'. All sheep sellers can declare an ABC Score in writing on the OJD Animal Health Statement for each consignment of sheep. Credit points towards the ABC Score can be claimed under four categories which relate to:

1. OJD prevalence in the region where the flock is located;
2. The level of flock testing for the disease (if any);
3. The OJD vaccination status of the flock and/or consignment of sheep; and
4. Identification of low risk groups within infected flocks by approved veterinarians.

Consignments of sheep that have been vaccinated in an approved manner can claim between one and four points towards their ABC Score depending on vaccination history. 'Approved vaccinates' are sheep vaccinated as lambs at 4–16 weeks of age and sheep over the age of 16 weeks that were vaccinated prior to any exposure to OJD infection.

Sheep buyers can inspect the Animal Health Statement for any consignments they are interested in buying. Buyers then determine the risk posed to their flock by understanding the score of their own flock relative to the purchased sheep and deciding whether they wish to take the risk. The maximum score possible is 10 and the higher the score the lower the risk.

Further information on the ABC Scheme can be obtained from your veterinarian or local animal health advisor or from the Animal Health Australia website: www.animalhealthaustralia.com.au/aahc/programs/jd/ojd.cfm

Vaccination site lesions

Vaccination against OJD results in injection-site reactions in a large number of sheep. A firm swelling usually develops at the site of injection, followed by a nodule 7–15 days later. In a small proportion of animals the lump may be more than 5cm in diameter or develop into an abscess and burst, which may predispose to flystrike. By two months after vaccination most swellings have decreased in size, and continue to decrease over time. However 25% of lumps can still be felt up to 30 months after vaccination.

The possible economic impact of these site reactions at slaughter has been evaluated. Results indicate that reductions in carcase weight due to trimming are low and carcasses are unlikely to be downgraded. Despite this producers should avoid vaccinating sheep which will be slaughtered as lambs and must follow the manufacturer's directions to administer the vaccine subcutaneously high on the neck behind the ear.

Further vaccine research

Whole flock vaccination

The effect of vaccinating adult sheep has been studied over four years in a Merino flock with a very high death rate due to OJD. Results suggest that vaccination of adult sheep, first exposed to OJD infection as lambs, does not protect against subsequent disease and death. However, vaccination at up to eight months of age may reduce the amount of bacteria that infected animals subsequently shed in their dung. This may prove beneficial in reducing pasture contamination in heavily infected flocks, however further research is needed to confirm this finding. No negative effects were seen even when infected adult sheep were vaccinated.

Long-term benefits of lamb vaccination

The potential value of an OJD vaccination program is likely to become more evident following vaccination of a number of successive lamb crops, particularly once vaccinated lambs begin to produce offspring.

Researchers are currently investigating the reduction in bacterial shedding over time following annual vaccination of lambs in flocks with a low, medium or high prevalence of OJD. The flocks will be monitored for six years to see how the level of shedding changes as the proportion of vaccinated animals in the flock increases. This should allow producers to more accurately predict the likely decrease in infection levels in their own flock following the introduction of a vaccination program.

For more information

For more information contact the MLA animal health team on 02 9463 9288.

The bottom line

Vaccination is proving to be an important management tool in the control of OJD. Australian research has shown that vaccination of lambs can decrease their subsequent death rate due to the disease by up to 90%. Although some vaccinated sheep do contract the infection, the number of OJD bacteria shed in vaccinated mobs is reduced by around 90%.

Vaccination can reduce the level of pasture contamination with OJD bacteria, lowering the risk of disease transmission to subsequent lamb crops. Ideally vaccination should be combined with grazing management strategies to reduce exposure of susceptible younger sheep to infected pastures.

It is important to remember that vaccination is not 100% effective in preventing disease. It is likely that an ongoing annual vaccination program will be needed on many farms to ensure that the disease is controlled and sheep and production losses remain low.



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