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Farmnote

Beef cattle vaccinations

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This Farmnote discusses the reasons for vaccination of beef cattle and the appropriate vaccines. It covers how to correctly apply vaccination programs in a timely and cost effective way.

A successful vaccination program complements management, nutrition, and genetics. It aims to ensure that more calves are born, mortalities are reduced, growth rates are optimised, weaner throughput is increased and sale returns are maximised.

Vaccinations should be carried out according to the manufacturer's directions found in the packaging.

Clostridial diseases

Clostridial bacteria are widespread in the soil and gut of normal healthy animals. Pathogenic clostridial bacteria (bacteria capable of causing disease) are more common in soils that are rich in humus and organic matter and tend to be less common in sandy soils.

When clostridia multiply they produce potent toxins. These toxins thrive in soils in warm weather following rain or in other oxygen-free environments such as decaying vegetation, wounds or carcasses.

The toxins may enter the body of the animal through ingestion (as is the case with botulism), they can be released in the gut (such as in the case of pulpy kidney/enterotoxaemia) or released from other tissues (such as in blackleg).

The major clostridial diseases that can be prevented by effective '5 in 1' vaccination programs are pulpy kidney (enterotoxaemia), tetanus, blackleg, malignant oedema and black disease. '7 in 1' vaccines protect against all of the above diseases as well as leptospirosis. Botulism is also caused by a clostridial bacteria but requires a separate vaccine.

Pulpy kidney/Enterotoxaemia

Pulpy kidney/enterotoxaemia results from the proliferation of a clostridial bacteria in the intestine that produces a toxin. This toxin damages blood vessels and the nervous system. It occurs in young rapidly growing animals on good feed. It usually follows a change in the digestibility of the diet, for example, going from winter pastures onto lush spring pastures, or introduction of a high grain ration. Signs of the disease include diarrhoea, bellowing, dullness, blindness, convulsions and death.

Tetanus

Tetanus is usually the result of contamination of deep wounds. The bacteria remain at the site of entry, multiply and produce a toxin that affects the nervous system. This causes stimulation and contraction of muscles causing the animal to appear stiff, with the tail held out and the head and neck stretched out. Eventually the animal will not be able to stand and will go into tetanic convulsions and respiratory failure that results in death.

Blackleg

Blackleg tends to occur in young cattle from six months to two years old that are on good quality feed and are rapidly growing. Blackleg is thought to result when spores of the bacteria, normally found in muscle, multiply as a result of bruising. They produce a toxin which causes severe muscle damage. The affected area becomes hot and swollen and a gas builds up, eventually resulting in gangrene. In most cases a limb is affected and the animal is lame. The toxin is absorbed into the bloodstream, eventually resulting in death. Often the affected animal is found dead. If they are found alive they will appear depressed and often have a hot, painful, crackling swelling above the hock in one (usually hind) leg.

Malignant oedema

Malignant oedema results from wounds becoming contaminated by soil which allows the clostridial bacteria to enter the body. Infection can also occur via the navel in newborn calves and following injections, if good techniques are not used. The toxins produced by the bacteria cause extensive swelling and the accumulation of bloody or clear fluid. The surrounding tissue dies and becomes gangrenous. The toxins are absorbed into the bloodstream, resulting in fever, weakness and eventually death.

Black disease

Due to absence of liver fluke in Western Australia black disease is rarely seen. Black disease is thought to result when there is damage to the liver, such as occurs with migrating liver fluke. This allows the bacteria concerned to multiply and produce toxin. This toxin causes severe liver damage and death.

Botulism

Botulism is a paralysing disease caused by the bacteria *Clostridium botulinum* which produces a powerful nerve toxin. Outbreaks of botulism can occur in extensive as well as intensive production systems. In extensive production systems, botulism occurs when cattle chew bones and decaying animal carcases that contain the botulinum toxin, in an effort to satisfy their protein and/or phosphorous requirements. In intensive production systems, outbreaks of botulism are relatively uncommon but can occur as a result of contamination of feed or water with rotting organic matter (for example, snakes, mice or lizards trapped in grain, hay or silage during harvesting or storage). It can also result from feeding incorrectly made silage or from grazing rotting vegetable matter in irrigation drains and around swamps.

Botulism causes paralysis and animals die from respiratory failure when the breathing muscles become paralysed. Affected animals display a stiff gait and will be sitting down and unable to rise. They may have their hind legs extended and their tongues may be protruding.

The best strategy against botulism is to vaccinate. The number of doses required varies with the vaccine used, for example, two initial vaccinations and an annual booster, or one vaccination per year, or one vaccination every two or three years.

Leptospirosis

Leptospirosis is a serious disease of livestock and humans caused by various strains of the bacteria *Leptospira*. Many producers are unaware that leptospirosis is present in their herd because one of the strains, *L. taravossi*, produces no obvious signs of disease in cattle, although it has been associated with infertility in dairy herds.

Infections caused by the other two strains of leptospirosis may be more obvious. Some symptoms may include delay to service, abortion in late pregnancy or 'redwater' (brownish-red coloured urine) may be seen in young calves as a result of the breakdown of red blood cells. Humans can become infected with all strains of leptospira. It causes flu-like symptoms that in many cases require hospitalisation.

Leptospirosis is spread through the urine of infected animals. New infections take place through cuts and abrasions of the skin when animals stand in contaminated water or on contaminated ground. Direct infection can also take place if infected urine splashes onto the membranes of the mouth, nose and eye.

Vaccinating cattle against leptospirosis should be considered as cheap health insurance, not just for livestock but for livestock producers and their staff as well. This disease can result in farm staff being unable to work for several weeks or months and this can lead to production losses greater than those due to infection of the cattle herd.

Pestivirus (BVDV)

Reproductive losses as a result of pestivirus infection include return to service, abortion, stillbirths, birth defects, ill thrifty calves and respiratory disease. In adult animals, the infection is rarely noticed. It is common among pregnant females exposed to the virus for the first time that reproductive losses occur.

Disease prevention measures include vaccination of cattle prior to joining. Vaccination needs to be repeated annually, as the vaccine eliminates the carrier animals from the herd making it highly susceptible to reproductive losses if the virus is introduced. Before the invention of vaccine, heifers were sometimes run with animals identified as persistently infected carriers which would allow the heifers to develop immunity.

An alternative to vaccination is strict exclusion of the disease after removal of persistently infected animals. The level of biosecurity required to reliably keep this disease out is rarely found on Australian farms. The choice of control plan should be based on a risk assessment done by your veterinary practitioner.

Vibriosis

Vibriosis is a common infectious venereal disease causing repeated return to service as a result of abortion, embryonic mortality and uterine infections. Infected bulls are generally responsible for introducing vibriosis into a clean herd and they spread it to susceptible cows and heifers during joining. It is displayed by animals failing to conceive and continuing to come on heat, occasional abortions and a spread out calving as a result of infected females returning to service towards the end of the joining period. As immunity develops, the incidence of the disease reduces, but reinfection can occur because immunity normally wanes a year after the initial infection. Vaccinating bulls annually against the disease is the best way to maintain a vibriosis free herd. The vaccine should be given four weeks before joining.

Pink Eye

Infectious bovine kerato-conjuntivitis (IBK), known as pink eye, is a painful and debilitating condition that affects many cattle herds. The primary causing agent is the bacterium *Moraxella bovis*. It attaches itself to the surface of the eye using "hair like" structures, called pili. It produces toxins that damage the eyes and haemolysins, enzymes that can cause the erosion of the cornea. The first signs are: excess production of tears and reddening of the eye membranes followed by the development of a cloudy appearance of the cornea that can cause temporary blindness. A small whitish spot usually appears in the centre of the lesion and in more severe cases it can continue to enlarge as corneal erosion expands and ulceration develops. In extreme cases, rupture of the eye can occur resulting in permanent blindness.

Treating and segregating early cases can help in controlling the disease. Dust, flies, overcrowding, and bright sunlight are amongst the main predisposing factors and also play a role in spreading the disease. Therefore special attention should be paid in minimising these factors. In some cases mustering animals for treating can magnify these factors and intensify the spread of the disease.

Recently a vaccine for pink eye has been made available in Australia. It is a single dose vaccine that targets the pili preventing the bacteria from attaching to the cornea. Although this vaccine only contains three of the seven known strains of *M. bovis,* Australian field studies have been encouraging. Given the production losses, treatment costs and welfare implications of pink eye, properties where the incidence is high should consider vaccination. It is important to emphasise that controlling predisposing factors will still be necessary in addition to vaccine to minimise the chances of pink eye occurring. Timing of vaccination will vary between properties, and is recommended between 3-6 weeks prior to the expected onset of the "pink eye season" (when predisposing factors are prominent).

Other vaccines

Vaccines are available for the control of E.coli, Bovine Respiratory Disease (Infectious Bovine Rinotracheitis, Mannheimia, Salmonella), Tick Fever and Ephemeral Fever. Use of these will depend upon property circumstances and should be undertaken in consultation with your veterinary practitioner.

Principles of immunity

The immune system in cattle does not mature until six months of age. The potential for infection may be quite high until this age which makes it critical that the new born calf is protected during this period. This can be achieved by vaccinating the dam ('5 in 1' or '7 in 1') two to six weeks before calving to ensure immunity is passed onto the offspring through the colostrum.

When the passive immunity passed on from the dam begins to decline, active immunity can be given through two doses of vaccine four to six weeks apart. The first dose provides a short period of immunity and increases the circulation of blood antibodies. The second dose generates what is known as an anamnestic response. This means that the animal produces a prolonged and specific immunity as it recognises the antigen that was present in the first vaccine dose. Certain virus infections, most notably pestivirus, can temporarily suppress the immune system of newly infected cattle. This can leave them open to infection with a range of other disease agents. This effect is most obvious in beef feedlots.

Vaccination technique

Vaccines are delivered by subcutaneous injection (under the skin, not into the muscle), in the area outlined by the rectangle in Figure 1. Choose a clean area of skin to inject through. When using a multi-dose inoculator gun, ensure that the needle is clean and sharp and changed regularly.

Lift the fold of the skin with your free hand and inject at the base of the tented skin (Figure 2). The objective when vaccinating is to get the opening of the needle resting between the skin and underlying tissues, so the vaccine is deposited in the right place. This is achieved by orientating the needle so that at entry it is about 45° to the skin, with the bevel parallel with the skin (Figure 3).

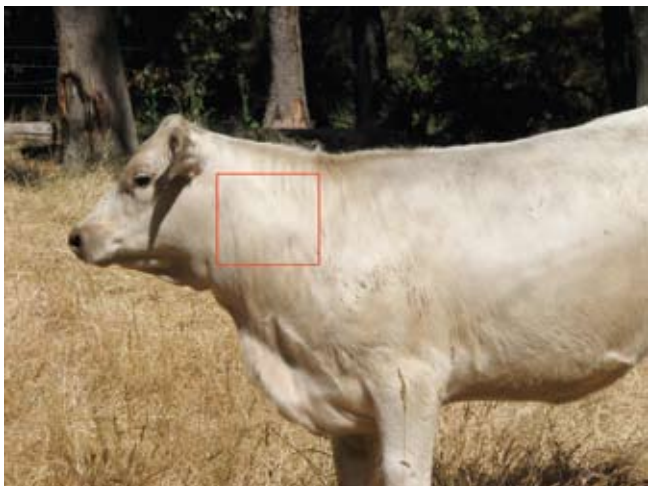

Figure 1 Vaccines need to be given under the skin in the area outlined by the rectangle

Figure 2 Lift a fold of loose skin with your free hand and inject at the base of the 'tented' skin

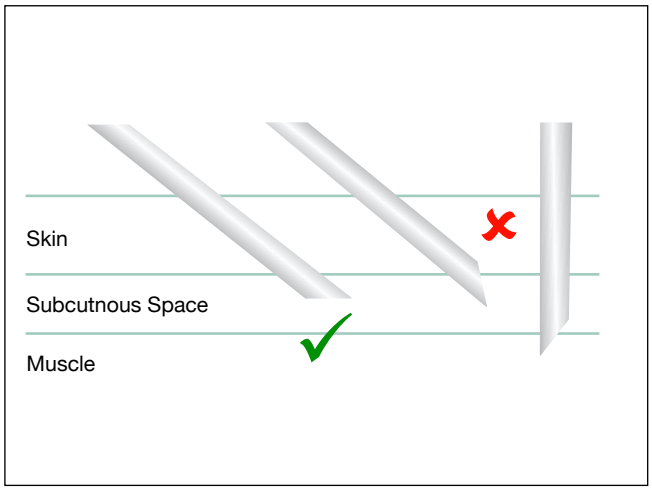

Figure 3 Correct vaccination technique is achieved when the needle, at entry, is about 45° to the skin with the bevel parallel with the skin.

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