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Eradication of the liver fluke in dairy cattle

By Dave Muirson, Technical Officer, Division of Animal Health, Harvey

In July 1987, a meat inspector found liver fluke (Fasciola hepatica) in a cow at an export abattoir at Waroona.

This was the first evidence of the liver fluke completing its life cycle in Western Australia.

Fortunately, the Department of Agriculture is reasonably confident that a comprehensive drenching programme has eradicated the liver fluke.

The establishment of liver fluke in the south-west coastal areas could cause a serious problem for cattle producers and the small number of sheep producers. Stock would need additional drenching, and if it was not carried out effectively production could be lost or stock could die. Once the liver fluke was established over a wide area eradication would be almost impossible.

About the liver fluke

The liver fluke has a complex life cycle. Adult fluke are leaf-like, and pale brown or greyish-brown. When mature they are from 15 to 40 mm long and up to 12 mm wide.

Liver flukes mature and live in the bile ducts of the animal host, where they lay large numbers of eggs (Figure 1). Under favourable conditions of moisture and temperatures of between 15°C and 24°C the eggs develop into the pre-hatch stage. They will only hatch into larvae if they find water and when they invade the host aquatic snail (Pseudosuccinea columella).

The emerging larvae must find a host snail within 24 to 30 hours to reproduce asexually or else they will die. After five to eight weeks and several larval stages later, depending on the temperature, minute tadpole-like larvae emerge from the snail. These larvae form cysts on herbage and are eaten by cattle and sheep. The larvae then migrate to the animal’s liver before entering the bile ducts.

A fluke may sometimes migrate through other organs or, in a pregnant cow, may infect the unborn young.

The liver fluke's snail host (far left), Pseudosuccinea columella, lives only in fresh water. The shell has a clockwise spiral when viewed from above.

The native aquatic snail (left) has an anticlockwise coil to its shell.

The liver fluke is a parasite best kept out of Western Australia. (Murdoch University photo.)
The liver is damaged during this migration. This damage alone may kill the animal (usually called acute fascioliasis) or may make it susceptible to black disease, a form of hepatitis. Adult flukes cause anaemia as a result of blood-feeding, and cirrhosis of the liver.

**The disease**

Animals suffering from fascioliasis have poor wool quality and reduced meat and milk production. Young stock show ill thrift and may die. The presence of flukes in the liver may cause it to be condemned at abattoirs as unsuitable for human consumption. These losses, together with the costs of control such as repeated drenching and vaccination for black disease, add up to considerable economic costs.

**The snail**

*Pseudosuccinea columella* is an aquatic snail found only in fresh water. It is a hardy, self-fertilising species well able to compete with established snails. It is the only host snail of liver fluke present in Western Australia.

The liver fluke snail was first identified in the Perth metropolitan area in 1975 and has since spread as far south as the Vasse River, colonising most natural and man-made waterways.

The South-West irrigation areas are a most favourable environment for it.

The snail is relatively small, the full grown specimen being about 11 mm long. It has a dark grey body and the empty shell is brown and translucent. Some red-brown specimens have been found in areas where the water course is in red soil or clay. The shell has a spiral clockwise coil when the apex is viewed from above whereas the native aquatic snail has an anticlockwise coil. When compared to the native aquatic snail, *P. columella*’s shell is thin and fragile.

The snail’s foot projects through an aperture that is more than half the length of the shell. When the snail withdraws, the aperture is plugged with the foot; there is no hard operculum. The tentacles on the the snail’s head are fleshy, flat and triangular rather than filamentous as on the native aquatic snail.

*P. columella* lives in small numbers in lakes, ponds, streams, drainage ditches and seepage areas. It prefers sunny, open, wet mud and shallow pools where there is abundant aquatic plant growth and algae on which it feeds. On cool sunny days the snail may be found on the waterline or even a few centimetres out of the water on the bank.
The snail was probably introduced into Western Australia with imported tropical fish and aquarium plants.

Finding liver fluke on farms

The infected carcass found at Waroona was traced back to its property by using the cattle tail tag. Faecal samples were taken from all dairy cows on the property to find out whether other animals were infected. Two more animals were found to have liver fluke.

Samples were also taken from all dairy cows on two neighbouring farms immediately north and south of the infected property because the farms' drainage and irrigation systems are connected. Another 12 infected animals were found. All three properties were placed under quarantine.

The owners of two of the properties had imported cows from the Goulburn Valley irrigation district in Victoria in 1985. One animal had survived from this consignment and was found to be infected despite being treated according to regulations in force at that time. Under those regulations cows imported from Victoria were correctly drenched twice with an approved flukicide at strategic times after arriving in Western Australia.

Regulations governing the importation of livestock from the Eastern States have since been amended, and a more effective flukicide is now used. Stock are not allowed free access potential liver fluke risk areas in Western Australia until they have successfully completed the treatment and quarantine period. Ideally, imported livestock should complete this period in the drier wheatbelt.

The eradication programme

Cattle, sheep and pigs from neighbouring farms were tested and found to be free of liver fluke. Information from maps from the Water Authority of Western Australia indicating direction of water flow in drainage and irrigation systems was used to determine the area to be investigated.

The host snail was found to have successfully colonised irrigation and drainage systems in the surrounding area.

Two attempts were made to reduce its numbers. The first, using copper sulphate, was unsuccessful because adequate concentrations of the chemical could not be maintained for long enough. The second attempt using Frescon® (trifenmorph) reduced snail numbers significantly, thus lowering the risk of larval fluke infestation considerably.

Milking herds on the three farms were drenched initially every two weeks with Fascol® (100 g/L bromsalans) at 105 mL per head. Dry stock were drenched every six weeks with Fasinex® (120 g/L triclabendazole) at 10 mL per 100 kg of body weight. To determine correct dose rates animals were weighed on electronic scales.

Fasinex® is the preferred flukicide. Unlike Fascol® it is effective against flukes at nearly all stages, being marginally inefficient only in the first few days after infection.

As Fascol® was the only drench registered for use in lactating cows at that time, the Department investigated the use of Fasinex® as an alternative to Fascol® at Wokalup Research Station in October 1987. No significant residues were found in milk later than four days after cows were treated with Fasinex®.
In February 1988, the Minister for Agriculture, after consultation with the Health Department, approved the use of Fasinex® in lactating cows, provided the three quarantined farmers discarded the milk for four days (eight milkings) after treatment. The farmers were compensated for loss of income from the Cattle Industry Compensation Act Trust Fund.

Once Fasinex® was approved for use, all animals were drenched at six weekly intervals. The drenching programme was easier to manage and, more importantly, it placed less stress on the dairy cows. The final drench was given in March 1989.

Discarded milk was given to surrounding farmers to feed safely to their calves. All cattle on neighbouring properties were monitored during the eradication programme. Results were negative, which suggests that the fluke had not spread from the original properties.

**Last minute problems**

Towards the end of the 22-month Fasinex® drenching programme some cattle developed a photosensitivity for a few days shortly after they were drenched. All classes of cattle were affected. The bare, white skin of the nose, vulva, scrotum and udders was the worst affected. Hair-covered areas were less affected and pigmented areas were not affected.

The exact cause of the photosensitivity is not known, but the frequent high doses of Fasinex® were implicated.

Cool, overcast weather, and holding cattle in shady paddocks, reduced the severity and numbers of affected animals during the final treatments.

**Release from quarantine**

By April, 1989, after some 22 months of intensive drenching, the three properties were released from quarantine.

Monthly faecal sample were taken from dry cows to ensure the fluke had been eradicated. If we assume a 300-day lactation, a six to eight week dry period and all cull cows going for slaughter, the entire milking herd would have been sampled at least once (or inspected at slaughter) over a 12-month period. Between them, the dry cows and milking cows (including first calvers) would have grazed virtually the whole farm.

Results of sampling so far have been negative, but monitoring will continue for a further two years. If a snail had become infected at the start of the eradication programme and if it had survived almost to the end of that 22-month period, the fluke could infect a calf soon after the last drench was given. This animal could escape sampling for up to three years.

After some 22 months of drenching cattle and the 12-month monitoring period, the Department of Agriculture is reasonably confident the liver fluke has been eradicated.

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