

BOVINE TB ERADICATION IN THE KIMBERLEY

On 6 September 2000, our speaker was John Creeper, a veterinary pathologist who worked with the Agriculture Department in Derby from 1985 until the end of 1992. An edited transcript of his superbly illustrated talk follows. It was too informative to warrant a summary.

Bovine TB is caused by a bacteria called *Mycobacterium bovis*. It has a predilection for lymph nodes of the respiratory system. Infected nodes can contain multiple circular yellow lesions or tubercles holding custard-like material. As the disease progresses, the infection spreads to the lungs and can affect not only other cattle but also humans.

Cattle with generalised TB lose condition, become weak and die. The vast majority of infected cattle appear normal – the disease can't be diagnosed on the basis on clinical signs. It can infect any organ of the body including the brain but most commonly there is liver involvement in generalised infections. In dairy cattle TB often spreads to the udder. *Mycobacterium* are very robust bacteria and can survive for months in chilled milk. This meant that, prior to pasteurisation, infected milk represented a public health risk.

Back in the 1940s, a survey of dairy cows in Victoria (predominantly Jersey cows) showed that 30% of dairy herds were infected. On individual farms up to 10% of cows were infected. The public health risk of so many infected cattle resulted in the beginning of TB eradication in Australia. The then Bureau of Animal Health has left us with three legacies from the original campaign:

- They put in place an identification system so infected cattle detected at slaughtered could be traced back to the property of origin;
- To assure accurate diagnosis of TB at abattoirs they created what has evolved into the AQIS—trained meat inspectors—and gave them regulatory power to condemn infected carcasses as not fit for human consumption; and,
- They were able to get farmers to agree to form the cattle industry compensation funds whereby a small percentage of the proceeds from the sale of each animal slaughtered went into a trust for the purpose of compensating farmers for the destruction of infected or condemned animals.

As a result of these measures TB eradication in the dairy herds was extremely successful – properties identified by abattoir monitoring as infected were repeatedly tested using an intra-dermal skin test or by selective destocking of heavily infected herds. Then, as the dairy campaign neared completion, attention focussed on the 12,000,000 beef cattle in southern Australia. This involved about 20,000,000 individual TB tests, which meant a lot of work for vets. In fact, most

veterinary practises in non-dairy rural towns in Australia came to be during this period because the enormous amounts of testing gave a steady income flow.

TB eradication in the south was given a boost during the 1975 beef crash when many farmers got out of beef and into sheep. It also helped that the average southern beef farm had 100 quiet cows running under control on 1000 acres. When authorities accustomed to this type of beef enterprise looked to the north of Australia and saw 6,000,000 wild animals almost out of control they were overwhelmed. They concluded that TB eradication was impossible and that the best they could do was quarantine the north from the south.

A fleet of AQIS inspectors ensured that the meat coming out of northern abattoirs was safe to eat but little Kimberley beef found its way to Australian dinner tables. It was low quality lean beef, which was frozen and shipped to the USA in cardboard cartons. We had a symbiotic relationship with US feedlot beef producers. The huge volume of fat produced by the USA feedlot beef industry – a typical feedlot steer has 20kg of fat around the kidneys – would normally have gone to waste had the lean meat not been coming out of northern Australia. It was added at the rate of 28% USA fat to 72% Australian lean beef to make beef patties.

Problems arose in 1979 when a delegation from the USDA let it be known that their TB program nearly finished and that, when it was, they wouldn't be taking beef from infected areas. Veterinary administrators immediately sent vets and stock inspectors to the Kimberley, Northern Territory and north Queensland to see if eradication was feasible. In the Kimberley they found approximately one million cattle mainly of semi-feral British shorthorn type. Herds of up to 30,000 head were common and one spread of leases had 120,000.

The 1975 beef crash had really hit the marginal beef producers in the north very hard. They didn't bother mustering for 2 to 3 years until prices recovered. Things were out of hand on the smaller properties. Cattle control was poor; bulls ran with the cows all year round; and there was a large proportion of unbranded cattle in every herd. In some places large numbers of uncontrolled cattle had overgrazed areas and caused soil degradation. Reliance on natural waters—rivers and billabongs—led to large cattle losses in times of drought. Man-made waters such as artesian bores and windmills were often poorly equipped.

One pastoralist told of worrying all season until his 5000 bullocks (each worth \$400–\$500) had been slaughtered because they paid for his running costs. His profit only came with the cows that he sold. The scant reserves for capital improvements, coupled with the attitude that pastoral stations were only leasehold, resulted in poor quality improvements on many stations. The majority of yards were

timber and would be totally unsuitable for safely testing large numbers of cattle if a TB Testing program was to go ahead.

A picture of the distribution of the TB infected cattle was built up by relating the daily sheet of cattle killed by earmark at the local abattoir to the records kept by the stations, trucking companies and AQIS meat inspectors. Mapping the infected populations showed that TB was mainly on the better stations – those with large numbers of cattle and usually with access to river systems. Herds could be evenly distributed along the rivers during much of the year but, as water holes dried up, thousands of cattle became concentrated within a small area. All the factors that encourage the spread of an infectious disease were present – overcrowding, immune suppression and, coupled with this, the cows were either late pregnant or just calved. Around man-made watering points in the dry season there might be no grass for a distance of about five kilometres. The cattle had to walk across this desert (where radiant heat has been recorded at 60° in the NT), graze beyond the bare areas and come back at night for a drink. We found that periods of stress were greatest in the late dry season and that with TB the well walled off lesions seem to break down when animals are under greatest stress.

After several years of quite intense epidemiological appraisal across Australia it was felt that TB was present in low concentrations within the northern Australian cattle herd, with pockets where infection rates were high and probably the source of persistence of the infection. The BTEC Campaign was launched and, fortunately, a lot of factors were in our favour. Main Roads started to upgrade the road system. BTEC low interest loans and generous capital depreciation allowances assisted cash strapped stations to build steel yards. Stations were paid to hold cattle for TB testing and received generous compensation for cattle destroyed for the purposes of TB eradication. An influx of rangeland agriculture scientists seeded large areas of degraded land to newly developed plant species such as Buffel grass on the cracking black soil loams – these are the soils that run very high cattle densities. In coastal plains, Birdwood Grass became established on stations such as Anna Plains and allowed similar stocking rates to the black soil pastures.

Emphasis was on spreading cattle out and getting them away from the river systems. Stations used BTEC loans to build additional watering points and cheap poly piping allowed extra watering troughs to be fed off these new bores. Similarly the use of dams was developed to allow water storage in areas where there was no underground water available so that cattle could spread out. These extra waters reduced the spread of infection through cattle being breathed on. They also spread out the grazing areas so that the problem of five kilometre bare zones didn't occur and, consequently, cattle condition improved.

BTEC coincided with the use of helicopters for mustering, thus allowing large areas to be mustered quickly but much more efficiently than previously. The TB program also coincided with the universal use of road trains to carry cattle – the three trailer 6 deck units which could carry 150 cows long distances in short space of time.

Brahman cattle were on several properties for some time prior to 1980 but these were nasty examples of the breed. Pastoralists then had access to the newer Brahmans developed in Queensland. Those beasts were placid, tolerant to heat and the cattle tick, had much lower modality rates than the Shorthorns and made much better use of the poor quality feed available in the end of the year.

With cattle control being the key requirement for the eradication of TB, fencing was critical. Most stations could be fenced into paddocks. The size wasn't terribly important initially so long as we could test all the cattle within that paddock and stop mobs of cattle mixing. One infected property – Pantijan – couldn't realistically be fenced. It was decided to remove all cattle by conventional means over a five-year period, or until the owners or contract musters could not economically muster any more, and then shoot any remaining cattle.

The traditional Kimberley fence used posts 10 metres apart with 4 barbed wires along the bottom panels and a single 8-gauge wire along the top. This is prohibitively expensive in both time to erect and in the cost of materials. BHP invented barbed wire that behaved like an elastic band which allowed steel posts to be placed 30 metres apart with 2 droppers in between. As a result a team could erect a fence at a rate of 10 kilometres per day.

The typical scenario for paddocked cattle in the BTEC campaign was fairly simple. Cattle in the paddock were mustered – usually by a combination of horse and helicopter. They were then yarded and drafted into fat cattle, which were sent to slaughter. Calves were branded and the remaining adult population was TB Tested.

TB Testing is the human equivalent of the mantoux test. It makes use of the fact that cattle infected with TB will react with a delayed hypersensitivity immune reaction if they are injected with a purified protein derivative of the mycobacterium cell wall. This derivative called tuberculin is injected beneath the skin in the hairless part of the tail fold. Four days later the injection site is felt and a positive result occurs when there is fluid swelling. The test is 60-80% sensitive and sometimes a fair bit of acrobatic ability was required to reach over and read the tails.

If an animal reacted positively to the test it was identified in some way – spray cans being the usual method – and kept with the other cattle tested until all of them

had been read. The reactors were then shot and post mortemed by the vet. A specific set on lymph nodes were sampled and sent to the laboratories in Perth for culture and Histopathology.

The basics of eradication sound pretty straightforward but we did encounter quite a few problems. Every cattle tested was ear tagged, and we had assumed that the mustering efficiency of helicopters was almost 100%, but we continued to turn up cattle at TB tests that had not been previously tested before. These were usually old bulls and bullocks that evaded mustering – and it was these cattle that invariably were infected.

To overcome this problem we decided to get the station to muster as best they could then we would send up stock inspectors with rifles to shoot any remaining cattle that refused to be mustered. Whilst this made me universally unpopular, shooting of these unmusterable cattle was the single most important factor in eradicating TB from the Kimberley.

The stock inspectors often had to make several passes of the country before they were confident they had all the cattle that had evaded the muster. This applied particularly in the thick river country and we found that the only way to clean up parts of the Fitzroy River was to have men on horseback on the ground in addition to helicopters. So many semi-automatic rifles in such a close area meant that firearm safety became an issue. We employed the army to train the stock inspectors in firearm safety and to pass on experience in planning these operations involving a lot of shooting.

One of the troubles using the intradermal skin test is that cattle become anergic or unresponsive if they are heavily infected. In heavily infected groups the most cost-effective way to eradicate the disease is to send the entire mob of cattle to the meatworks. Pastoralists were particularly opposed to depopulating of infected mobs so, if the owner of the cattle wished to retain the breeder group, we introduced requirements such as weaning – which involves removing calves at 6 months of age and growing them out in a separate paddock. There are many other benefits of weaning and on the majority of the stations, given the benefits seen in these infected groups, applied this approach to the rest of the herd.

The last resort for heavily infected breeder groups was the gamma interferon blood test. This was developed by CSL and it measures a chemical which is released by macrophages when they are infected with an intracellular organism which they cannot kill. Run in tandem with the skin test the sensitivity increases to around 80%. The test did have some application but being an ELISA test required some expertise, which wasn't readily available. The sensitivity of the test was only marginally better than the intra-dermal test. Every animal needed to be individually

identified through the allocation of a number and when positives were found the animals had to be removed. The schooling level of the ringers wasn't very high and on one occasion we had to run all the cattle around again because we couldn't find the reactor.

Unfortunately there were some cattle populations in which the rate of spread of the disease exceeded the rate in which our TB tests could remove infected animals. Fairfield, the station near Tunnel Creek, was one and we ultimately depopulated this station by mustering all cattle and sending them to the meatworks. All destocked cattle were painted with a yellow stripe along their backs so that, in the event of a cattle truck roll-over, we could identify any escapees and shoot them from the air.

The two infected properties that couldn't be fenced were mustered by the owners as best they could before we came in and shot them free of stock. After a few years of shooting cattle became hard to find and the costs in helicopter hire were prohibitive. We overcame this by introducing cattle with radio collars into these areas. The theory was that cattle will tend to find each other and form mobs and this is exactly what happened. We picked up the radio signals using a receiver attached to the helicopter and monitored the collared cattle for any additions.

The Kimberley is now free of TB and cattle are free to go anywhere in Australia. The BTEC program was the largest animal disease eradication program ever completed in the world. The USA, by comparison, is no better off than it was in 1979. Mexico has an intractable TB problem and the UK has a major problem with badgers harbouring TB and spreading it to cattle. NZ has a similar problem with Australian Ringtail possums and in some areas they have given up on control efforts. Donkeys and horses don't carry TB but pigs can.

To wrap up the talk, it is interesting to see where the Kimberley cattle industry is now. On Friday, the *Danni F II* sails from Wyndham with 15,000 Brahman cattle heading for Libya. These cattle are worth \$100 a head more than the same weight southern cattle—the reason being our trading partners prefer Kimberley cattle. So, rather than being considered the poor cousin, they are now regarded with envy by southern producers.

Editor's Note: The *Danni F II* rescued 25 crew from a Liberian-registered bulk carrier sinking in the Indian Ocean, about 200 nautical miles north of Cocos Islands, whilst sailing between the Kimberley and Libya.