A.V.A. CONFERENCE PAPER, SYDNEY, MAY, 1969

PROGRESS IN THE ERADICATION OF CONTAGIOUS BOVINE PLEUROPNEUMONIA IN AUSTRALIA

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Introduction

Little more than a decade ago, contagious bovine pleuropneumonia (CBPP) was one of Australia's major cattle problems. The outlook for its control and eradication was not good; the incidence of the disease was thought to be high, on many stations not all cattle could be mustered, and there were insufficient fences to control cattle movement. It was widely held that control of the disease would be a slow process, since it depended on correction of these deficiencies that were closely related to the economics and organisation of the industry.

Present Position

Today the outlook is entirely different; the areas where the disease is present are limited to parts of the far north of Western Australia, the Northern Territory and Queensland, occupying 251,800 square miles or 8.5% of the mainland compared with the 889,100 square miles or 30.1% of the mainland affected in 1959. For the calendar years 1966, 1967 and 1968 there were 1, 3 and nil new occurrences of infection respectively, and in each occurrence only one infected animal was found; in addition, 2 properties remained infected throughout that period. The number of cases of the disease arising from these new occurrences and from infected properties were: in 1966, no cases in Queensland, 1 in the Northern Territory, 20 in Western Australia and 1 in South Australia; in 1967, 3 in Queensland and none in any of the other States, and in 1968 there have been 2 in the Northern Territory and 2 classed as suspicious in Western Australia.

At a meeting of the Subcommittee on the Control and Eradication of CBPP in March 1968, areas of Australia were classified into three categories according to their pleuropneumonia status. These were Quarantine, Protected, and Free Areas. Previously each State had its own classification to facilitate internal control of the disease, but areas with the same designation, particularly Protected Areas, had differed in status between States and even within a State. For the first time a national classification with uniform conditions of movement between areas was adopted. The Quarantine or Infected Areas are the East Kimberley Infected Area in Western Australia, the Victoria River District in the Northern Territory, and the Gulf and Carpentaria Infected Area in Queensland. Though, for administrative purposes, the whole of these areas is designated as Infected, there are only 3 properties in Queensland, 1 in the Northern Territory and 1 in Western Australia so regarded.

In other parts of the northern states the disease is considered to be eradicated, but because these areas have been cleared for only a comparatively short time, or because a complete check of the cattle in the area is physically impossible, their Free status is not fully established. These are designated as Protected Areas; they can be broadly defined as areas that are in the transition from Infected to Free status. Much of Queensland and the Northern Territory, most of the Kimberley region of Western Australia and the north east of South Australia are in this category.

The final classification is that of Free Areas; in these the disease is entirely absent and will remain so except for occasional outbreaks, but such occurrences are becoming rarer as the disease is being eradicated. Traditionally these areas have received store cattle, for fattening and subsequent marketing, from northern Australia so that outbreaks in southern areas were inevitable while there was a high level of infection in the north. The progressive elimination of the disease in areas where it was once endemic has diminished the probability of outbreaks in Free Areas.

The Free Areas are in south east Queensland (South East Queensland Protected Area), the central and southern portion of the Northern Territory (the Central Australia Protected Area), that portion of Western Australia south of the 20°S parallel, that part of South Australia south of the Quorn line, Victoria, Tasmania and New South Wales. The last outbreaks in these areas were in Victoria in 1965 (White 1966) and in New South Wales in 1956. The disease has not occurred in that part of Western Australia south of the 20°S parallel since 1942 and it has never occurred in Tasmania.

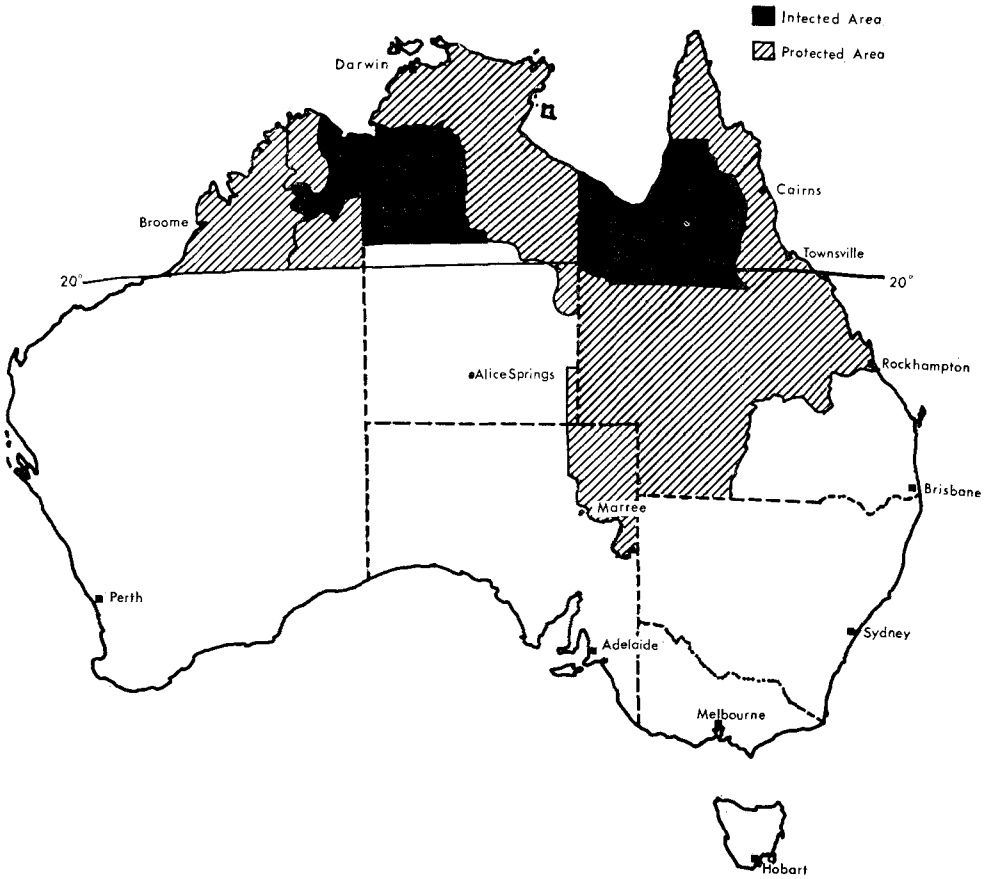
National Eradication Campaign

These major advances in the control of the disease have been due to two factors, imaginative and courageous administrative decisions and the rigorous application of disease control measures. Some of this work has been described by Hudson (1964, 1966-67) and Mulhearn (1964).

The first move to improve the pleuropneumonia situation in those areas in Australia where the disease was endemic was the supervised vaccination of travelling mobs of cattle from areas and properties known to be infected in Queensland and the Northern Territory. In 1956 the Northern Territory Administration and the South Australian Department of Agriculture declared the Central Australia Protected Area, an area considered to be free of the disease and from which infected cattle were then excluded.

In 1958 the Standing Committee on Agriculture appointed a subcommittee to examine the problem of pleuropneumonia. The Chief of the Animal Health Division of CSIRO and the Chief Veterinary Officers of Queensland, the Northern Territory, and Western Australia drew up a report, now known as the Gill Report, on the distribution of the disease in Australia and the measures required to bring about its control; this was presented in 1959. Consequent on this, the subcommittee was supplemented by the Chief Veterinary Officers from the other mainland states and was named the Subcommittee on the Control and Eradication of CBPP.

Finance was provided by all mainland states according to a formula that took into account both the beef and dairy cattle numbers and the value of production of the cattle industries in those states after allotting a basic 5% of the total costs to each participating state. The Commonwealth made its contribution by financing the campaign in the Northern Territory and research by CSIRO. Since that time, up to June 1968, approximately $506,000 has been paid to



Distribution of contagious bovine pleuropneumonia in Australia, January 1969. The areas for control purposes, quarantine and protected, are shown; the remainder is free of the disease.

Queensland and Western Australia for control and eradication work in those states. In addition both States, particularly Queensland, have made enormous contributions to the campaign apart from contributing to the fund.

The presence of the disease in the extensive unfenced, unsupervised areas of northern Australia gave rise to problems that had not previously been faced in respect of a contagious disease in this country. Detection of diseased cattle or even affected herds, the first step in the control of a disease, was almost impossible and even if detected, the testing, vaccinating and control of such herds could not be undertaken in the normally accepted way. Consequently control measures were a compromise between the ideal methods and those that were possible. Inevitably such compromises involve a degree of risk, but these proved to be much less than expected. A further consequence of this situation was that it was important to obtain and maintain the co-operation of station owners and managers.

The vaccination of travelling stock was continued. In the past, many outbreaks had occurred in these mobs that were sometimes made up of cattle from a number of properties, some infected and some not. The susceptible cattle were particularly prone to infection while closely herded, and once the disease commenced in a travelling mob the effects were often far-reaching because of spread to cattle in the mob and to others they contacted during their often long protracted journeys. Vaccination of the mob reduced the spread of the disease in that mob, and significantly reduced the risk of transmitting the infection to cattle on properties adjacent to stock routes. The rapid development in the past 5 years of the road train and beef cattle road system for moving cattle to abattoirs or to other properties, has had a marked favourable influence on the progress of the campaign.

On those stations where pleuropneumonia was known to exist, the vaccination programme was extended to include as many cattle as possible so that, in some instances, up to 70% or 80% of the cattle would be vaccinated in the first year in which a programme was mounted. Where possible, blood testing was undertaken at the same time, but in many instances vaccination alone was almost beyond the capacities of the stations and then the disadvantages of vaccination without testing, namely positive reactions to the CF test for CBPP for up to 3 to 4 months after vaccination, had to be accepted.

The next important move was to limit the movement of cattle from infected to non-infected or less infected areas. A complete embargo on movement from one to the other would have crippled the cattle industry; again a compromise scheme was adopted. Cattle from known infected properties, not areas, could only move to abattoirs for immediate slaughter. Movement of cattle from areas in which pleuropneumonia was suspected, was subject to conditions which depended on the suspected degree of infection in the area of origin and the degree of freedom in the recipient area. At the most, they could be held in isolation and blood tested twice within 30 days with negative results if moving from an infected to an uninfected area. As the degree of difference in status between the two areas decreased, the conditions were modified to vaccination before entry or to a negative reaction in a single blood test or even to certification that they had been 6 or 12 months in a pleuropneumonia-free area. Since 1956 many thousands of cattle have moved from Queensland to New South Wales without any outbreaks occurring. Substantial numbers of these cattle have moved on into Victoria after 180 days residence in New South Wales.

The objection to these conditions of movement is that infected cattle, undetected by blood testing and unaffected by vaccination, could pass through control barriers and start new outbreaks. In retrospect, this objection was unwarranted. Because so many travelling cattle were vaccinated, the chance of infection being spread by cattle movements was minimised. Later there was a marked improvement in the management of properties in northern Australia so that if outbreaks did occur, they could be detected and controlled before they created a major problem.

As the campaign got under way it became easier to define the areas where infection was present and to be more specific as to desirable conditions of movement. In the near future infected properties, rather than infected areas, will be specified. Thus, the many properties in these areas that are entirely free of the disease will be able to buy and sell cattle far more freely.

Up to this stage the individual infected animal had received rather less attention than the infected herd although, in the minds of all those concerned, the detection of these animals was the keystone on which the success of the eradication scheme would depend. Eventually these cattle would have to be found, isolated or slaughtered and the disease dealt with on the properties from which they came. How could infected animals be recognised?

The complement fixation (CF) test, which had been used to detect cases successfully in southern

states, was of limited value in northern areas for though the test is accurate and reliable, it is cumbersome, time consuming and results may not be known for 3 or 4 days or longer; this is a serious limitation on its application where cattle cannot be held for these periods. Besides, the enormous number of samples for testing would have severely taxed the entire veterinary diagnostic laboratory facilities at some times of the year.

Acute cases of the disease can be suspected on clinical signs and confirmed by autopsy, but where the lesion is sequestrated, infected animals cannot be recognised so that visual inspection of cattle is of limited value. However, cattle moving along stock routes, and sometimes cattle being mustered on properties, were inspected by stock inspectors and veterinary officers, but this was not an efficient method of detecting infected animals.

It soon became clear that inspection of the lungs of all cattle killed at northern abattoirs was the best way to detect cases. In the first instance the inspectors of the Commonwealth Department of Primary Industry carried out this task, but they were unable to give the extra time required for the detailed inspection of lungs and so specialist inspectors were employed. These were stock inspectors who had undergone a period of intensive training on the examination of cattle lungs. Inspectors are now stationed at five abattoirs in Queensland and at three in Western Australia. The inspectors of the Commonwealth Department of Primary Industry and veterinary officers of the Animal Industry and Agriculture Branch provide this service in the Northern Territory. The system has been outstandingly successful in that cases have been found that would otherwise have been missed and the properties of origin dealt with; thus a more accurate assessment of the incidence and occurrence of the disease has been possible.

The conventional CF test (Campbell and Turner 1953) was used for several years on serums from cattle killed at abattoirs in Queensland. However, the low incidence of reactors in comparison with the enormous amount of work required led to the suspension of the procedure. Blood samples are still taken from an animal with a suspicious lesion if possible. Western Australia has continued to blood test a high proportion of cattle killed at abattoirs in its area, but the numbers of cattle killed and hence the amount of testing required are much less than in Queensland.

In the Northern Territory blood tests are carried out on cattle moving away from quarantined properties and those moving from the Victoria River District to Protected Areas. A rapid test (Pearson and McPherson 1966) is used for this purpose and results are verified by the complement fixation test for CBPP (Campbell and Turner 1953).

In Queensland, blood testing of cattle on properties has been specially directed at those stations on which the disease is known or suspected to be present, dairying areas where cattle movement is minimal, and in other areas for survey purposes where a high proportion of cattle can be mustered and held. For these purposes the Huddart test (Huddart 1963), is carried out on the property in a well equipped mobile laboratory (Ladds 1969). The results are known within 24 hr and the reactors can be autopsied; if these are free of disease, the remainder can be released. In many instances only a sample of cattle, perhaps 25% of the herd, can be tested, but special attention is given to those animals that have been longest on the property. However, in assessing the pleuropneumonia status of the property, if only a low percentage is tested, a much longer period of surveillance, on the property and at abattoirs, is maintained than is the case where a high percentage is tested. Thus, poor information in one aspect of control is compensated for by increasing the amount available from another aspect.

Future Activities

Complete eradication of the disease is possible within a decade, but there are problems requiring attention before this is achieved. There may still be a few infected properties where the disease has not been detected, but existing measures, particularly vaccination and the checking of cattle at abattoirs, should eliminate the infected cattle from these. Some properties have problems of terrain and geography that may be beyond the resources of the owners.

The problem of false positive reactors to the complement fixation test for CBPP is important in the control of the disease and in relation to the export of live cattle. Such is the suspicion and fear of CBPP in other countries that a false positive in a draft of cattle is enough to disqualify the whole shipment even though the animal may be clean on autopsy. The complement fixation test is the accepted test for this disease throughout the world and any reaction to it has to be acted upon by both the exporting and the importing country. The nature of false positive reactors is being investigated.

The uniformity of the test is also a problem that affects our export. Our overseas trade is conducted on a national basis but testing cattle for export is a state (or territory) matter so that tests in various laboratories should be uniform. Because the test is complex this is difficult to achieve, but extensive work by CSIRO and state laboratories is now under way. State officers have met to discuss variations in the test and further meetings are planned; the CSIRO test has been accepted as the standard test, and standard serums are now being distributed to states to enable them to check their tests. Colour standards to replace lysed red cells have been developed, and a different system for titrating complement may be introduced. These measures will go far in establishing uniformity.

The research programme in CSIRO will continue until the disease is eliminated. Topics under study are inter-relationships of the strains of mycoplasma in cattle, possibly important in animals giving false positive reactions, the role of various components of serum antibody in resistance to the disease, aspects of the pathogenesis and the transmission of infection by aerosol droplets. At the same time the CSIRO laboratory at Parkville produces all the pleuropneumonia vaccine used in Australia and is a diagnostic reference centre for CBPP.

Conclusions

What can we learn from this remarkably successful campaign? First, co-operation between States and between the States and Commonwealth is very important in a project of this nature; every effort should be made to foster and maintain this in any similar undertaking. Secondly, this is a very good example of the principle of reducing the incidence of a disease by the least expensive and most expedient method before embarking on other intensive disease control measures; in this case vaccination has reduced the susceptible population, and thus the incidence of the disease, to the level at which it can be dealt with on a property-by-property basis. Thirdly, research effort must continue in parallel with the application of disease control measures; the V5 vaccine, the standard test for the disease and much ancilliary information has come out of research in Australia, but equally important, a small number of personnel with a high degree of training and experience have been available to provide expert knowledge. Finally, the success of disease control work depends, in large part, upon the efforts of field officers, and their role must always be recognised.

Acknowledgments

I wish to thank Mr. A. L. Clay, Dr. M. R. Gardiner and Dr. R. W. Gee for their assistance in the preparation of this paper.

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(Received for publication 30 January 1969)