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IMPLEMENTATION OF AN ACTIVE SURVEILLANCE PROGRAM IN THE BEEF INDUSTRY OF QUEENSLAND, AUSTRALIA.

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La filière bovine est l'un des secteurs les plus importants de l'agriculture australienne et le Département chargé du secteur primaire du Queensland a pris conscience de la nécessité de fournir une meilleure information afin de promouvoir la circulation des animaux, des produits d'origine animale et du matériel génétique originaires de cet Etat. Par conséquent, un plan de surveillance active a été mis en place pour compléter l'information récoltée de manière passive. Le programme pilote comportait 3 volets : l'envoi d'un questionnaire aux propriétaires/dirigeants d'exploitations; l'examen en élevage d'un échantillon de bovins et la constitution d'une banque d'échantillons pour l'analyse sérologique d'une série de maladies; le stockage de sérums pour des analyses rétrospectives. Cette communication présente les résultats sérologiques obtenus pour 5 maladies majeures qui ont été recherchées dans le cadre du programme dans 4 régions administratives du Queensland en 1995. On y discute aussi certaines des modifications proposées pour améliorer le plan de surveillance active à l'échelle de l'Etat tout entier. Ce sont plus particulièrement les séroprévalences des troupeaux aux virus de la leucose bovine ezootique, de la diarrhée virale bovine, à Anaplasma marginale, à Babesia bovis et à Babesia bigemina, qui sont rapportées ici. Les propositions d'amélioration du programme visent notamment à assurer que toutes les régions prélèvent leurs échantillons sur la même pyramide des âges de bovins et que les meilleurs résultats sont sélectionnés pour l'ensemble des animaux prélevés. Les différentes stratégies d'échantillonnage préconisées en matière de maladies enzootiques et rares sont aussi brièvement évoquées.

INTRODUCTION

The beef industry is one of Australia's most important agricultural industries, contributing between $2.4 and $3.2 billion in export income in recent years (Ashton *et al.*, 1996). In Queensland in 1995, there were about 9.7 million beef cattle producing approximately 723,00 tonnes carcass weight of beef. About 80% of this was exported, which in value terms, is almost 50% of Australian beef and veal exports (Anon, 1995). In recent years, there has also been rapid growth in the trade of live cattle, especially to South East Asia (Anon, 1996). The Queensland Department of Primary Industries (QDPI) has recognised that there will be increasing requirements for more specific, objective and representative information on the health status of Australian livestock populations. These changes have occurred in response to the Office International des Epizooties (OIE) updating of codes to act as guidelines for the international movement of animals, animal products and genetic material with minimal disease risk (Baldock, 1995).

The QDPI has taken note of the criteria set down in the OIE Animal Health Code Articles which deal with a standardised approach to the surveillance and monitoring of animal health and embarked on a pilot active surveillance program. The information collected as part of this program complements passive surveillance data collected mainly from diagnostic laboratory records. The beef industry was chosen for the pilot because it is an export oriented industry where animal health status claims are likely to become increasingly important. The pilot program consisted of three components: the administration of a questionnaire to property owners/managers; on farm examination of a sample of cattle and collection of samples for serological testing for a range of diseases; and the storage of sera for retrospective analysis. The program has evolved since it was initiated in the north region of Queensland in 1993 and other regions have implemented portions of the program in slightly different ways. There were some differences in the procedures used to select herds for sampling; questionnaire design and content; and diseases tested for in each region. This paper reports the serological results of five core diseases which were tested for as part of the program activities in four administrative regions of Queensland in 1995 and discusses some of the proposed modifications to improve the statewide active surveillance program.

MATERIALS AND METHODS

Sampling strategy

The sampling strategy was designed to detect diseases where the herd prevalence was ¤ 5% and the within herd prevalence ¤ 10% for each of the four regions. This meant that 30 animals were to be sampled from 60 herds within each region (Cannon and Roe, 1982). All beef herds in Queensland with more than 10 cattle must be registered with the QDPI for disease control purposes. The sampling frame for active surveillance activities was region specific. For the south and south east regions, it consisted of registered herds with ¤ 30 breeders, whereas in the north and central regions, registered herds with ¤ 50 breeders were included. Also, for inclusion in the survey, properties had to have sufficient numbers of homebred stock of suitable ages available for sampling. A stratified random sample of 60 herds was selected from the database of properties meeting the breeder herd size criteria for each region. The number of herds selected per local government area was directly

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proportional to the total number of herds meeting the breeder herd size criteria. This selection process also ensured that there was an adequate geographic spread of selected properties in each of the regions.

Data and sampling procedure

A government veterinarian and or a government stock inspector visited each property. During the property visit, a sample of stock was examined and blood samples collected. In most cases, a questionnaire was completed on the same day that samples were collected. The questionnaire sought information on enterprise size and type, genotype, breeder management, bull management, mortalities and vaccination history. In some regions, questionnaires also requested information on clinical signs which could be confused with diseases not present in Queensland. Specifically, owner/managers were asked questions which dealt with nervous signs, chronic diarrhoea and abortion. Thirty animals were sampled per herd. Blood samples were collected from fifteen cattle 6-24 months of age and 15 cattle ⊗ 24-36 months of age and excess sera were stored for possible future retrospective analysis. In all regions, females were sampled almost exclusively.

Laboratory testing

Samples were tested for antibodies to *Anaplasma marginale, Babesia bovis, Babesia bigemina*, Bovine Leukaemia Virus (BLV) and Bovine Viral Diarrhoea Virus (BVDV). Serum samples were subjected to the following tests using standard or other published techniques (Corner and Bagust, 1993): Serum neutralisation test (SNT) for antibodies to BVDV, agar gel immunodiffusion test (AGID) for antibodies to Bovine Leukaemia Virus (BLV), enzyme linked immunosorbant assay (ELISA) for *B. bovis*, indirect fluorescent antibody test (IFAT) for *B. bigemina* and card agglutination test (CAT) for *A. marginale*. All of the above agents are List B OIE diseases except for BVDV which is a List C OIE disease. A herd was classified as seropositive if one or more sampled animals gave a positive serological result.

Statistical analysis

Epi Info Version 6 (Dean *et al* 1994) and Microsoft Excel were used for descriptive data analysis.

RESULTS

No region met the desired sampling level of 60 herds.

Table I
Serological results for Bovine Leukaemia Virus (BLV), Bovine Viral Diarrhoea Virus (BVDV), *Anaplasma marginale, Babesia bovis* and *Babesia bigemina* for four administrative regions of Queensland, Australia in 1995.

		Herds seropositive			Cattle seropositive
Agent	No. herds	No. (%)	95% C.I. (%)	No. cattle	No. (%)
BLV	142	5 (3.5)	1.2-8.0%	4231	6 (0.14)
BVDV	143	130 (90.0)	85.0-95.1%	4275	1970 (46.1)
A. marginale[a]	78	62 (79.5)	68.8-87.8%	1367	677 (49.5)
B. bovis[a]	59	43 (72.9)	59.7-83.6%	875	280 (32.0)
B. bigemina[a]	66	59 (89.4)	79.4-95.6%	982	337 (34.3)
A. marginale[b]	39	7 (17.9)	7.5-33.5%	1161	13 (1.1)
B.bovis[b]	39	7(17.9)	7.5-33.5%	706	8 (1.1)
B. bigemina[b]	39	1 (2.6)	0.1-13.5%	745	1 (0.1)

[a] north, central and south east regions which are endemically infected with the cattle tick, *Boophilus microplus*.
[b] south region which is free of the cattle tick, *Boophilus microplus*.

DISCUSSION

The active surveillance system described has been a compromise taking cost, quality and time constraints into consideration. No regions met the sampling target of 60 herds. However, for the diseases reported, the data still provide more accurate measures of herd prevalence on a state basis than has been obtained from passively collected surveillance information. For example, the herd prevalence of antibodies to BLV found in the surveillance program was 3.5%. Ward (1995) estimated a herd seroprevalence of 6.8% in the Queensland beef industry using information from export testing records. Although the figure of 6.8% is within the 95% confidence interval reported here, the estimated herd seroprevalence from the present program is likely to be a more accurate estimate of the true prevalence of BLV antibodies in Queensland cattle herds because of the sampling procedures used. These results therefore provide a better basis for the design of protocols for the movement and export of beef cattle and beef cattle products from Queensland.

The herd seroprevalence for BVDV was 90.9% which is similar to the 89% (47/53) reported by St George *et al* (1967). The herd seroprevalences of *A. marginale, B. bovis* and *B. bigemina* in the tick infected area were 79.5%, 72.9% and 89.4% respectively. The results for herds in the tick free area prompted further investigations which revealed that most of the seropositive cattle had been introduced from the tick infected area of Queensland. This highlighted the importance of ensuring that cattle were homebred and had not been depastured on other properties during their lifetime.

For more meaningful animal seroprevalences to be calculated and compared, there was a need for better age information on sampled animals. Such information would allow the calculation of more accurate age specific and crude animal seroprevalences for the regions and the state. The differences in age structure of the samples across the regions would have had little effect on herd seroprevalences, especially for diseases which are endemic. For animal seroprevalences though, the age of sampled animals would strongly affect crude animal seroprevalences. Improved recording of animal age would also increase the value of samples stored for possible retrospective analysis. For ease of comparison, it would be desirable to have consistency across regions with respect to ages of animals sampled.

The sampling strategy used in this active surveillance program was adequate for endemic diseases, but needs to be reassessed for rarer diseases. For herds where no seropositive animal was detected, all that could be concluded was that the within herd seroprevalence was less than about 10%. This figure depended on the age structure of animals sampled and test performance parameters. For diseases which are rare and for diseases where there is a need to support a case for freedom, alternative strategies are required. For a disease such as BLV, where the herd and animal seroprevalences were apparently low, repeated samplings over a number of years may be an acceptable and cost effective strategy to build confidence in the results. To support a case for freedom from a disease agent will often require more than sampling a specific number of animals. Biasing sampling to high risk groups of animals is necessary to decrease costs and increase the efficiency of any surveillance effort. This is the basis for including questions in the on-farm questionnaire about conditions which could be confused with exotic diseases to Queensland. If responses to these questions raise the suspicions of staff, then further detailed investigations can be undertaken to rule out a possible exotic disease.

The primary aim of the system was to collect data which was more specific, objective and representative of the beef cattle population in Queensland than had previously been collected on a regular basis. This data has been transformed into information to assist the beef industry to justify specific claims about the health status of the Queensland beef herd. There is a need to increase the quality of some data without increasing the cost of collection. One approach will involve the targeting of staff training. The experience gained in implementing this active surveillance program has already proved useful in more specific disease surveys. Of particular note, was the serological survey of paddocked horses undertaken in Queensland as an important part of the follow-up to the second detection of Equine Morbillivirus in horses in Queensland (Ward et al., 1996). In addition, maintenance of a serum bank for retrospective analysis may prove to be invaluable in the event of an outbreak of a major trade-limiting disease in the Australian beef cattle industry.

BIBLIOGRAPHY

Anon (1996) *Industry Projections for Cattle and Sheep - Autumn 1996*, Market Intelligence Unit, Australian Meat and Livestock Corporation.

Anon (1995) *Statistical Review* - Australian Meat and Livestock Corporation, July 1994-June 1995.

Ashton D, Martin P, Rudwick V and Barret D (1996) *The Australian Beef Industry 1996*, ABARE Report, Canberra.

Baldock F (1995) A Queensland response to changing information needs in animal health. In *Proceedings of the Epidemiology Chapter of the Australian College of Veterinary Scientists, Melbourne*, May 21-26,1995, p54-59.

Cannon R, Roe R (1982) *Livestock Disease Surveys : A Field Manual for Veterinarians*, Bureau of Rural Science, Department of Primary Industry, Canberra.

Corner L, Bagust T, editors (1993) *Australian standard diagnostic techniques for animal diseases*. Standing Committee on Agriculture and Resource Management, CSIRO, Canberra.

Dean A, Dean J, Coulombier D, Brendel K, Smith D, Burton A, Dicker R, Sullivan K, Fagan R, Arner T. Epi Info, Version 6: a word processing, database and statistics program for epidemiology on microcomputers. Centres for Disease Control and Prevention, Atlanta, Georgia, U.S.A. 1994.

Microsoft Excel Version 5.0a (1984-1993) Microsoft Corporation. Soft-Art Dictionary and Program Copyright 1984-1993.

St George T, Snowdon W, Parsonson I, French E (1967) A serological survey of mucosal disease and infectious bovine rhinotracheitis in Australia and New Guinea, Aust Vet J 43, 549-557.

Ward M (1995) Serological studies of bovine leukaemia virus infection in Queensland beef cattle, Aust Vet J., 72, 71-72

Ward M, Black P, Childs A, Baldock F, Webster W, Rodwell B, Brouwer S,1996. Negative findings from serological studies of equine morbillivirus in the Queensland horse population. Aust Vet J 74(3), 241-243.