

ANTIBODIES TO LEPTOSPIRAL SEROTYPES IN SERA OF NORTH QUEENSLAND CATTLE

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SUMMARY

Sera from cattle in North Queensland were tested for the presence of antibodies to 10 strains of *Leptospira*. The samples were collected either at slaughter or in the field and came from two main geographical areas, namely the Atherton Tableland and the East Coast (the coastal area from Tully to Bowen).

The greatest number of positive reactions were found with *L. pomona* (3.37%) and *L. hyos* (6.3%). In cattle from the East Coast there was a lower incidence of *L. pomona* antibodies and a higher incidence of *L. hyos* antibodies than in those from the Atherton Tableland.

Titres to the hebdomadis serogroup were present in 1.67% of animals tested. There were a few positive titres to *L. australis*, *L. broomi*, *L. canicola*, *L. icterohaemorrhagiae* and *L. zanoni*. No antibodies to *L. grippityphosa* and *L. robinsoni* were detected.

I. INTRODUCTION

The incidence of leptospirosis in man in North Queensland is high, especially in the coastal area between Cairns and Tully (Derrick *et al.* 1954). Derrick (1956) reported that 55% of the clinical cases in this area occurred in people associated with the canefields.

The serotypes known to occur in man in this area are *Leptospira australis*, *L. bratislava*, *L. broomi*, *L. canicola*, *L. celledoni*, *L. grippityphosa*, *L. hyos*, *L. icterohaemorrhagiae*, *L. kremastoi*, *L. medanensis*, *L. mini*, *L. pomona*, *L. robinsoni* and *L. zanoni*.

This paper presents the results of a serological survey of North Queensland cattle for 10 of these serotypes.

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II. MATERIALS AND METHODS

(a) Source of Sera

The sera tested for *L. pomona* and *L. hyos* were collected from March 1963 to June 1964 from herds in two areas, the Atherton Tableland and the East Coast (Figure 1).

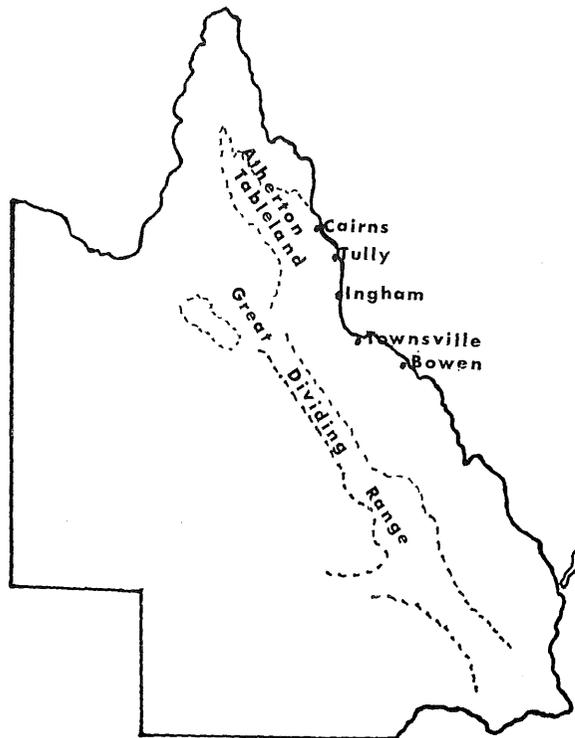


Figure 1.—Map showing areas of Queensland from which cattle sera originated

The Atherton Tableland, situated west of Cairns, has an elevation of 2,000-3,000 ft and although within the tropics experiences a subtropical climate. Rainfall averages from 40 in. per annum in the north to 120 in. in the south-east. August, September and October are usually dry months. Water supplies are good.

The East Coast area covered by the survey extends from Tully in the north to Bowen in the south and westwards to the Great Dividing Range. Except for the narrow coastal strip from Ingham to Tully, which has an average of 60-130 in. per annum, the annual rainfall is lower and more seasonal than on the Atherton Tableland. The winter months are very dry, the average rainfall from April to September over much of the area being 3-6 in.

Sera from 2,285 cattle were tested for antibodies against *L. pomona*, 1,518 being from the East Coast and 767 from the Atherton Tableland. These included samples from 1,684 cattle which originated mainly from the East Coast and which were destined for export overseas. The remaining sera, coming mainly from the Atherton Tableland, underwent routine testing because of suspected leptospirosis.

Sera from 554 cattle were tested for *L. hyos* antibodies, 487 coming from the Atherton Tableland and 67 from the East Coast. All were from herds in which leptospirosis was listed among the diseases suspected.

Sera for testing for other serotypes were collected at the Ross River Meatworks (Townsville) and the Queerah Meatworks (Cairns), and from individual properties in the field. Of 925 sera collected during 1963 from the Ross River Meatworks, 160 were from cows and the remainder from steers approximately 3–4 years of age. In most cases 20 sera were collected from each property represented.

Sera were stored at -15°C until tested.

(b) Method of Testing

The agglutination-lysis test as described by Winks (1962) was used. Any serum showing 50% agglutination at a 1/30 or greater dilution was recorded as positive.

Serotypes used as antigens were *L. australis*, *L. broomi*, *L. canicola*, *L. grippotyphosa*, *L. hyos*, *L. icterohaemorrhagiae*, *L. kremastos*, *L. pomona*, *L. robinsoni* and *L. zanoni*. In addition, *L. medanensis* and *L. mini* were used to test those sera that gave reactions with *L. kremastos*.

Schuffner's medium and 0.2% tryptose phosphate broth, both with the addition of 10% rabbit serum, were used to grow the leptospiral cultures. Schuffner's medium without rabbit serum was used as a diluent for testing.

III. RESULTS

The results of testing for *L. pomona* and *L. hyos* antibodies are shown in Tables 1 and 2. The chi-square test has been used in evaluating their significance.

TABLE 1

RESULTS OF TESTING SERA FOR *L. pomona* AND *L. hyos* ANTIBODIES IN CATTLE FROM TWO AREAS OF NORTH QUEENSLAND

Area	<i>L. pomona</i>									<i>L. hyos</i> Routine		
	Export			Routine			Total			No.	No. Positive	% Positive
	No.	No. Positive	% Positive	No.	No. Positive	% Positive	No.	No. Positive	% Positive			
Atherton Tableland	253	13	5.1	514	44	8.5	767	57	7.4	487	25	5.1
East Coast	1,431	12	0.8	87	8	9.2	1,518	20	1.3	67	10	14.9
Total	1,684	25	1.48	601	52	8.6	2,285	77	3.37	554	35	6.3

TABLE 2
RESULTS OF TESTING BOVINE SERA FOR LEPTOSPIRAL ANTIBODIES

Serotype	No. of Herds	No. of Sera	No. Positive	% Positive
<i>L. pomona</i>	132	2,285	77	3.37
<i>L. hyos</i>	58	554	35	6.3
<i>L. kremastos</i>	55	1,375	23	1.67
<i>L. australis</i>	68	1,108	10	0.9
<i>L. canicola</i>	72	1,290	5	0.38
<i>L. icterohaemorrhagiae</i>	72	1,290	5	0.38
<i>L. broomi</i>	68	1,108	3	0.27
<i>L. zanoi</i>	89	1,286	2	0.15
<i>L. robinsoni</i>	89	1,286	0	0
<i>L. grippityphosa</i> ..	60	1,506	0	0

Overall, there was a lower incidence of *L. pomona* antibodies in the East Coast area than on the Atherton Tableland.

In animals from herds with a history of infertility and/or abortion and calf losses, there was an incidence of 8.6% positive reactions to *L. pomona*, there being no significant difference between the two geographical areas.

In the East Coast area, a much higher incidence of *L. pomona* antibodies was found in routine sera from suspect herds than in the samples from cattle for export. This difference was significant at the 1% level. On the Atherton tableland, the difference was less marked and not significant.

The incidence of *L. hyos* was 6.3%. Though relatively small numbers were tested for *L. hyos* on the East Coast, there was a greater percentage of positive reactions here than on the Tableland (significant at the 5% level).

The ratio of pomona to hyos reaction differed greatly in the two districts. On the East Coast the ratio was 1 : 11.5, whereas it was 1 : 0.7 on the Atherton Tableland.

The results of testing for antibodies to other serotypes are shown in Table 2.

There was no evidence of antibodies to either *L. grippityphosa* or *L. robinsoni*.

Four of the five reactions to *L. icterohaemorrhagiae* were associated with higher titres to *L. pomona*. The remaining one positive serum showed agglutination only at 1/30 to *L. icterohaemorrhagiae*.

Table 3 gives details of titres of the sera reacting to other serotypes. *L. australis* reacting sera came from 4 herds and *L. canicola* from 3 herds.

Sera reacting to *L. kremastos* came from properties scattered throughout the area. The greatest incidence of positive reactions was from a property near Townsville: 7 of 20 sera tested exhibited titres ranging from 1/30 to 1/1000. Subsequent testing of these sera with *L. mini* and *L. medanensis* showed that in most cases agglutination occurred with these serotypes at the same or higher titres.

TABLE 3

TITRES OF SERA REACTING TO *L. australis*, *L. broomi*, *L. canicola*, *L. kremastos*, and *L. zanoni*

No. of sera

Dilution	1/30	1/100	1/300	1/1000	Total
<i>L. australis</i>	5	5	..	..	10
<i>L. broomi</i>	2	1	..	..	3
<i>L. canicola</i>	5	..	..	..	5
<i>L. kremastos</i>	13	6	3	1	23
<i>L. zanoni</i>	2	..	..	..	2

IV. DISCUSSION

Most of the positive serum agglutination tests in the present study were to *L. pomona* and *L. hyos*. A predominance of these two serotypes was also found in cattle in south-eastern Queensland (Spradbrow 1964), in New South Wales (Keast, Forbes, and Wannan 1964), and in North Queensland (Emanuel, Mackerras, and Smith 1964). Vaccination of cattle for leptospirosis is rarely practised in North Queensland, so the results in this study do not include titres produced as the result of vaccination.

The incidence of *L. pomona* and *L. hyos* antibodies was lower than that found by Winks (1962) in beef cattle in Central Queensland. He found 28.4% positive *L. pomona* and 47.8% *L. hyos* reactions. Spradbrow (1964) found titres of 1/100 or greater to *L. pomona* and *L. hyos* in 9.5% and 11.4% respectively of cattle in south-eastern Queensland.

The relatively high incidence of *L. pomona* on the Atherton Tableland is not surprising, as a greater concentration of cattle, particularly for dairying, favours spread between cattle; also pigs, which are known to be a common reservoir of infection, are raised, often in proximity to dairy herds. In contrast, the East Coast, which is mainly utilized as a beef-raising area, carries a lower cattle population density and there is little if any contact between cattle and pigs. Infection from contaminated surface water may be more important in cattle in the higher rainfall area of the Atherton Tableland than on the East Coast. Derrick *et al.* (1954) noted an increased incidence of leptospirosis in man after heavy rainfall.

The spread of *L. hyos* to cattle also occurs from pigs and is probably of importance on the Atherton Tableland. Rodents and bandicoots are carriers of *L. hyos* but in these animals it may be a different subserotype (Emanuel, Mackerras, and Smith 1964). The main source of *L. hyos* infection in beef cattle in the East Coast area is not known. It may be possible to trace infection to water supplies contaminated by bovine excretors or by native animals.

Infection by a member of the hebdomadis serogroup (*L. kremastos*, *L. mini* and *L. medanensis*) appeared to be responsible, at least on one property, for positive titres in sera. Emanuel, Mackerras, and Smith (1964) also found hebdomadis serogroup antibodies in sera from one herd in North Queensland and adduced evidence that the organisms were present in wild marsupials and rodents.

The agglutination reactions with *L. icterohaemorrhagiae* were probably not significant of infection with this serotype, as other serotypes (e.g. *L. pomona*) sometimes induce production of heterologous antibodies to *L. icterohaemorrhagiae* (Emanuel, Mackerras, and Smith 1964).

The incidence of antibodies to other serotypes was negligible. Although they are present in some wild rodents and marsupials in the area (Emanuel, Mackerras, and Smith 1964), there is no evidence that they infected cattle.

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