Prevalence of markers of Q fever exposure in the Kimberley, Western Australia

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Abstract

Although a large pastoral industry exists in the Kimberley region of Western Australia, there is no previously published information about the prevalence of immune markers for Q fever exposure in this region's population. This paper identifies the prevalence of, and factors associated with, positive immune markers of Q fever, and reports the uptake of Q fever vaccination by eligible subjects in the Kimberley region of Western Australia. Data regarding Q fever risk-factors were obtained using a standard questionnaire. Immunity and previous exposure to Q fever were assessed using both serology and a skin test, in accordance with accepted protocol. Fifty-nine subjects underwent Q fever pre-vaccination testing.The prevalence of a positive skin and/or blood test,indicating past exposure was 66 per cent (95% CI 52% – 78%). After controlling for age and having lived on a farm at any time, employment in the pastoral industry was the only factor significantly associated with being skin and/or blood test positive (OR=24.6, 95% CI 3.0 – 204). Acceptance of vaccination was high, with 75 per cent of eligible subjects undergoing vaccination. The high prevalence of immune markers for Q fever in the Kimberley in this sample indicates that the disease is present in the region, despite the last recorded case being in 1986. Ensuring that Q fever vaccination is readily accessible to pastoralists, abattoir workers and other at-risk groups is a challenge that needs to be met by these industries and health services of the region. *Commun Dis Intell* 2003;27:267–271.

Keywords: Q fever, immunity, vaccination

Introduction

The Kimberley region in the far north of Western Australia, has supported a large pastoral industry for many years. This industry contributes significantly to the economy, history and the culture of Aboriginal and non-Aboriginal people of the region. High prevalences of immune markers to Q fever (indicating previous exposure) and/or high Q fever incidences, have been documented in other Australian regions with a large pastoral industry, such as central and south-west Queensland and northern New South Wales.[1,2,3,4] No published information about Q fever immunity exists for the Kimberley or any other regions of Western Australia.

In 2002, health services in Western Australia were informed that the National Q Fever Management Program would be extended to include free vaccination for pastoral workers until the end of the 2002–03 financial year. The Kimberley Public Health Unit, in partnership with the Kimberley branch of the Pastoralist and Graziers Association (PGA), Community Health Services throughout the region, and the Kimberley Division of General Practice conducted a Q fever vaccination program in the latter months of 2002.

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The Kimberley region is sparsely populated, with a population of 32,000 scattered over 420,000 square kilometres. There are pastoral stations throughout the region, in sub-tropical as well as semi-arid areas. A few members of the pastoral community have ready access to health services provided by nurses and Aboriginal health workers in remote area clinics, visiting primary health care staff employed by the Department of Health Western Australia, the Royal Flying Doctor Service and Aboriginal Community Controlled Organisations. However, most people living and working on pastoral properties, can only access primary health care by travelling to one of the six towns in the region. This may involve many hours driving on rough roads or flying by light aircraft at the individual's own expense. There is very little private general practice in the region, with almost all medical practitioners being employed by the Department of Health Western Australia or a non-government organisation.

The aims of this paper are:

- to identify the prevalence of immune markers to Q fever in the Kimberley region of Western Australia;
- to identify the factors associated with the presence of positive immune markers; and
- to report the uptake of vaccination by eligible subjects during the first four months of the program.

Methods

Subjects eligible for the National Q Fever Management Program were informed about the program by word-of-mouth, radio interviews and advertisements in local newspapers and professional newsletters. Pre-vaccination screening was conducted at a variety of workplace settings such as the 2002 PGA Annual General Meeting at Go Go Station and an abattoir (the only one in the region, a small enterprise that operates for about six months each year and employs less than 20 people), and at Community Health Centres in several towns throughout the region.

An employee questionnaire, pre-screening and vaccination, and consent forms were obtained from the National Q Fever Management Program's website, http://www.qfever.org. All subjects completed these forms prior to Q fever pre-vaccination screening. Data regarding Q fever risk-factors were obtained using the employee questionnaire. Immunity and previous exposure to Q fever were assessed using both serology and a skin test, in accordance with the protocol described by Marmion.[5] Testing was conducted by doctors and community health nurses under the supervision of a medical practitioner experienced in this field. Skin tests were read after seven days. Serological testing for antibodies to *Coxiella burnetii* (immunofluorescent assay, followed by confirmatory enzyme immunoassay in borderline cases) was done at PathCentre, Perth.

The outcome of interest was the presence of immune marker(s) to Q fever indicating past exposure. Subjects with a positive skin test and/or a positive blood test were classified as immune 'positives', i.e. have been previously exposed to Q fever, and were not eligible for Q fever vaccination. Subjects with negative blood and skin tests were classified as non-immune 'Negatives' and were offered Q fever vaccination.

Data were entered into SPSS. The association between being 'positive' and Q fever risk factors, i.e. independent variables, such as occupation, length of time working in their current industry, length of time living on a farm, consumption of unpasteurised milk etc, was analysed using logistic regression.

In accordance with ethics guidelines, patient-identified information was restricted to two of the authors, who were responsible for interpretation of all test results.

Results

Fifty-nine subjects were tested between 23 August and 26 November 2002. None reported a past history of Q fever, or having been tested or vaccinated for Q fever. No-one was refused testing because of a medical contra-indication to being tested. Fourteen (24%) reported a past history of an influenza-like illness lasting more than seven days. The demographic characteristics of these subjects and their risk factors for Q fever are shown in Tables 1 and 2.

Table 1. Demographic characteristics of subjects, n=59

Characteristic	Frequency	
	n	%
Sex		
Male	47	80
Female	12	20
Age (years)		
Range	16–65	
Mean/median	38/35	
<20	5	8
20–29	17	29
30–39	13	22
40–49	11	19
50+	13	22
Occupation		
Pastoral industry	33	59
Abattoir worker	12	21
Other (includes vets, stock inspectors, nurses)	11	20

Table 2. Subjects' exposure to Q fever risk factors

Risk factor	Yes		No	
	n	%	n	%
Grew up/live on a farm,* n=54	43	80	11	20
Regularly visit(ed) a farm,* n=55	37	67	18	33
Feedlot work, n=55	11	20	44	80
Stock/farm* work, n=55	36	65	19	35
Tannery work, n=55	0	0	55	100
Animal transport, n=55	26	47	29	53
Shearing, n=55	6	11	49	89
Animal husbandry, n=55	17	31	38	69
Livestock buying, n=55	11	20	44	80
Milking cows/goats, n=55	12	22	43	78
Collecting cattle/sheep manure, n=55	16	29	39	71
Slaughtering livestock privately, n=55	32	58	23	42
Dressing kangaroo carcasses/pelts, n=55	16	29	39	71
Consuming unpasteurised cow/goat milk, n=55	23	42	32	58
Other activity associated with livestock production, n=55	16	29	39	71
	Range		**Mean/median**	
Work duration in current industry (years)	0–50		18/19	
Years lived on a farm*	0–48		18/18	

* Sheep, cattle, goat or diary farm

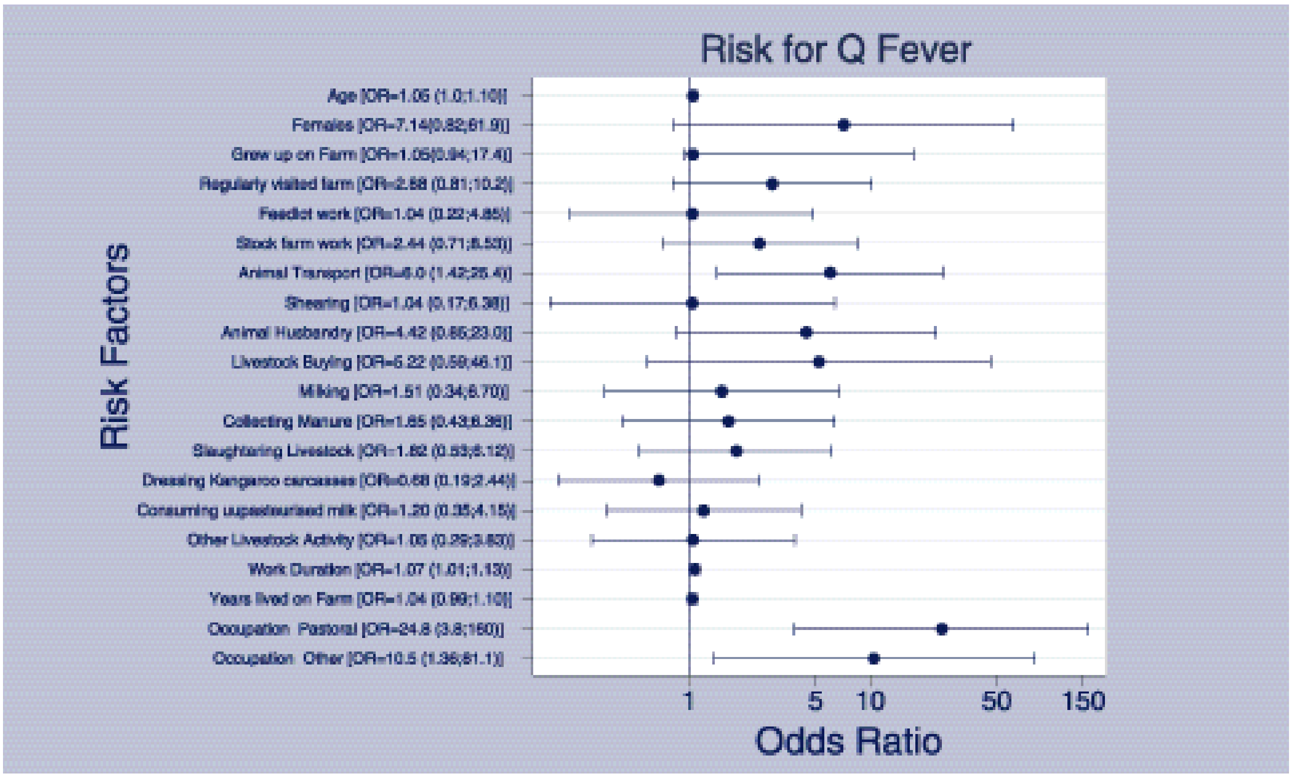
Of the 59 subjects tested, 12 did not present at the appropriate time for reading of the skin test. All but one of these 12 subjects had negative serology. Of the 59 subjects for whom blood test and the 47 for whom skin test results were available, three (5%) had positive serology and 30 (64%) had a positive skin test. Combining skin and serology results in the 47 patients for whom both tests were available, 31 subjects (66%, 95% CI 52%–78%) were 'positive' and 16 (34%, 95% CI 22%–48%) were 'negative'. At least seven (23%) of the 'positive' subjects were born, and had lived, in the Kimberley all or almost all their lives.

Logistic regression was used to explore the association between the outcome variable 'positive' and the independent variables listed in Tables 1 and 2. Univariate analysis indicated a significant association between 'positive' and the occupation groups; 'pastoral industry', and 'other', and 'ever having worked in animal transport' (p=0.001, p=0.024 and p=0.015, respectively), as shown in the Figure. The associations between 'positive' and age, sex and 'grew up/live on a farm' were of borderline significance (p=0.069, p=0.074 and p=0.06, respectively). The association between 'positive' and tannery work was not calculable as none of the subjects had worked in a tannery.

Multivariate analysis including age, occupation groups (abattoir worker, pastoral industry and other), 'grew up/live on a farm' and the interaction between occupation and 'grew up/live on a farm' showed that the occupation group 'pastoral industry' was the only variable consistently and significantly associated with 'positive' (p=0.003), i.e. after controlling for age and having grown up or lived on a farm, the odds of a pastoral worker being 'positive' was 25 times that of any other occupational group (OR=24.6, 95% CI 3.0 – 204).

Of the 16 subjects who were eligible for vaccination following testing, 12 were vaccinated, one refused and three were planning, but had not yet had the opportunity, to be vaccinated. Nine (75%) of the 12 subjects who were vaccinated were abattoir workers, two (17%) were pastoral workers and one (8%) was a vet.

Figure. Univariate analysis of risk factors for Q fever exposure



The ORs for age, work duration and years lived on a farm are for each year of increase.

Farm refers to a sheep, cattle, goat or diary farm.

Discussion

This first report of the prevalence of immune markers of Q fever exposure in the Kimberley region shows a high prevalence of positive immune markers despite the absence of any recorded Q fever cases since 1986 (personal communication, Jag Atrie, Communicable Disease Control Program, Department of Health Western Australia) and lack of anecdotal reports of the disease from medical practitioners in the region. The prevalence of positive immune markers in our sample is higher than the 18.5 per cent reported from central Queensland where reported Q fever incidence is much higher than in the Kimberley.[2]

The reasons for the above findings may include the stoic nature of remote pastoralists who tend to avoid taking time off work and seeking health care for minor, self-limiting symptoms. For example, one of the subjects, a station manager, had clinical and serological findings consistent with Q fever infection, but said he did not intend seeking medical advice until the end of the mustering season. Relatively poor access to health care also plays a role in the remote area residents not presenting for health care unless symptoms are severe. Lack of awareness of Q fever among health staff may have contributed to lack of testing and notification of cases. In addition, pastoral practices in the Kimberley are different to those of south-west Queensland and northern New South Wales, with fewer cattle per unit of land area and the bulk of pastoral work being done in the 'dry season' only (personal communication, Nathan Webb-Smith, Beefwood Park Station). This may influence pastoralists' exposure to Q fever in such a way as to predispose to the development of sub-clinical infection followed by natural immunity, rather than clinical disease.

A large proportion of non-immune subjects were vaccinated indicating high community acceptance of Q fever vaccination in this region. However, achieving high vaccination coverage, especially among pastoral industry workers will be a challenge for both the health and pastoral industries. Reasons for this include remoteness of workplaces, the small number of staff at each station, the logistical difficulties inherent in Q fever vaccination (as a minimum of two visits seven days apart are required for adequate pre-vaccination screening) and the high staff turnover in both industries (for example, only five of the eight health staff trained in Q fever pre-vaccination screening in August 2002, were still working in the region in January 2003, and of the six individuals tested at one pastoral station, two had ceased employment prior to the reading of the skin test—the manager's reaction to this indicated that this level of staff turnover was not uncommon).

One of the limitations of this study is the small sample size. Further testing of at-risk groups in the Kimberley would be useful in confirming these findings. Testing of livestock and wildlife, and sampling of stockyard dust would also be useful as there is limited information about the environmental prevalence of the causative organism (*Coxiella burnetii*) in the Kimberley.

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