

Q fever vaccine uptake in South Australian meat processors prior to the introduction of the National Q Fever Management Program

Adriana Milazzo,¹ Kathryn B Featherstone,¹ Robert G Hall²

Abstract

Despite the availability of a vaccine, the incidence of Q fever disease among populations at risk continues to be high. Q fever is an important cause of morbidity for workers, particularly in the meat and agricultural industries. Following an increase in 1998 in the number of Q fever notifications among meat processors to the Communicable Disease Control Branch, South Australia, a survey was conducted in the same year to assess the uptake of Q fever immunisation programs in meat processors and to identify barriers to offering these programs. This survey was conducted prior to the introduction of the National Q Fever Management Program in 2001 that provided a targeted vaccination program to specific at-risk occupations. The results of the survey highlighted that very few meat processors in South Australia offered a Q fever immunisation program to their workers. More importantly, this article highlights that there was a wide variety of attitudes and beliefs about Q fever disease and its prevention. These attitudes and beliefs have the potential to impact on whether workers at risk are offered or seek Q fever vaccination. Previous attitudes may return and levels of protection in at-risk occupations will decrease without a concerted effort at a state level. A replication of this study should benchmark the prevailing attitudes about Q fever programs. In response to the 1998 survey a number of strategies and initiatives were developed to address the barriers to Q fever vaccination in South Australian meat processors. The National Q Fever Management Program (2001–2005) further enhanced the ability to address barriers such as vaccine cost. *Commun Dis Intell* 2005;29:400–406.

Keywords: Q fever, vaccination, meat processors

Introduction

Q fever is a zoonotic disease caused by the obligate intracellular bacterium, *Coxiella burnetii*. It is an acute illness with symptoms of fever, fatigue, profuse sweats, rigors and marked loss of weight. Chronic Q fever may develop as a result of the persistence of *C. burnetii* in the body. Manifestations of this include endocarditis, hepatitis, osteomyelitis and post Q fever fatigue syndrome. The incubation period ranges from 14 to 60 days, but is usually about 20 days.^{1,2} Cattle, sheep, kangaroos and goats are the main reservoirs for human infection in Australia, with transmission between animals occurring via infected ticks. Transmission of *C. burnetii* from animals to humans occurs most commonly via inhalation of infected dust or droplets.²

Q fever is an important cause of morbidity in meat process workers. Data from the National Notifiable Diseases Surveillance System (NNDSS) report the number of Q fever notifications between 1991 and 2003 for Australia ranged from 482 to 870 notifications. Although the numbers appear to be small it is the rate of disease in occupational groups, such as meat processors, and potential issues of turnover of workers in the industry that can impact adversely on the cost benefit of implementing Q fever vaccination programs. The epidemiology of Q fever in South Australia reveals that 54 per cent of notified cases between 1990 and 2003 were directly or indirectly linked to meat processors.

As Q fever is an occupational hazard in meat processors, employers are obliged to provide a safe work environment for employees (Section III, Occupational Health, Safety and Welfare Act, 1986, South Australia).

1. Communicable Disease Control Branch, Department of Health, South Australia
2. Public Health Group, Department of Human Services, Victoria

Corresponding author: Ms Adriana Milazzo, Communicable Disease Control Branch, Department of Health, PO Box 6 Rundle Mall, Adelaide South Australia 5000. Telephone: +61 8 8226 7177. Facsimile: +61 8 8226 7187. Email: adriana.milazzo@health.sa.gov.au

Employers can meet their legal obligations by providing Q fever immunisation programs as recommended in the *Q fever Information Kit for the Australian Meat Industry*.³ However, despite the availability of a vaccine since 1989 and due to the slow uptake of Q fever immunisation programs by industry, the incidence of Q fever disease among meat process workers continues to be high.

Vaccination requires two medical consultations seven days apart. Pre-vaccination testing requires a serum antibody estimation and a skin test to exclude people likely to have hypersensitivity reactions to the vaccine, or who have prior immunity. After vaccination, immunity takes two weeks to develop and appears to be long lasting. Ideally, Q fever vaccination should be offered to recruits three weeks prior to commencing work so that they are fully immune before entering the plant.

An increase in the number of Q fever notifications to the Communicable Disease Control Branch (CDCB), South Australia, was noted in May 1998. In South Australia rates were less than 0.6 per 100,000 in 1995, 1996 and 1997 but increased in 1998 to 1.68 per 100,000 population. In total, 14 of 25 (60%) cases notified in 1998 were linked to meat processors. The increase in notifications in 1998 was unexpected, particularly of workers in the meat industry. During the preceding three year period 20 cases of Q fever had been notified and less than 50 per cent reported working in a meat processor.

In Australia, few studies have been conducted to determine barriers to the uptake of Q fever immunisation programs in workplaces with this occupational hazard. Our study assessed the uptake of Q fever immunisation programs in South Australian meat processors and asked workplaces to identify barriers and factors supporting and encouraging the offering of Q fever immunisation programs.

These research questions are in line with recommendations by Bell, *et al.*⁴ They recommended assessment of uptake of vaccine in meat processors, research into attitudes and barriers to vaccination at smaller meat processors and identification of barriers to program adoption.

Methods

Stakeholder working party

A stakeholder working party of representatives from peak industry and union bodies, the National Meat Association (South Australia branch), the Australian Meat Industry Employees Union and CDCB, was convened in 1998 to discuss the increase of Q fever notifications among workers employed in the meat industry. The stakeholder working party decided

to assess the uptake of Q fever immunisation programs in workplaces and to identify barriers to offering these programs through a survey. The CDCB coordinated the survey.

The population

A list of accredited meat processors in South Australia in 1998 was obtained from the Meat Hygiene Unit, Department of Primary Industries. An accredited meat processor was defined as a facility processing meat for wholesale. Meat processors were included in the survey if their work involved slaughtering or boning animals that were known to transmit Q fever.

The target population comprised four categories of meat processors: domestic export (category 1); retail and country slaughterhouse (category 2); pet food (category 4) and game meat (kangaroo) (category 8). There were 70 meat processors in the four categories and 68 were eligible to participate in the survey. Of those 68 meat processors, 65 (96%) were interviewed by telephone over a three day period in September 1998. Participants were interviewed by telephone because they were geographically spread throughout South Australia. Verbal consent was obtained at the time of interview, by the CDCB interviewer, who asked to speak to the plant manager. Three could not be contacted. Respondents were usually managers and occupational health and safety officers in the larger meat processors and business owners in the smaller ones.

Data collection

A respondent from each meat processor was interviewed using a semi-structured questionnaire. There were two elements of research to this study: quantitative and qualitative. Quantitative data included information on work-site details of the number of workers employed full time, part time or casual and the time interval between a new worker being told they were employed to actual commencement of employment. Questions on pre-screening and availability of vaccination to workers and visitors were asked. Guidelines and strategies for planning a Q fever pre-screening and immunisation program are documented in the *Q Fever Information Kit for the Australian Meat Industry*. The kit was developed to ensure a uniform protocol across the meat industry for vaccination of new employees. Seven criteria were selected from the information kit as a means to measure the practice of Q fever immunisation programs in South Australia.

Respondents were also asked why they did not offer a Q fever immunisation program to employees if they did not have one in place, and were invited to make comments on Q fever prevention and immunisation in the South Australia meat industry. These

open-ended questions were used to collect qualitative data on knowledge, beliefs and attitudes about Q fever immunisation in the workplace.

The questionnaire was piloted to five meat processors. As a result of the pilot test, the questionnaire was modified and inconsistencies corrected.

Data were entered and analysed using Epi Info version 6.04. Qualitative data were coded into themes that emerged from responses. The similarities and differences between the four categories are discussed later.

Feedback of results

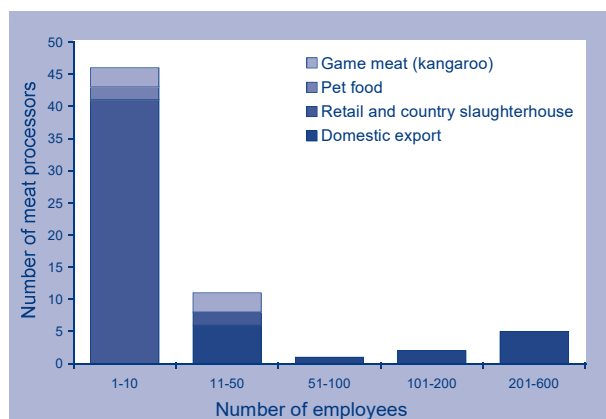
A summary of survey results was posted to all participating meat processors. The survey results were presented to the stakeholder working party and representatives reported to their respective industries.

Results

Demography of meat processors

The majority of meat processors, 43 of 65 (66%), belonged to category 2. However, category 1 meat processors employed the largest number of workers (range 18–570) (Figure). Sixty-six per cent of meat processors employed casual workers. Category 1 meat processors employed more casual workers than other meat processors. At the time of the survey 2,687 meat workers were employed in the industry. Of these, 2,353 (88%) of total number of employees were permanent workers and 334 workers were employed on a casual basis. The majority of meat processors in all categories stated that new employees commenced work within one week or less of being told they have employment.

Figure. Number of employees, South Australia, 1998, by category of meat processor



Q fever immunisation programs

Of 65 meat processors surveyed, 49 (75%) did not offer a Q fever immunisation program to employees. The majority of workers who did not have access to vaccination, worked in categories two, four and eight meat processors (Table 1).

Assessment of Q fever immunisation programs in meat processors

None of the 16 (25%) meat processors offering a Q fever immunisation program met the standard criteria in the industry information kit. Seven criteria in the industry information kit were used in this study to measure the timing and appropriateness of Q fever immunisation programs (Table 2).

Information about Q fever was provided to new employees by less than half of meat processors who had a vaccination program in place. Most of these processors provided information on commencement of employment and two provided it one week prior to commencement. Very little information about Q fever was provided to contractors or visitors to the

Table 1. Total number of employees offered Q fever immunisation program, South Australia, 1998, by category of meat processor

	Domestic export Category 1	Retail and country slaughterhouse Category 2	Pet food Category 4	Game meat (kangaroo) Category 8	Total
Number of processors with a vaccination program	10	4	0	2	16
Total number of processors per category	14	43	2	6	65
Number of staff with access to vaccination program by category*	1,870	39	0	18	1,927
Total number of staff per category*	2,393	191	5	98	2,687

* Based on survey responses.

Table 2. Criteria for Q fever vaccination programs and number of meat processors meeting each criterion, South Australia, 1998

Criteria for appropriate Q fever vaccination programs*	Total number of meat processors who implement the criterion	Comments
1. Plant informs new employees of Q fever and vaccine	19/65 (29%) [†]	11/19 (79%) domestic meatworks 5/19 (29%) country slaughterhouses
2. Plant informs contractors and visitors about risk of Q fever and availability of vaccine	6/65 (9%) [†]	5/6 domestic meatworks 1/6 game meat
<i>Of those meat processors offering a Q fever vaccination program:</i>		
3. New employees are screened and vaccinated prior to commencement of work	2/16 (13%) [‡]	Both processors vaccinated 1 month prior to commencement of work
<i>if not 3, then</i>	6/16 (38%) [‡]	6 processors provided a skin test within 2 weeks of commencing work
4. New employees are screened on 1st day of induction program		
5. All employees participate in a pre-screening program	11/16 (69%) [‡]	5 processors vaccinated only high risk workers
6. Vaccination is given on 7th day following skin test	146/16 (88%) [‡]	1/16 administered within 5 days 1/16 administered after 3 weeks
7. Vaccination is performed by trained general practitioner or registered nurse	16/16 (100%) [‡]	

* Criteria used to measure appropriateness of Q fever vaccination programs was adapted from *Q Fever Information Kit for the Australian Meat Industry*, Meat Research Corporation, 1997.

† 65 total number of processors.

‡ 16 total number of processors with a vaccination program.

processor, while two processors invited contractors to participate in the company's immunisation program at their own expense.

Most meat processors offered pre-screening and vaccination to employees on commencement of employment and up to two weeks following commencement. Six companies offered skin testing but not in the recommended time periods. These respondents stated that skin testing was provided to new employees 'when possible', 'three times a year', 'in groups' and 'months later'.

All but one processor offered vaccination to all employees, the other offered it to permanent workers only. Skin testing and vaccination was performed mainly by general practitioners.

Barriers to implementation

Interviewers requested to speak to the plant manager for the purposes of the survey. As Q fever is an occupational hazard in meat processors, employers are obliged to provide a safe work environment for employees. While the interviewers did not clarify the specific responsibilities for occupational, health, safety and welfare (OHSW) of each respondent, respondents in larger meat processors tended to

have higher levels of knowledge than respondents in smaller ones, even though their OHSW obligations in the workplace were the same.

The survey elicited a number of barriers to effective Q fever immunisation programs. Respondents from each category differed in their responses to questions about Q fever and occupational health and safety in the workplace. Three basic themes emerged.

Knowledge and attitudes

Respondents from category 1 were more knowledgeable about Q fever compared to other meat processors. Knowledge and experience of the impact of the disease on employees and their families also motivated some employers in categories 2 and eight to provide immunisation programs. The two respondents in category 4 knew little about Q fever. This category demonstrated the lowest level of awareness and knowledge of Q fever. Category 2 respondents were spread across a continuum of no knowledge to a high level of knowledge. Commensurate with the general lack of knowledge about Q fever, category 2 respondents were not sure about what is a risk, and how to assess their risks of Q fever infection:

'It's got to do with volume. Only a risk if large volumes of 1,000 sheep a day'.

'... only cattle from up north are infected'.

Workers from all four categories and who had 25–30 years working experience in the industry, reported to have been told by industry trainers and others that they were not at risk.

'I was told that because I have been around goats and roos (kangaroos) etc for a long time that I have immunity to it'.

Cost

It was common for those respondents who were aware of Q fever associated with the meat industry to say that the costs of immunisation programs were a barrier, and often the reason programs were not implemented. Even category 1 respondents, who worked in meat processors with Q fever immunisation programs, spoke about cost saving practices used in the workplace, such as having two to three vaccination catch-up sessions a year.

Two respondents framed the burden of cost in the early loss of staff. Vaccinated workers who stayed for only a few days or weeks were more expensive to replace than unvaccinated workers. Employers may be reluctant to invest in high turnover workers, but willing to do so with workers who committed significant time with employers. Some respondents told of practices that they employed to avoid paying for the vaccination of employees who worked for less than two weeks.

'I wait for two weeks to see if they hang around before vaccination. If they don't, then I don't do it'.

Given that many respondents commented on the prohibitive cost of Q fever immunisation programs, it is not unexpected that they wanted the cost of vaccination to be reduced or subsidised. Cost reduction was seen as a role of any or all of the employer, employee, vaccine manufacturing company and the government. Others wished to contain cumulative costs that rise with each employee who leaves after a short work span through a system whereby employees who leave within, say two weeks, reimburse the employer for the cost of vaccination.

Provision of services

General practitioners were expected to be knowledgeable about Q fever disease and actively advise on immunisation for meat processors and their workers. They were seen as important health resources. General practitioners were relied upon to provide recommendations and Q fever vaccinations,

and support advocates of immunisation programs in the workplace. In some incidences, they did not fulfil this expectation.

'When I go to the doctor, he just mentions keeping tetanus up to date'.

Likewise, respondents who sought medical advice about the appropriateness of Q fever vaccinations in their workplace told the interviewers that general practitioners generally dismissed their query. If vaccination was not actively supported by the general practitioner, respondents neglected the issue.

Respondents complained about lack of skilled general practitioners for Q fever vaccination.

'Especially rural general practitioners. They should learn how to do it (Q fever vaccination)'.

Trained Q fever immunisation providers were located sparsely around the state. For vaccination services outside the worksite, the employee must travel on two occasions to the provider and this may involve significant travel. In addition, the employee is absent from the worksite for varying lengths of time.

Factors supporting and encouraging Q fever immunisation programs

Several factors were linked to the implementation of a program. Respondents in category 1 spoke about the cost of having employees off work due to injury. They recognised the occupationally acquired nature of Q fever disease and subsequent work days lost due to illness, which has a financial impact on the business. The cost of preventing Q fever disease in employees was seen as a sound financial investment. Some respondents in all categories except category 4 were adamant that the benefits of Q fever vaccination in the meat industry outweighed the costs. The impact of Q fever on WorkCover levies is an incentive for meat processors to maintain vaccination levels in their employees, particularly for category 1 employees.

Suggestions offered by respondents to reduce the cost of vaccination in the workplace included delivering immunisation programs in a flexible way, such as utilising local registered nurses and ensuring local rural general practitioners were trained in Q fever immunisation.

Respondents were keen that information about Q fever prevention and immunisation be provided to them. They were clear that information about Q fever included risks, description of the disease, vaccination costs and employer responsibilities. The information must be presented in a way they could understand. One respondent suggested a personal visit.

'What should happen is not a report, but get a people-person to ring up, make an appointment and come here and talk to us in our country language... Someone we can relate to'.

Some respondents said that information about Q fever should not be limited to meat processors and their workers, but shared with the rural community, people who work with or are exposed to animals. One meat processor attempted to provide an incentive through sharing vaccination costs with its rural community.

'We advertised in the local paper for people in the community to participate (in the vaccination program). Only one did'.

The slaughter-floor and lairage were considered by industry to be high-risk work areas and some meat processors have policies that restricted workers and visitors without Q fever vaccination from these areas. A program that issues proof of Q fever vaccination via a personal zoonosis record card to employees enables potential employers to ascertain risk and work allocation in the meat processor, was suggested.

Respondents identified a general lack of knowledge about Q fever in the industry and rural community, from knowledge about the disease, its prevention and control, to technical implementation and legal obligations of immunisation programs in the workplace. Strategies offered included compiling a list of general practitioners knowledgeable about zoonotic disease and informing people at risk of Q fever about the disease, the risks, cost of vaccination and responsibilities of employers. Education settings were highlighted as legitimate providers of information on Q fever, both for preparing young people before entering the workplace and for participants in courses for the meat industry.

Discussion

Category 1 meat processors employed the largest number of workers (n=2,393) and of the 14 processors, 10 (71%) offered employees a Q fever immunisation program. In comparison, categories 2, 4 and 8 employed a total of 294 workers and of these 51 processors, 6 (12%) had an immunisation program in place. Differences in the values and attitudes about Q fever immunisation programs appeared to relate to the size and function of the category.

No meat processor fulfilled all seven criteria for a standard Q fever immunisation program. Reasons given by respondents for not doing so, ranged from a lack of knowledge of the risk of disease, vaccine cost and inaccessibility to trained immunisation providers. Similar barriers to vaccination have previously been reported.⁴

Respondents provided the study team with an understanding of the barriers to implementing Q fever immunisation programs in meat processors and possible strategies to encourage the uptake of Q fever immunisation programs. Once the topic of Q fever was raised with meat processors, there was an immediate demand for information about prevention and immunisation for the industry and others in the community at risk.

Subsequent to the survey, the stakeholder working party acted to increase the Q fever immunisation uptake in South Australia meat processors between 1998–2000. The stakeholder working party implemented strategies given the jurisdiction of the organisations represented on the group, that is, immunisation provision, prevention and information dissemination. Alliances with a number of organisations with a vested interest in Q fever prevention were established. Service provision gaps were mapped and identified and addressed through training of immunisation service providers. Access to services was formalised through a register of trained service providers for meat processors and was regularly maintained. Awareness raising of Q fever disease issues to at-risk, influential and other health and industry groups took place using a variety of methods and resources.

In October 2000 the Federal Minister for Health announced a National Q Fever Management Program. The program commenced in 2001 and provided free skin test and vaccination for targeted at-risk groups. The purpose of the program was to reduce the burden of Q fever disease in Australia. Meat process workers and visitors and contractors to meat processors were identified as targeted groups of the national Q Fever Vaccination Program. Funding provision for this group allowed for free skin test, vaccine and service delivery money for two doctor's visits and serology test.

The two years prior to the National Q Fever Management Program enabled South Australia to implement initiatives that provided the South Australia component of the national program with a strong basis to immediately provide funded service delivery, the major barrier the state could not address alone.

The Commonwealth Government funding for the national program ceased in South Australia in 2005. In South Australia the provision and responsibility of Q fever vaccination programs for employees reverted to meat processors' managers.

States are better situated to monitor gaps in service provision, use flexibility in service delivery such as using local registered nurses, liaise with trainers of students in accredited meat industry courses through their state systems, promote influential peers in reach-

ing specific at-risk groups, provide financial advice to smaller employers regarding the relationship of WorkCover levies and maintaining vaccination levels in employees and target all information in a way that meets the target groups' interests and needs.

The National Q Fever Management Program was funded to improve vaccine uptake, particularly for workers in rural and regional Australia; it has been a time-limited program that does not ensure sustainability and maintenance of high vaccine coverage in individuals or occupations at risk. A concerted effort at national and state level is required to address the issues of this occupationally-related disease.

Acknowledgements

The authors thank the following people for their participation and contribution to the project: Paul Sandercock, National Meat Association (South Australia branch) and Graham Smith, Australian Meat Industries Employment Union (South Australia branch). We are also grateful to the meat processors for participating in this survey.

References

1. Marrie TJ. Q fever. In: Marrie TJ, ed. *Q fever Vol 1. The Disease*. CRC Press Boca Raton, Florida; 1990.
2. Marmion B. *Q fever: Your Questions Answered*. CSL Limited. MediMedia Communications, New South Wales; 1999.
3. Meat Research Corporation. Q fever. Information Kit for the Australian Meat Industry. Australian Meat and Livestock Corporation, Sydney; 1997.
4. Bell M, Patel M, Sheridan J. Q fever vaccination in Queensland abattoirs. *Commun Dis Intell* 1997;21:29-31.