# Q Fever as an Occupational Illness at the National Institutes of Health

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BECAUSE OF AN OUTBREAK OF Q fever at the University of California at San Francisco in early 1979 (*1*), the National Institutes of Health Occupational Medical Service (OMS) has explored the possibility of a similar incident occurring at the Institutes. The results of serologic testing of exposed employees and of animals at the NIH Animal Center, a review of the history of Q fever as an occupational illness at NIH, and recommendations for surveillance and prevention are presented here.

## Subjects and Methods

Between May 1979 and April 1981, blood was collected in serum separating tubes from employees and animals. Serum was prepared by centrifugation at 3,000 rpm for 10 minutes. The serum was then frozen to $-30\,^{\circ}C$ and transported in frozen $CO_2$ in insulated containers.

Microagglutination titers to phase 2 *Coxiella burnetii* antigen were performed by Dr. Paul Fiset, professor of microbiology at the University of Maryland, according to the method devised by him and his associates (*2*). The subjects were employees of the Veterinary Resources Branch and of the National Heart, Lung, and Blood Institute's Section on Laboratory Animal Medicine and Surgery, all of whom had regular contact with large animals.

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## Results

Serums of 80 employees were studied, and the results were as follows:

| | *Employees* | |
|---|---|---|
| *Titers* | *Number* | *Percent* |
| Less than 1:2 ..... | 75 | 94 |
| 1:2 ..... | 3 | 4 |
| 1:4 ..... | 1 | 1 |
| 1:8 ..... | 1 | 1 |
| Greater than 1:8 ... | 0 | 0 |

Of these 80 employees, 47 worked at the NIH Animal Center in Poolesville, Md., which has large outdoor grazing areas as well as indoor cages and kennels, and the remaining 33 persons worked at the main NIH campus in Bethesda, Md., where all animals are kept in relatively close confinement. At the time of the employee survey, a random survey was made of large animals at the Animal Center, which supplies the main campus (see table). Titers of 1:8 or greater were considered to be indicative of current or previous Q fever infection. Titers of less than 1:8 may indicate either infection in the distant past or a nonspecific reaction, and they are difficult to interpret (Dr. Fiset, telephone conversation, June 8, 1981). The five employees with positive or low level titers worked at the main campus. Other than the place of employment, there were no differences between the work histories of these 5 employees and those of the other 75. The low level positive titers in goats and sheep were considered to be probably indicative of infection that had occurred in the distant past.

## Discussion

Q fever was first described by Derrick (*3*) in August 1937, following an outbreak of febrile illness among packinghouse workers in Australia. In 1935, Davis and Cox (*4*) isolated an agent infectious for laboratory animals from the tick *Dermacentor andersoni*. These two researchers were working at the Rocky Mountain Laboratory (RML) in Hamilton, Mont., which was established in 1902 to help control Rocky Mountain spotted fever. The RML became a field station of the U.S. Public Health Service in 1921 and a part of the National Microbiological Institute (predecessor to the National Institute of Allergy and Infectious Diseases) in 1948.

In May 1938, Dr. Rolla E. Dyer from NIH spent 4 days at the RML where Davis and Cox's agent was being studied. On his return to the South Building in downtown Washington, D.C. (the previous location of NIH), Dyer developed a febrile illness, the course of which was similar to that described for Q fever in Australia. Serologic comparison suggested that the two diseases were identical (*5,6*). Thus, the first reported case of Q fever in this country was an occupational illness acquired by an NIH employee. Indeed, only one naturally occurring case was reported in the United States before 1946 (*7*).

In the spring of 1940, 15 cases of Q fever were recognized among 153 workers at the South Building where Q fever research was being performed (*8*). None of those infected worked in the rooms where the research was carried out. This lack of infection among the researchers was probably due to previous inapparent infection since 6 of the 10 researchers had positive agglutination titers. It was in clinical reports of these 15 infected persons that Q fever was first recognized as a primarily pulmonary disease. Two additional cases occurred in the same building in the fall of 1940 (*9*).

In late 1940, the Q fever research facilities were transferred to Building 5 on the NIH Bethesda campus. Between December 1945 and June 1946, Q fever was diagnosed in 47 employees in Building 5 (*10*). A common factor with the 1940 outbreak was that, in both instances, *C. burnetii* antigen was being prepared from egg yolk sac suspensions by centrifugation.

In early 1948, Q fever research was transferred to Building 7, also on the Bethesda campus. This building was described in an internal memorandum of that time as "a building specifically designed for research in infectious diseases for the specific purpose of protecting the individual workers and adjacent population groups." Nevertheless, in November 1948, eight employees, none of whom was specifically involved with Q fever research, contracted the disease (unpublished NIH documents). Again, yolk sac suspensions of *C. burnettii* were being centrifuged. Q fever research continued at the Bethesda campus into the early 1950s, but an extensive immunization program effectively prevented any further recognized clinical disease.

The current serologic study reveals no evidence of recent Q fever infections among employees working with animals carrying positive titers. That these animals are capable of shedding rickettsias in large numbers, particularly around the time of parturition, is well accepted (*11*). It is also known that people may lose their serologic reactivity over time while retaining a delayed hypersensitivity skin reaction to dilute Q fever vaccine (*12*). Thus, without skin testing, we are unable to say how many of these employees have had previous undiagnosed or inapparent infections. Although no recent infections have occurred,

Results of a survey of animals for titers to phase 2 *Coxiella burnetii*, National Institutes of Health Animal Center

| Animal | Number tested | Titers | | | | | |
|---|---|---|---|---|---|---|---|
| | | less than 1:2 | | 1:2 or 1:4 | | 1:8 or greater | |
| | | Number | Percent | Number | Percent | Number | Percent |
| Goats | 98 | 0 | 0 | 55 | 56 | 43 | 44 |
| Sheep | 95 | 19 | 20 | 20 | 21 | 56 | 59 |
| Dogs | 49 | 38 | 78 | 0 | 0 | 11 | 22 |
| Pigs | 27 | 27 | 100 | 0 | 0 | 0 | 0 |
| Burros | 26 | 26 | 100 | 0 | 0 | 0 | 0 |
| Horses | 8 | 8 | 100 | 0 | 0 | 0 | 0 |

experiences at the University of California (*1,13*) and more recently at the University of Colorado (*14*) underscore the importance of preventive measures.

The ideal prevention program would consist of a skin test for each exposed employee, with immunization for those who are found to be skin-test negative. This type of program has been in effect at the RML for more than 20 years with much success (*12*). Unfortunately, no Q fever vaccine or skin-test antigen has yet been approved for general use. Until they are available, the following guidelines for Q fever surveillance and prevention have been implemented at NIH. These guidelines are meant to strike a balance between adequate protection for animal handlers and the practical consideration of running an animal care facility. One should bear in mind that Q fever is rarely a fatal disease in otherwise healthy people (*15*).

—OMS has made educational presentations to employee groups and aided in writing educational materials. A special information bulletin has been distributed to exposed employees.

—A high index of suspicion will be maintained by OMS physicians, and a special stamp will identify the charts of exposed employees.

—Preemployment examinations for exposed employees will include careful screening for pregnancy and for chronic diseases, especially valvular and congenital heart disease.

—Pregnant employees and employees at increased risk for endocarditis should not work with potentially infected animals near the time of animal parturition.

—Serum Q fever titers will be obtained on all newly exposed employees and yearly thereafter.

—A periodic survey of large animals at the NIH Animal Center will be made to determine Q fever titers.

—Potentially infected animals should be housed and transported in areas that are not subject to traffic by non-animal workers. Such animals should not be housed in or near patient care areas.

—Animal housing areas should have negative air pressure relative to the central corridor, and exhaust air should not be vented toward other occupied areas or air shaft intakes.

—Street clothing should not be worn in animal care areas, and work clothing should not be worn outside of these areas.

—Proper microbiological techniques should be used in the handling and disposal of tissues and excreta from potentially infected animals.

—Masks and gloves should be worn in high-risk situations, such as exposure to placental tissues and fluids.

—Dissolvable laundry bags should be used to contain soiled work clothes, and laundry workers should wear masks when handling these bags.

—Automatic cage washers are preferable to manual washing.

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