Evidence is increasing of the wide distribution and spread of Q fever among animals and man in the United States. The control of this disease requires more knowledge of its whereabouts. The author of this paper reviews the current situation and suggests a course of action.

THE EPIDEMIOLOGY OF Q FEVER IN THE UNITED STATES

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Much has been accomplished toward understanding Q fever infections in man and animals. The disease, once considered a medical curiosity, a wartime occurrence, or an infection confined to some areas of this country, is now known to occur throughout the world. In Europe Q fever is a prevalent and severe public health problem, perhaps because of infection in more animals or because people live in closer proximity to infected animals. Development of similar situations in this country is not unlikely. Current information regarding the disease in the United States indicates that, instead of complacency or cessation of study by public health agencies, this problem requires further study and clarification.

Concerted field and laboratory studies conducted from 1947 to 1954 by numerous teams of workers in California, Texas, and Montana led to extensive knowledge concerning the natural history of the disease within known infected areas. Human infections were found to result from occupational exposure to infected livestock (cattle, sheep, and goats), from residence near infected premises, or from household use of raw infected milk. Many infections were attributable only to casual exposure to contaminated environments or livestock. Commercially pasteurized milk was demonstrated occasionally to contain viable Coxiella burnetii. Subsequent laboratory studies indicated that, if vat-holding temperatures were raised to 145°F, pasteurization would destroy the rickettsiae present in naturally infected milk. Destruction of the agent in milk would not, however, affect the other important sources of human disease.

Infection in man may result in mild to severe illness which can be debilitating and sometimes develops into chronic disease. Symptoms are similar to those of influenza, brucellosis, virus pneumonia, or atypical pneumonia. Diagnosis of the disease is difficult because of nonspecific symptoms and the necessity for laboratory confirmation either by isolation of the causative agent or by demonstration of a rise in specific serum antibody. Therapeutic use of broad-spectrum antibiotics can complicate serological interpretation, since these drugs may interfere with the usual patterns of antibody production. Thus, it is apparent that many cases remain undiagnosed, especially in regions where
awareness of the disease is limited or absent.

Prevention of human infections presents certain problems. Interest in the study of this asymptomatic animal disease and responsibility for its control appear to be divided between agricultural and public health agencies. Although vaccines are effective in preventing infections among selected groups of people, such as laboratory workers,11,12 the casual or occupational exposure of great numbers of people precludes control through immunization of human beings. Apparently the prevention of Q fever in man can be accomplished only through its control in livestock.13 The need for such control will become more urgent as recognition of the Q fever problem becomes more widespread and the disease is found to occur among people in many areas.

Man, as well as animals, contracts the disease by inhalation of air-borne rickettsiae14 disseminated from the reservoir of Q fever in naturally infected livestock. Arthropods have been found to be infected, but they rarely contribute to human disease. Dairy cattle and sheep are highly susceptible to natural infection. When susceptible cows were introduced into infected herds, 45 per cent developed serological evidence of infection within six months.15 Exposure of susceptible sheep to infected flocks resulted in a 26 per cent infection rate.16 In cows the agent localizes in the gravid uterus or in the lactating mammary gland. Serologically positive cows shed infected placentas, especially at first parturition following infection.17 Approximately 50 per cent of positive cows shed rickettsiae in their milk; half of these animals develop chronic infections and continue to excrete the agent.18

Intensive contamination of the environment occurs from the rickettsiae expelled in infected placentas and fluids discharged at parturition, since these membranes contain as much as a billion guinea pig infectious doses per gram of material. The rickettsiae become disseminated as the membranes desiccate and disintegrate. Similarly, placentas of infected sheep19 are responsible for environmental contamination during the lambing season, which coincides with the highly seasonal incidence of human cases in Northern California.20 Once introduced into an area, the agent which is notoriously resistant to destructive forces21 becomes air-borne and readily infects other animals. These factors suggest that, unlike other rickettsial diseases which are dependent upon arthropod vectors for spread, Q fever possesses a vast potential for extensive spread. That this spread occurs was proved by the finding of infection in all of 259 herds tested within the endemic Los Angeles area.22 Presence of the agent in livestock of other areas could result in development of similar disease problems.

The first indication that Q fever may occur in cattle of other supposedly uninfected areas of the country was obtained by Shepard in 1948.23 By testing 50 serums from each of 37 states he found that serologically positive dairy and beef cows were present in 16 states. He concluded that cows with serums containing antibody against C. burnetii could be found in many parts of the country, but that elucidation of the geographical distribution of Q fever in man must await general recognition of the disease.

Data available from recent studies indicate a much more extensive occurrence of Q fever than was formerly realized. Bovine and human infections are being encountered in many areas presumably free of infection. Significantly, infections are being detected wherever a search for the disease is made.

A bovine survey performed in Ohio in 195424 indicated the presence of Q fever in many dairy herds. Tests of serums from a number of cows, consist-
ing of 5 per cent of the cattle in 15 counties scattered throughout the state, disclosed that infected animals were present in 2 per cent of the 748 herds sampled. The initial evidence of infection was one serologically positive cow, subsequently proved to be infected, in a group of 70 adult show animals. Within a year 14 adult cows in this herd had become positive and the agent was isolated from several animals. Although other herds within the same county were free of infection, those having direct contact with the positive animals were found to contain infected cows. Tests on sera from persons in the area showed that human infections had also occurred. The authors concluded that foci of infection were present within the state, that infection was spreading, and that a potential endemic situation existed. A subsequent surveillance program by the Ohio State Department of Health is discovering more human cases and is demonstrating that more bovine infection exists than was indicated by the original survey.

The discovery of Q fever and of its prevalence in Wisconsin, a state that exports large numbers of dairy cows, is of particular concern because of possible spread of infection to other areas through shipment of animals. Eight per cent of the 2,100 herds tested throughout the state contained serologically positive animals. The disease was especially widespread in the nine southeastern counties where 27 per cent of the herds and 8 per cent of the cattle were positive. In some counties up to 75 per cent of the herds and as many as 45 per cent of the cows in some herds were serologically positive. This condition approximates, in some respects, that encountered in the highly endemic areas in Southern California. The Wisconsin survey also showed that infections had occurred among persons exposed to infected cattle, as well as among the general populace.

Considering the numerous foci of bovine infection recently found, and the known characteristic spread of the causative agent, it is likely that Q fever already is, or may be developing into, an unrecognized nation-wide problem. With the resulting gross environmental contamination by these resistant organisms it is difficult to visualize how the disease can fail to become widespread among livestock. With the growth and spread of enzootic foci the sources of infection will increase until contamination is great enough to give rise to human infections and disease. This cycle has already been recognized in the known endemic areas of California, Texas, and Idaho where human cases continue to appear.

Evidence being received currently, although fragmentary, supports the hypothesis that bovine infections are increasing and will lead to more human infections in many areas of the country. Development of an endemic situation can be postulated in Wisconsin where animal infection rates are high and human infections occur. Ohio represents a similar, but less advanced stage of epidemiological development. The disease must be present in Pennsylvania where positive serum titers were detected in six of 73 veterinarians tested. Infections have been reported from Mississippi, Louisiana, North Carolina, and Virginia. Unpublished reports indicate that other areas are experiencing Q fever infections. For instance, Tjalma has proved the occurrence of human infections in Iowa and postulates the spread of bovine infections within infected herds. Sussman in New Jersey reported a human case contracted from an infected dairy herd. Animal or human infections are known to occur in Arizona and Nebraska.

The occurrence of Q fever infections in various regions should not be allowed to remain a matter for speculation. It is now essential to determine the nation-wide status of infections with C. burnettii
to ascertain where the disease occurs, the magnitude of the problem, and to evaluate its potential for increasing. The distribution, prevalence, and spread of infection among livestock and its resulting occurrence in man should be determined by coordinated surveys at state levels. Considerable interest in such surveys is evident from progress made in studies already under way. Additional data which will be needed can be obtained only by stimulating the interest of research workers and public health officials.

A simple means for rapid accumulation of the needed data is available by use of the capillary-tube agglutination test. It is highly specific and sensitive for detecting antibody against C. burnetii present in bovine serum of milk and in guinea pig, human, and sheep serum. The validity of the test has been confirmed by other investigators. It is being widely used in this country and other parts of the Western Hemisphere and makes extensive human and animal surveys feasible. Using pooled milk from entire herds a simple and rapid determination of the infection status of large animal populations can be made. Several thousand herds have been sampled and tested within a period of three weeks.

Prevention and control of disease are goals of public health practice. Control measures are most effective when instituted before disease becomes well established. The need for control of Q fever cannot be judged adequately before necessary basic information has been collected. Consequently, there is need for early acquisition of nation-wide data on the occurrence of Q fever. Once the extent of infections or of its spread are determined an accurate evaluation of the problem becomes possible. The consideration of appropriate control measures, if indicated, would constitute another phase in the over-all attack on Q fever in this country.

REFERENCES


16. Lennette, E. H. Unpublished data.


Mental Health Commissioners Meet

The commissioners who direct state mental health and hospital programs met in October under the auspices of the American Psychiatric Association. On the basis of a review and analysis of current trends in these programs the group issued a public statement. Its gist is that, in view of the immense cost of mental illness and the evidence that recently expanded expenditures for personnel, training, and research have resulted in decreasing mental hospital populations and the greatest number of discharges in history, now is the time to invest heavily in mental health and hospital programs. The result, in the foreseeable future, it is believed will decrease capital costs for construction of hospitals as well as add greatly to the productive potential of the nation.

The group agreed to follow up this first meeting with a permanent organization for regular meetings and exchange of information. George W. Jackson, M.D., of Topeka, Kans., is chairman of an organizing executive committee.

Among the 49 states, mental health services are under the direction of the state health department in 27 states; in 12 there is a state mental health department; in five the program is a responsibility of the department of public or social welfare; and in five of a state hospital, department of hospitals, or of institutions.