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EPIDEMIOLOGICAL INVESTIGATIONS ON Q FEVER IN TURKEY

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SYNOPSIS

Q fever is endemic in Turkey in both human beings and animals. Cows, sheep, goats, and dogs may play a role as reservoirs of *Coxiella burnetii*. *Ornithodorus lahorensis* ticks also harbour the agent. The disease is disseminated throughout Turkey; epidemics among human beings are relatively rare.

The aim of this paper is to summarize the researches which have been made on Q fever in Turkey to date. The presence of Q fever in Turkey was demonstrated five years ago by the author,[8, 9, 10, 11, 13] and his collaborators. The epidemiology of the disease is much less obscure than that of many infectious diseases that have occurred in Turkey.

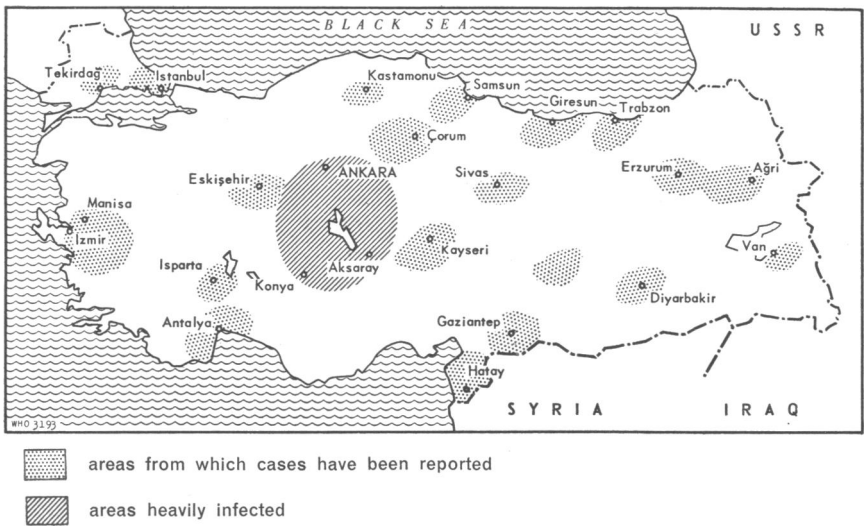
Geographical distribution, established serologically

2,181 sera obtained from different parts of Turkey were examined for Q-fever antibodies in our laboratory. Positive results indicate that cases of Q fever occur in at least the following areas or cities : Adana, Aksaray, Amasya, Antalya, Çorum, Diyarbakir, Erzurum, Eskişehir, Gaziantep, Giresun, Kastamonu, Kayseri, Konya, Isparta, Istanbul, Izmir, Malatya, Manisa, Maraş, Samsun, Sivas, Tekirdağ, Trabzon, and Van.

Fig. 1 illustrates that Q fever is not located in one part of Turkey, but is distributed throughout the country. Areas shown blank may be infected, but, up to date, either infection has not been demonstrated, or no investigation has been made. We may say that laboratory facilities are not available in every part of Turkey for the diagnosis of Q fever, and as yet physicians and veterinarians have little information about it.

The disease has been known to the Turkish people as an animal infection, under the name " eskì hastalik " (old disease). The occurrence of the infection among human beings and animals throughout Turkey suggests that it is not a new disease in this country.

FIG. 1. AREAS IN TURKEY FROM WHICH CASES OF Q FEVER HAVE BEEN REPORTED



Sera from different sources were examined by complement-fixation test (CFT). A slight modification of Bengtson's technique [2] was used in this laboratory; 1/40++ positive results were accepted as positive. The results are summarized in table I.

TABLE I. SEROLOGICAL TESTS FOR Q-FEVER ANTIBODIES IN VARIOUS SERA

Sources of sera	Negative or anticomplementary	Positive ++ results with Q-fever CFT * (titres)						Total positives	Total tests
		1/10	1/20	1/40	1/80	1/160	1/320		
Venereal Disease Laboratory	113	7	4	3	—	—	—	14	127
Pneumonia cases **	1,233	71	107	87	37	27	28	357	1,590
Various animals	479	55	13	13	1	1	—	83	562
Various animals †	380	13	23	7	23	—	—	66	446

* To secure economy of antigen, final dilutions of 1/40 were selected for most of the sera tested.
** We were only rarely able to obtain two samples of these sera.
† These figures were obtained from the Etlik Veterinary Institute ; the titres were 1/16, 1/32, 1/64, 1/128, 1/256, and 1/512.

Serological research showed that human beings, sheep, cows, goats, buffaloes, and dogs were infected in the different districts mentioned on page 553.

Seasonal incidence

Cases of Q fever occurred sporadically; only one important epidemic has been reported [8] in Turkey—in 1948—and the case-occurrence curve reached two peaks in March and August. Two epizootics among goats which occurred in March of 1950-1 were also reported by Mrs. Cavide Atillâ. No other detailed figures are available.

Sources and modes of infection

Data from various authors suggest that infections occur mainly among persons in contact with animals, e.g., medical and veterinary personnel. The following tabulation shows the distribution of cases among different professions; the figures are taken from references 1, 4-6, 8-14.

Profession	*Number of cases of Q fever*
Housewife	12
Peasant	92
Industrial worker	21
Student	7
Teacher	2
Clerk	16
Doctor, nurse	8
Veterinary personnel	10
Shopkeeper	9
Food trader	10
Laboratory worker	4
Total	191

Inhalation of infective dusts. Inhalation of dust from sheep-wool was the cause of an outbreak which occurred in central Anatolia.[1, 4-6, 8, 10]

Q-fever antibodies were detected among people working in the pleuropneumonia vaccine laboratory in Pendik Bacteriological Institute (Istanbul) and among dairy workers on the State farm at Ankara. Mrs. Cavide Atillâ also examined four sera obtained from shepherds of a flock in which an epizootic of Q fever had previously occurred. Many of them described in their case-history an influenza-like disease which resembled Q fever. Results are given in table II.

An outbreak occurred in our laboratory in 1948.[7] Three doctors and two technicians contracted the disease from the inhalation of faeces dust while packing infected ticks. An epidemic also occurred in Ozancik village, of which, again, the cause was probably inhalation of infective dust from sheep-wool.

We have previously reported [10, 11] observation of contact infections in some cases, particularly among doctors and nurses. We have isolated

TABLE II. Q-FEVER ANTIBODIES IN THE SERA OF ANIMAL CONTACTS

Source of sera tested	Number of sera	Q-fever CFT titres						Total negatives	Total positives
		1/10	1/20	1/40	1/80	1/160	1/320		
Laboratory assistants	8	—	—	1	1	2	2	2	6
Ghazi State Farm dairy workers	6	—	—	1	1	—	—	4	2
Shepherds	5	—	1	1	—	2	—	1	4
Sheep dogs	3	—	—	—	—	2	—	1	2

a strain of *Coxiella burnetii* from the sputum of a Q-fever case.[16] An assistant in a fever clinic was infected from his patient, whose disease had been diagnosed as Q fever. He developed typical Q-fever symptoms and diagnosis was established clinically, radiologically, and serologically; Q-fever CFTs were positive, 1/320.

Milk. Caminopetros has reported [3] that sera obtained from goats and sheep exported from Turkey to Greece contained Q-fever antibodies. Payzin in 1948 [9, 10, 14] and Turtin [17] in 1951 also demonstrated the presence of Q-fever infections among sheep, goats, cows, and buffaloes in several instances. In 1948, we also isolated *C. burnetii* from the milk of cows and sheep in Ankara [10] and, on one occasion only, from unpasteurized butter.[11] We must mention here that butter is not pasteurized in Turkish cities other than Ankara, Istanbul, Bursa, and Izmir.

Ticks. There are many species of ticks in Turkey; for instance, *Ornithodorus lahorensis*, *Boophilus*, *Rhipicephalus bursa*, and *Hyalomma savignyi* were tested for *C. burnetii*. *O. lahorensis* are much the most frequent in every part of Turkey. Many attempts have been made to isolate *C. burnetii* from *O. lahorensis* ticks without success. Payzin [10] demonstrated that this tick is able to maintain *C. burnetii* for at least six months, and transmits the disease.

Payzin & Akyay [12] reported recently that *C. burnetii* occurs naturally in *O. lahorensis* ticks. Faeces of this tick may be a source of infection for human beings, as illustrated above. We have been unable to demonstrate that *Melophagus ovinus*, human lice, or *Pulex irritans* harbour *C. burnetii*.

Infection-rates among different animal species

Results of CFT of different animal sera tested for Q fever are summarized in table III. The sera were obtained from different parts of Turkey,

and it is evident that the disease is disseminated throughout the country. A high percentage of every kind of domestic animal was found infected with Q fever.

TABLE III. PERCENTAGE OF POSITIVE CFT FOR SERA FROM VARIOUS ANIMALS *

Results	Sheep	Goats **	Cows	Dogs	Buffaloes	Total
Number of positives	59	36	58	3	2	158
Number of negatives	297	242	304	1	47	891
Percentage positive	16.5	13	16	—	4	15
Total	356	278	362	4	49	1,049

* The sources of these figures are references 3, 4, 9, 17.

** 127 of 278 sera were tested by Caminopetros. These sera were obtained from goats exported to Greece from Turkey. 110 sera were from white Ankara goats.

Character of strains isolated

We have isolated many strains of *C. burnetii*, which were tested with CFT or cross immunity tests by the author and by Dr. D. B. Lackman of the Rocky Mountain Laboratory, Hamilton, Mont., USA (personal communication). No significant differences from the other classical strains were observed. Some strains were found to have poor antigenicity, particularly those isolated from sputum, milk, and ticks.

Clinical observations

Radiological findings were recorded for practically all human cases. The main symptoms were those of atypical pneumonia. Exanthemata occurred in some cases, which resembled typhus or measles, and which were confused with these diseases.[8-15] Only one case of Q fever was reported in which radiological examination showed no changes in the lungs.[16]

Disease induced experimentally in goats in Ankara was characterized by only slight rise in fever and cough for one week.[10] A broncho-pneumonia-like disease was observed by Mrs. Cavide Atillâ in a herd of goats during an epizootic. A continuous fever, with no other symptoms, was recorded in an infected cow from which *C. burnetii* was isolated, and Q-fever antibodies were demonstrated in its milk. Many cases of actual infection among sheep were reported by Mrs. Atillâ during the epidemic mentioned above.

Treatment

Good results were obtained with new antibiotics, such as chloramphenicol, aureomycin, and oxytetracycline.[a] Only one untreated case died from Q fever.[8]

RÉSUMÉ

La fièvre Q, décelée en Turquie il y a 5 ans, est répandue dans l'ensemble du pays, ainsi qu'il ressort de l'analyse de 2.181 sérums. L'incidence n'est pas connue de façon précise pour toutes les régions, faute de laboratoires de diagnostic. Le nom de « vieille maladie » donné à cette affection dans le pays témoigne de son ancienneté.

Les tests sérologiques ont montré que les hommes, les moutons, les chèvres, les vaches, les buffles et les chiens pouvaient être atteints. Une épidémie a été observée en 1948, avec deux maximums, en mars et août. Deux épizooties chez les chèvres ont été signalées en mars de la même année. L'homme paraît s'infecter au contact des animaux. La maladie est donc plus fréquente chez le personnel médical et vétérinaire et les bergers. Les poussières provenant de la laine de moutons ont causé une poussée épidémique en Anatolie; des fèces de tiques ont provoqué des infections de laboratoire. *Coxiella burnetii* a été isolée du lait de chèvre et de vache. On a démontré récemment que la tique *Ornithodorus lahorensis* peut héberger *C. burnetii* pendant au moins 6 mois et propager la maladie. Cette tique est de beaucoup la plus répandue en Turquie. *C. burnetii* a aussi été décelée chez les poux humains et chez *Pulex irritans*. Les diverses souches de *C. burnetii* isolées étaient analogues aux souches classiques; quelques-unes cependant avaient un faible pouvoir antigénique. Chez l'homme, les symptômes les plus courants sont ceux de la pneumonie typique. La maladie expérimentale chez les chèvres se traduit par la fièvre et la toux, parfois par des symptômes broncho-pneumoniques. De bons résultats ont été obtenus par le traitement aux antibiotiques (chloramphénicol, auréomycine, oxytétracycline).

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[a] Oxytetracycline is the non-proprietary name for Terramycin (see *Chron. World Hlth Org.* 1953, **7**, 41).