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A Cluster of Cases of Spotted Fever in a Kibbutz in Southern Israel

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During the 3-year period 1984–1986, 13 cases of spotted fever were clinically diagnosed and serologically confirmed among the 341 residents of an agricultural settlement in the Negev desert in southern Israel (attack rate 3.8 %, expected attack rate 0.13 %). The disease was observed more frequently during the warmer months, with a peak in June. Nine cases were children and adolescents and 4 were adults (attack rate 6.2 % and 2.0 % respectively; $p<0.05$). The clinical and laboratory findings were consistent with a multisystem involvement. A "tache noire" was not observed in any case. Four cases required hospitalization for complications including severe toxicity, intractable vomiting, thrombophlebitis and hyponatremia. Three of the hospitalized patients were adults and only one was a youngster. All patients recovered. The geographic distribution of the cases showed a clustering in the marginal area of residency: 8 cases occurred among the 121 residents of this area (6.6 %), vs. only 5 cases among the 220 residents of the central area (2.3 %) ($p<0.05$). This finding suggests that in endemic areas, the inhabitants of the interface between man's habitat and a wild ecological niche have a higher risk of acquiring spotted fever.

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INTRODUCTION

Spotted fever (SF) was first described in Israel in 1946, in the fertile northern coastal plain (1). The disease is characterized by an acute febrile picture with exanthem but it usually follows a milder clinical course than Rocky Mountain spotted fever (RMSF) (2, 3). Rickettsiae, different by the immunofluorescent method from other members of the SF group, have been isolated from patients, Rhipicephalus sanguineus ticks, dogs and hedgehogs, but the epidemiology of the disease in Israel is incompletely understood (4, 5).

During the last 15 years, SF has been reported from other areas of the country, including the Negev desert (6, 7). This area, which comprises about 60 % of the country's landmass, is characterized by high diurnal temperatures, a mean annual rainfall of less than 200 mm, high saline content of the soil and sparse vegetation.

During the 3-year period 1984–1986, an outbreak of SF was observed in a small, self-contained rural settlement in the Negev. The purpose of this report is to describe the clinical and epidemiological aspects of the outbreak.

BACKGROUND

Kibbutz Zeelim is an agricultural settlement established in 1949 in the north-western region of the Negev desert. In recent years Zeelim has had a relatively stable population of about 350 members, 200 of whom are adults and 150 children and adolescents <17 years.

The members of the kibbutz share property and daily living arrangements such as cooking, laundry, day-care centers, preschool and school recreation and other physical activity centers. The population of the kibbutz live in single-story, attached, 2–4 family units, distributed in a marginal and in an inner area of residency (Fig. 1). The settlement also has an area of communal services and activities (i.e. kitchen, dining hall, clinic, school and day-care centers) and an area of light industrial workshops, garages, poultry runs and farm feed lots.

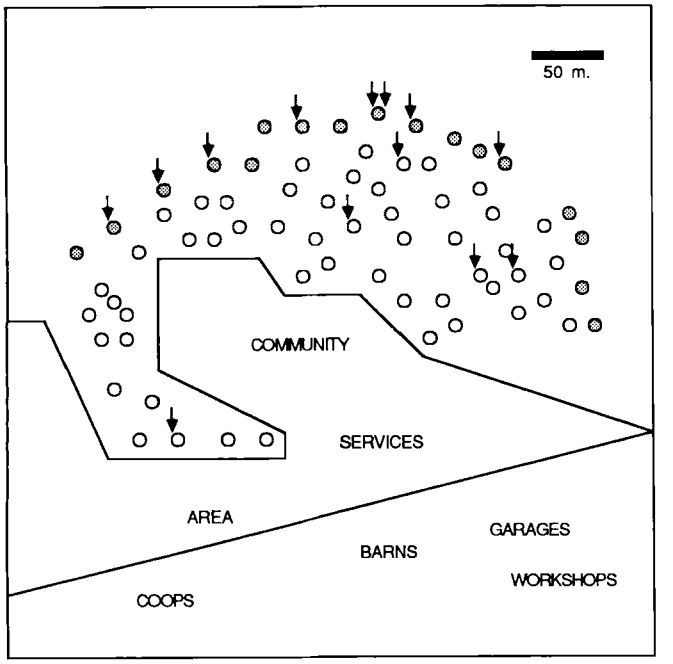

Fig. 1. Schematic map of Kibbutz Zeelim. ⊙, Marginal area of residency; ○, inner area of residency; ↓, case of spotted fever.

The houses and communal services buildings are surrounded by artificially irrigated gardens, while the land in the workshop and animal husbandry areas remains uncultivated.

All members of the kibbutz attend 1 primary care clinic. This clinic is located in the kibbutz and is freely accessible. Kibbutz members tend to contact the physician, who is also a member of the community, immediately upon onset of illness.

MATERIALS AND METHODS

Serological confirmation of SF. Acute and convalescent serum samples from suspected cases of SF were examined for the presence of specific IgG and IgM antibodies to SF group of rickettsiae by the immunofluorescent antibody method as previously described (3). Demonstration of IgM antibodies at a dilution of 1:40 and/or a 4-fold rise in IgG type antibodies between the acute and convalescent samples was considered diagnostic of SF.

Statistical analysis. Chi-square test was used to evaluate statistical significance.

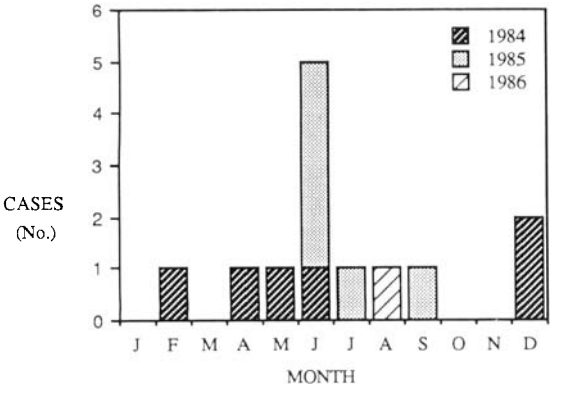

Fig. 2. Occurrence of SF by month (1984–1986).

Table I. *Annual attack rate of SF in Kibbutz Zeelim 1984–1986 by area of residency and age group*

	Area of residency							
	Marginal (n=121)				Inner (n=220)			
	Youngsters[a] (n=58)		Adults (n=63)		Youngsters[a] (n=88)		Adults (n=132)	
Year	Cases (n)	%	Cases (n)	%	Cases (n)	%	Cases (n)	%
1984	3	5.2	1	1.6	2	2.3	0	0
1985	1	1.7	2	3.2	2	2.3	1	0.8
1986	1	1.7	0	0	0	0	0	0
Total	5	8.6	3	4.8	4	4.6	1	0.8

[a] Kibbutz members younger than 17 years.

RESULTS

During the 3-year period 1984–1986, SF was clinically diagnosed and serologically confirmed in 13/341 residents of the community (attack rate: 3.8%). Six cases each were diagnosed in 1984 and 1985, and 1 case was found in 1986. The annual attack rate was 1.8% in 1984 and 1985, and 0.3% in 1986. 10 cases were diagnosed during the warmest months of the year (April–September) with a cluster of cases in June 1985. Seasonal distribution of the cases is shown in Fig. 2.

Eight patients were males and 5 females. The disease occurred more frequently in children and adolescents than in adults: 9/146 youngsters (6.2%) acquired the disease while only 4/195 adults (2.0%) ($p<0.05$). Four cases were children <5 years. The annual attack rate of SF by age group and place of residency is shown in Table I. Overall 8/13 cases (5 children and adolescents and 3 adults) occurred among the 121 members of kibbutz living in the marginal area of the settlement, while only 5 cases (4 youngsters and 1 adult) occurred among the 220 residents of the inner area ($p<0.05$).

A tick bite history was elicited in only 2 cases. The initial symptoms of the disease were a sudden rise in the body temperature, headache, myalgia and photophobia. A typical rash appeared in all the cases 2–5 days after the onset of fever. It began on the hands and feet and extended centripetally. The rash was characterized by 2–5 mm diameter, red, non-

Table II. *Symptoms and signs in 13 cases of SF*

Symptoms and signs	No.	%
Fever	13	100
Rash	13	100
Splenomegaly	6	46
Subcutaneous swelling	4	31
Hepatomegaly	3	23
Myalgia	3	23
Lymphadenitis (regional)	3	23
Sore throat	1	8
Cough	1	8
Thrombophlebitis	1	8

Table III. *Laboratory abnormalities in 13 cases of SF*

Laboratory abnormalities	No.	%
SGOT >40 IU/ml	11	85
Leucocyte count <5000/μl	10	77
Hyponatremia (Na <132 meq/l)	4	31
Thrombocyte count <100000/μl	1	8

confluent and non-pruritic, slightly elevated macules. A tache noire or eschar, as has been described in Mediterranean spotted fever, was not observed in any case, but localized swelling on the face or scalp, with or without regional adenopathy, was noted in 4 patients, probably indicating the site of the tick attachment. Clinical symptoms and signs, and laboratory abnormalities observed in the patients are summarized in Tables II and III.

The clinical picture was considered severe in 5 cases, 4 of whom required hospitalization for complications including severe toxicity, intractable vomiting, thrombophlebitis and hyponatremia. Three of the hospitalized patients were adults and 1 was a young adolescent ($p<0.1$).

11 patients were treated with tetracycline, 1 child received erythromycin and another, who presented with mild symptoms, did not receive specific treatment. All patients recovered without sequelae.

DISCUSSION

Spotted fever has been known to occur in the Negev region since 1971 (7) and the reported incidence of the disease in the area has been increasing (8). In 1981, based on passive communication to the Regional Office of the Ministry of Health, the incidence of SF in the Negev area was estimated to be 13.6/100000 inhabitants (8). This data is quite impressive when compared to other epidemiologic surveys of the SF group of diseases. In a recent study, carried out in the most endemic counties in North Carolina, the mean annual incidence of RMSF, as determined by active surveillance, was 14.6/100000 (9).

In 1983 Gross et al. found that 18.3% of 389 women residents of the Negev had antibodies to SF (10). This high prevalence rate compared to the relatively few reports of clinical disease lead to the speculation that many cases of the disease are not recognized, are subclinical, or not reported. This may be the case for Kibbutz Zeelim before 1984. The disease has been diagnosed in other settlements located less than 20 km from Zeelim since the early seventies. However, SF was not recognized in Zeelim before February 1984, when an adult member of the community was hospitalized because of severe symptoms of SF. Increased awareness of the problem resulted in clinical diagnosis and serological confirmation of 12 more cases in a 3-year period.

As in other endemic areas, SF showed seasonal variation with a cluster of cases in June and it also affected youngsters more frequently than adults (9, 11). In most other surveys of SF, the higher attack rate has been found among 6–11 year old children (9, 11). This fact has been attributed to the frequent contact of children of this age with dogs and exposure to their ticks during outdoor recreational pursuits (12). In contrast, we found in the present study that SF preferentially affected younger children. The reason for this is not clear but it should be noted that in the kibbutz life-style young children are allowed to play outdoors freely. It is possible that this results in early exposure to the hyperendemic disease.

The geographic distribution of the clinical cases is also striking. 8/13 patients clustered

in a narrow marginal area which comprises only one third of the population of the kibbutz. This cluster of cases cannot be explained only by the higher proportion of children and adolescents in the marginal area as compared to the core of the settlement. In fact, the tendency of the disease to occur in the periphery was even more marked among the adults. For the adult population the risk for acquisition of SF during the 3-year period was 6 times higher in the marginal area than in the inner area, while for the youngsters living in the marginal area the risk was less than 2-fold. It may be postulated that rickettsiae-infected ticks and wild reservoirs maintained an ideal stable cycle in this area of the Negev for many years. Settlement of man in the desert has resulted in profound changes in this ecosystem and exposed the residents at the interface between man's habitat and the natural ecological niche to the disease. In the inner and older areas of the settlement, this natural habitat was destroyed a long time ago, lowering the risk of the inhabitants of this area to acquire SF.

The clinical and laboratory findings in Zeelim patients are consistent with a multisystem involvement due to a generalized vasculitis and are very similar to those described for infection with other members of the SF group, especially Mediterranean SF (Boutonneuse fever) and RMSF (12–16). However, the tache noire, reported in 2/3 of the cases of Boutonneuse fever was not observed in Zeelim patients indicating that SF, as it occurs in Israel, is different from SF in other areas of the Mediterranean basin (3, 14). The tendency of the disease to be more severe among the adult population in the kibbutz, as revealed by the high hospitalization rate, has been described also in RMSF (13).

It should be noted that in the present study, SF cases were initially identified clinically by the presence of fever and a characteristic rash. Other potential forms of the disease, including subclinical infections and atypical presentations as have been described for RMSF, were not investigated (17). To better understand the epidemiology of SF in the region, additional field studies are necessary.

ACKNOWLEDGEMENT

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