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Observations of Two High-Risk Populations from the Swiss Plateau, a Region Heavily Infested with *Ixodes ricinus/Borrelia burgdorferi* Complex[a]

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INTRODUCTION

In western Europe, Lyme borreliosis develops after tick bites of *Ixodes ricinus* infected with *Borrelia burgdorferi*. In Switzerland, no population of this tick species devoid of infection has been detected to date.[1]

Two groups of people considered high-risk populations because of their frequent contact with the woods were studied: (1) sportsmen (such as orienteerers), who spend a lot of their time running in the forest, which increases their risk of coming in contact with *I. ricinus* and thus *B. burgdorferi* infections, and (2) a population without clinical signs of Lyme borreliosis, but living in a rural area (Aarberg) in the Swiss Plateau where biotopes favorable to *I. ricinus* are numerous.

METHODS

The sportsmen were asked to donate blood in the spring of 1986 (sample I) and to answer a questionnaire about their training habits, history of tick bites, and Lyme symptomatology. This procedure was repeated in the fall of the same year (sample II) and will be done twice again during 1987. Of the original 964 subjects, 565 have been retested so far (samples I and II). The tests used were indirect immunofluorescence test (IF)[2] for sample I and enzyme-linked immunosorbent assay (ELISA)[3] for samples I and II.

The other studied population consisted of 491 persons entering the hospital of

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Aarberg. None of these patients presented with any signs of Lyme borreliosis. Each individual had to fill out a questionnaire concerning professional and leisure activities in the woods and history of tick bites. The sera were tested by ELISA.

RESULTS

Nearly 80% of the orienteerers have a history of tick bites. Among the participants, 19.8% presented positive IgG titers ($\geq 1/128$; sample I, IF). Analyzing the reported symptoms, we found that 28% of the 107 persons with clearly high IgG titer had mentioned skin, joint, or nervous involvement, whereas 18.4% of the subjects with low titers presented the same manifestations ($p < 0.05$). Twenty-one orienteerers had very high IgG titers (1/1024). Only one had a history of probable arthritis, the remainder

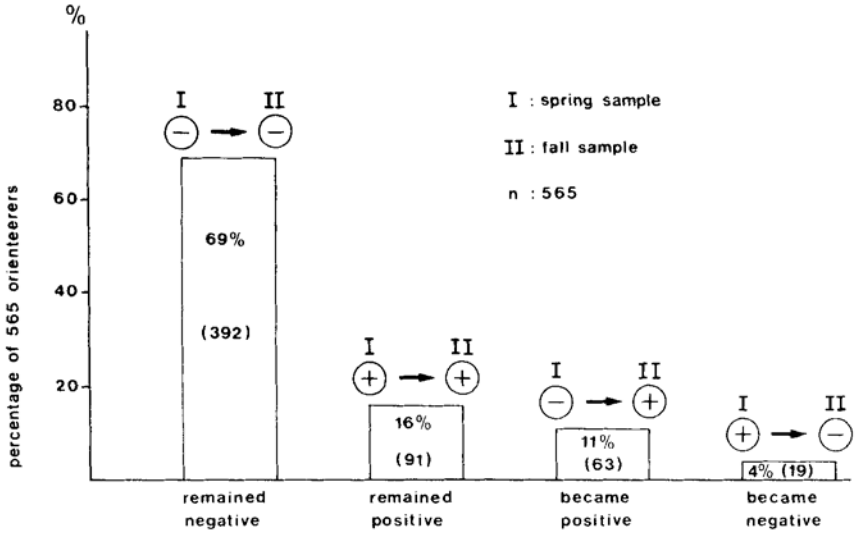

FIGURE 1. Serological follow-up of 565 orienteerers over 6 months, IgG by ELISA.

reported no symptoms. During the first year, the majority of the titers remained stable. A shift from negative to positive was seen in 11.1% (FIG. 1). Two of the persons who presented with a seroconversion had developed symptoms: one an ECM, one a facial palsy; their titers rose from negative up to 1/1024 (IgG).

Of the 491 sera of patients of Aarberg without clinical symptoms of Lyme borreliosis, 26.6% presented positive titers (IgG). We tried to find a correlation between age and value of antibody titers, in view of the relatively high mean age of the studied population (56.5 years). No correlation could be found between these two parameters. It has not been possible to explain the high percentage of positive individuals by a higher exposure to such risks as professional and leisure contacts with woods or history of tick bites referring to the questionnaire (FIG. 2). On the other hand, the results have demonstrated that the percentage of men with positive antibody titers was higher than the percentage of positive women ($\chi^2 = 11.7447$, $p = 0.001$).

DISCUSSION

In the orienteerers study, the most astonishing finding is the relative lack of symptoms in the group with the highest titers, hinting that nonapparent infections with the spirochete seem to be important. During the half year, the majority of the titers remained stable; 11.1% shifted from negative to positive. This was probably due to recent contact with infected ticks but was accompanied in only two cases by disease manifestations.

The population of Aarberg that did not present symptoms of Lyme disease presented a high percentage of positive individuals, which was surprising. We can

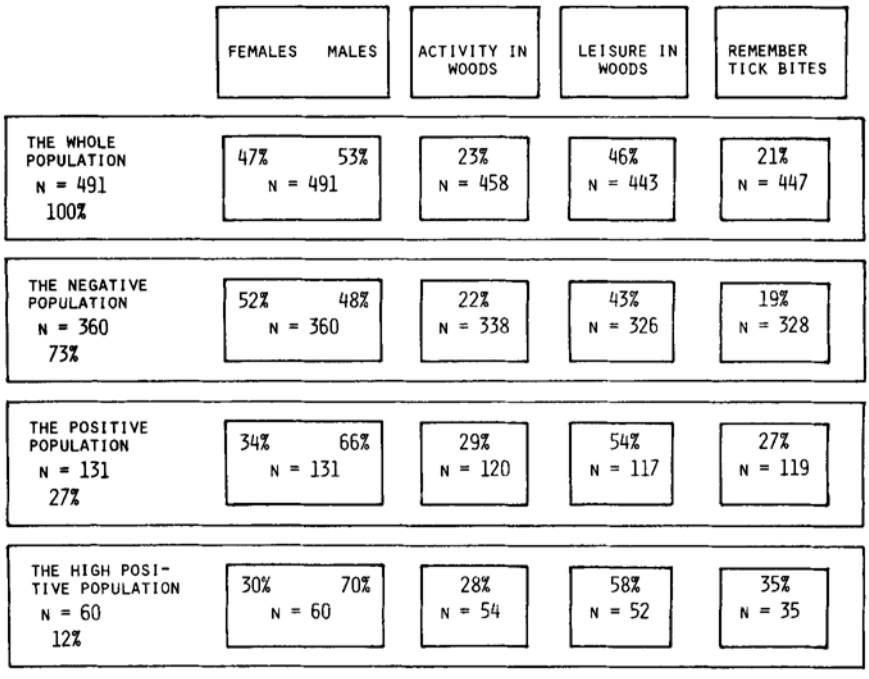

FIGURE 2. Percentages of rural population exposed to different risks.

explain this only by the rural behavior of the people of the studied region, which in itself is a risk factor. The persons, mainly living in small villages, have close contact with nature and ticks, even though tick bites are not often remembered. Such contacts are probably more frequent for men than for women.

What is important to point out in these studies is the high prevalence of nonapparent *B. burgdorferi* infections in the sportsmen, who belong to a population directly exposed to infected tick bites and are fully aware of this risk (80% remembered tick bites), as well as in the rural population of Aarberg, which does not have the same awareness of the encountered risks (21% remembered tick bites) but which is also directly exposed to tick bites because of its rural life style.

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