

control. The other groups were inoculated with a total of 0.1, 1.0, 33, 100, 500, 1000, 1500 and 2000 µg protein of fraction 3 of *T. rhodesiense* respectively, in 4 injections on days 0, 7, 14, and 21<sup>8</sup>. On day 28, the rats were challenged with  $5 \times 10^2$  *T. brucei*. 500 µg gave 100% protection while 1000 and 1500 µg gave 66% protection (table 1).

In the 2nd experiment, 2 groups of 10 female rats of an average weight of 200 g were used. 1 group was kept as control. The other group was inoculated with a total of 750 µg of fraction 3 *T. rhodesiense*, in 2 injections on days 0

and 10<sup>8</sup>. On day 13, the rats were challenged with  $5 \times 10^2$  *T. brucei*, this being one of the shortest periods of inoculation for a secondary response<sup>8,9</sup>. As can be seen from table 2, 70% of experimental animals exhibited no infection.

These results strongly suggest that trypanosomal fraction 3 has potentialities as an immunizing preparation against heterologous strains. Further investigations are being carried out to determine the scope of these potentialities.

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### Endogenous control as a possible basis for varying migratory habits in different bird populations<sup>1</sup>

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**Summary.** In handraised experimental groups of 4 populations of *Sylvia atricapilla*, it was found that the development of migratory restlessness under constant conditions was a fairly good reflection of the different (typical, partial, and non-) migratory habits of the populations. Thus, the different migratory habits seem to be endogenously preprogrammed and genetic in origin. The results of a preliminary cross-breeding experiment are at least compatible with the assumption that partial migratory habit in the blackcap is due to polymorphism.

In many bird species, migratory habits are differentiated according to age, sex, or populations. For example, populations of migratory species of higher latitudes are often more typically migratory than those of lower latitudes, which often are only partial migratory or even resident<sup>2</sup>. Such an example is realized in the blackcap *Sylvia atricapilla*: the north and middle European populations are exclusively, or almost exclusively, migratory, the south European ones are partial migrants, and those of the Canaries and Cape Verde Islands are considered to be resident<sup>3-5</sup>. In 1976 and 1977, 17 blackcaps from southern Finland, 25 from southern Germany, 25 from southern France and 24 from the Canaries were handraised, and from their 50th day after hatching kept in constant experimental conditions (light/dark ratio 12.5 h/11.5 h, 22 °C). In the development of migratory restlessness (which in this species is shown to be a fairly good reflection of actual migration<sup>6</sup>) the birds showed conspicuous population differences which were in agreement with the migratory habits of their populations of origin: all Finnish and German birds exhibited migratory restlessness in contrast to only 80% of the French and 20% of the birds from the Canaries. Thus the graduated migratory habits of the different populations are at least on principle also expressed in birds kept in constant conditions. These results suggest that the different migratory habits of the populations investigated are not so much direct responses to various environmental conditions but rather endogenously preprogrammed and genetic in origin. If this conclusion is true, according to the results obtained it is also probable that the different migratory habits within partially migrating populations such as in the blackcaps from southern France, are based on polymorphism. Polymorphism has formerly already been discussed by Lack<sup>7</sup> as a possible basis of partial migration, according to ringing recoveries.

The supposed polymorphism can be proved by cross-breeding experiments. If the assumption proves right, then, for instance, sedentary individuals from partially migrating populations should also produce migratory offspring (provided that in populations such as these, migrants and nonmigrants do not form isolated subpopulations, for which no indications exist in the blackcap). A first preliminary cross-breeding experiment was conducted. A male and a female blackcap from southern France which, in constant conditions, did not develop migratory restlessness and which derived from 2 different nests, were bred 1977 in an aviary at Radolfzell; 3 young birds from this breeding pair could be handraised and investigated in the same constant conditions as previously their parents: 2 out of 3 birds exhibited migratory restlessness, the 3rd one did not. This result is at least compatible with the assumption that, in the blackcap, partial migration is based on polymorphism. The investigations are to be continued and the quantitative aspects of the migratory restlessness of the experimental birds of the different populations are dealt with elsewhere.

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