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**Brief Report**

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# Social Organisation and SIV Sero-Epidemiology of a Patas Monkey Population in Senegal

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**Key Words**
Patas monkey · Social organisation · Field study · Virology · Epidemiology · Simian immunodeficiency virus (SIV) · Seroprevalence · Sexual transmission · Senegal · *Erythrocebus patas*

## Introduction

Apart from a study on green monkeys *(Cercopithecus aethiops sabaeus)* in Saloum, Senegal [1], no proper epidemiological studies (i.e. based on the known demographic structure of a population) have so far been published on the prevalence of SIV in monkey populations in their natural habitats. This work reports on the SIV seroprevalence of a population of patas monkeys *(Erythrocebus patas)* in relation to its social organisation.

## Study Site, Material and Methods

The population of patas monkeys studied inhabits the Fathala forest in the National Park of the Saloum Delta, Senegal. The exact locality, the habitat, ecological conditions and our protocol for capture, blood sampling and testing (Elisa and Western blot commercial kits) have all been described previously [1, 2]. Monkeys are released in situ after blood sampling.



## Results

Almost all of the patas monkeys live in heterosexual, unimale troops (harem). The mean demographic structure of heterosexual troops (n = 4) is 1 adult male (8.5% of adults), 10.8 (9–12) adult females (91.5% of adults) and 24.3 (21–28) immatures (67.2% of the population). Mean troop size is 36 (34–39), but troops include sometimes more than 50 members. Males leave their group of origin before becoming adult. They then live alone or form bachelor parties, the mean size of which (n = 5) is 7.2 (2–13), with 2.8 (2–4) adults and 4.4



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**Table 1.** SIV serology and seroprevalence (%) in the heterosexual patas monkey population inhabiting the Fathala forest, Saloum, Senegal

| | Adult males | Adult females | Adults | Immatures | Total |
|---|---|---|---|---|---|
| SIV+ | 1 | 1 | 2 | 1 | 3 |
| SIV– | 5 | 10 | 15 | 27 | 42 |
| Total | 6 | 11 | 17 | 28 | 45 |
| Prevalence, % | 16.7 (ms) | 9.1(ms) | 9.7 (fs) | 3.6 (ms) | 5.6 (fs) |

ms = Measured seroprevalence; fs = fitted seroprevalence following demographic structure. The seroprevalence (%) of the adult sample is: 2 seropositive adults for 17 adults = 11.8%. The seroprevalence of the adult population is: percentage of seropositive adult males in the adult males' sample (16.7%) × percentage of males in the adult population (8.5%) + percentage of seropositive adult females in the adult females' sample (9.1%) × percentage of females in the adult population (91.5%) = 1.4 + 8.3% = 9.7%. The seroprevalence of the total sample is: 3 seropositive monkeys for 45 sampled = 6.7%. The seroprevalence of the population is: percentage of seropositive adults (9.7%) × percentage of adults in the population (32.8%) + percentage of seropositive immatures (3.6%) × percentage of immatures in the population (67.2%) = 3.2% + 2.4% = 5.6%.

(0–10) immatures. The sero-epidemiologic study deals only with heterosexual groups.

Serological results of 45 blood samples are presented in table 1. The SIV seroprevalence of the adult class and of the whole population have been adjusted and accordingly reflect the actual demographic relations of the population.

## Discussion

The difference in seroprevalence found between immatures and adults in the population of green monkeys studied previously was marked (21 vs. 81%) and highly significant ($\chi^2 = 26.2$, $p < 0.001$) and thus suggested transmission by the sexual route similar to that which occurs in humans [1]. Similar results and conclusions have emerged with wild grivets [3]. Transmission by the sexual route has been verified for the green monkey in captivity [4]. Among the patas monkeys we studied, the seroprevalence of immatures is also lower in comparison to that of adults (4 vs. 10%; 17% if taking adult males only), but the difference is not significant. Because they show the same trend, the results also suggest the possibility of heterosexual transmission. Transmission by bites, which has also been demonstrated [4] may provide one explanation for the non-negligible values found with immatures.

Why is the seroprevalence of patas monkeys so much lower than that of green monkeys (6 vs. 45%), exact Fisher test: $p = 0.000006$)? Several hypotheses may be proposed: (1) the specificity of the tests is low, either because the SIV of patas monkeys is very different from SIVagm and HIV2 or because the nature of the immune response (threshold, duration, structure of antibodies) of the patas monkeys is different; (2) the pathogenicity of the virus of the patas monkeys is much stronger than that of the green monkey, thus resulting in increased mortality

of the infected individuals and therefore a low prevalence among the survivors [5]; (3) finally, the social organisation of patas monkeys may be less favourable to the spread of the virus. In contrast to the situation in green monkeys, all young male patas monkeys are expelled from their troop of origin before reaching sexual maturity, i.e. before they have the opportunity to be infected through sexual interaction. Thus, virus transmission is reduced between troops. Furthermore, while all green monkey females have access to several males [1, 2, 6], in a patas troop females have permanent access only to the single adult male. Thus, virus transmission is also reduced within troops.

## Conclusion

In comparison to the green monkey, our results show that the seroprevalence of SIV is very low in the patas monkey (6 vs. 45%). This may be because SIV and the corresponding antibodies of the patas monkey are different from those of the green monkey. But it must also be noted that the social organisation of the patas monkey is far less favourable to the spread of the virus than that of the green monkey. As previously shown in green monkeys, the difference in seroprevalence found in the patas population between adults (10%) and immatures (4%) suggests heterosexual transmission similar to that which occurs in humans. As the seroprevalence of immatures is not negligible, however, other possible pathways of transmission (such as by biting) should be considered.

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