considered an unimportant malaria vector in that State (LOURENÇO-DE-OLIVEIRA et al., 1989; OLIVEIRA-FERREIRA et al., 1990; KLEIN et al., 1991a, b).

Thus, further investigations were required to determine whether biological differences could exist between An. oswaldoi collected in Acre and those in other areas. In order to clarify these points, experimental infections using laboratory-based mosquito families were conducted. Analysis of male genitalia showed that all progeny from Rondonia, originating from anophelines identified as An. oswaldoi s.l., were actually An. konderi. In Acre, although An. oswaldoi s.s. and An. konderi were sympatric, 85-90% of the families were An. oswaldoi s.s., showing that there are differences in the distribution and prevalence of these species in these 2 States. These findings suggest that the species identified as An. oswaldoi s.l. by KLEIN et al. (1991a, b) and used in their experiments were possibly different from those used by BRANQUINHO et al. (1993, 1996).

The infection rates found for oocysts and sporozoites in An. darlingi controls of both An. oswaldoi and An. konderi were very similar (Figs 1 and 2). Therefore, we feel justified in inferring that the higher positivity rate of oocyst infection in the midguts of An. oswaldoi s.s. as compared with An. konderi is indeed a plausible conclusion. The same can be concluded with sporozoite infection in the salivary glands, as the latter were not examined, since only An. oswaldoi s.s. specimens were positive.

The number of mosquitoes available for examination of midguts and salivary glands depended on the seasonal availability of the species of the An. oswaldoi complex and on the proportion of mosquitoes that ingested blood and survived until the end of sporogony. Such problems limited the number of feeds examined. The results presented represent a total of 7 and 8 feeds for An. konderi and An. oswaldoi s.s., respectively. However, 7 of the 27 fed on An. konderi mosquitoes and 10 out of 17 on An. darlingi, were negative, while 4 of the 8 trials were negative for both An. oswaldoi s.s. and the control.

Some explanations for these results are: (1) mosquitoes could have failed to ingest viable male and female gametocytes, (2) the blood taken contained no viable gametocytes, (3) the ookinete failed to cross the midgut wall, or (4) the oocysts failed to develop into sporozoite forms. The inability of oocysts to rupture and produce viable sporozoites, or the failure of sporozoites to migrate to and destroy the salivary glands, the destruction of released sporozoites, are alternative mechanisms of mosquito resistance to infection by Plasmodium parasites (ROSENBERG, 1985; PONNUDURAI et al., 1988). Other factors in the blood meal may also interfere with anopheline infection rates (CARTER et al., 1988; NAOTUNNE et al., 1991).

Our findings indicate that An. oswaldoi s.s. can transmit P. vivax and suggest that this species is more susceptible than An. konderi. Although An. oswaldoi s.s. is an exophilic and zoophilic species, it may be involved in malaria transmission. In areas where human outdoor activities at dusk, when mosquito activity is intense, are the rule, exophily does not seem to impede malaria transmission. This applies especially when there is a high density of the anopheline population, as occurred in previous studies in Acre, at a time when more than 85-90% of captured mosquitoes were An. oswaldoi and in 1 locality this was the only species which tested positive for Plasmodium (NATAI et al., 1992; BRANQUINHO et al., 1993). In spite of being considered to be mainly zoophilic, i.e. Plasmodium-positive An. oswaldoi specimens reported by BRANQUINHO et al. (1993) had been collected on human bait (M. S. Brancoquinho, personal communication). Therefore, despite presenting a low infection rate in the salivary glands in relation to the controls (An. darlingi), there are strong indications that An. oswaldoi may have importance in local malaria transmission in Acre.

Owing to problems in the morphological distinction of members of the An. oswaldoi complex, we have been conducting molecular characterization of these mosquitoes based on ribosomal DNA sequences. Our preliminary results indicate that a molecular distinction will be possible between An. oswaldoi and An. konderi, thus giving another indication that these are actually 2 distinct species.

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References


