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PLASMODIUM FALCIPARUM INFECTION INDUCED IN THE BLACK SPIDER MONKEY, *ATELES FUSCICEPS*, AND BLACK HOWLER MONKEY, *ALOUATTA VILLOSA*

SIR,—The first report of human malaria producing infections in monkeys was that of TALIAFERRO and TALIAFERRO (1934), who transferred *Plasmodium falciparum* from man to the Panamanian black howler monkey, *Alouatta villosa*. These infections were transitory, with parasitaemias evident immediately after intravenous inoculation of large numbers of parasites and persisting for only a few days. Other non-human primates of the New World that have since been shown to be susceptible are the titi marmoset (*Saguinus geoffroyi*), night monkey (*Aotus trivirgatus*), white-faced capuchin, (*Cebus capucinus*), and squirrel monkey (*Saimiri sciureus*) (PORTER and YOUNG, 1967; GEIMAN and MEAGHER, 1967; YOUNG and BAERG, 1969; YOUNG and ROSSAN, 1969).

PORTER and YOUNG (1967) failed in attempts to establish *P. falciparum* from man in the black howler monkey and in the Panamanian black spider monkey, *Ateles fusciceps*. We now report the successful passage of monkey-adapted exotic strains of *P. falciparum* to these primate species.

Aotus monkeys infected with Uganda-Palo Alto or Malayan (Camp) *P. falciparum* served as donors. Concentrations of $4{\cdot}0 \times 10^6$ to $2{\cdot}9 \times 10^9$ parasites were injected intraperitoneally into wild-caught infant and juvenile *Ateles* and *Alouatta*, weighing 1·6-3·1 and 0·6-2·3 kg. respectively. No naturally acquired plasmodial infections were found in them. All spider monkeys and one howler monkey (353D) had been splenectomized before the parasites were injected. At the time of passage an immunosuppressant, azathioprine (Imuran®), was administered orally at a dosage of 5 or 10 mg. per kg. of body weight. Spider monkey 750C received 10 mg. per kg. of the drug on days 56 and 86—88 after inoculation. Supplemental materials and methods have been outlined elsewhere (PORTER and YOUNG, 1966; YOUNG and BAERG, 1969).

As listed in the Table, *P. falciparum* developed in 2 of 6 *Ateles* and 3 of 7 *Alouatta*. No differences between the malaria strains were evident as both produced low grade infections of relatively short duration. A maximum parasitaemia of 260 per c.mm. was recorded for the *Ateles* on the 6th day of the initial patent period in 185D. A maximum count of 170 per c.mm. among *Alouatta* hosts was recorded from 477D before its death on the 5th day of ascending parasitaemia. No gametocytes were seen in the blood films.

The splenectomized black spider monkey has been shown to be a suitable model for induced *P. vivax* (YOUNG and PORTER, 1969; BAERG, PORTER and YOUNG, 1969). Our results show that it is slightly susceptible to some foreign strains of *P. falciparum* which had previously been adapted to other monkeys.

The black howler monkey was even less susceptible to these non-indigenous strains of *P. falciparum*. The low grade infections in *Alouatta* combined with the difficulty of maintaining them in the laboratory environment appears to limit severely their usefulness as experimental hosts for human malaria.

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Attempts to infect *Ateles fusciceps* and *Alouatta villosa* with *Plasmodium falciparum* from *Aotus trivirgatus* donors

Species of primate	Malaria strain	Recipient monkey	Parasites inoculated	Period examined	Prepatent period	Patent period	Parasitaemia maximum
	Origin	No.	$\times 10^6$	Days	Days	Days	per c.mm.
Ateles fusciceps	Uganda	185D	1,156	136	1	13	260
					—	6*	<10
		750C	792	214	—	—	—
		958B	726	45	—	—	—
	Malaya	249D	1,190	55	6	3	<10
		188D	1,441	145	—	—	—
		488D	4	87	—	—	—
Alouatta villosa	Uganda	533D	1,104	52	5	3	<10
		508D	1,037	23	21	3†	<10
		446D	1,104	51	—	—	—
		510D	1,156	8	—	—	—
		353D	479	7	—	—	—
	Malaya	477D	1,441	21	17	5†	170
		803D	2,918	35	—	—	—

*Recrudescence after a 17-day subpatent interval.

†Died during patent infection.

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