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BRIEF COMMUNICATIONS

ADAPTATION OF A NIGERIAN STRAIN OF *PLASMODIUM FALCIPARUM* TO PANAMANIAN *AOTUS TRIVIRGATUS**

RICHARD N. ROSSAN, HOWARD A. CHRISTENSEN, AND JAMES S. HARPER III
Gorgas Memorial Laboratory, Panama, Republic of Panama

Abstract. A patent infection (more than 190 days duration) with *Plasmodium falciparum*, obtained directly from a patient who had been exposed to malaria in Nigeria, was established in a splenectomized Panamanian owl monkey, *Aotus trivirgatus griseimembra*. Subinoculations from the original monkey recipient into one splenectomized and two normal *A. t. griseimembra* produced primary patent parasitemias of 18–54 days duration. These results represent the first successful adaptation of *P. falciparum* from man to a monkey of Panamanian origin.

The failure to establish lines of *Plasmodium falciparum* directly from man in Panamanian nonhuman primates has been detailed and summarized.[1,2] Porter and Young,[3] using *Saguinus geoffroyi*, reported 4- to 15-day patent periods following inoculation of infected human blood, but a single attempt to transfer the infection to a second *S. geoffroyi* was unsuccessful. However, after as few as two passages in *Aotus trivirgatus* of Colombian origin, the Panama II strain of *P. falciparum* proved to be infective for Panamanian *A. trivirgatus* and subsequently for *Alouatta villosa trabeata*.[4] The present report presents the establishment of a Nigerian falciparum strain in Panamanian *A. trivirgatus*.

MATERIALS AND METHODS

The monkeys used in this study were *A. trivirgatus griseimembra* captured in Panama.[5] Routine laboratory procedures concerning monkey husbandry and blood smear preparation have been published previously.[6]

The patient (C.H.), from whom infected blood was obtained, stayed in Lagos, Nigeria from 5 April to 12 April 1979, and in Madrid, Spain from 12 April to 15 April 1979. He returned to Panama on 15 April. No antimalarial drugs were taken during the trip. The onset of symptoms of fever, chills, and headache began on 20 April 1979, and 3 days later a diagnosis of a *P. falciparum* infection was made by blood film examination. Within 1 hour of the diagnosis, 9 ml of citrated blood ($1,900 \times 10^6$ parasites) were drawn and inoculated intraperitoneally into a splenectomized *A. t. griseimembra* (9442).

RESULTS

Data on the course of infections in *A. t. griseimembra* are shown in Table 1. During the extended patent period in the initial recipient (9442), five peak parasitemias were noted, the highest of which occurred 2 months after the initiation of patency. Subinoculation to a second splenectomized monkey (9382) on patent day 19 produced a less virulent infection than in the donor, as indicated by the shorter duration of patency, lower maximum parasitemia, and fewer recrudescences.

Contrasting parasitemias occurred in two unaltered recipients, monkeys 9445 and 9455 (Table 1). Parasites in 9445 never became countable by the Earle-Perez method, but were detected on thick blood films for 18 days. The parasitemia in 9455 was patent for 10 days longer than in 9445, and achieved a maximum count of 2,730 parasites per mm^3. Both animals were splenectomized when parasite-negative on thick blood films; a total of three recrudescences ensued in 9445, the first one beginning on day 13 post-splenectomy. *Aotus* 9455 died 7 days post-surgery, and remained parasite negative.

Although gametocytes have been observed, they did not appear to be mature.

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* Address reprint requests to: Dr. Richard N. Rossan, Gorgas Memorial Laboratory, P.O. Box 935, APO Miami 34002, or Apartado 6991, Panama 5, Republic of Panama.

TABLE 1

Infection parameters of Plasmodium falciparum *(Nigerian strain) in* Aotus trivirgatus griseimembra

Monkey no.	No. parasites inoc. × 10^5	Route*	Alteration	No. days prepat. and (subpat.)	Patent period (days)	Maximum parasitemia	
						Per mm³	Patent day
9442	1,900	ip	Splenectomy	11		47,500	13
						1,020	33
						299,340	75
						234,390	105
					192	117,660	152
				(9)	44	12,550	9
				(16)	39	5,100	11
9382†	18	iv	Splenectomy	1	54	8,170	24
				(26)	51	13,110	7
9445†	0.4	iv	None	2	18	<10	—
			Splenectomy‡	(29)	51	359,690	20
				(26)	104	170,940	8
				(37)	41	144,700	11
9455†	48	iv	None§	1	28	2,730	8

* ip, intraperitoneal; iv, intravenous.
†Subinoculated from monkey no. 9442.
‡ On day 32 post-inoculation.
§ Splenectomized on day 31 post-inoculation; died on day 7 post-surgery.

DISCUSSION

Collins et al.[7] also adapted a Nigerian *P. falciparum* strain in splenectomized *A. t. griseimembra*. The primary passage monkey probably originated from Colombia (Collins, personal communication). Infections of our Nigerian strain in Panamanian *A. t. griseimembra* were less severe than those reported by Collins et al.;[7] none of our monkeys died of malaria-related causes, and chemotherapeutic intervention was not required to sustain the experimental host.

Data presented herein document the first instance of a long term parasitemia in Panamanian *A. t. griseimembra* of *P. falciparum* derived directly from a human infection and passage to subsequent recipients.

We are unable to explain the factors contributing to the successful adaptation of an African strain in a Panamanian monkey in contrast to the numerous failures associated with indigenous falciparum strains. A detailed biochemical analysis might reveal differences between strains, leading to adaptation by the former but not the latter.

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