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)MPARATIVE INFECTIVITY OF *PLASMODIUM FALCIPARUM* COLOMBIA STRAIN) TO *ANOPHELES QUADRIMACULATUS* SAY AND *ANOPHELES ALBIMANUS (WIED.).*

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NTRODUCTION. Studies on the comparasusceptibility of *Anopheles quadrimaatus* and *A. albimanus* to *Plasmodium iparum* have been made previously by eral workers. Boyd *et al.* (1938) and d and Jobbins (1940) found that *A. manus* from Cuba and Panama were hly susceptible to *P. falciparum* from ir own region, but distinctly refractory strains of the same parasite species n the Nearctic region. *A. quadrimacus* mosquitoes from Florida exhibited a h degree of susceptibility to infection strains of *P. falciparum* from both the otropical and the Nearctic regions. es and Young (1950), in a similar ly using a South Carolina strain of *P. iparum,* a Panama strain of *A. albinus,* and the Q-1 strain of *A. quadaculatus,* found that the latter species more susceptible to infection. Jeffery *al.* (1950) showed that *A. albimanus* n Panama (A-2 strain) was markedly erior to *A. albimanus* from the Florida s (A-3 strain) and the Q-1 strain in susceptibility to infection with a Pana strain of *P. falciparum.* Because of these previous reported differences, studies were made on the comparative infectivity of a Colombia, South America, strain of *P. falciparum* to the Q-1 strain of *A. quadrimaculatus* and a Central American strain of *A. albimanus.*

METHODS AND PROCEDURES. The Colombia strain of *Plasmodium falciparum* is a chloroquine-resistant strain described by Young and Moore (1961) and was originally from the Magdalena Valley of Colombia, South America.

The *A. quadrimaculatus* (Q-1 strain) mosquitoes were originally from the southeastern United States and have been maintained in the laboratory since 1941. The *A. albimanus* (A-9 strain) mosquitoes were originally from El Salvador and were obtained through the courtesy of Dr. H. G. Simkover, Shell Development Company, Modesto, California. The colony has been maintained since 1960.

The patients were adult Negro males being treated for neurosyphilis. Patients A and B were infected by intravenous inoculation of parasitized blood which had been stored frozen in a dry ice chest

(—78° C.) for 346 and 384 days respectively. In patient A, parasites were first demonstrated 6 days post inoculation and gametocytes 12 days later. In patient B, parasites appeared on day 13 and gametocytes 16 days later. Patient A received no antimalarial drugs prior to or during the feeding period whereas patient B received 10 grains of quinine 12, 10, 9, and 8 days prior to the appearance of gametocytes. No other antimalarials were given during the study period.

Three- to five-day old adult female mosquitoes were caged in lots of 100 in pint ice cream carton cages and allowed to feed, through the screened top, on the patient's leg. Engorged mosquitoes were incubated in these cages at 78° to 80° F. and fed 5 percent honey water daily in a cellulose sponge. Eight to 10 days after feeding, the mosquitoes were dissected and the guts microscopically examined for the presence of oocysts.

The feedings were designed to study (1) the initial period when the *A. qu rimaculatus* mosquitoes could be infec and (2) the comparative susceptibility the *A. quadrimaculatus* (Q-1) and *albimanus* (A-9) mosquitoes to infect by the Colombia strain of *P. falcipar*

RESULTS. The results of initial in tivity feedings using *A. quadrimacul* are shown in Table 1. Patient A dem strated a rapid increase in gametoc density reaching a peak of 2790 per cr on day 5 after which the number slo declined. Patient B demonstrated slower rate of increase reaching a peak 1110 per cmm on day 8 followed b slow decrease in density. The mosqui were first infected on gametocyte da with patient A (gametocyte count of per cmm) and gametocyte day 5 v patient B (gametocyte count of 200 cmm). Both patients were infectious day after reaching a gametocyte co greater than 100 per cmm.

The results of eleven comparative fe

TABLE 1.—Infectivity of *Plasmodium falciparum* (Colombia strain) to *Anopheles quadrimacul* (Q-1 strain) and *A. albimanus* (A-9 strain)

Patient	Day of gametocytemia	Gametocytes per cmm	No. mosq. dissected		Percent infection		Infection ratio	Gut infection index		Gu infect index
			Q-1	A-9	Q-1	A-9	Q-1/A-9	Q-1	A-9	Q-1/
A	1	30	25	..	0	..	..	0	..	.
	2	110	25	..	0	..	..	0	..	.
	3	680	25	..	52	..	..	132	..	.
	4	1640	25	..	48	..	..	220	..	.
	5	2790	25	25	56	8	7.0	448	44	10.
	6	2697	25	25	80	20	4.0	1984	116	17.
	7	2697	25	25	72	36	2.0	792	688	1.
	8	2536	25	25	88	36	2.4	1892	1244	1.
	9	2247	25	25	44	12	3.7	636	160	4.
B	1	10	25	..	0	..	..	0	..	.
	2	40	25	..	0	..	..	0	..	.
	3	30	25	..	0	..	..	0	..	.
	4	140	25	..	0	..	..	0	..	.
	5	200	25	..	16	..	..	44	..	.
	6	450	25	19	72	0	∞	388	0	∞
	7	810	25	..	64	..	..	433	..	.
	8	1110	25	15	56	0	∞	220	0	∞
	9	940	25	22	60	32	1.9	312	182	1.
	10	1100	35	25	89	12	7.4	1174	56	21.
	12	850	25	25	32	0	∞	164	0	∞
	13	900	25	25	56	8	7.0	132	16	8.
* Totals			285	256	65	16	4.2	755	243	3.

* Totals are given for comparative feedings only.

igs are also shown in Table 1. The in-ection rates with the *A. quadrimaculatus* anged from 44 to 88 percent with patient and 32 to 89 percent with patient B. n contrast, the infection rates with *A. lbimanus* ranged from 8 to 36 percent ith patient A and 0 to 32 percent with atient B. In the total of 11 feedings, ne *A. quadrimaculatus* had an infection ate of 4.2 times that of the *A. albimanus*.

The intensity of infection, as measured y the average number of oocysts per gut 100 (gut infection index) was in all in-ances higher for the *A. quadrimaculatus* nan comparable lots of *A. albimanus*. he ratios showed a wide variation but ne average gut infection index ratio was 1.

These results indicate that with the olombia strain of *P. falciparum*, the Q-1 rain of *A. quadrimaculatus* is more sus-ptible to infection than is a strain of *A. bimanus* from El Salvador (A-9). In is case, neither of the mosquitoes was indigenous with the strain of *P. falci-rum*. This adds support to reports in ne literature that *A. quadrimaculatus* is sceptible to infection by *P. falciparum* om widely separated geographical areas.

The *A. albimanus* (A-9 strain), although ot refractory to the Colombia strain of *. falciparum*, did not demonstrate the arked susceptibility that would be ex-ected if the two were coindigenous and ey are therefore considered as belong-g to separate distributional populations.

The susceptibility relationship between *. albimanus* and *P. falciparum* appears to markedly affected by the geographical igin of the strains of parasite and vector. hus, this vector does not seem ideally ited to infectivity studies on new strains *P. falciparum*.

These results and previous studies rongly suggest the desirability of using tablished strains of mosquitoes in in-ctivity studies involving new strains of *falciparum*. The most desirable mos-ito would be one which not only had en used in comparable studies, but hich showed a susceptibility to infection non-coindigenous strains of malaria, thus making it useful for the study of malarias from widely separated geographical areas. It appears that the Q-1 strain of *A. quadrimaculatus*, which was used by Eyles and Young (1950), Jeffrey *et al.* (1950) and in the present study as well as having had wide use in other related studies, is one of the mosquito strains which could be considered as a standard for comparison.

ACKNOWLEDGMENT. The author wishes to acknowledge the technical assistance of Mr. Thomas S. Kearse, Biological Laboratory Technician.

SUMMARY. The Q-1 strain of *Anopheles quadrimaculatus* proved to be more susceptible than an El Salvador strain of *A. albimanus*, to a Colombia strain of *Plasmodium falciparum*, when the two species of mosquito were fed simultaneously. The gut infection index in *A. quadrimaculatus* was 3.1 times that in *A. albimanus*. The average infection rate in *A. quadrimaculatus* was 4.2 times that in the *A. albimanus*.

Initial infection of *A. quadrimaculatus* occurred one day after the gametocyte count exceeded 100 per cmm in each of the two patients studied.

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