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A FIELD TRIAL OF COMPETITIVE DISPLACEMENT OF *AEDES POLYNESIENSIS* BY *AEDES ALBOPICTUS* ON A PACIFIC ATOLL

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Abstract. Prior laboratory studies and field observations suggested that it might be possible to reduce the size of the population of, or eliminate, *Aedes polynesiensis* by the introduction of *Aedes albopictus.* The former mosquito is the principal vector of nonperiodic filariasis caused by *Wuchereria bancrofti* and the latter is a closely related species refractory to the development of human filariae. The practicability of such competitive displacement was studied by a field trial on a remote coral atoll where there was an established population of *A. polynesiensis.* Three strains of *A. albopictus* were liberated at separate localities on the atoll and their fate was followed for 4 years. One strain disappeared within 12 months after release and the other two disappeared within 48 months. It was not clear whether *A. albopictus* failed to become established because the strains were unsuitable, the general environment was inappropriate, or *A. polynesiensis* was present in such numbers that *A. albopictus* rarely succeeded in mating with its own species.

Filariasis caused by nonperiodic *Wuchereria bancrofti* is an important cause of human morbidity on many islands in the South Pacific Ocean from Fiji eastward. The principal mosquito vectors of the parasite in this area are day-biting *Aedes polynesiensis* Marks and closely related species of the *scutellaris* complex. Since the larvae of *A. polynesiensis* and related species are found in a great variety of small natural and man-made containers and the adults do not rest in houses, these mosquitoes are especially difficult to control with the limited financial resources available to most island administrations. For monetary and other reasons, long-term effective control of *W. bancrofti* by mass chemotherapy with diethylcarbamazine also does not appear likely on most islands.

Aedes albopictus Skuse, whose biology is very similar to that of *A. polynesiensis*, has a very wide geographic distribution in Asia ranging from Madagascar to islands in the western Pacific. It also has been introduced into and is widespread in the Hawaiian Islands. Despite morphologic and other similarities to *A. polynesiensis*, *A. albopictus* is refractory to the development of both the periodic and nonperiodic forms of *W. bancrofti* and *Brugia malayi.*[1-5]

Interspecific competition appears to have been an important factor in the natural evolution, dispersal, and abundance of animals, and the concept of competitive displacement has been used in attempts to control deleterious insects and other animals.[6] An example of the operation of competitive displacement among mosquitoes is the partial replacement of the indigenous *A. albopictus* in urban areas of Southeast Asia by the accidentally introduced *Aedes aegypti.*[7]

The concept that *A. polynesiensis* might be displaced by a deliberate introduction of *A. albopictus* arose when the senior author observed that a laboratory colony of *A. polynesiensis* inadvertently contaminated with *A. albopictus* eventually was replaced by the latter species. It also was noted that *A. albopictus* generally was a more vigorous species in the laboratory than was *A. polynesiensis.* Finally, it was known that in Asia, where *A. albopictus* coexists with various members of the *scutellaris* complex, the population of *A.*

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albopictus is relatively large and that of the *scutellaris* species relatively small.

After extensive laboratory studies confirmed the ability of *A. albopictus* to displace *A. polynesiensis* completely or almost completely under laboratory conditions,[8-17] it was decided to study competition between the two species in the field. The area selected for the experiment was a coral atoll, Taiaro, in the Tuamotu Archipelago of French Polynesia. Human filariasis is a much more important problem on high volcanic islands in the Pacific than on coral atolls and, consequently, it was known from the beginning that if competitive displacement by *A. albopictus* were to be used for the control of *A. polynesiensis* it eventually would have to be employed on high volcanic islands. However, a variety of practical considerations dictated the choice of the experimental site. Health and political authorities understandably were reluctant to permit the introduction into their territory of exogenous mosquito species which fed on man. Although there would be no danger from *A. albopictus* with respect to transmission of filariasis, it was necessary to consider the potential of this mosquito species as a pest and its capacity to transmit dengue and other viruses.

With respect to the potential of *A. albopictus* as a pest, extensive experience with this species in Asia and the Hawaiian Islands indicated that *A. albopictus* was not a pest of undue significance and probably would not be more of a problem in this regard than was *A. polynesiensis*. *A. albopictus* was a known potential vector of dengue and chikungunya viruses as were *A. polynesiensis* and certain other *scutellaris* species. There was no evidence that *A. albopictus* was a more effective vector of these or other viruses than *A. polynesiensis*. Furthermore, *A. aegypti*, which probably *is* a more effective vector of dengue and chikungunya viruses than either *A. albopictus* or *A. polynesiensis*, already exists in the areas where *A. albopictus* would be employed for filariasis control. The experience of the Hawaiian Islands was reassuring, as no dengue or chikungunya outbreaks have occurred since *A. aegypti* disappeared from Oahu about 25 years ago.

Despite the unlikelihood of adverse effects from the introduction of *A. albopictus*, it was decided to conduct the field trial on a remote island from which further natural spread of the species was very improbable. This precaution was taken to preclude further dissemination of *A. albopictus* should it become established and fail to reduce the population of *A. polynesiensis*, or should other information come to light which would argue against its intended use. Consequently, after careful consideration of the possible risks and benefits by the local political and health authorities and with their consent and that of the owner of the island in question, the field trial described below was carried out.

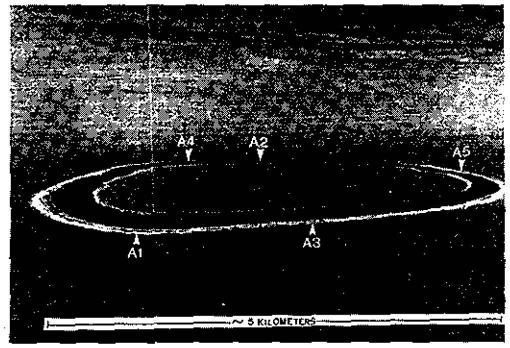

FIGURE 1. Aerial view of Taiaro showing approximate locations of study areas (see text).

DESCRIPTION OF TAIARO

Taiaro is a small atoll nearly circular in shape and about 5 kilometers in diameter located at 15° 44′ South latitude and 144° 38′ West longitude (Fig. 1). Although thickly wooded and benefited by abundant and relatively consistent rainfall, it has been inhabited in recent years only by two or three workmen or one family. Small trading ships visit the island about four times a year to pick up copra and leave supplies. Because there is no pass into the lagoon or safe anchorage near the island, all freight and passengers must be transported over the fringing reef through the surf in a small boat, while the trading ship lies offshore. The nearest adjacent land is another coral atoll about 25 miles away.

In the course of this field trial the annual rainfall varied between 1,090 and 2,150 mm and was distributed fairly evenly throughout the year. Rainfall for the 12 months following the release of *A. albopictus* (see below) was particularly abundant. The average maximum and minimum temperatures can be presumed to be about 29° C and 25° C, respectively, the same as those on other atolls at about the same latitude in the Tuamotu Archipelago, with not more than 2° C difference in the averages between the warmest and coldest months. Taiaro is subject to prevailing southeast tradewinds.

There are coconut plantations on parts of the island as well as dense groves of *Pandanus*. Other common trees are *Pisonia grandis*, *Guettarda speciosa*, *Calophyllum inophyllum*, *Terminalia catappa*, *Barringtonia speciosa*, and *Cordia subcordata*. The only abundant mammal on the island is the Polynesian rat, *Rattus exulans*. During the field trial there also were a few domestic dogs and pigs and a considerable number of chickens. Relatively large numbers of sea birds roosted on the island and there were small numbers of two species of terrestrial birds. Small lizards were abundant.

A preliminary survey revealed the presence of a large population of *A. polynesiensis* on the island, even in areas visited infrequently by the small human population. Larvae of *A. polynesiensis* were common in coconut half shells, tree holes, depressions in tree root buttresses, and in a variety of artificial containers near the single human habitation. Before the release of *A. albopictus*, the only other mosquitoes observed on the island were *Culex annulirostris* and *Culex roseni* in a few small ground pools and large man-made containers.

EXPERIMENTAL PLAN

Since the objective of the trial was to reduce or eliminate the *A. polynesiensis* population, it was necessary to obtain an estimate of the magnitude of this population in those areas where *A. albopictus* was to be released, as well as in comparison areas. This was done in two ways. First, relative adult mosquito population densities were determined by counts of the number of mosquitoes which teams of two collectors collected off one another in measured time intervals. Five specific collection stations were established in each study area and mosquitoes were collected sequentially at each station on the same day for exactly 10 minutes. Collections were made as frequently as possible in each area on each visit to the island. The order in which study areas and collection stations were visited was rotated to compensate for fluctuations in adult densities caused by the time of day during which the collections were made. Records were kept of the time of day, cloud cover, and the presence or absence of wind and rainfall during each collection.

The *A. polynesiensis* population also was studied by means of larval and pupal collections. On each visit to the island a search was made in the study areas for collections of water which appeared suitable for the development of *A. polynesiensis* or *A. albopictus*. The amount of water per container was recorded, and an exact count (or estimate for larger containers) was made of the number of larvae and pupae present in the breeding site. Prior to the release of *A. albopictus*, aquatic stages of *A. polynesiensis* were replaced in their original sites in order not to change the population and all adults captured were released immediately after collection. Before *A. albopictus* was released, specific identification of mosquitoes was not necessary, as the only mosquito species biting by day, or found in the breeding sites examined, was *A. polynesiensis*. Following the release of *A. albopictus*, all larvae, pupae, and adult mosquitoes were killed and identified under the microscope. In a few instances pupae were allowed to hatch and the emerging adults were identified.

On the final visit to the island *A. polynesiensis* adult females were hatched from pupae and maintained on sugar solutions for 5 to 7 days. The ovaries were then examined for evidence of autogenous development.

Since it was not known if prolonged laboratory colonization affected the ability of *A. albopictus* to become established in nature, three different "strains" were liberated, each at a different locality, widely separated from the release point of the other strains. The "Poona" strain originated from Poona, India and had been maintained as a colony in Baltimore, Maryland since 1966. The "Hawaiian" strain originated from Oahu, Hawaii and had been maintained as a colony in Baltimore since 1968. The "Hawaiian-wild" strain had never been colonized and the mosquitoes released originated from eggs collected in nature on Oahu, Hawaii.

The study sites where each strain of *A. albopictus* was released were as follows. "Area 1" was situated in the northwestern part of the atoll adjacent to the only permanently inhabited residence on the island and the area where most of the dogs, pigs, and chickens usually were found.

FIGURE 2. Part of Area 1.

FIGURE 3. Typical *A. polynesiensis* breeding site in half-coconut shells.

Area 1 essentially was a large open coconut grove with relatively little underbrush (Fig. 2). There were no rats on the island capable of opening coconuts (i.e. *Rattus rattus*), and consequently all mosquito breeding in coconuts was in the half shells of mature nuts which had been opened to harvest the copra (Fig. 3). Area 1 also had a few large trees with rot holes and buttresses capable of holding rainwater as well as most of the relatively few man-made breeding sites on the island —such as a watering trough for the pigs. This area was believed to be the site most suitable for the implantation of *A. albopictus*, and consequently the strain thought most likely to become established, the Hawaiian-wild, was released there.

"Area 2" was situated in the northeastern part of the atoll in a coconut grove interspersed with dense stands of *Pandanus*, other trees, and a great deal of ground vegetation. This area was well-shaded and protected from the wind by the relatively dense vegetation. Also, it was a roosting site for fairy terns (*Gygis alba*). The Poona strain of *A. albopictus* was released there.

"Area 3" was situated in a coconut grove interspersed with other large trees in the southwestern part of the island. There was a dense ground cover of ferns and an extensive grove of large *P. grandis* trees in one part of the area (Fig. 4). The root buttresses, trunks, and branches of these immense trees contained many cavities capable of holding water. Like Area 2, Area 3 was well-shaded and protected from the wind. The Hawaiian strain of *A. albopictus* was released there.

"Area 4" and "Area 5" also were coconut groves with thick underbrush on the northern and eastern parts of the atoll, respectively. No *A. albopictus* was released at these sites and their role was to serve as indicators of the natural fluctuations in *A. polynesiensis* populations resulting from variations in rainfall, wind, and the collection efforts.

All three strains of *A. albopictus* were transported to Taiaro as eggs and reared to the adult stage on the island. Between 3,000 and 6,000 females (and a comparable number of males) of each strain were liberated. Many females were given a blood meal on man and both sexes had access to a sugar solution prior to their release. In addition, because of limited laboratory facilities, some larvae and pupae derived from the eggs transported to the island were placed in tubs and allowed to emerge in nature. All releases of adults took place between 26 January and 5 February 1970 although some adults emerged after these dates from immature stages placed in tubs. In an effort to favor the implantation of *A. albopictus*,

FIGURE 4. Tree holes in *P. grandis* in Area 3.

TABLE 1

Female Aedes *mosquitoes captured in 10-minute collections on human bait in study areas prior to and after release of* A. albopictus

Months before (−) or after (+) release of *A. albopictus*	Study area				
	I	II	III	IV	V
−8	30/270 (9.0)*	30/690 (23.0)	30/129 (4.3)		
−3	30/489 (16.3)	25/1,883 (75.3)	25/430 (17.2)	10/251 (25.1)	
0	40/802 (20.1)	35/1,087 (31.1)	42/584 (13.9)	50/980 (19.6)	42/1,226 (29.2)
+3				15/403 (26.9)	15/487 (32.5)
+6	20/446 (22.3)	25/245 (9.8)	20/316 (15.8)	15/58 (3.9)	15/346 (23.1)

* No. collections/no. mosquitoes collected (average number of mosquitoes per collection).

black ovitrap jars and tin cans containing rainwater were placed around the release sites. However, this tactic was only marginally effective since many of the jars were overturned by land crabs and rats and the tin cans soon rusted through.

RESULTS

Pre-release population of A. polynesiensis

There was an abundant adult *A. polynesiensis* population in the areas chosen for the release of *A. albopictus* (Table 1). The average number of mosquitoes captured in 10-minute periods was higher in Area 2 than in either Areas 1 or 3, and was slightly higher in Area 1 than in Area 3. There was considerable variation in populations within each area from one study period to another (e.g., 8 months and 3 months before release) and this probably reflected variations in antecedent rainfall and resulting mosquito production. We searched for and found no evidence that the *A. polynesiensis* population on Taiaro was autogenous.

The abundance of the pre-release *A. polynesiensis* population was also evident from data on the prevalence and density of larvae and pupae (Table 2). A high proportion of breeding sites thought suitable for *A. polynesiensis*, especially tree holes, contained that species. Though not shown in Table 2, it was observed that only half as many coconut shells with water contained *A. polynesiensis* in June 1969 (8 months pre-release) as compared with January to February 1970 (at the time of release). Furthermore, the coconut shells positive in June 1969 had only about one-half as much water per larva or pupa as did those in January to February 1970. There also was much less water per larva or pupa in tree holes in June 1969 as compared with January to February 1970.

Post-release activity of A. albopictus

Both adult male and female *A. albopictus* dispersed rapidly from the release points. Specimens of both sexes were recaptured more than 100 meters from their respective release points within 3 days and at least 600 meters away within 9 days.

Female *A. albopictus* were captured feeding on man for many days after release and some were

TABLE 2

Prevalence and density of larvae and pupae of Aedes polynesiensis *in potential habitats* in June 1969 and January–February 1970, prior to release of* A. albopictus

Type of habitat	Number examined	% positive	Number of larvae and/or pupae in positive containers		
			Avg.	Range	No. ml water per larva and/or pupa
Coconut shells	251	53.0	16.6	1–99	6.1
Tree holes	76	88.2	158.4	1–2,315	2.7
Palm spathes	13	84.6	33.0	1–115	11.5
Ovitraps	65	73.8	43.3	1–363	5.3

* Habitats containing water which appeared suitable for larval development.

TABLE 3

Number of adult Aedes albopictus *(albo) and* A. polynesiensis *(poly) captured in study areas by time after release of* A. albopictus

	Study area																		
	I					II				III					IV		V	
	albo		poly			albo		poly		albo		poly			albo	poly	albo	poly
Months after release	F	M	F	M	%*	F	M	F	M	F	M	F	M	%*	F	F	F	F
3	+†	+	+			+		+			+	+			0	403	0	487
6	20	0	557	2	3.5	0	0	320	0	9	1	387	5	2.5	0	57	0	284
12	3	1	1,200	0	0.3	0	0	954	0	15	1	1,122	3	1.4				
23	0	1	772	15	0.1	0	0	238	0	1	1	315	44	0.6				
48	0	0	1,665	1	0.0	0	0	657	0	0	0	928	0	0.0				

* *A. albopictus* as percent of total mosquitoes captured.
† Actual counts not made. *A. albopictus* and *A. polynesiensis* identified as indicated. In all cases the majority of mosquitoes in each area were *A. polynesiensis*.

thought to have survived for at least 3 weeks. (The battered condition of the latter specimens suggested that they were some of the specimens liberated rather than the next generation.) Small swarms of male *A. albopictus* were observed hovering near collectors and, when possible, mating pairs of mosquitoes were captured with the aid of a small net. The following combinations were observed: *A. albopictus* male and female, 12 times; *A. albopictus* male and *A. polynesiensis* female, 16 times; *A. polynesiensis* male and *A. albopictus* female, once; *A. polynesiensis* male and female, once. These collections demonstrated the relative aggressiveness of the *A. albopictus* males.

Post-release population of A. albopictus

The fate of *A. albopictus* following release is shown in Tables 3 and 4. Neither adult nor larval or pupal *A. albopictus* could be found in Area 2 at 12 months following release, nor could any *A. albopictus* be found on the island after 48 months. Those mosquitoes shown in Table 3 as having been captured 6 months after release include those from the timed collections shown in Table 1 plus others. During the last visit to the island a special effort was made to examine as many mosquitoes as could be recovered from the areas where the releases took place and more than 10,000 larvae and pupae and more than 3,000 adults were identified without detecting a single *A. albopictus*.

Six months after release of *A. albopictus* several unexpected observations were made. First, *A. albopictus* had dispersed rather evenly throughout Areas 1 and 3 and was not encountered more frequently, as had been expected, at the actual release sites. Second, larvae and pupae of *A. albopictus* were not more common in man-made

TABLE 4

Number of aquatic stages of Aedes albopictus *(albo) and* A. polynesiensis *(poly) collected in study areas by time after release of* A. albopictus

	Study area														
	I					II					III				
	Containers examined with larvae or pupae			Larvae and pupae examined		Containers examined with larvae or pupae			Larvae and pupae examined		Containers examined with larvae or pupae			Larvae and pupae examined	
		% with					% with					% with			
Months after release	No.	albo	poly	No.	% albo	No.	albo	poly	No.	% albo	No.	albo	poly	No.	% poly
3	9	100.0	100.0	92	50.0	3	33.3	100.0	44	9.1	5	20.0	100.0	54	1.9
6	10	30.0	80.0	123	44.7	13	7.7	100.0	172	4.7	16	25.0	100.0	76	9.2
12	17	35.3	94.2	173	8.1	11	0.0	100.0	147	0.0	42	21.4	100.0	457	5.5
23	23	13.1	100.0	470	1.5	15	0.0	100.0	333	0.0	99	0.0	100.0	1,609	0.0
48	603*	0.0		8,041	0.0	97*	0.0		491	0.0	185*	0.0		2,207	0.0

*Number of containers with water—not examined individually to determine how many contained larvae or pupae.

breeding sites, such as ovitraps and tin cans, than they were in natural breeding sites, such as tree holes. Finally, *A. albopictus* was not more abundant in Area 1 near the people, dogs, pigs, and chickens than in the more sylvan environment of Area 3.

DISCUSSION

We do not know why *A. albopictus* failed to become established on Taiaro, but the following are possible explanations. This species may not have been able to find sufficient suitable vertebrate hosts for blood meals, although these appeared to be sufficient in the peridomestic environment (Area 1). The strains of *A. albopictus* introduced may not have been adaptable to the relatively hot, dry, and windy environment of an atoll. Two of the strains had been reared for some time as laboratory colonies, and the third, though "wild," originated in an urban environment of Hawaii quite unlike Taiaro. It may be significant that the Poona strain that disappeared first was the one that had been colonized the longest. On the other hand, the Poona strain was liberated in an area which may have had the largest *A. polynesiensis* population—as indicated by captures of biting adults. It should be remembered, however, that collection of a large number of biting adults in a short time interval may reflect a lack of opportunity for the mosquitoes to feed beforehand, rather than the presence of a large population. Another factor which may have led to the failure of *A. albopictus* to thrive was the unexpected wide dispersal of the adults soon after liberation. We had anticipated that most of the liberated *A. albopictus* would remain near the release site and overwhelm the local *A. polynesiensis* population. Finally, it should be noted that *A. albopictus* males frequently were observed mating with *A. polynesiensis* females in nature as they had been observed to do under laboratory conditions.[8, 12, 13, 16] It is possible that *A. albopictus* males were sufficiently diverted from their own females by the large *A. polynesiensis* female population to affect the impregnation rate of the female *A. albopictus*. Wide dispersion and dilution of the population would be an additive factor in the latter explanation.

If *A. albopictus* failed to become established on Taiaro because of the large indigenous population of *A. polynesiensis*, then it could not be used for competitive displacement as originally envisioned without concurrent steps being taken to reduce the indigenous population. Although it has been stated that *A. albopictus* does not occur in the South Pacific because it is unable to compete with the indigenous *scutellaris* species,[18] no data have been presented to support that view. *A. albopictus* had no difficulty in competing with the indigenous *scutellaris* species on Guam—even after accidental introduction.[19] On the other hand, if *A. albopictus* failed to become established because of the unsuitability of the strains liberated, the number of adults released, or the nature of the environment, then the Taiaro releases were not an adequate test of its ability to displace *A. polynesiensis*.

If further field trials of competitive displacement of *A. polynesiensis* by *A. albopictus* are to be carried out, they should be done by liberating massive numbers of *A. albopictus* on a volcanic island where aquatic habitats and vertebrate hosts are numerous. Furthermore, "wild" *A. albopictus* from a similar type of habitat should be utilized. If an atoll were to be used for another field trial, "wild" *A. albopictus* from a natural atoll population (e.g. from an atoll in the Indian Ocean) should be released. The need for further field trials will depend on how the problem of nonperiodic human filariasis on Pacific islands evolves. One complicating factor is that volcanic islands that would have easy access and facilities for continuous work and observation usually are those where filariasis is less important than it is on the more inaccessible volcanic islands. Health and political authorities naturally are reluctant to approve experimentation on populated islands where filariasis is not an important public health problem.

Irrespective of the eventual success or failure of *A. albopictus* to displace *A. polynesiensis*, the experience on Taiaro indicates that future field trials would add to our knowledge of mosquito biology and might contribute to knowledge of how to control accidentally introduced vector or pest mosquitoes. Obviously, the factors that govern the ability of mosquitoes to colonize new territory are complex.

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BRIEF COMMUNICATION

TREATMENT FOR TRICHURIASIS WITH OXANTEL

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Abstract. Single doses of oxantel given to 24 children and 37 adults with light to moderate infections of *Trichuris trichiura* effected cures in 20 of 26 (77%) trials with 10 mg/kg body weight, in 23 of 25 (92%) with 15 mg/kg, and in 10 of 10 trials with 20 mg/kg. In cases not cured, the egg-counts were reduced 50% to 91%. Side effects were not observed, and no drug-associated changes were detected by biochemical, hematologic, and urine examinations before and after treatment.

Oxantel, a meta-oxyphenol analog of pyrantel,[1-4] is *trans*-1,4,5,6-tetrahydro-2(3-hydroxystyryl)-1-methyl pyrimidine. It is a potent antiwhipworm agent in animals.[5] Its pamoate salt is very poorly absorbed after oral administration[6] so that effective concentration in the cecum and colon can be attained without danger of systemic reactions. The present study was an initial clinical evaluation of oxantel's anthelmintic efficacy against the whipworm of man, *Trichuris trichiura.*

PATIENTS AND METHODS

The subjects were 24 children 7 to 15 years of age, and 37 adults. All but 4 had light or moderate infections (based on the criteria of Keller and Leathers[7]) with egg-counts of less than 5,000/g of feces. The higher egg-counts were over 5,000 but less than 10,000/g. In addition to being infected with *T. trichiura*, other criteria for inclusion in the study were absence of pregnancy, of hepatic or renal insufficiency, and of diarrhea or dysentery in subjects willing to be bled for hematologic and biochemical examinations. These criteria were followed since this was our first experience with the drug.

Pretreatment examinations included: 1) standard dilution egg-count (Stoll); 2) complete blood count and hemoglobin determination; 3) determination of serum bilirubin, serum glutamic oxaloacetic transaminase, serum glutamic pyruvic transaminase (SGPT), and blood urea nitrogen; and 4) urine examination. These were repeated on the 10th and 22nd days after treatment.

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An oral suspension of the pamoate salt of oxantel with a concentration of 50 mg/ml was given in a single dose of 10, 15, or 20 mg/kg body weight. All of the subjects were given the drug between 8:30 and 10:00 in the morning and were kept under observation for 2 hours for possible immediate drug reactions. They were seen the following day for recording of any delayed side effects.

Results of treatment were classified as complete cure (failure to demonstrate *Trichuris* eggs in post-treatment stools by acid-ether concentration technic), incomplete cure (egg-counts significantly reduced after treatment), and treatment failure (no reduction in egg-counts).

RESULTS

Of the 26 subjects given a dose of 10 mg/kg, 20 (77%) were cleared of their infection and in the remaining 6 the reduction of egg-counts ranged from 50% to 91%. Of the 25 patients given 15 mg/kg, 23 (92%) were cleared of their infection and the remaining 2 had egg-count reductions of 84% and 91%, respectively. All of the 10 subjects treated with a single dose of 20 mg/kg were completely cleared of their infection. Efficacy did not differ between adults and children. However, if the cases were arbitrarily divided into those with lower and higher egg-counts using the criteria of Keller and Leathers,[7] there seemed to be an indication that patients with higher egg-counts require the larger dose to be cured of their infection.

Stools were collected from the subjects during the first 3 days after treatment to see if trichurids