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MASS ADMINISTRATION OF AN ANTIMALARIAL DRUG COMBINING 4-AMINOQUINOLINE AND 8-AMINOQUINOLINE IN TANGANYIKA[1]

by

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In order to study the feasibility of interrupting malaria transmission in an area of holo-endemic malaria solely by the mass administration of a combination of 4- and 8-aminoquinoline, three zones were selected near Morogoro, Tanganyika. These zones were the village complexes of Mlali, Kidodi and Chazi. Each contained from 5000 to 7000 people, and appeared to be sufficiently isolated that human or mosquito influx from untreated surroundings was of no importance, although when the trial had commenced a certain amount of development and immigration occurred in the zone of Kidodi. None of the zones had previously been exposed to residual spray or larvicidal methods of mosquito control, mosquito nets were not in common use, nor had antimalarial drugs been available except for clinical use at small village dispensaries.

The zones were selected on the basis of their similarity. Malaria is uniformly holo-endemic in all three, with a great preponderance of Plasmodium falciparum followed by P. malariae. P. vivax is rare. The vectors are Anopheles gambiae and funestus with an overall sporozoite rate of from 8 to 10%, and are present the year around, reaching a maximum following the rainy season of March to May. The socio-economic aspects and racial composition of all zones do not differ materially. Geographically, all three are at an altitude of 1500 feet, have an annual rainfall of 35 to 40 inches, and are backed immediately by high

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mountains and traversed by rivers in perennial flow. The mean annual temperature range is from 65 to 80°F in all zones. They are densely inhabited over an area of 25 square miles and surrounded by barren uninhabited country.

METHOD

(1) The Drug

The drug, a mixture of amodiaquine base and primaquine diphosphate prepared by Messrs Parke, Davis & Company and named "Camoprim", was dispensed in the form of triangular-shaped pink tablets called "Infatabs". The bitter taste of the two drugs was effectively disguised, provided the tablets were not held in the mouth for longer than ten seconds: at no time during the trial was difficulty experienced in their use.

Each "Camoprim Infatab" contained 75 mg amodiaquine base and 15 mg base primaquine. It was determined, by "minimal effective dose" and toxicity trials with each constituent, and with the two combined, that the people in all zones were sufficiently immune to respond satisfactorily to the following quantity: ages 0-5 years, 1 "Camoprim Infatab" (amodiaquine base 75 mg + primaquine base 15 mg); ages 6 and more, 2 "Camoprim Infatabs" (amodiaquine base 50 mg + primaquine base 30 mg). Although parasite clearance was achieved with these doses, in one zone later on an increase was made.

The duration of the suppressive effect of a single dose of the drug was found to be 22 days, after which time asexual parasitaemia reappeared.

(2) Administration of the Drug

The drug was administered on a detailed individual census system drawn up before the trial began and added to as immigrants arrived. A medical worker paid visits for treatment on a personal basis to everybody in the zone. If a person was missing on the day of treatment return visits were made until he was found. Such a coverage could not have been achieved without the co-operation of the public, approached correctly through the community leaders and made fully aware by health education and demonstration of the advantages of the project. By diligent maintenance of the

census records, and persistent follow up of defaulters in the zones Mlali and Chazi (the latter only under treatment for a short time), population coverage was maintained in the region of 95 %. The census cards contained sufficient details to enable the individuals to be identified, by name, sex, apparent age and location of house and family status. Difficulties expected through absenteeism for agricultural or religious purposes, local habits and superstitions were all guarded against as best they could be, and the advice of the community leaders sought as each problem arose.

(3) Frequency of Drug Administration

Using the census and by individual visits, trained staff administered the drugs on the following schedules:

(a) Weekly administration took place for 39 weeks in the Mlali zone.

(b) Fortnightly administration took place for 8 fortnights in the Chazi zone, although prior to this for 6 months Chazi was used as an untreated contrast area.

(c) Monthly administration took place for 9 months in the Kidodi zone.

(4) Description of the Zones and Population

Mlali zone

Mlali is the group name given to two adjoining sub-chiefdoms lying at the foot of the western face of the Uluguru Mountains (altitude 7000 feet) and 12 miles south-south-west of the provincial capital, Morogoro. The zone itself is at an altitude of 1500 feet and is centred on two rivers which have been dammed to provide an extensive area of irrigation for rice. One sub-chiefdom rests on Mlali proper, the other on Kinyenze, each of these large village aggregates having satellite villages and scattered housing nearby, decreasing to the periphery. There are two primary schools. The zone tends to be an ecologic oasis, being bordered on the east by the high Uluguru Mountains, on much of the north and all the west by tracts of barren uninhabited country, and on the south by a large sisal estate, itself ending in barren land.

The population of the central part of Mlali at the beginning of the trial was 3000, but by progressive expansion of treatment to the periphery by the ninth weekly mass treatment somewhat more than 5000 people were included, coverage having reached the natural boundaries and a certain amount of population increase having taken place. Thereafter the population remained between 5500 and 5900.

Owing to continual population migration, albeit on a small scale, necessitating frequent revision of the census it was not possible to arrive at an absolutely reliable figure for the population coverage. That tabulated below was estimated by comparing those treated with those missing treatment based on a study of the census cards, but a failing inherent in this method is that a number of those missing treatment may in actual fact have emigrated and should have been struck from the census. It might be a matter of some weeks before this migration could be accepted as a fact.

Mlali zone	Treated	Missed	Total	Coverage
At the 6th weekly dose	4225	139	4364	96.8%
" " 16th " "	5484	288	5772	95.1%
" " 25th " "	5393	354	5747	93.8%
" " 39th " "	5770	291	6061	95.2%

Kidodi zone

Kidodi is the group name given to villages flanking the central market town of Kidodi, lying at the foot of the eastern face of the Southern Highlands Mountains which reach an altitude of 6000 feet, and about 70 miles south-west of Morogoro. The zone itself is at an altitude of 1500 feet and depends upon two rivers in perennial flow from the mountains. Three miles to the east of the central village complex, habitation ceases and the same occurs to the north. However, at the start of the trial the southern area was uninhabited, but after a few months a development scheme started with the importation of a considerable labour force for work on sugar estates, this force tending to remain at Kidodi over night before moving off to estate camps seven miles distant. There is a central primary school of large size and two miles north along the road, at the edge of the settled area, a mission with an intermediate and another primary school.

The population at Kidodi at the commencement of the trial was 4400, rising to 4900 by the third monthly treatment and thereafter slowly to 6500, more by immigration than by natural increase. A proportion of the labourers arriving for work on the sugar development remained in Kidodi, as did a number of attendant petty merchants and their dependents. These were in general not amenable to the work of the trial.

Using the same method of calculation as at Mlali, the population coverage at Kidodi was as follows:

Kidodi zone	Treated	Missed	Total	Coverage
At the 2nd monthly dose	4837	243	5080	95.2%
" " 4th " "	4963	297	5260	94.4%
" " 6th " "	5365	534	5899	90.9%
" " 9th " "	5915	565	6480	91.3%

It is considered, however, that these percentages may be misleadingly high, as there were transients present who avoided the census and some emigration occurred with a delay in adjusting the census cards to it. For Kidodi (but not Mlali or Chazi), the more correct figures may be derived from a comparison of those treated and those examined four weeks later. Using the various methods of estimation, the percentage coverage at Kidodi lay in the following range:

2nd monthly dose coverage:	93.6 to 95.2
4th monthly dose coverage:	91.5 to 94.4
6th monthly dose coverage:	86.0 to 90.9
9th monthly dose coverage:	89.5 to 91.3

Chazi zone

Chazi is the name given to a group of villages stretching for five miles along a main road about 65 miles north-west of Morogoro. The zone is centred on Chazi Hospital, a leprosarium. To the west rise the Nguu Mountains, altitude 6000 feet, and the zone itself is at 1500 feet. There are three perennial rivers falling from the mountains and crossing the zone. To the south the country is barren

and to the east, in the plain formed by the confluence of the rivers, it is undeveloped with sparse habitations. Along the road northwards ribbon housing exists without a natural break. Local illness is treated at Chazi Hospital; there are two primary schools, one in the northern end of the artificially-determined boundary of the zone.

The population of Chazi was not determined in detail at the outset of the project, as the zone was reserved as an untreated control area and as little interference with the local people as was feasible was made. When it was proposed to carry out treatments at intervals of two weeks, a census was undertaken. At that time 6100 people were recorded, and the total increased to 7500 as the coverage improved and extended along the main road northwards.

Population coverage at the final treatment was assessed by the same method as at Mlali, and was as follows:

Chazi zone	Treated	Missed	Total	Coverage
At 8th fortnightly dose:	7133	351	7484	95.3%

RESULTS

Results of treatment were evaluated by means of periodic assessment of the parasite rates, density, gametocyte prevalence and species distribution; by splenometry and by dissection of vector anophelines. The sporozoite rate was determined on all females of the Anopheles funestus population and only on gravid females of A. gambiae, as proposed by Gillies (1954). It has been shown that the entry of newly-emerged A. funestus into the normal anopheline population is sufficiently steady not to interfere significantly with the sporozoite rate, but that the emergence of A. gambiae, often with a considerable variation in numbers from week to week, may result in marked fluctuations in the rate; for this reason pre-gravids of this species are excluded from the assessment.

The various examinations were carried out at intervals of approximately two months. In this report the results that proved significant have been tabulated as follows - parasite rate, P. falciparum gametocyte rate, and sporozoite rate. The

human age-groups are recorded in two ways; one is that usually used by the Ministry of Health, Tanganyika, and includes the divisions 0-2 years, 3-5, 6-10, 11-15 and 16 years and older, and the other that of Davidson & Draper (1953), that is, 0-11 months, 12-23 months and 2-4 years. The latter provides more accurate information concerning the younger children.

Results in the Zone of Weekly Treatment, Mlali

The results of weekly treatment with "Camoprim" at a dosage of 1 tablet (25 mg amodiaquine base + 15 mg primaquine) for children aged 0-5 years, and 2 tablets for those aged more than 5 years, over a period of 39 weeks, are shown in Tables 1 to 3.

From these tables it is seen that there is an abrupt diminution in the crude parasite rates and gametocyte rates from the high figures of the initial survey characteristic of holo-endemicity. The few people remaining infected were found on follow-up to be mainly those who had missed treatment during both weeks preceding that particular examination.

The sporozoite rate assessed in the two main vectors fell from 9.3% to a figure between 0.8 and 1.7%.

Results in the Zone of Monthly Treatment, Kidodi

The results at Kidodi where "Camoprim Infatab" was given for six months at a dosage of 1 tablet for children aged 0-5, and 2 for those aged 6 or more, are shown in Tables 4 to 6. It will be observed that following the sixth month an increase in dosage was made to 1 tablet for ages 0-2, 2 tablets for children aged 2-1/2 to 5, and 3 tablets for older people. This higher dosage was given once a month for three months.

From these tables it is seen that there is only a moderate fall in the parasite and sporozoite rates, whilst there is a marked rise in the gametocyte rates. Numbers of people receiving the regular monthly treatments were parasite positive upon examination at the end of the month. They were tested for any evidence of acquisition of drug resistance on the part of the parasite, following the fourth mass treatment. In this test 94 of the infected people were examined 7 days after their

next regular monthly treatment: 93 had been cleared of asexual parasitaemia, and 1 showed scanty P. falciparum trophozoites which were cleared by an additional dose of the usual amount. Two gametocyte carriers were also cleared by one or two doses spaced at weekly intervals. All cases were among children aged 5 and it appeared that the dosage was not quite sufficient at this one age-point. Resistance was not found.

Results in the Zone of Fortnightly Treatment, Chazi

At Chazi for the first six months no treatment was given, the parasite and sporozoite indices being recorded on three occasions as contrast to the work being carried out at Mlali and Kidodi. These indices remained stable, the only unusual occurrence being a slightly reduced parasite rate among some people who turned out to be receiving sulfone treatment at Chazi Leprosarium.

Subsequently treatment was commenced at intervals of two weeks at a dose of 1 tablet for children aged 0-5 years, and 2 tablets for those aged more than 5. The results of treatment for eight administrations every 2 weeks are shown in Tables 7 to 9.

From the right-hand column of these tables it will be seen that treatment resulted in a reduction in parasite and sporozoite rates to the low level found with once-weekly treatments.

DISCUSSION

The people living in the zones selected for this trial are with very few exceptions Bantu and the adults have acquired a considerable degree of immunity to malaria. Consequently a lesser quantity of drug is required to suppress parasitaemia than would be the case among non-immunes, and for them the dosage schedules of 4-aminoquinolines described by Clyde (1961), rather than those listed by Covell, Coatney, Field & Jaswant Singh (1955), may be used. Combinations of 4- and 8-aminoquinolines have been used in mass drug administration trials in Malaya (Walker, 1955) and Panama (Clark, 1954), and the potentialities of the "Camoprim" combination used in the present trial have been investigated among non-immune subjects by

Courtney et al. (1960). These investigations have, however, been performed among people with considerably less immunity to the disease and in areas of lesser endemicity. The dosages found adequate by these workers are greater than are necessary among residents of holo-endemic areas of Tanganyika; but the enhanced premunition in the older age-groups of the people indigenous to Tanganyika, although it assists materially in the schizontocidal action of effective drugs, does not lengthen the duration of time over which a single dose, irrespective of quantity, will afford protection.

In this trial, the drug used combined an efficient schizontocide (amodiaquine) with a gametocytocidal drug (primaquine). Preliminary toxicity tests had shown the latter to have no haemolytic effects at the dosages used. The action of primaquine in preventing late relapses was of little importance in this trial. With the two drugs in combination, it was found that the low dosages were taken readily and without gastric disturbance even by small children, and were effective in eliminating parasitaemia, the blood being kept clear for 22 days.

Infected cases at Mlali and Chazi were, with few exceptions, found among people who had missed treatment. The results of investigation of these cases, together with those at Kidodi, are shown in Table 10, the right-hand column of which contains the numbers of infected cases who had apparently not missed any treatment. These few exceptions could often be attributed to mistaken identity through errors in the census, but the possibility of inadequate dosage cannot be ruled out in view of the specific finding that the amount given was only just adequate for children aged 5 years, the most critical age-group.

In these zones of weekly and fortnightly treatment, transmission was greatly reduced, the sporozoite rates falling from an average of about 9% to 1%. However, transmission was not interrupted: in order to accomplish this in the holo-endemic area concerned, it is considered that more than 97% of the population would have to receive unbroken treatment. This coverage would be impossible to attain even if some form of legal compulsion was practicable for the chronic dissidents and eccentrics, which it is not.

Despite the co-operation of the great majority of the people, under field conditions in Tropical Africa the maintenance of an effective census record is extremely difficult. Even within apparently static communities there is a constant migration of families: the correct identification of every individual is a matter of difficulty when the worker is assisted by the general public, but individuals through ignorance or deliberate perversity sometimes change their names and mislead the census taker. These problems were particularly in evidence in the zone of monthly treatment, Kidodi, where the results of treatment were less satisfactory than at Mlali and Chazi. At Kidodi, parasitaemia reappeared among fully treated people before the next drug dose was given, even when that dose was increased. The sporozoite rate was reduced by half but no more. Although the crude parasite rates were reduced, a very great increase in the gametocyte rates occurred. In addition to the recurrence of parasitaemia after the third week of treatment in many people co-operating fully with the project, there was a larger defaulter group at Kidodi than elsewhere related principally to a development scheme in the neighbourhood causing an influx of labourers.

CONCLUSION

From the results of this trial of a drug combining a 4- and an 8-aminoquinoline (amodiaquine and primaquine), in an area of Tanganyika where malaria is holo-endemic, where Plasmodium falciparum greatly predominates, and where the adult people have acquired a considerable amount of premunition, it appears that treatment given to 93% or more of the population at weekly or fortnightly intervals will greatly interfere with transmission but will not stop it. A dosage of amodiaquine 75 mg base and primaquine 15 mg base for children up to 5 years, and 150 mg and 30 mg respectively for those aged 6 or more, clears parasitaemia and reduces the sporozoite rate of the local vectors from about 9 to the relatively low level of 1. In order to achieve this population coverage, an individual census was necessary and treatment was administered to each person by trained medical staff. Nevertheless, it was apparent that the dose was marginally effective particularly in the quantity of 75 mg amodiaquine and 15 mg primaquine administered to 5-year-old children.

When the same or a larger dose of this drug combination was given at intervals of 1 month in an area of similar high transmission, parasitaemia reappeared in many of those treated shortly before the next dose was due, and a marked increase in gametocyte rates was observed. The sporozoite rate was reduced by half. However, a factor that interfered with assessment of the trial was the difficulty in obtaining full population coverage owing to the migration of labourers, only about 90% of the people being reached for treatment.

SUMMARY

(1) In 3 similar zones in Tanganyika where malaria is holo-endemic and the average sporozoite rate between 6.9 and 9.3%, an attempt was made to interfere with malaria transmission solely by the use of a combination of amodiaquine and primaquine.

(2) The drug combination was administered individually by trained responsible staff on a census basis to the population, which numbered between 5000 and 7000 in each zone. The people were of Bantu stock with a high degree of acquired immunity to malaria. It was found by preliminary trials that, in consequence of this immunity, those aged 0-5 years were cleared of parasitaemia within 7 days by the low dose of 75 mg amodiaquine base and 15 mg primaquine base, and those aged 6 or more by twice these quantities.

(3) In the two zones where treatment was given effectively to 93% or more of the population, at weekly intervals for 39 weeks in the Mlali zone, and at intervals of 2 weeks for four months in the Chazi zone, parasite rates were reduced to very low levels and the sporozoite rate to about 1.0%.

(4) In the zone where treatment was given at the same and later at an increased dosage, at intervals of 1 month (Kidodi), parasite rates fell only moderately, many treated people showing a recurrence of parasitaemia shortly before the next treatment fell due. Gametocyte rates increased markedly. The sporozoite rate fell by half. In this zone population coverage was slightly less than 90% and continual migration of alien labourers was taking place.

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TABLE 1. ZONE OF WEEKLY TREATMENTS (MLALI) - PARASITE RATES
(All species with a great preponderance of P. falciparum)

Age-group	Prior to treatment		(10.6.60) After 6 weeks' treatment		(19.8.60) After 16 weeks' treatment		(20.10.60) After 25 weeks' treatment		(26.1.61) After 39 weeks' treatment	
	Examined/ Infected	Parasite rate	Examined/ Infected	Parasite rate	Examined/ Infected	Parasite rate	Examined/ Infected	Parasite rate	Examined/ Infected	Parasite rate
		%		%		%		%		%
0-11/12 months	63/42	66.7	75/1	1.3	86/4	4.7	78/5	6.4	57/3	5.3
12/12-23/12 months	81/78	96.3	75/4	5.3	93/2	2.2	104/6	5.8	89/7	7.9
2-4 years	135/126	93.3	150/6	4.0	112/6	5.4	113/11	9.7	104/5	4.8
0-2 years	184/167	90.8	200/8	4.0	230/11	4.8	216/15	6.9	173/12	7.0
3-5 years	153/130	84.9	150/7	4.7	110/4	3.6	100/8	8.0	68/3	4.4
6-10 years	170/119	70.0	150/2	1.3	150/3	2.0	150/6	4.0	134/4	3.0
11-15 years	163/105	64.4	150/3	2.0	150/6	4.0	150/7	4.7	129/3	2.4
16 and over	364/97	26.6	250/13	5.2	200/9	4.5	150/12	8.0	150/7	4.7

(Examined = Number of people examined: Infected = Number of people found infected)

TABLE 2. ZONE OF WEEKLY TREATMENTS (MLALI) - P. FALCIPARUM GAMETOCYTES

Age-group	Prior to treatment		After 6 weeks' treatment		After 16 weeks' treatment		After 25 weeks' treatment		After 39 weeks' treatment	
	Rate (%) among all slides	Rate (%) among positive slides	Rate (%) among all slides	Rate (%) among positive slides	Rate (%) among all slides	Rate (%) among positive slides	Rate (%) among all slides	Rate (%) among positive slides	Rate (%) among all slides	Rate (%) among positive slides
0-11/12 months	39.8	57.5	0.0	-*	1.2	-*	2.3	-*	3.5	-*
12/12-23/12 months	33.3	35.3	2.7		1.1		2.2		4.5	
2-4 years	29.6	32.0	1.3		2.7		3.6		1.9	
0-2 years	34.2	37.8	1.5		1.3		2.6		4.0	
3-5 years	22.3	26.1	1.3		0.9		2.7		0.0	
6-10 years	8.8	13.6	0.0		0.0		1.3		0.7	
11-15 years	7.8	16.2	0.0		1.3		0.7		0.0	
16 and over	5.5	20.4	0.4		0.5		1.0		1.3	

Note: The numbers examined and numbers infected are the same as in the corresponding Parasite Rate Table

(* The number of infected cases was too small for these assessments to be of value)

TABLE 3. ZONE OF WEEKLY TREATMENTS (MLALI) - SPOROZOITE RATES

	Prior to treatment	After 6 weeks' treatment	After 16 weeks' treatment	After 25 weeks' treatment	After 39 weeks' treatment
	March/ April 1960	(10.6.60)	(19.8.60)	(20.10.60)	(26.1.61)
Total vectors dissected*	2 470	875	600	348	570
Total with sporozoites	230	13	5	6	5
Sporozoite rate	9.3%	1.5%	0.8 %	1.7%	0.9%

(* The vectors being Anopheles funestus all-age and A. gambiae gravids)

TABLE 4. ZONE OF MONTHLY TREATMENTS (KIDODI) - PARASITE RATES
(All species with a great preponderance of P. falciparum)

Age-group	Prior to treatment		After 2 months' treatment		After 4 months' treatment		After 6 months' treatment			After 9 months' treatment	
	Examined/ Infected	Parasite Rate(%)	Examined/ Infected	Parasite Rate(%)	Examined/ Infected	Parasite Rate(%)	Examined/ Infected	Parasite Rate(%)		Examined/ Infected	Parasite Rate(%)
0-11/12 months	111/44	39.6	75/11	14.7	72/17	23.6	106/31	29.2	Increased dosage quantities	91/14	15.4
12/12-23/12 months	62/60	96.8	72/27	37.5	74/32	43.3	111/54	48.7		73/17	23.3
2-4 years	141/134	95.0	146/63	43.2	135/54	40.0	102/57	55.9		113/31	27.4
0-2 years	219/133	60.7	194/54	27.8	178/64	35.9	246/92	37.4		200/40	20.0
3-5 years	216/201	93.1	143/56	39.2	130/41	31.5	138/63	45.7		150/41	27.3
6-10 years	225/194	86.2	150/50	33.3	150/43	28.7	150/44	29.3		200/39	19.5
11-15 years	252/159	63.1	150/27	18.0	150/25	16.7	150/38	25.3		200/43	21.5
16 and over	348/119	34.2	200/22	11.0	200/31	15.5	200/51	25.5		200/28	14.0

(Examined = Number of people examined: Infected = Number of people found infected)

TABLE 5. ZONE OF MONTHLY TREATMENTS (KIDODI) - P. FALCIPARUM GAMETOCYTES

Age-group	Prior to treatment		After 2 months' treatment		After 4 months' treatment		After 6 months' treatment			After 9 months' treatment	
	Rate among all slides	Rate among positive slides	Rate among all slides	Rate among positive slides	Rate among all slides	Rate among positive slides	Rate among all slides	Rate among positive slides		Rate among all slides	Rate among positive slides
	%	%	%	%	%	%	%	%		%	%
0-11/12 months	25.3	61.4	9.3	63.6	16.7	70.6	16.9	58.1	Increased dosage quantities	7.6	50.0
12/12-23/12 months	32.3	33.4	22.2	59.3	25.7	59.4	24.3	50.0		12.3	52.9
2-4 years	22.7	26.8	19.8	46.0	20.0	50.0	19.6	35.1		7.9	29.0
0-2 years	26.1	42.9	16.5	59.3	20.2	56.3	20.3	54.3		9.5	47.5
3-5 years	23.6	25.3	18.2	46.4	18.5	58.5	18.1	39.7		8.8	31.7
6-10 years	15.6	18.0	12.0	36.0	13.3	46.5	12.7	43.2		6.0	30.8
11-15 years	8.4	13.9	4.0	22.2	4.0	24.0	8.0	31.6		6.5	30.2
16 and over	3.5	10.0	1.5	13.6	2.0	12.9	3.5	13.7		2.0	14.3

Note: The numbers examined and numbers infected are the same as in the corresponding Parasite Rate Table

TABLE 6. ZONE OF MONTHLY TREATMENTS (KIDODI) - SPOROZOITE RATES

	Prior to treatment	After 2 months' treatment	After 4 months' treatment	After 6 months' treatment		After 9 months' treatment
Total vectors dissected*	853	600	600	555	Increased dosage	607
Total with sporozoites	59	25	23	23		22
Sporozoite rate	6.9 %	4.2 %	3.8 %	4.1 %		3.6 %

(* The vectors being Anopheles funestus all-age and A. gambiae gravids)

TABLE 7. ZONE OF FORTNIGHTLY TREATMENTS (CHAZI) - PARASITE RATES
(All species with a preponderance of P. falciparum)

Age-group	Parasite Rates prior to treatment						Commencement of treatment at Chazi	Parasite Rates after 8 fortnightly treatments	
	1*		2*		3*				
	Examined/ Infected	Parasite Rate	Examined/ Infected	Parasite Rate	Examined/ Infected	Parasite Rate		Examined/ Infected	Parasite Rate
		%		%		%			%
0-11/12 months	64/39	60.9	30/19	63.3	54/36	66.7		74/3	4.1
12/12-23/12 months	59/39	66.1	35/28	80.0	51/44	86.3		76/6	7.9
2-4 years	171/128	74.9	63/54	85.7	71/64	90.1		80/5	6.3
0-2 years	165/107	64.9	85/66	77.6	118/91	77.1		168/11	6.5
3-5 years	184/136	73.9	50/41	82.0	65/57	87.7		112/8	7.1
6-10 years	128/112	87.5	50/37	74.0	50/34	68.0		150/2	1.3
11-15 years	147/91	61.9	50/32	64.0	50/29	58.0		150/5	3.3
16 and over	213/68	31.9	50/12	24.0	50/11	22.0		150/11	7.3

Notes: The Chazi Parasite Rates prior to treatment were made at the following times in relation to the work at Mlali and Kidodi:

1* = At time of Mlali pre-treatment and Kidodi pre-treatment examinations

2* = At time of Mlali after 6 weeks and Kidodi after 2 months

3* = At time of Mlali after 25 weeks and Kidodi after 6 months

Immediately after Chazi examination No. 3, fortnightly treatment was commenced in this zone.

TABLE 8. ZONE OF FORTNIGHTLY TREATMENTS (CHAZI) - P. FALCIPARUM GAMETOCYTES

Age-group	P. falciparum gametocytes prior to treatment						Commencement of treatment at Chazi	Falciparum gametos. after 8 fortnightly treatments	
	1*		2*		3*				
	Rate among all slides	Rate among positive slides	Rate among all slides	Rate among positive slides	Rate among all slides	Rate among positive slides		Rate among all slides	Rate among positive slides
	%	%	%	%	%	%		%	%
0-11/12 months	27.4	46.1	30.0	47.4	29.6	44.4		1.4	-*
12/12-23/12 months	25.2	37.9	31.4	39.3	31.4	36.4		2.6	
2-4 years	16.8	25.3	23.9	27.8	23.9	26.6		2.5	
0-2 years	20.6	37.4	30.6	39.4	29.7	38.5		2.4	
3-5 years	18.8	28.3	22.0	26.8	23.1	26.3		2.7	
6-10 years	18.6	20.5	14.0	18.9	18.0	26.5		0.7	
11-15 years	5.2	8.3	10.0	15.6	6.0	10.3		0.7	
16 and over	3.2	8.3	2.0	8.3	4.0	18.2		0.7	

Notes: The numbers examined and infected (infected by all stages of parasite) are the same as in the corresponding Parasite Rate Table.

(* The number of cases was too small for useful completion of this column)

P. falciparum gametocyte rates were taken at Chazi at the following times in relation to work at Mlali and Kidodi:

1* = At time of Mlali pre-treatment and Kidodi pre-treatment examinations

2* = At time of Mlali after 6 weeks and Kidodi after 2 months

3* = At time of Mlali after 25 weeks and Kidodi after 6 months

Immediately after Chazi examination No. 3, fortnightly treatments were commenced in this zone.

TABLE 9. ZONE OF FORTNIGHTLY TREATMENTS (CHAZI) - SPOROZOITE RATES

	Sporozoite Rates prior to treatment (%)			Commencement of treatment at Chazi	Sporozoite Rate (%) after 8 fortnightly treatments
	1*	2*	3*		
Total vectors dissected*	3 814	600	488		513
Total with sporozoites	343	54	43		7
Sporozoite Rate	9.0	9.0	8.8		1.4

(* The vectors being Anopheles funestus all-age and A. gambiae gravids)

Notes: The Chazi mosquito dissections took place at the following times in relation to work at Mlali and Kidodi:

1* = At time of Mlali pre-treatment and Kidodi pre-treatment examinations

2* = At time of Mlali after 6 weeks and Kidodi after 2 months

3* = At time of Mlali after 25 weeks and Kidodi after 6 months

Immediately after the Chazi examination No. 3, fortnightly treatments were commenced in this zone.

TABLE 10. RESULTS OF INVESTIGATIONS OF POSITIVE CASES FOUND AFTER DRUG ADMINISTRATION

Area	Parasite surveys carried out after	Total number found positive/ number examined	Results of investigation of positives				
			New to the census		Defaulters from the 2 preceding treatments	Defaulters from the immediately preceding treatments	No treatment missed
			Staying in the area	Transients*			
Mlali (weekly treatment) Total population about 6000	6 weeks' treatment	33/900	7	7	8	5	6
	16 weeks' treatment	33/840	4	19	6	1	3
	25 weeks' treatment	48/766	7	33	5	1	2
	39 weeks' treatment	29/654	6	16	5	2	0
Chazi (fortnightly treatment) Total population about 7000	8 fortnightly treatments	37/730	3	30	-	-	4
Kidodi (monthly treatment) Total population about 6000	2 months' treatment	209/837	18	29	-	38	124
	4 months' treatment	204/808	29	54	-	15	106
	6 months' treatment	288/884	29	72	-	23	164
	9 months' treatment	191/950	23	56	-	21	91

*As "transients" have been classified those who could not be found on follow-up and had either left the area, or given false names.

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SKETCH MAP OF THE AREA OF THE CHEMOTHERAPY FIELD TRIAL IN TANGANYIKA 1961