

Helminthiases of children in the State of Paraná

by

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As director of the Service of Rural Prophylaxis in the State of Paraná for two and a half years already, since the beginning of 1919 I have been collecting evidence as to the rate of infection by intestinal worms of the inhabitants of the State, with regards both to race and age. Infection by hook-worm, *Ascaris* and *Trichuris* are more prevalent than infection by *Strongylus*, *Enterobius* and *Tania* and should be of closer interest to the public-health worker. It is hoped that the evidence collected, based on a great number of examinations and showing a high incidence, may be of value to those interested in the subject.

Two tables each will be given for hook-worm, *Ascaris* and whip-worm; they will show at a glance the sanitary conditions of certain zones of the state. A table is also given indicating positive results obtained from the examinations of children up to 5 years of age for any worm or association of worms.

HOOK-WORM DISEASE—This is notoriously the most important. The tables

show the incidence of infection according to information from Local Sanitary Posts; the first deals with children from birth up to 10 years of age and comprises 3 municipalities of the coastal region (Tropical zone) and 1 from the North of the State (subtropical) and the second children up to 5 years of age and comprises 18 places in the state, distributed over the coast, the north, the *sertão* (interior) and the *campos* (plains). These tables are made on the strength of microscopical examination, as seemed advisable to me. This has to be mentioned as nowadays there is a practice, followed chiefly by the North Americans, of basing statistics on the counting of worms expelled after the administration of strong anthelmintics. Professor SAMUEL DARLING estimated the error resulting from microscopical examination as reaching 150/o, whereas by counting this is reduced to 10/o. The practice does not seem undesirable but it would have to be carried out in rural hospitals of which we have none.

Great care was taken to reduce the

chances of error in the microscopic examination of faeces. Whenever a sample of faeces has given negative results upon direct examination on double slides, repeated, it is the service's practice to make a suspension and centrifugalise it. The result is only set down as negative after lengthy examination on two slides of distended sediment obtained by centrifugation. Statistical evidence based on such methods must carry conviction and must be considered sufficiently exact. Work on a big scale and purporting to find out the patient so as to carry out a curative prophylaxis cannot furnish such rigorous results as experimental research restricted to a limited number of cases. But in no case do results stand for absolute accuracy.

Table I. In this the incidence of hookworm in children up to 1 year, from 3 to 6 years and from 6 to 10 years is studied; a total of 4 911 cases microscopically examined.

In children up to 1 year of age the following percentages were obtained: in Guarakessaba 20.30/o; in Antonina 32.70/o; at Morretes 38.00/o and at Thomazina 12.90/o. These results are based on 435 examinations with 114 positive results, which gives an average incidence of 26.20/o. A few children of one or two months were found to be infected, but the greatest number of positive results were obtained from examination of children of 6 to 12 months of age. For children of 1 to 3 years the incidence became 4 times as large in Guarakessaba (89.50/o), three times in Antonina (85.10/o) and twice in Morretes (77.80/o) and Thomazina (28.10/o). The average for this age was of 77.60/o. For the age of 3 to 6 years there is a rise of 10 to 200/o, as the following will show: Guarakessaba 99.70/o; Antonina 97.50/o; Morre

tes 91.40/o, and Thomazina 480/o. For the age of 6 to 10 years the percentage remained unchanged in Guarakessaba (99.60/o) and Antonina (96.60/o), whilst in Morretes there was an advance of 60/o (970/o) and one of 140/o at Thomazina (62.20/o). Average rate of infection 93.70/o. Summing up it may be stated that out of 1,543 examinations made at Guarakessaba 1,373 were positive, i. e. 88.90/o; at Antonina out of 1,342 examinations, 1,192 i. e. 88.80/o were positive; at Morretes out of 1,459 examinations, 1,279, i. e. 87.40/o were positive; while out of 567 examinations made at Thomazina only 259 were positive so that the percentage fell to 45.60/o. The three municipalities of the coast have an elevation slightly over sea-level and a frankly tropical climate; Thomazina, the town in which the examinations were made is at an elevation of 500 metres and enjoys a subtropical climate. These two factors, elevation and temperature, reduced the incidence by nearly 500/o. The average rate of infection for the four districts reached 83.40/o, as shown by 4,911 examinations.

Table II. This table refers to 5,489 children up to 5 years of age, whose microscopical examination was made in 18 places within the state and comprising 4 geographical zones. In the 7 places lying along the coast the incidence lay between 68.6 and 79.50/o with an average rate of 72.20/o. In the three districts of the Northwest it lay between 14.90/o and 44.80/o, which gives an average of 29.40/o. In the 4 districts of the *sertão* the rate of infection lay between 3.970/o and 14.10/o, with an average of 8.70/o.

In the *Campos* regions, in which 4 districts were studied, the following rates were obtained; Curityba 3.30/o, Lapa 1.70/o, while

in Ponta Grossa and Guarapuava it equalled 0. The average for the region was of 1.250/o. The fourth numeric column of Table II is rather demonstrative, showing as it does that in the elevated parts of the state, which enjoy a temperate climate, and above all in the *Campos*, which have a cold climate, the sanitary situation of the children is fairly satisfactory. The same cannot be said for the coast where the situation has always been very unsatisfactory. Next in order comes the North Zone and the zone of the Lower Paraná, with a sub-tropical climate or, according to some geographers, with a temperate climate and hot summers. Table II shows that the incidence of hook-worm disease is much higher in the low-lying districts, damp and hot, which is no novelty. The indications in the table referring to Paranaguá and Jacarésinho were taken from the reports of the ROCKEFELLER Commission, while many of those concerning districts of the Campos and Sertão were furnished to me some time ago by DR. ALAN GREGG. Out of 5,500 children up to 5 years of age, examined in 4 zones of the state, it was ascertained that more than half (52.40/o) harboured hook-worms. Even if the excellent climate of two thirds of the state is taken into account, the situation as a whole must be regarded as very serious. We did not understand why with more than 500/o positive examinations the ROCKEFELLER Commission decided not to medicate any more children of less than five years, the more so as the Commission is active only in regions in which the infection must be still much more prevalent than here. Table I enables one to see that the incidence of infection rises considerably at the age of 6 to 10 years. Efforts

must be made to relieve children of this age more than ever of their dangerous parasites.

ASCARIS INFECTION. Out of a total of 4,911 children up to 10 years of age, for which microscopical examinations were carried out in 4 districts of the state of Paraná, we found that 4,498, i. e. 91.50/o, harboured *Ascaris lumbricoides*. These examinations were carried out in three districts of the coast and one of the Northwest, as is seen in Table III, all of them therefore districts with a hot climate and belonging to the low-lying regions. Summing up one may say that, of children up to one year of age belonging to the four districts, 54.70/o were infected with *Ascaris*. For the age of 1 to 3 years there was an enormous increase, with an average of 92.60/o; from 3 to 6 years this rose further to 96.30/o, only to fall to 95.60/o for the age of 6 to 10 years. The mean figure for the incidence of all ages up to 10 years of age rose to above 900/o. Does this state of affairs not call for serious measures? I for my part believe that it does and have done my best to further a serious campaign against it. Concerning *Ascaris* infection there is yet table IV, showing 2,644 children of all ages up to 5 years, from 5 districts of the coast, 1 of the Northwest and another from the *Campos*, with an average of 90.880/o, a rate which, considering the extreme youth of the subjects examined, is deplorably high. Cold climate and elevation do not influence the rate of infection by *ascaris* to the same extent as in the case of hook-worm disease. On the coast the mean incidence was of 900/o; in the Northwest of 800/o and in the *Campos* of 600/o. I consider these to be very high rates and in a future work will show that in this country *ascaris* infections

attains all ages and is the cause of many troubles.

TRICHURIASIS. Out of a total of 4,911 children of all ages up to 10 years, microscopically examined at Guarakessaba, Antonina, Morretes and Thomazina, I found 3,975 to be infected with *Trichuris trichiura*. Table V shows the incidence of whip-worm infection on the coast, in children of all ages up to 10 years, to vary between 75 and 92% while in the North of the state, in the city of Thomazina, it only came up to 38.2%. I do not wish to attribute this difference (of more than 50%) exclusively to climate and elevation, for, if that were the case, the incidence of whip-worm infection should be extremely low in Curityba, with its cold climate and its elevation of 950 metres, which is not what is seen. Table VI shows the incidence of Curityba to be much higher than that of Thomazina or São José da Boa Vista. It also shows that out of 435 children of less than 1 year of age only 30% were infected with *Trichuris*, while this rate is seen to rise up to 80% in children from 1 to 3 years of age. In children from 3 to 6 years and 6 to 10 years the rate of infection remains stationary: about 87.5%. The average for the 4,911 children examined was of 80.9%. This is a very high rate, but I feel confident that it will be lowered as soon as a greater number of children from all regions with different elevation, habits and means of living, have been examined. These investigations will be pursued until evidence from at least half the districts of the state has been brought together. At present there are about 50 districts in the state of which only 6 are coastal and 2 belong to the Lower Paraná, the two shores of the

state, with the same climate. Table VI shows only children up to 5 years of age, examined in 7 places of the State. In five districts of the coast the incidence varied between 38.5% and 85.6%, which gives an average of 66.1%. At São José da Boa Vista, the rate was of 32.5% lower therefore than at Thomazina, with its 42% for the same age. At Curityba the incidence of whip-worm infection was found to be of 50.5%. In this town it is much higher still in older people. We are preparing some more complete statistical evidence as to this point.

POLYHELMINTHIASIS. Polyhelminthiasis would appear to be the best name for infections by associated worms. In children of the age selected, infection by one worm is very rare, therefore all children infected by any worm are included in the next table (Table VII). This refers to 5,116 children of all ages up to 5 years examined in 11 places in the state. Out of these 5,116 examined, 3,857 were infected, i. e. 75.39%. Seven places along the coast, with rates varying between 44.3 and 99.3%, furnished an average of 83.8%. For three places in the Northwest the mean rate was of 80.8% and for Curityba of 71.4%. It must be remembered that these are children of less than 5 years of age and that older ones are infected on a still larger scale. At any point of the coast of Paraná, multiple infections affect 95% of subjects of all ages taken as a whole. It is not for nothing that our efforts were not limited to the treatment of hook-worm disease. In Our Service of Rural Prophylaxis all worms are attended to with the same care. Systematic campaigns are made against all worms in subjects of

all ages. These may be summed up as the curative prophylaxis and sanitation of the soil, together with propaganda of sanitary

education of the people by all means within our power.

Curityba, Feb. 15, 1921.

Table I

HOOK-WORM INFECTION

in Children up to 10 years of age, microscopical examinations in four districts of the STATE OF PARANÁ

Evidence collected from July 1919 to June 1920

ZONES	PLACES	Up to 1 year of age			From 1 to 3			From 3 to 6			From 6 to 10			TOTALS		
		Ex.	Pos.	o/o	Ex.	Pos.	o/o	Ex.	Pos.	o/o	Ex.	Pos.	o/o	Ex.	Pos.	o/o
COAST	Guarakessaba	167	34	20,3	325	291	89,5	451	450	99,7	600	598	99,6	1543	1373	88,9
	Antonina	122	40	32,7	270	230	85,1	405	395	97,5	545	527	96,6	1342	1192	88,8
	Morretes	84	32	38,0	339	264	77,8	456	471	91,4	580	563	97,0	1459	1276	87,4
Northwest	Thomazina.	62	8	12,9	121	34	28,1	156	75	48,0	228	142	62,2	567	259	45,6
	TOTALS	435	114	26,2	1055	819	77,6	1468	1391	91,0	1953	1830	93,7	4911	4100	83,4

Table II

HOOK-WORM INFECTION

In children up to 5 years of age, microscopical examinations in 18 Places of the
STATE OF PARANÁ

Evidence collected from 1919 to 1920

ZONES	PLACES	Number of Ex.	Positive Rex.	Percentage	Average for each zone
Coast	Guaratuba	555	391	70,4	Tropical Climate 72,2 o/o
	Guarakessaba . . .	793	536	67,5	
	Iha do Mel	58	43	74,1	
	Paranaguá	220	151	68,6	
	Antonina	283	225	79,5	
	Morretes	725	491	67,7	
	Porto de Cima . .	277	216	77,9	
North-west	Jacarésinho	1.678	725	44,8	Subtropical Climate 29,1 o/o
	S. José da Boa Vista	181	27	14,9	
	Thomazina	35	10	28,5	
(Interior)	Imbituva	106	15	14,1	Temperate Climate 8,7 o/o
	Campo do Tenente .	74	9	12,1	
	S. Matheus	103	5	4,8	
	Rio Negro	76	3	3,9	
(Plains)	Curityba	91	3	3,3	Cold Climate 1,25 o/o
	Lapa	114	2	1,7	
	Ponta Grossa . . .	35	0	0,0	
	Guarapuava	85	0	0,0	
		5.489	2.879	52,4	

Table 3

ASCARIS INFECTION

in Children up to 10 years of age, microscopical examinations in four districts of the STATE OF PARANÁ

Evidence collected from July 1919 to June 1920

ZONES	PLACES	Up to 1 year of age			From 1 to 3			From 3 to 6			From 6 to 10			TOTALS		
		Ex.	Pos.	o/o	Ex.	Pos.	o/o	Ex.	Pos.	o/o	Ex.	Pos.	o/o	Ex.	Pos.	o/o
COAST	Guarakessaba	167	88	52,6	325	323	99,3	451	450	99,7	600	599	99,8	1543	1460	94,6
	Antonina	122	62	50,8	270	249	92,2	405	383	94,6	545	522	95,7	1342	1216	90,6
	Morretes	84	72	85,7	339	329	97,0	456	453	99,3	580	573	98,7	1459	1427	97,8
Northwest	Thomazina	62	16	25,8	121	76	62,8	156	129	82,6	228	174	76,3	567	395	69,6
	TOTALS	435	238	54,7	1055	977	92,6	1468	1415	96,3	1953	1868	95,6	4911	4498	91,5

Table IV

ASCARIS INFECTION

In Children up to 5 years of age, microscopical examinations in 7 places of the
STATE OF PARANÁ

Evidence collected in 1920

ZONES	PLACES	Number of Ex.	Positive Res.	Percentage	Average for each zone
Coast	Guaratuba	555	522	94,0 o/o	Tropical Climate 89,9 o/o
	Guarakessaba . . .	793	732	92,3 o/o	
	Antonina	241	233	96,6 o/o	
	Morretes	725	673	92,8 o/o	
	Ilha do Méi	58	43	74,1 o/o	
North-west	S. José da Boa Vista	181	145	80,1 o/o	Subtropical Climate 80,1 o/o
(Plains)	Curityba	91	55	60,4 o/o	Cold Climate 60,4 o/o
		2.644	2.403	90,88 o/o	

Table V

TRICHURIS INFECTION

in Children up to 10 years of age, microscopical examinations in four districts of the STATE OF PARANÁ

Evidence collected from July 1919 to June 1920

ZONES	PLACES	Up to 1 year of age			From 1 to 3			From 3 to 6			From 6 to 10			TOTALS		
		Ex.	Pos.	o/o	Ex.	Pos.	o/o	Ex.	Pos.	o/o	Ex.	Pos.	o/o	Ex.	Pos.	o/o
COAST	Guarakessaba	167	42	25,1	325	305	93,8	451	451	100	600	600	100	1543	1398	90,6
	Antonina	122	41	33,6	270	197	73,0	405	334	82,4	545	445	81,6	1342	1017	75,7
	Morretes	84	44	52,3	339	298	88,0	456	438	96,0	580	563	98,9	1459	1343	92,0
Northwest	Thomazina.	62	5	8,0	121	43	35,5	156	66	42,3	228	103	45,1	567	217	38,2
	TOTALS	435	132	30,3	1055	843	80,0	1468	1289	87,7	1953	1711	87,6	4911	3975	80,9

Table VI

TRICHURIS INFECTION

In children up to 5 years of age, microscopical examinations in 7 places of the
STATE OF PARANÁ

Evidence collected in 1920

Zones	Places	Number of Ex.	Positive Res	Percentage	Average for each zone.
Coast	Guaratuba	555	214	38,5 o/o	Tropical Climate 66,1 o/o
	Guarakessaba . . .	793	649	81,8 o/o	
	Antonina	241	201	83,4 o/o	
	Morretes	725	621	85,6 o/o	
	Ilha do Méi	58	24	41,3 o/o	
North-west	S. José da Boa Vista	181	59	32,5 o/o	Subtropical Climate 32,5 o/o
(Plains)	Curityba	91	46	50,5 o/o	Cold Climate 50,5 o/o
		2.644	1.814	68,60 o/o	

Table VII

POLYHELMINTHIASIS

In children up to 5 years of age, microscopical examinations in 11 places of the STATE OF PARANÁ

Evidence collected from 1919 to 1920

Zones	Places	Number of Es.	Positive Res.	Percentage	Average for each zone
Coast	Paranaguá	1.309	581	44,3	Tropical Climate 83,8 o/o
	Guarakessaba . . .	924	828	89,5	
	Antonina	803	747	93,0	
	Guaratuba	693	493	71,1	
	Morretes	746	679	91,0	
	Porto de Cima . . .	147	146	99,3	
	Ilha do MéI	58	57	98,2	
North-west	Jataby	16	15	93,7	Subtropical Climate 80,8 o/o
	Thomazina	148	106	71,6	
	S. José da Boa Vista	181	140	77,4	
(Plain)	Curityba	91	65	71,4	Cold Climate 71,4 o/o
		5.116	3.857	75,39	