THE INTENSIVE METHOD OF CONTROL APPLIED TO YAWS *

A PRELIMINARY REPORT

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During former years that form of treponemiasis known as yaws, framboesia, bubas, or pian, was regarded in Puerto Rico as a medical curiosity. It was known that cases of the disease could be found in a coastal community in the northwestern part of the Island, and interested physicians sought patients there when they were required for study or demonstrations, but no effort was made to eradicate the infection or to locate other affected communities.

It was recognized from general clinical observations that the disease was not a serious problem to the Island, and the studies of Costa Mandry [1, 2] on the Wassermann reaction in the general population gave additional evidence of this fact. Occasional cases of the disease were also now and then found in Coamo, Peñuelas and Carolina.

Historians all agree that yaws was introduced into this Island with the Negro slaves who were imported from the African coast during the second and third decades of the sixteenth century [3, 4], and who, on arrival, transmitted it to the other Negroes in the slave colonies and to all Europeans or natives who came in contact with those affected. The disease was well recognized at the time, and there are accurate descriptions of the characteristic lesions and the many names in vogue for the different skin manifestations (*guindas, cangrejos, clavos, flema salada, savanas,* and *izas*)[4]. When slave trading was discontinued (1865), the disease began to decline very rapidly and appeared only in small localized endemic foci here and there throughout the Island [4].

In 1510, an epidemic disease, *mal gallicus,* made its appearance in the Island, attacking both Indians and Spaniards. This disease was known as *bubas,* a name which was later used to designate yaws or *Framboesia tropica* [5].

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During the years 1902 and 1903 there was an extensive epidemic of yaws among the children attending the rural schools of Jobos, in the municipality of Isabela in the northwestern corner of the Island, but this was mistaken for syphilis. However, treatment with potassium iodide and internal mercury medication, together with external applications of mercury salts, produced good results. From 1903 to 1917, no attention was called to the disease in this section.

In 1917, Font y Guillot, and Hernández [6] presented a clinical and bacteriological study of a number of cases of yaws which occurred in this same rural district (Jobos) of the municipality of Isabela. The article is illustrated with pictures of the lesions in the different stages of the disease and of *Spirochaeta pertenue* isolated from one of the patients.

Two cases were reported by the officer of health of Isabela, after which a study was begun and about 40 cases of the disease were found. Eleven of these were transferred to the Isolation Hospital of the Health Department of Puerto Rico at San Juan and constituted the basis for the study carried out.

In 1931 a complaint was received by the Commissioner of Health from a resident of a community in the hills, called Río Abajo of Utuado, stating that many cases of bubas had developed in the children of the school and that in recent months the disease had been spreading throughout the community. Dr. M. Román Benítez was directed to investigate, and he made a diagnosis of framboesia, showing that the disease had been present for years, and estimating that there were then at least eighty active cases in the community, many of them in school children.

A reconnaissance was first made by an experienced sanitary inspector for the purpose of outlining the zone in which the disease existed. This was immediately followed by a census of the entire population of the affected area, which appeared to cover not more than four or five square miles. In this census the sanitary inspector noted, in each household visited, whether there was a history of yaws in the family and whether there were patients with active lesions. This information was used as a guide by the physicians and nurses for summoning patients for examination and treatment, since

it was impossible for the treatment staff to make house to house visits at that time. The census showed a population of 1,091 persons. Examination and treatment with neoarsphenamine were undertaken by the public health unit of Adjuntas and Utuado, of which one of us (J.B.G.), is medical officer. The control of yaws was only one item in the program, and a maximum of only one day each week could be given to the work by one physician and two nurses.

The plan followed—a modification of the intensive method for treating hookworm disease introduced by Howard in British Guiana in 1914 [7]—was based on careful examination of the entire population and treatment of all infected persons with neoarsphenamine. Unfortunately, it was not practicable, with the facilities available, to perform a Wassermann test on every person, but special effort was made to perform this test on every member of the families in which cases of yaws were found. Treatment and reexaminations were carried on, more or less continuously, from September 1931, to July 1932. In September 1932, a house to house survey was made of the entire area by a physician, Dr. P. K. Nair, and a nurse. The condition of each patient was recorded, and Wassermann tests were made; nine recurrences and ten new cases were found. Treatment was begun immediately afterward and was continued for about three months. In 1933 another house to house survey was made by Dr. Luang Bhayung and a nurse. This was followed by treatment of active cases, but the number remaining was small. A fourth survey was made in February and March, 1934, by one of us (J.B.G.). In this survey specimens of blood were taken from as many persons, other than patients, as was possible. Nine persons with active yaws lesions were found.

The purpose of this report is to show the results of the survey of 1934 and the progress made up to that time, giving special attention to the effect of neoarsphenamine used alone in the treatment of yaws.

There was some disadvantage in the fact that there were no facilities for hospitalization, and patients had to return to their homes in the hills immediately after treatment. For some, this meant fording a stream of considerable size and swiftness and a climb of 1,500 feet up the steep slopes. There-

fore, the dosage of neoarsphenamine was kept rather lower than is customary in general practice, 0.6 gm. being as a rule the largest dose used. The first series of injections given to each patient began with a small dose and increased in accordance with the weight of the patient and his apparent tolerance. No cases of acute illness occurred as a result of treatment. Albuminuria appeared in a few cases and in these instances treatment was temporarily suspended.

In the analysis of results for this report, those cases for which there was reasonably complete information are considered as a separate group. Unfortunately, not all these patients had Wassermann tests in both 1931 and 1934.

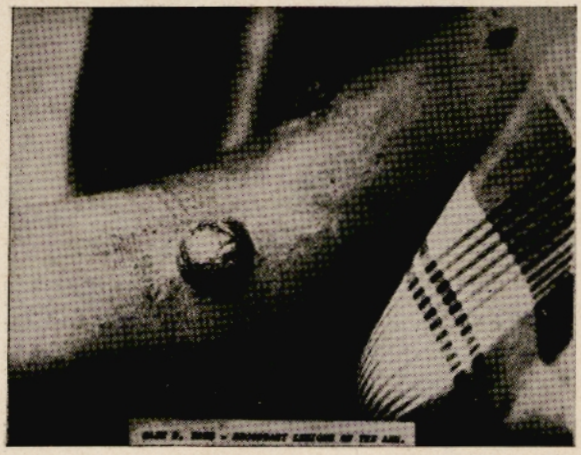
The lesions found are not classified in this report, nor are recurrences. Figures 1, 2, and 3, show some typical lesions encountered during the study. The certainty with which obvious lesions disappear has been sufficiently emphasized by others. The disappearance of lesions in many of our patients was much slower than experience elsewhere would have led us to expect, but persistence invariably led to success.

SEROLOGICAL STUDIES

In the present study, both the Wassermann and the Kahn tests were employed. In the Kahn tests we followed the classical technique. In the Wassermann test we used the technique described by one of us (Costa Mandry) in recent studies on the Wassermann reaction in Puerto Rico [1-2]. In this technique a 0.4 per cent colesterinized antigen is employed and the fixation period consists of two hours in the ice box and one half hour in the water bath at 37°C.

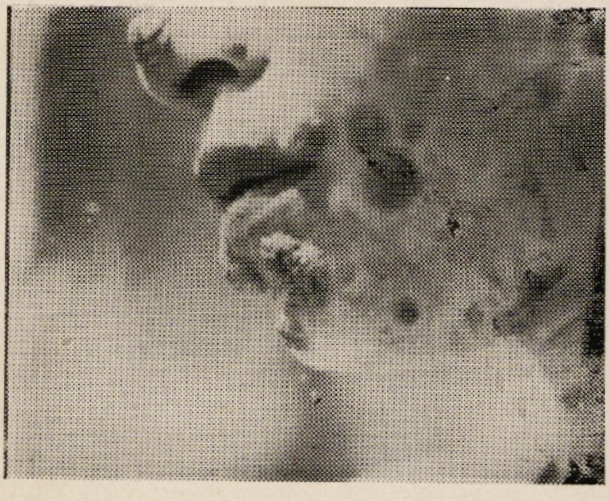
In the survey of 1931, patients and others from whom blood was to be collected were assembled in a school on days previously appointed. In the survey of 1934, some blood specimens were taken in the homes. Transportation was a serious problem, since the area was located about 75 miles from the laboratory and 20 miles from the railroad. In the early stages of the work many specimens were lost because of delay in reaching the laboratory, but this difficulty was overcome by sending a messenger direct to the laboratory as soon as the specimens were taken. The expense was insignificant in comparison with the other costs involved.

Yaws. Primary or initial lesion of the leg.



Yaws. Secondary lesions of the arm.

Yaws. Typical lesions (nails, *clavos*) on the plantar surface of the foot.



Yaws. Secondary lesions about the face.

DISCUSSION

It is a well known and established fact that the Wassermann reaction is positive in the majority of yaws patients. In our study of 94 persons, each of whom showed manifest lesions of the disease, 78.2 percent gave a positive Wassermann reaction. Three years later the Wassermann and Kahn tests were repeated on 65 of these patients who had been treated and kept under observation. The Wassermann reaction was positive in 56.9 percent (Tables 1 and 2). This indicates that, despite repeated treatment with arsenic salts, the Wassermann reaction persisted as positive in over 50 percent of the patients, notwithstanding the disappearance of clinical manifestations of yaws. Table 3 shows the results

TABLE No. I

PERSONS HAVING ACTIVE YAWS LESIONS IN 1931, CLASSIFIED BY WASSERMANN REACTION BEFORE TREATMENT AND IN 1934

	Total Number of Cases	Wassermann Reaction							
		Negative		Positive				Test not Performed	
				One or Two Plus		Three or Four Plus			
		1931	1934	1931	1934	1931	1934	1931	1934
Males	67	12	21	10	6	44	19	1	21
Females	27	8	7	3	4	15	8	1	8
Total	94	20	28	13	10	59	27	2	29

of the Wassermann reactions in persons with a history suggestive of yaws but without active lesions of the disease, before treatment was begun and again in 1934. The study of the Wassermann reaction in the general population where the disease was endemic, showed results more or less similar to those obtained during the same year in a survey of the Wassermann reactions of the population of the rural zone of Puerto Rico, carried out by one of us (Costa Mandry). Table 5 shows the percentage of positive reactions to the Wassermann and the Kahn tests in the different rural municipalities of Puerto Rico in which the survey was carried out. Two municipalities, Adjuntas (Guayabo Dulce) and Arecibo (Esperanza), were in close proximity to Río Abajo,

TABLE No. II

PERSONS TREATED, CLASSIFIED BY NUMBER OF TREATMENTS AND LAST WASSERMANN REACTION

Result of Wassermann Reactions	Cases		After One to Six Treatments				After Seven to Twelve Treatments				After More than Twelve Treatments			
			Male		Female		Male		Female		Male		Female	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Negative	44	45	12	50	8	53	17	46	1	20	3	43	3	33
Positive (+ or ++)	17	17	4	16	3	20	6	16	1	20	1	14	2	22
(+++ or ++++)	36	37	8	33	4	27	14	38	3	60	3	43	4	45
No Test	7	6	5	17	2	11	...	...	...	...	...	...	...	...
Total	104	...	29	...	17	...	37	...	5	...	7	...	9	...

TABLE No. III

PERSONS WITH HISTORY SUGGESTIVE OF YAWS BUT WITHOUT ACTIVE LESIONS IN 1931, CLASSIFIED BY WASSERMANN REACTION BEFORE TREATMENT AND IN 1934

	Number of Cases	Wassermann Reaction						
		Negative		Positive				Test Not Performed
				One or Two Plus		Three or Four Plus		
		1931	1934	1931	1934	1931	1934	1934
Males	23	0	8	12	2	11	0	13
Females	11	1	2	6	1	4	1	7
Total	34	1	10	18	3	15	1	20

where yaws was endemic. The Wassermann and Kahn reactions among these groups were very close in their positive figures to those obtained from the population free from manifestations of yaws in Río Abajo, except in the age group 7 to 14 years, in which the positive percentage was higher in Río Abajo. It was in this age group that the majority of cases of yaws occurred in this municipality.

The number of cases under observation in this study is not large enough to serve as a basis for definite conclusions, but a brief analysis may serve as a guide for the conduct of future control measures.

In a community with a total census of 1,091, active lesions, diagnosed as those of yaws, were found in 94 persons. In addition 34 persons were found to have a history suggestive of yaws but no active manifestations of the disease. The Wassermann test was performed on 517 persons, of whom 411 gave negative reactions, 32 gave reactions of one or two plus, and 74 gave reactions of three or four plus. These results are compared with those obtained in Costa Mandry's study of the general population and of two rural communities near the one studied, in which living and social conditions were similar (Tables 4 and 5).

Tables 1 and 2, showing the Wassermann reaction of treated persons demonstrate clearly that optimism based on the disappearance of clinical signs of yaws is not justified. After thirty months of consistent efforts at treatment, at least 53 persons among the 104 treated still showed positive Wassermann reactions. The reactions among persons who had had twelve or more treatments were not significantly different from those of persons who had had fewer treatments.

It must be concluded that, to rid a community of this infection, still more intensive efforts must be directed to treatment of the known cases. Conclusions on epidemiology in this zone must be left for further study. It can be said that the infection appears to have been present for many years and to have spread in families, the appearance of one case leading to others among intimate contacts. It appears also that the school has served as a central point of distribution, for many first infections in families new in the community occurred in school children.

TABLE No. IV

RESULTS OF THE WASSERMANN AND KAHN REACTIONS IN THE UNSELECTED RURAL INHABITANTS OF PUERTO RICO AND THE INHABITANTS OF RIO ABAJO WITH NO CLINICAL MANIFESTATIONS OF YAWS BEFORE PUBLIC HEALTH MEASURES WERE INSTITUTED IN 1931 AND AGAIN IN 1934

Age Groups in Years	Test	Percent of Positive Reactions		
		1905 Unselected Rural Inhabitants Utuado Excluded 1931	Río Abajo—Utuado	
			484 Inhabitants 1931	377 Inhabitants 1934
Under 7	Wass.	.....	3	3.1
	Kahn	.....	3.1	3.1
7—14	Wass.	1.72	9.4	4.9
	Kahn	2.3	8.1	4.8
15—19	Wass.	3.96	5.4	10.7
	Kahn	4.24	3.9	13.3
20—44	Wass.	6.59	6.3	7.5
	Kahn	6.46	5.5	7.5
Over 44	Wass.	8.13	5.8	8.5
	Kahn	8.91	4.4	8.5
All Ages	Wass.	5.03	7	6.1
	Kahn	5.3	7	6.4

Table 6 shows the results of the Wassermann test in 1934 in persons who gave a negative reaction in the first survey of 1931.

TABLE No. V

POSITIVE WASSERMANN AND KAHN REACTIONS AMONG THE RURAL POPULATION IN DIFFERENT MUNICIPALITIES IN PUERTO RICO

Municipality	Rural Districts	Number of Tests Performed	Percentage Positive	
			Wasser man	Kahn
Aguadilla	Aguacate	208	5.28	7.21
Arecibo*	Esperanza	322	5.90	4.96
Caguas	Borinquen	279	6.09	6.09
Adjuntas*	Guayabo Dulce	327	2.44	2.75
Humacao	Candelero	203	5.91	6.40
Río Piedras	Quebrada Arenas	337	4.45	4.74
Loíza	Medianíá Alta	229	6.11	6.55
Total		1,905	5.03	5.30

* Rural areas in close proximity to Utuado (Río Abajo)

TABLE No. VI

RESULTS OF THE WASSERMANN TEST IN 1934 ON PERSONS WHO GAVE A NEGATIVE REACTION IN 1931

	Number of Tests 1931	Results of Test 1934		
		Negative	Positive	No Wassermann Available
			Two or Three Plus	
Males	180	56	1	23
Females	211	72	1	138
Total	391	128	2	261

Table 7 shows the results of the Wassermann tests in a group of inhabitants on whom the test was not performed in 1931.

TABLE No. VII

WASSERMANN REACTIONS IN 1934 OF PERSONS ON WHOM THE TEST WAS NOT DONE IN 1931

	Number of Tests	Results of Tests			
		Negative	Positive		No Tests Available
			One or Two Plus	Three or Four Plus	
Males	273	45	1	2	226
Females	299	59	.....	3	237
Total	572	104	1	5	462

Table 8 shows the results of the Wassermann tests on persons in whom yaws appeared after the first survey of 1931.

TABLE No. VIII

WASSERMANN REACTION ON CASES WHICH APPEARED SUBSEQUENT TO SURVEY OF 1931

		1931			1932			1934		
	Number	Negative	Positive	No Test	Negative	Positive	No Test	Negative	Positive	No Test
Males	7	4	.....	3	3	2	2	2	2	3
Females	7	5	.....	1	2	2	3	3	2	2
Total	14	9	.....	4	5	4	5	5	4	5

SUMMARY

1. A study of endemic yaws in a rural community of Puerto Rico and the results of the intensive method of control are here presented. The number of cases studied is not large enough to serve as a basis for definite conclusions.

2. A positive Wassermann reaction was obtained in 78 percent of persons with definite manifestations of yaws and in 10.5 percent of persons with a history of having had the disease but with no clinical manifestations at the time of examination.

3. About 50 percent of the persons who originally had clinical manifestations of yaws gave a positive Wassermann

reaction after three years of intensive treatment with neoarsphenamine and after all clinical evidence of the disease had disappeared.

4. As evidence of the cure of the infection, the mere disappearance of the lesions has no value; therefore, efforts to control the disease must be based on frequent serological examinations of the blood.

5. All the evidence brought out in this study indicates that intimate contact is the most important factor in the transmission of yaws.

6. More intensive treatment must be directed toward the known cases to rid the community of the infection.

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