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THE PREVALENCE OF YAWS (FRAMBESIA TROPICA) IN THE UNITED STATES*

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Among the more serious diseases of the tropics, yaws or frambesia tropica is of interest not only because it is striking in appearance, easily communicable and disabling, but also because of its close resemblance in many respects to syphilis. Though often simulating syphilis both clinically and pathologically, it is a much less serious disease, as it does not attack the central nervous system or viscera and is not transmitted by heredity. It is, furthermore, much more easily eradicated by arsphenamin than is syphilis. It is with the object of discussing the prevalence of yaws in the United States and recording a case recently observed in New York that this communication has been written.

REPORT OF CASE

History.—L. C., aged 18 years, unmarried, a full blooded negress, born in Montserrat, British West Indies, applied for treatment at the dermatologic department of the Harlem Hospital, Nov. 30, 1921. Her parents and an only brother, aged 17 years, were living and well. None of her family, to her knowledge, had ever suffered from a similar disease. She did not remember having had any of the diseases of childhood and had been attended only once in her life by a physician, when suffering from cramps incident to menstruation. The menses were established at 13, and since then had been regular.

The patient had lived all her life on the island of Montserrat until July 10, 1921, when she sailed for the United States, arriving in New York, July 22. About two weeks before leaving Montserrat, she had come in contact with two young children who were suffering from sores on the face and hands. On inquiring of the parents as to the nature of these sores, she was told that a physician had said that the children were suffering from yaws. On arriving in New York, she secured work by the day as a housemaid. As far as she was aware, none of the people with whom she came in contact had any disease

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Fig. 1.—Generalized eruption consisting of individual and grouped lesions covered with crusts, some of them suggesting the appearance of a corymbiform syphilid.

of the skin. The patient was certain that she had been entirely free from any eruption until November 10, when she noticed on her right thigh a "pimple" which occasioned considerable itching. It grew larger and in a few days attained its maximum size, that of a 5-cent piece.

Coincident with the first appearance of this lesion, she began to suffer from headache and rheumatic pains in the left shoulder and chest and from sore throat. The pains had continued to the time of treatment. She had not suffered from malaise or fever. About one week after she had first noticed the lesion on the thigh, the rest of the eruption which she now presented made its appearance. Some of these lesions, she stated, lasted only a few days, leaving a scaly surface after their disappearance. She said that she had had sexual intercourse only once in her life, five or six weeks before the appearance of the eruption.

Physical Examination.—Examination revealed that the patient was well nourished and in apparent good health. She weighed 125 pounds (57 kg.) and was 5 feet and 1 inch (1.5 meters) in height. The eruption consisted of about thirty individual and grouped lesions, varying in size from that of a split pea to that of a silver quarter. They were distributed as follows: on the scalp, there were six lesions; on the face and neck seven (the largest being about the size of a 10-cent piece), and on the trunk and arms, twelve, the largest being the size of a quarter. In the midscapular region were two large lesions surrounded by a number of smaller satellites resembling a corymbiform syphilid. The eruption on the lower extremities was confined to a single lesion on the anterior aspect of each thigh and a flattened macerated patch on the sole of the right foot, the macerated appearance being partly due, perhaps, to a poultice which she had applied.

The individual lesions were all painless, and fairly firm to the touch. They gave the appearance of being superficially attached to the skin. Some of them were dry and scaly; others were covered with dirty, yellowish crusts, suggesting an impetigo. All of the lesions, except the dry ones in process of involution, exuded pus on pressure; and, when the crusts were removed, a red, papillomatous, raspberry-like surface was presented. When the lesions were irritated by friction, there was a profuse serous discharge. Under the breast, there was a patch from which the crust had been removed by friction and maceration, giving the appearance of a syphilitic condyloma. The mucous membranes of the mouth and genitalia were entirely free of any eruption. The palms were also unaffected. The eruption did not cause any disagreeable odor, the patient being very cleanly in her habits.

Laboratory Examinations.—Examination by dark-field illumination of the serous discharge revealed large numbers of spirochetes indistinguishable (by the ordinary observer) from *Spirochaeta pallida*. These examinations were made on several occasions by Dr. Howard T. Phillips (a former associate). A Wassermann test by the New York Board of Health was reported negative, December 2, while a similar examination by Dr. Oliver Hillman gave a four plus reaction with both cholesterinized and crude alcoholic antigens.

Animal inoculations were made by Drs. Wade H. Brown and Louise Pearce of the Rockefeller Institute, who reported: "Examination of fluid obtained from several nodules from patient L. C., Dec. 20, 1921, showed an abundance of long and delicate spirochetes of the type *Treponema pertenue*. Inoculations were made from this fluid into the testicles of four normal rabbits. One of the animals inoculated developed a secondary bacterial infection. The others

showed practically no immediate reaction. Within three to four weeks, there was a definite inguinal adenitis in all animals, and there was suggestive enlargement and increased tension of the testicles. The adenitis persisted for some time. The testicular condition, however, subsided. At the end of six weeks, transfers were made from lymph nodes of two of the original animals. These animals gave a reaction analogous to those of the first group, but the lesions which developed in the testicles were very slight, consisting chiefly in slight swellings and increased resistance, with some thickening of the tunics.

"Castration of one of these animals performed eleven weeks after inoculation showed slight but definite enlargement of the testicle, diffuse thickening of the tunics and a small nodule situated in the region of the head of the epididymis. There was also well marked adenitis in this animal. Dark-field examination of material showed no spirochetes, but this material was used for a third series of transfers.

"Examination of another animal inoculated with material from lesion of patient showed, at the end of seventeen weeks, a condition which was more characteristic. Both testicles were slightly enlarged, somewhat congested and over the surface of the tunics there were a number of minute granulomatous nodules which were identical in all respects with tunic nodules, which we have frequently observed in the strain of yaws, originally isolated by Dr. Nichols and studied in this laboratory during the last year.

"The mild reaction in the testicles which followed inoculation of comparatively large numbers of actively motile spirochetes associated with slight but definite lymphadenitis, and finally the production of the tunic lesions described, leads us to believe that there is very little doubt that the infection in this case is due to *Treponema pertenue* rather than to *pallidum*."

Histologic Examination.—December 8, a piece of tissue was excised from the chest, under local anesthesia, and the following histologic report was made by Dr. Walter J. Highman:

"Low Power Zeiss, Ocular 4, Objective A. Epidermis is found thrown up in almost verrucous manner and on account of confluence of strands of epidermis inclusions of papillae are established which resemble small islands. Within these, as well as in the corium underlying the epidermis, is an infiltration.

"High Power, Ocular 4, Objective D.D. The infiltration in the islands is found to consist of lymphoid and epithelioid cells in a lacey network of connective tissue fibers, a high degree of edema present and occasional actual minute abscesses. In the corium the infiltration in general has the same character but added thereto are numerous foci consisting almost entirely of plasma cells filling perivascular spaces about the arterioles, which themselves have slightly, if at all, thickened walls and swollen endothelium.

"Comment: The conditions simulated are tuberculosis verrucosa, syphilis, blastomycosis, sporotrichosis and kerion. Tuberculosis verrucosa is excluded by lack of giant cells and the large number of plasma cells. Syphilis can be less readily excluded but gummas practically never show the verrucoid appearance here exhibited and the vascular changes are on the whole not sufficiently profound. The other three conditions are excluded by the relatively small number of true abscesses. By exclusion, diagnosis remains: Yaws."

Diagnosis.—The patient was presented before the Dermatological Section of the New York Academy of Medicine, December 6 by me (in conjunction with

Dr. B. F. Ochs) as a questionable case of frambesiform syphilis.¹ Having had no previous experience with yaws and having had little opportunity to study the case, we did not wish to hazard a diagnosis of this disease. Dr. Herman Goodman, the only one present who had had any personal experience with yaws, made a diagnosis of this disease from the clinical appearance. Dr. Pearce, who had recently seen cases of yaws in Africa, saw the patient a few days later, and unhesitatingly agreed with this diagnosis, on clinical grounds.

Treatment.—The treatment consisted solely of six intravenous injections of neo-arsphenamin, administered during a period of seven weeks, beginning, Dec. 22, 1921. After the fourth injection, the eruption had entirely disappeared, leaving a brownish pigmentation, which had persisted to the time of writing. The dosage of the first two injections was 0.45 gm., and of the succeeding four injections, 0.6 gm. The subjective symptoms, including headache and pain, had entirely disappeared one week after the first treatment. A second Wassermann test made, April 21, 1922, by Dr. Hillman was reported as plus minus.

Fig. 2.—Large individual macerated yaw of the sole.

Summary.—The patient, a negress of 18, who came directly to New York from the West Indies (Montserrat) where she had always lived and where she claimed to have been exposed to yaws two weeks before sailing, after nearly four months residence in New York developed a generalized eruption which corresponded with descriptions of yaws and which was so diagnosed by two observers who were familiar with the disease. There was a general adenopathy. There were no lesions of the mucous membranes. Spirochetes were found by dark-field illumination. The Wassermann test was positive, and the eruption cleared up readily under neo-arsphenamin. The histologic diagnosis by exclusion was yaws, and the result of rabbit inoculations strongly favored the same diagnosis. The conclusion would, therefore, seem warranted that the patient was suffering from yaws, and that the infection had been imported from the West Indies (where the disease is common) to New York, where even a single case appears to be a great rarity.

1. Fox, Howard: Arch. Dermat. & Syph. 5:411 (March) 1922.

THE LITERATURE

The question of the occurrence of yaws in the United States was discussed in 1915 by Edward J. Wood.² He attempted briefly to mention every case that had been reported in the United States previous to his publication as he had found "the records of yaws in the literature so few." In addition to recording a case of his own, he was able to find only eight other case reports, one of which concerned a patient observed in Canada. I have also been surprised at the small number of cases recorded in this country and have only been able to find a few additional cases which had not been included by Wood and a few cases subsequently reported.

According to Wood, the first authentic reference to yaws in American literature is to be found in a volume by Brickell on the Natural History of North Carolina, etc., published in 1737. In the course of his description, this early writer says "The Yaws are a disorder not well known in Europe but very common and familiar here. It is like the Lues Venerea having most of the symptoms that attend the Pox, such as Nocturnal pains, Botches, foul Eruptions and Ulcers in several parts of the body. . . . This distemper was brought hither by the Negroes from Guinea where it is a common distemper among them. This distemper though of a venereal kind, is seldom cured by Mercurials, as I have often experienced." According to Joseph Jones,³ the first recorded observations on yaws as occurring among the negroes of Louisiana were made by Du Pratz in 1758, in his "History of Louisiana." The author mentions yaws in giving advice to prospective purchasers of negro slaves, saying in the course of his remarks, "You must ask your examining surgeon if he is acquainted with the distemper of the yaws which is the virus of Guinea and incurable by a great many French surgeons though very skillful in the management of European distempers." Roman, in his history of Florida, in 1776 (quoted by Jones) writes "I have seen three or four instances of the disease called body yaws (in the islands) and in Carolina the same distemper. Mercurial medicines are used against it."

Humphreys,⁴ in a letter written to Benjamin Rush in 1770, said that among a number of slaves "was a lad about 18 years of age who was a miserable object; from the disorder called the yaws; he was vastly more affected with it than any person I ever saw, before or since; from his head to his feet he was thickly set with those sorts

2. Wood, E. J.: The Occurrence of Yaws in the United States, *Am. J. Trop. Dis.* **2**:431 (Jan.) 1915.

3. Jones, J.: Medical and Surgical Memoirs of Various Diseases, New Orleans **11**:1184, 1887.

4. Humphreys, T.: Minutes of a Case of Yaws, *Philadelphia Med. Museum* **1**:442, 1805.

of knots or ulcers which that disorder produces when it is in its worst stages."

Van Zandt,⁵ in 1831, reported a case of yaws seen in New York. The patient was a negro cook on board a vessel from the West Indies, who stated that previous to sailing he had slept in a bed in which a "negro had died with the yaws." The disease appeared after he arrived in New York. There were febrile symptoms for a few days, followed

Fig. 3.—General topography of frambesia lesion showing high degree of epidermal hyperplasia (acanthosis) with island-like inclusions of papillae. At the upper left hand corner is an abscess and there is a similar one at the upper right below crust. The distribution of the infiltration is clearly shown. (Low power.)

by an eruption of small pimples not larger than a grain of mustard seed which later became protuberant pustules. One crop of pustules followed another in regular succession. When the patient was nearly convales-

5. Van Zandt, C. A.: Case of Yaws, *New York Med. Chirurg. Bull.* **2**:4 (Nov.) 1831.

cent, there were painful hard swellings of the soles. It is interesting, in view of the present almost miraculous remedy (arsphenamin) for yaws, to read the formulas of seven different prescriptions which the writer had used in treating this patient.

McDowell,⁶ in 1858, wrote a short and rather unsatisfactory report entitled "Framboesia or Yaws." The patient was a negro infant of 2 years. He presented an ulcerating, fungoid growth about the anus which was large enough to interfere with defecation. His mother was a native of Africa and was said to have had the "same disease." About three months previously, the child had had fever and "an eruption over most of the body."

Cartwright,⁷ in the following year, reported a case of yaws associated with vesicorectovaginal fistula. The patient was a negress in New Orleans. The eruption involved the nates and lower abdomen as far as the umbilicus. "Hard excrescences had formed on the spots occupying the integuments of the labia and through fissures in these excrescences granulated pallulations resembling mulberries had protruded distilling a very fetid ichorous humor. The mama pian or mother yaw was situated near the upper commissure of the right labium majus." There were torturing pains by night, and inguinal swellings which were painful and hard but not suppurating.

Doane,⁸ in 1876, wrote a brief and unconvincing report entitled "A case of yaws framboesia or fungoid growth arising from syphilis." The patient was a negress of 35, from Jamaica. The writer stated that she "had a growth (resembling raspberries placed in layers) upon the external and outward portions of the right leg. There was also a small ulcer, undoubtedly syphilitic in its origin. On pressing over the tibia, great pain was caused and upon the back syphilitic papules were seen causing some itching." The writer added that the patient had been seen in consultation with Dr. E. L. Keyes, Sr., "who pronounced the above diagnosis of yaws correct."

Jones,⁹ in 1878, reported a case of yaws in New Orleans in a thorough and painstaking manner. His patient was a sailor, born on an island on the coast of Africa. His father was a native of France, his mother of Africa. He stated that he had contracted the disease three months previously, his ship having been visited by natives suffer-

6. McDowell, G.: Framboesia or Yaws, *New Orleans M. J.* **15**:192 (March) 1858.

7. Cartwright, S. A.: Case of Framboesia and Vesico-Recto Vaginal Fistula, *New Orleans M. J.* **15**:512 (July) 1859.

8. Doane, L. G.: A Case of Yaws Framboesia or Fungoid Growth Arising from Syphilis, *Pharmacist & Physician* **9**:6 (Aug.) 1876.

9. Jones, J.: Observations on the African Yaws, etc., in *Insular and Continental America*, *New Orleans M. & S. J.* **5**:673 (March) 1878.

ing from yaws. During the voyage, he had suffered from severe constitutional symptoms. The eruption first appeared on the face as vesicles, drying to form crusts. It became generalized and was especially severe on the fingers and toes, with swelling and ulceration of the phalanges.

Fig. 4.—Two features of the frambesia lesion stand out in this section: In the center is a transsected arteriole, the perivascular space of which is distended by an infiltration, prevailing of plasma cells. The vessel itself is but slightly altered, if at all. The independent infiltration above is in vague relation to venules and consists of lymphocytes, a few plasma and epithelioid cells, and a moderate number of fibroblasts. This area, with more vascular changes, would be suggestive of syphilis. (High power.)

McCosh,¹⁰ in 1895, presented a case before the New York Surgical Society as "syphilis cutanea vegetans or framboesia." The report was brief, not mentioning yaws and merely describing a "papillomatous excrescence on the tip of the nose which looks much like a large rasp-

10. McCosh, A. J.: Syphilis Cutanea Vegetans or Framboesia, *Ann. Surg.* **21**:46 (Jan.) 1895.

berry." Microscopic examination revealed simple inflammatory tissue. The patient who was an unmarried woman, about 24 years old, had previously suffered, at different times, from rhinitis and sores on the roof of the mouth, throat and nasal septum.

Matas,¹¹ in 1896, writing in Dennis' "System of Surgery," spoke of two patients with yaws in New Orleans. One, he said, was an imported case, that of a mulatto from Mauritius, seen in 1877; the other patient was a full blooded negro seen in 1895. "This patient," he wrote, "was a Louisianan by birth and there is no clue in his history by which contagion may be traced. Still we are loath to believe that this disease can originate de novo in the United States." A photograph showing the patient's face, with numerous warty excrescences that were also said to cover the body, certainly seemed to present a condition characteristic of yaws.

McMurrin,¹² in 1900, in a communication entitled "Yaws and Smallpox," described the clinical symptoms of the two diseases and followed with a report of a classic case of smallpox, for comparison with the report of a somewhat different condition which he surmised might be yaws. An epitome of this report, which was not very convincing, was as follows: The patient was an unmarried woman of 24, who, on the preceding night, had complained of pains in her back. There was no inflammation of the mucous membranes of the mouth and throat. The temperature was 101 F., pulse 100, respirations 20. The next morning the temperature was 100 F. On the fifth day, there was a vesicular eruption on the forehead and hands and a slight eruption on the breast. At this time, the temperature, pulse and respirations were normal. Her condition continued to improve, with no impairment of health. "The tubercles peeled off and I did not observe any pitting on her face." The patient had never been vaccinated.

In 1910, Nichols and Siler,¹³ in separate communications, reported a case of yaws, from both the clinical and pathologic standpoint. The patient was a colored soldier returned from the Philippines, where, according to the writers, his infection had probably occurred. This entailed the rather long incubation period of eighty-six days. The clinical diagnosis was made when the patient was suffering from his second crop of lesions, appearing as typical fungoid papules covered with dirty, yellowish crusts. *Spirochaeta pertenuis* was found by dark-

11. Matas, Rudolph, in Dennis' System of Surgery, New York and Philadelphia, Lea Brothers & Company 4:866, 1896.

12. McMurrin, R. L.: Yaws and Smallpox, Virginia M. Semi-Month. 4:646 (Feb. 9) 1900.

13. Nichols, H. J.: Yaws: with a Demonstration of Infected Tissue, Proc. New York Path. Soc. 10:1 (Feb. and March) 1910. Siler, J. F.: Report of a Case of Yaws, Mil. Surgeon 27:306 (Sept.) 1910.

field illumination in the serous exudate. The Wassermann reaction (Noguchi method) was negative. Inoculation of a monkey's eyebrow was positive, the spirochaeta being found and transferred to rabbits testicles, and transmitted through five generations.

White and Tyzzer,¹⁴ in the following year, recorded another imported case of yaws in the person of a Porto Rican sailor. While the eruption was not at all typical of yaws, a probable clinical diagnosis of this disease was made by exclusion. The eruption consisted of "four strange looking, elevated, dry, tumor masses unaccompanied by any signs of local or general inflammation or disturbance." There was also a general and marked glandular enlargement. The Wassermann reaction was negative (Noguchi method). Puncture of a gland showed "a small infrequent spirochaeta which corresponded sufficiently with Castellani's *Spirochaeta pertenuis*." Inoculation of the eyebrow of a monkey was successful, lesions appearing at sites of inoculation after a period of incubation of sixteen days. Inoculation of the cornea of ten rabbits was unsuccessful. A detailed histologic examination revealed that the epidermis was "markedly acanthotic and hyperkeratotic or moderately parakeratotic." The cutis showed a marked mononuclear infiltration with no giant, epithelioid or plasma cells, the vessels being normal except for moderate dilatation.

Lyle,¹⁵ in 1912, reported a case of "gumma of the liver as a sequel to yaws." The patient was a man, 46 years old, from the West Indies, who gave a history of having yaws thirty-nine years previously. As confirmatory evidence, he stated that at that time he had been isolated, together with two other members of his family, in a "hospital given over to the treatment of yaws." There was no history of syphilis, and a positive Wassermann reaction was obtained only after a provocative injection of arsphenamin. The case was recorded as disproving the relationship between syphilis and yaws as "it has been claimed that an attack of yaws gave an immunity to syphilis."

Wood, in 1915, reported what he considered to be a case of yaws in North Carolina, in an infant whose "parents had always lived in that state and at no time had come in contact with any one from the West Indies or other endemic center of the disease." The importance that this case would assume is unfortunately greatly lessened from the fact that the diagnosis was only made later in retrospect from a study of notes and photographs. There is no mention of any search for spirochetes or of a Wassermann test having been made. The patient was an infant of 5 months who presented a generalized, fungating

14. White, C. J., and Tyzzer, E. E.: A Case of Framboesia, J. Cutan. Dis. **29**:138 (March) 1911.

15. Lyle, H. M. H.: Gumma of the Liver as a Sequel to Yaws, Ann. Surg. **55**:111 (Jan.) 1912.

pustular eruption, part of which was shown by accompanying photographs. The lesions appeared in crops, were autoinoculable and were accompanied by itching and constitutional symptoms. The palms and soles were affected and there was a dactylitis. There was no glandular enlargement. When the patient was seen four years later, there was only a scar on the forehead to indicate the past trouble. According to the mother, all the children in the house had had the disease in milder form.

Davis,¹⁶ in 1916, briefly reported two cases of yaws in a girl of 6 and a brother of 11 years who had apparently acquired the disease during a visit to Porto Rico. The eruption appeared after their return to this country. "The little girl showed one lesion on the lower lip, two in the right popliteal space and one typical cauliflower growth about 3 inches above the right popliteal space and one a few inches below. The boy had a few lesions of the same character on the legs. There was one sister at home who had a very large lesion on the buttock."

Evans,¹⁷ in the following year, reported, in a brief and casual manner, two cases in which the patients were supposedly suffering from some manifestation of yaws contracted in tropical countries. The first patient was a returned missionary, from the South Sea Islands. He gave a history of suffering from frambesia eleven years previously. He presented "callouses or nodules about the size of a grain of wheat on the palmar surface of the index finger and thumb of the left hand. These were itchy and painful. There was also a small elevated spot in the left nostril." The lesions had been present two weeks or less. The second patient was a man who had served in the Philippines during the Spanish-American War. Since then, he had suffered from painful, recurring crops of vesicles and pustules of the soles, causing great pain and difficulty in walking. No spirochetes were found by staining. The eruption disappeared and did not return after one injection of 0.6 gm. arsphenamin.

Stephenson,¹⁸ in 1920, reported fully the case of an American sailor in whom yaws developed while he was stationed at Brest, France. The writer thought the infection probably took place in a barber shop which was patronized by French Colonial troops recently returned from Africa. The patient was transferred to the United States, with the diagnosis of impetigo contagiosa. The eruption consisted of "crusted, circumscribed and pustular foul smelling lesions" of face, scalp and

16. Davis, C. N.: Yaws (Familial), *J. Cutan. Dis.* **34**:466 (June) 1916.

17. Evans, E.: Yaws: A Clinical Report of Two Cases, *Wisconsin M. J.* **15**:380 (March) 1917.

18. Stephenson, C. S.: Yaws; with Report of a Case which Developed in a Temperate Climate, *Mil. Surgeon* **47**:344 (Sept.) 1920.

penoscrotal junction. Some were "granulomatous and not unlike a fig in both color and consistence." When the eruption appeared, the patient had been away from Brest more than nine months. On admission to hospital, the diagnosis of frambesiform syphilis was made. The Wassermann reaction was positive. He was taken to the Vanderbilt Clinic, where opinions differed, the majority considering the disease to be syphilis. However, a Brazilian dermatologist was present that day, and he made the unhesitating diagnosis of yaws. Examination of serum from lesions showed spirochetes. Under arsphenamin, the eruption promptly cleared up and in ninety days the patient was returned to duty. The Wassermann reaction was then negative. A histologic examination revealed acanthosis and a plasmoma and marked polymorphonuclear infiltration, with here and there small abscess formation. There was an absence of changes in the vessels and connective tissue, suggestive of syphilis.

Schamberg and Klauder,¹⁹ in 1921, published an elaborate study of a case of yaws in the person of a white American soldier returned from service in France. The eruption involved the palms, soles, scalp, forearms and penis. There were "brownish-yellow crusts which on being detached disclosed a raw surface consisting of red or yellowish fungoid granulations, secreting a thin, slightly purulent secretion." He gave no history of syphilis. Dark-field examination of the skin lesions showed "spirochetes with the morphological characteristics of *Spirochaeta pallida*." The Wassermann reaction was four plus with several types of antigen. There was a successful inoculation of rabbit testicles, but failure to produce corneal and scrotal lesions in the rabbit by intravenous injection of blood in the acute stage. Several attempts were also made to inoculate a monkey, but without success. The eruption entirely disappeared after a second full dose of neo-arsphenamin. A histologic examination, revealed hyperkeratosis and acanthosis of the epidermal tissue and extensive lymphoid and polymorphonuclear infiltration of the corium, with absence of blood vessel changes. Spirochetes were found in the "leukocytic areas of the apices of the papillae subadjacent to the rete."

FURTHER REFERENCES TO CASES

In the search for further references to cases of yaws in the United States, some dermatologic statistics were consulted. In 1914, a report of the committee on statistics of the American Dermatological Association was published by the chairman, Dr. S. Pollitzer.²⁰ This was

19. Schamberg, J. F., and Klauder, J. V.: Study of a Case of Yaws Contracted by an American Soldier in France, *Am. J. Trop. Med.* **1**:49 (Jan.) 1921.

20. Pollitzer, S.: Report of the Committee on Statistics of the American Dermatological Association, *J. Cutan. Dis.* **32**:312 (April) 1914.

a combined report from various clinics scattered over the United States. It covered a period of thirty-four years, from 1877 to 1911 inclusive, and contained a tabulated list of more than 679,376 cases. In this enormous total, there were only twenty-eight cases of yaws. Thinking that even this very small number of cases had been largely observed in some of the southern clinics, I consulted the individual annual reports of previous years and was surprised to learn that none of these cases had been reported from the south. Of the twenty-eight cases, twenty were reported from Boston alone, twelve of these being seen in the year 1878. Of the remainder, three were reported from Chicago, one each from New York and Philadelphia and two from cities not mentioned. The fact that the great majority of these patients were observed in the large seaports strongly suggests that the disease was imported from some foreign country. In the statistical report of the American Dermatological Association from the year 1916, a total of more than 58,000 cases were reported from seventeen different cities, and not a single case of yaws was mentioned.

OPINIONS AS TO PREVALENCE OF THE DISEASE

It is evident from the small number of cases of yaws recorded in our literature and from the statistics here quoted that the disease is either very rare in the United States or that its presence is unrecognized. Yaws could scarcely be prevalent in the northern part of this country, as it is strictly a tropical disease. It seems evident that the comparatively few cases seen in the northern states are imported from elsewhere. That yaws is more prevalent in the South than is generally supposed is the opinion of Wood, who writes "Since studying the condition more fully I am inclined to suspect that we have been overlooking yaws and that among the negroes the disease has occurred in the South frequently and has been counted as syphilis." Continuing, he says that "every negro is assumed by most writers to be guilty of syphilis until he proves his innocence. Can it be," he adds, "that syphilis is being generally confounded with yaws in this manner and can it explain the well-recognized mildness of present day syphilis among the negro? Surely, we see comparatively few cases of tertiary manifestations among the negro in comparison to that seen in the white man." In a similar vein, McMurrin writes that "a great many of the cases that have been diagnosed by the members of our profession may not have been smallpox but the disease I shall briefly describe" (referring to yaws).

An opposing view to the ones here quoted was expressed by Matas, in 1896, who wrote "How rare yaws has become in this country is demonstrated by the records of the Charity Hospital in New Orleans which show that only two cases have appeared in its clinics in the last

nineteen years. That yaws must be a rarity in the Southern as well as Northern states would seem highly probable to me from the paucity of scientific reports in the South.

In an attempt to obtain further information on this subject, I have recently corresponded with a number of dermatologists in the South. Of the ten correspondents who answered a brief questionnaire, only one, Dr. H. E. Menage of New Orleans, had personally seen a case of yaws in the United States. This was a case observed "years ago at the Charity Hospital," which, he wrote, "we took for yaws," and added "if my memory serves me correctly he was a negro, native born." The others who wrote that they had not encountered the disease in this country were Drs. Marcus Haase (Tennessee) J. B. Shelmire, I. L. McGlasson and E. D. Crutchfield (Texas) J. L. Kirby-Smith (Florida) J. H. Edmonson (Alabama) E. P. McGavock (Virginia) C. O. Abernethy (North Carolina) and J. H. Fox (Mississippi). Of these, Dr. Kirby-Smith had formerly studied the disease in the Philippine Islands. He wrote "I am sure I would recognize yaws when seen in my practice." In answer to the question as to whether yaws was at all prevalent in the United States at present, all answered in the negative except one (Dr. McGavock). All who expressed an opinion regarding the former prevalence of the disease (in slavery times) answered in the negative. In this connection, Dr. Haase wrote "I do not think it was prevalent among the slaves as the negroes were excellently cared for at that time because they were valuable property"; an opinion that coincides with my own regarding some other skin diseases in the negro.

The question of the former prevalence of yaws among the negro slaves imported from Africa, particularly in the seventeenth and eighteenth centuries, is purely a matter of speculation. One thing seems certain, namely, that the disease has never gained a foothold and become endemic to any degree in the United States. From his study of the subject, Jones concludes that "the yaws is an African disease and disappears gradually when introduced upon the North American Continent."

Granted that yaws has not obtained a permanent foothold in the southern states, such an occurrence in the future would seem to be within the range of possibilities on account of the prevalence of the disease in neighboring countries. In his volume on the "Geography of Diseases," Clemow²¹ says, in regard to yaws, that the West Indies "form one of the most important centres in the world of this disease." According to this writer, it is especially prevalent in Jamaica, Guadeloupe, Martinique, Trinidad, St. Lucia, Grenada, Antigua and Dominica

21. Clemow, F. G.: *The Geography of Disease*, London, C. J. Clay & Sons, 1903, p. 560.

It appears uncommon in Central America, but is fairly widely distributed in South America. The great prevalence of yaws in Santo Domingo is shown in a recent and most instructive study of 1,046 cases by Moss and Bigelow.²² During the last two weeks of their stay in the island, the daily number of new and old cases ranged between 100 and 300.

If yaws by some possibility should become endemic in the southern part of the United States, it would not be a great cause for alarm. Though the disease is a most undesirable one, its diagnosis can now be aided by laboratory methods, and its successful treatment by arsphenamin constitutes one of the great triumphs of modern medicine.

CONCLUSIONS

1. Whether yaws was prevalent in the Southern states during the earlier days of slavery appears doubtful. It is a question at all events that can never be settled.
2. Yaws is a rare disease at the present time in the United States, in spite of its great prevalence in certain parts of the West Indies.
3. The majority of the recorded cases have been observed in our northern seaports and have evidently been imported from foreign countries.
4. Yaws would probably never thrive in the northern states as it is purely a tropical disease. With modern laboratory aids to diagnosis, and treatment with arsphenamin, the disease could easily be eradicated if it ever obtained a foothold in the Southern states.

DISCUSSION

DR. JOHN E. LANE, New Haven: Dr. Fox's reference to the history of yaws in this country reminds me that the Rev. John Clayton, in 1687, referring to Virginia, wrote to Dr. Nehemiah Grew of London as follows: "Among the Indians they have a Distemper which they call Yaws, which is nearly related to the French-Pox; which they are said to cure with an Herb that fluxes them. But this I have only by Hear-say." A description of yaws is given in a book attributed to John Tennant, published in Annapolis about 1730, entitled "Every Man His Own Doctor, or the Poor Planter's Physician." The treatment described in this book is rather interesting. A decoction of sumac root, bark of pine and bark of spanish oak was used for purge and emetic, and in addition two pills made of equal parts of deer's dung and turpentine were to be taken at bedtime.

DR. WILLIAM ALLEN PUSEY, Chicago: I think Dr. Fox has done a service to us in giving the facts of this matter in America. It is gratifying that yaws has not obtained a foothold here. This is rather difficult for me to understand, because communication between gulf ports and the West Indies has been very intimate since the settlement of the country; the conditions among the negroes in the subtropical districts along the gulf are very like those in the West Indies, and it is very remarkable to my mind that the disease has not

22. Moss, W. L., and Bigelow, G. H.: Yaws: An Analysis of 1,046 Cases in the Dominican Republic, *Bull. Johns Hopkins Hosp.* **33**:43 (Feb.) 1922.

obtained a foothold there. This suggests the possibility that there is some other factor in its propagation, which is not included in the ordinary term "tropical climate," because the tropical and other features of the climate of a good part of our gulf border are not unlike those of the West Indies. The only part of Dr. Fox's conclusions that I would be inclined to say is not self-evident is the view that yaws cannot get into this country because it is a tropical disease. I should say rather that the possibility of its communication to this country is exceedingly unlikely, owing to some factor as yet unknown, because it may be some other thing—perhaps the variety of sugar cane or of bananas which these people eat—rather than the climate that is responsible for the disease.

DR. CHARLES J. WHITE, Boston: I am sorry to say that I cannot enlighten the association on the great number of cases recorded in Boston. I was entirely unaware of such an occurrence. It was before my day, of course. We cannot account for it in the way of immigration; we do have some inhabitants from the Cape Verde Islands, but, so far as I am aware, they do not have yaws. The man we saw was treated with iodid of potassium and the lesions disappeared very quickly.

DR. JAY FRANK SCHAMBERG, Philadelphia: From the clinical photographs and the histologic pictures shown by Dr. Fox, it is evident that his is a classic case of yaws. The pictures are almost identical with those in the case reported by Dr. Klauder and myself. There are some points of general interest. In the first place, I believe it is beyond the powers of any man to distinguish between *Spirochaeta pallida* and *Spirochaeta pertenuis* under the dark field. But you will find that the field will swarm with spirochetes in yaws; whereas, in the secondary eruption of syphilis, they are sparse. We also found that *Spirochaeta pertenuis* was very difficult to stain with coloring agents that are very quickly taken up by *Spirochaeta pallida*. Another point is the difficulty of perpetuating this infection through successive generations of rabbits. Dr. Klauder succeeded in carrying it through a series of rabbits, but after a time lost it. We sent a strain on to Dr. Nichols of the Army and after a time his strain died out too. It appears to be easier to perpetuate *Spirochaeta pallida* than the spirochete of yaws.

A matter of importance is that, in this disease, we have an infection very strongly resembling syphilis, yielding a strongly positive Wassermann reaction, exhibiting a spirochete difficult to differentiate, and succumbing to the same arsenicals as syphilis. This may readily cause confusion in diagnosing the disease and, by a posteriori reasoning, it may lead to injustice to men enlisted in the Army or Navy. This happened in the case we reported. A soldier in France contracted a disease which was diagnosed as syphilis but which was proved to be yaws. If it had been syphilis, the man would not have been entitled to compensation because the disease would then not have been contracted in the line of duty. I think the diseases are of common origin, but in yaws the spirochete has become attenuated and is readily destroyed. The organisms in yaws appear to be very easily exterminated by a few injections of neo-arsphenamin. They are occasionally found in the spleen. An observation that may shed some light on our obscure comprehension of the significance of a persisting positive Wassermann reaction is this: While there is a very rapid disappearance of the lesions in yaws after one or two injections, the Wassermann reaction does not clear up right away. There is nothing in the literature on this, but in the case studied by us we made tests from week to week, and in spite of the prompt disappearance of the lesions, there was a very slow disappearance of the positive Wassermann reaction.

It was still slightly positive when the patient disappeared from observation. What is the significance of this persisting Wassermann reaction? Does it mean that the arsphenamin treatment killed most of the spirochetes and that those that survived were gradually destroyed by the natural defenses of the body, or does it mean that all were destroyed and that the positive Wassermann reaction was due to the presence of antibodies in the blood? In view of the fact that the statement is commonly made that yaws is cured by one or two injections of one of the arsphenamins, it is urged that the Wassermann reactions in these cases be followed up.

DR. CHARLES M. WILLIAMS, New York: This case is of interest in connection with the case I presented before the New York Academy of Medicine which was diagnosed syphilid. I think the evidence is correct. The resemblance of yaws to syphilis is exceedingly close; and, if a man is not on the lookout for yaws, the diagnosis is rarely made. Considering how many men treat syphilis and how few think of yaws, there is opportunity for a great leak. There are two points in the diagnosis. The case of Dr. Fox is classic. One special point is the great number of lesions. This is a diagnostic point between yaws and the lesions of syphilis. Very often we think of secondary syphilis as being all over the body, and this is ordinarily the case; but, in my experience, there have been very few lesions in the cases of frambesiform syphilis; whereas, in yaws, there are many. Also, in looking up the literature in my own case, I found that lesions on the scalp and over the forearm are a very common feature in yaws.

DR. E. L. OLIVER, Boston: I should like to say a few words about the case Dr. White reported. I was working under Dr. White at that time, and one of the tests mentioned in the literature of this disease is the lack of sensitiveness of the lesions to acetic acid. In the case reported by Dr. White, I removed the crust covering one of the lesions and then applied 30 per cent. acetic acid, and I found that the lesions were totally insensitive to the acid, although they looked as if they would be very sensitive.

DR. MARCUS HAASE, Memphis: It is easy to understand why yaws was not imported to the United States during the time of slavery. The dealers naturally picked the specimens that they brought to the Southern states. These men were placed on the block with nothing more than a strap on, if they were not entirely naked, when they were shown by the auctioneer, and naturally they would not bring one into the country with any such blemishes as yaws would produce.

DR. HOWARD FOX, New York (closing): In regard to Dr. Schamberg's remarks concerning the profusion of spirochetes seen by the dark-field illumination, this was apparent when our examinations were made. I do not feel that the average observer could possibly distinguish morphologically between *Spirochaeta pallida* and *Spirochaeta pertenuis*. That the organisms, as Dr. Schamberg mentioned, have been found in the spleen, is true, but they do not seem able to obtain a foothold in this or other internal organs and produce any damage. It does not seem probable that yaws could become endemic in temperate climates. Up to the present time, it has been a strikingly tropical disease, and it has been said that in the tropics it is not encountered at an elevation higher than 800 feet. Dr. Williams' suggestion that many cases are overlooked is perfectly plausible. The disease in the United States must either be rare or unrecognized. It seems unlikely that yaws is really prevalent considering the present large number of well trained dermatologists scattered over different sections of the United States.

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