

THESIS ON

Clinical Observations on Yaws
as studied on the West Coast of
Africa 1922 - 1936.

by

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EXTENT OF WORK DONE.

Foreword and Conditions of Work.

(1) That the close observation of a Disease, in its efflorescent stage typical, and in its tertiary stage to be diagnosed by a simple laboratory test, is of any great value, may not at first be apparent. My own experience in West Africa coincides with the experience of practitioners elsewhere, viz:- in Yaw clinics (a) Patients are too numerous, (b) Country Districts are far removed from laboratory aid, (c) In the larger towns where laboratory aid might be obtained, patients come and go, and the result of a laboratory diagnosis is only useful in a very few cases. Recognition of the aberrant secondary forms, and some knowledge of the pathological processes underlying the numerous tertiary forms are therefore imperative if any sort of rational treatment is to be given.

(2) This thesis has been gleaned from the clinical knowledge gained as follows:-

(a) Six years in the Northern Territories of the Gold Coast, where I acted as M.O., M.O.H. of a large District. (Yendi). Here Yaws were very prevalent and at the time of my taking over, little or no treatment had been carried out.

(b) Eighteen months in the Gambia in charge of Mother

and Infant Welfare Work. Owing to the nature of the work, Yaws was not treated in either of the clinics, and I saw few cases.

(c) Five years in the Kibi District of the Gold Coast as private practitioner and occasional relieving M.O. Yaws are very prevalent in Kibi.

(3) Particulars of Tribes etc. shown on adjoining maps.

(4) Extracts from Reports and cases quoted were written at the time of observation. Conclusions arrived at bear directly on the work done. Numerous photos were taken but were lent for propaganda work. There is therefore a paucity of illustrations, but the principal points are, I think, demonstrated in the accompanying prints.

SOCIAL FACTORS associated with YAWS.

1. The temporary disablement of the second stage and the chronic disablement of some forms of the tertiary stage have a very important economic effect on a community.

2. Owing to its mode of dissemination, Yaws is more prevalent among people of insanitary habits:- the unclothed and semiclothed, the poorer classes and bush dwellers.

3. Amongst the comparatively wealthy who practise polygamy, the hoarding together in their sleeping quarters of the smaller children with very little covering tends to the promulgation of the disease.

4. The sleeping arrangements to some extent account for the prevalence being greater amongst boys than amongst

girls. Girls are more clothed, and better cared for as to their sleeping quarters, - this for their own protection, and because they act as attendants for older people.

5. The external conditions of a community where Yaws is prevalent give rise to the internal association of the disease with devitalising factors - avitaminosis, intestinal parasites, (especially round worm) scabies, any disease common in the District, gonorrhoea, malaria~~ct~~. These things are the common associates of the Yaw ~~S~~pironema in its host. Though Yaws itself may not be a direct cause of Death, it is not a disinterested factor in the death rate. "An underlying cause of ill-health may be of greater importance than an evident cause of death."

Sir Malcolm Watson. Lancet. Feb. 1936.

6. Although these factors affect treatment and render the hope of controlling the Disease remote, still it is slowly but surely receding before the advance of civilisation, education and a higher standard of living. Meanwhile in private practice there is a lack of funds to pay for lengthy treatment, and in an ever growing clinic such as I held in Yendi, the Government supplies of drugs were constantly being exhausted.

CONTINUITY OF OBSERVATIONS.

Patients travelled great distances for treatment. Their home duties and their own mental outlook made attendance, after the alleviation of urgent symptoms, unlikely.

Deductions as to the progress of the disease have there-

fore to a great extent, been made from the same forms at different stages in different patients. Comparative observations as to the value of different treatments were difficult. Cases quoted are examples taken from a large number of similar cases.

SYNONYMS. Framboesia. Yaws. Pian. Boubas.

(Brazil) Coke (Fiji) Parangi (Ceylon), Dube. Jagga (Gold Coast. N.Ts.) Gyataw, (Gold Coast Colony. Twi)

AETIOLOGY. The cause of the Disease known as Yaws is the ^{Spirochaete} Spirochaete Pertenuis discovered by Castellani in 1905, and practically identical with the Sp. Pallidum.

Opinions vary as to whether the coils are as sharp and regular as those of Sp. Pallidum. After taking numerous slides I thought that some irregularity might be detected, but had no means of measuring. Weight of evidence seems to point to the existence of two separate Spirochaete^s. Van Nitsen R., Lejeune E., Miguens, Serra G. and Van Den Branden. "Yaws always produces Yaws." "Syphillitis always produces Syphillitis." M'Kenzie Alan gives a case of syphillitic infection in a man suffering from uncured Yaws. Blacklock and others reserve judgement. I found the Spirochaete^s numerous in serum from primary and secondary sores. I took slides from twenty cases of Clavus and from many more of Gangosa and Ulceration, but recovered the Spirochaete from no case of tertiary Yaws. From Clavus, Gangosa etc. there was a mixed infection with very large bacilli predominating.

In the primary and secondary sore the blood reaction is at first polymorphnuclear, but very shortly plasma cells appear and the reaction becomes fibroblastic. The circulating blood did not give any definite picture attributable to the condition, as obscuring factors e.g. malaria, intestinal parasites, guinea worm, etc. were invariably present. I did not recover the Spironema from the circulating blood nor from the serum from enlarged glands.

Whether the Spironema, either not recovered, or in a different form, is directly the cause of the tertiary manifestations, whether these are an allergic reaction, or due to a toxin circulating in the blood is open to question.

INFECTION AND DISSEMINATION.

1. Yaws is chiefly spread by direct infection from one person to another, an abraded surface on one person coming into contact with a yaw on another.

2. In the Colony the natives believe it to be spread by the use of the same rough sponge when washing. The sponge in general use is made of fine, dried, white grass and is much rougher than any loofa. These sponges are used on the smallest infants.

3. By the use of the same clothing when it comes into close contact with the body.

4. In the N.Ts. there was a common belief that flies passing from one sore to another could carry Yaws.

5. By the deposit of fresh pus from a yaw sore being

rubbed or pressed into an abraded surface.

6. Spread by bite of flies or other insects can, I think, be negatived.

1. Infection by contact. Yaws generally starts at points of possible contact. In Infants the first sore is often round the mouth or nose, due to sucking an infected mother. Or, on the lower abdomen, due to being carried on the back of an infected person. Mother to Child and Child to Mother is common. // Number of consecutive Mothers with Infants reporting with Yaws. All the Infants were under two years and breast fed.

1/	Infants with Yaws. Mothers not affected.	64 cases.
2/	Mother and Infant developed the disease at the same time.	
	Duration 1 year 15 cases.)	
	" 5 months... .. 2 "	
	" 4 " 1 "	
	" 3 " 4 "	
	" 2 " 5 "	27 cases.
3/	Mother had had Yaws for some time.) Child had developed it recently.)	... 18 cases.
4/	Both had developed Yaws recently but the Child at a later date than the Mother	... 6 cases.
5/	The Child had developed Yaws first and the Mother later	... <u>8 cases.</u>
	Total	<u>123 cases.</u>

These figures not only show transmission by contact, but they establish immunity on the part of many Mothers, also they suggest that the Mother is more apt to give Yaws to a sucking Infant than the Infant to the Mother.

Case. Yendi 1924. Old man with dried up sore of lower

abdomen developed a secondary rash a week after reporting with an ulcer. He was in the habit of sitting in the evenings, practically naked, nursing a naked grandchild covered with Yaws. When he first reported, the true nature of the case was overlooked, because of his advanced age.

2. Infection by Sponge.

Case. 26/11/35. Child 10 months old, secondary rash. Only known source of infection, Brother of 10 years who was in the habit of using the Child's sponge.

Case. 20/1/36. Child 3 years old acquired yaws from older brother. Both used the same sponge.

Information in both these cases reliable. There was little chance of bodily contact.

3. Infection by use of the same clothing.

Case. A Child six months old with large primary inside posterior end of left labium and extending on to the perineum, was brought together with sister of three years old with primary in natal cleft and wide spread secondary. On questioning the Mother, she admitted that she frequently interchanged the children's small cloths - a mistake which might easily be made while bathing the children, and which she made in my office when she went to reclothe the children after examination. The position of the primary on the smaller child almost precluded any other mode of infection.

4. Infection carried by flies passing from one sore to another. This may be possible but I have no information on this mode of dissemination.

5. Infection by contact with Yaw secretion. By deposit of pus from Yaw sore being sat on by person with abraded buttock. In the N.T. clinic, so high was the incidence of the site of the primary sore in the small naked boys, on the area over the ischial tuberosity, that this mode of dissemination could not be overlooked. I have not seen a primary on this site in the Colony where even small children wear ^{some} sort of bathing pants or covering.

Case. 1925. Brothers apparently the same age had primary sore of buttock followed by secondary Yaws.

6. Infection by bite of flies or other insect. From 1923 - 1928 I met no case of secondary Yaws in the residential Schools. The children were examined at the beginning of each term for admission, and readmission. Though within a short distance of a Yaw infected village, the fact that many of the kinder-garten children had not yet had Yaws, did not give rise to any outbreak in the Schools. There were various outbreaks of the common infections. None of my staff has ever contracted Yaws in the course of their work. In Yendi, and the outstations to which we trekked, flies abounded. I have seen a child brought in with its face so covered with flies as to be invisible. Though I took every precaution, I was constantly being bitten; my staff were less protected and more bitten. In the Schools we were constantly on guard against invasions of bed bugs. Taking into consideration the length of time I worked in these Schools, we would have had some outbreak of Yaws, had it been carried by a portable host such as insects or bugs.

Among bush tribes pediculosis capitis is common, but the body louse is uncommon. Though secondary Yaws of the scalp is fairly common, I have not seen a primary of the scalp.

Transmission during the Tertiary Stage. All my experience goes to show that no form of the tertiary stage is at any time infectious for Yaws, and that no case of

primary or secondary Yaws has arisen from contact with a case in the tertiary stage.

AGE AND SEX.

No age and neither sex is immune. Because of the great care taken of neonatal infants they do not often acquire Yaws, but this I do not consider any sign of immunity at birth. Frequently in the N.Ts. where the adult population suffered widely from Yaws, Infants under three months were brought to the clinic covered with secondary Yaws. In Suhum, 1936. an Infant of 12 days was brought suffering from a small secondary Yaw rash. I went carefully into this case and discovered that the child had since birth been carried on the back of a small nurse maid who herself had Yaws. The Mother had neither sign nor history of Yaws. The umbelical cord has no dressing amongst these people, and the only cause that suggested itself for the rapid inoculation and spread, was through the wound of the cord.

Again the old man to whom I have already referred shows that though there seems to be a certain immunity in old age, it is possible to acquire the Disease even in advanced age. I have treated quite a few old people for secondary Yaws.

It is generally accepted that 5 - 9 years are the most susceptible. I should say anywhere between 3 and 10 years, varying according to the habits of the people; i.e. the age at which a small child sleeps separately from his Mother. Next in order of frequency is the young

labouring man who has to sleep at close quarters owing to his work. The next most frequent Yaw patient is the young married woman with two or three children, who acquires the disease from her own children. As in most infectious diseases, incidence varies inversely with age, except in the very young.

At centres I noted the preponderance of males attending. This is because the boys and young men are more exposed to infection, and because it is easier for the men and boys to travel the long distances.

I append:-

1. A table for 1926 - 1927 for all new Yaw cases treated in Yendi - This is by Dr. Robertson, as I had by that time moved into Tamale.

2. A table of my own figures for February to October 1925. of secondary Yaws and secondary Yaws accompanied by tertiary manifestations attending at the central Yendi clinic.

3. In the Colony, where the conditions for the sexes were more equal owing to dress, etc. I took 100 cases consecutively of frank secondary Yaws, between 5 and 9 years of age - Males 52 Females 48. The number is too small for any definite conclusion, but indicates that neither sex is in any way immune.

Remarks. All figures show a distinct preponderance of males, but not so great (considering all circumstances) as to imply any immunity on behalf of the Females.

The only other point shown by my figures is the early

stage at which tertiary yaws can supervene, while the secondary stage is still florescent.

SEASONAL INCIDENCE.

Whilst Yaws are to be met with all the year round, towards the end of the year the Disease shows a definite increase, October till towards the end of January. Clavus becomes more painful at the beginning of the rains and during the Hamattan season. I do not quote figures for these statements, because it was only towards the end of my stay in Yendi that I managed to put up four large huts to accommodate Yaw patients from the District. (The chief objected to these people living in the town.) I was thus able to accommodate from 200 to 400 people on a Government area away from the town.

In the District of Kibi the cocoa season - November till March - enabling the people to pay fees and therefore attend for treatment vitiates the accuracy of any figures for seasonal incidence. Dr. Robertson's highest figures are for April, July and August ^{of November} Data supplied to me by Dr. Robertson, M.O., Yendi.

All new Cases.

Disease. Yaws.

<u>Months.</u>	<u>Male.</u>	<u>Female</u>	<u>Total.</u>
1926.			
April.	175	150	320
May	123	124	247
June.	138	144	282
July.	240	243	483
August.	158	144	302
September.	41	22	63
October.	101	62	163
November.	192	205	397
December.	137	102	239

Months.	12.		Total.
	Male.	Female	
1927.			
January	130	89	219
February	133	108	241
March	146	117	263
	<u>1714</u>	<u>1510</u>	<u>3224</u>

My own Data above referred to.

Cases of frank secondary Yaws with no evidence of tertiary complications.

Date.	Age.												
	0	-	5	5	-	10	10	-	18	Adult	Male	Female	Total.
1925.	0	-	5	5	-	10	10	-	18	Adult	Male	Female	Total.
Feb.	14	-	6	15	-	5	3	-	0	13	-	12	45 - 23 68
Mar.	73	-	40	36	-	21	15	-	7	35	-	44	159 -112 271
Apr.	15	-	12	18	-	11	1	-	3	22	-	17	56 - 43 99
May.	17	-	11	21	-	10	6	-	0	20	-	22	64 - 43 107
June.	22	-	19	17	-	8	4	-	6	29	-	20	72 - 53 125
July.	57	-	40	36	-	15	13	-	4	40	-	43	146 -102 248
Aug.	37	-	41	27	-	22	15	-	9	29	-	37	108 -109 217
Sept.	48	-	37	20	-	17	7	-	3	25	-	19	100 - 76 176
Oct.	64	-	62	24	-	26	12	-	7	27	-	27	127 -122 249
	<u>347</u>	-	<u>268</u>	<u>214</u>	-	<u>135</u>	<u>76</u>	-	<u>39</u>	<u>240</u>	-	<u>241</u>	<u>877</u> - <u>683</u> <u>1560</u>

Yaws accompanied by Clavus.

Date.	Age.												
	0	-	5	5	-	10	10	-	18	Adult	Male	Female	Total.
1925.	0	-	5	5	-	10	10	-	18	Adult	Male	Female	Total.
Feb.	0	-	0	0	-	0	0	-	0	1	-	0	1 - 0 1
Mar.	0	-	0	0	-	0	0	-	1	2	-	0	2 - 1 3
Apr.	0	-	0	0	-	0	0	-	0	0	-	0	0 - 0 0
May.	0	-	0	0	-	0	0	-	0	1	-	2	1 - 2 3
June.	0	-	0	2	-	0	1	-	1	8	-	0	11 - 1 12
July.	0	-	2	1	-	0	0	-	3	7	-	8	8 - 13 21
Aug.	2	-	1	1	-	2	6	-	6	11	-	10	20 - 19 39
Sept.	3	-	0	2	-	2	3	-	2	19	-	4	27 - 8 35
Oct.	1	-	0	6	-	5	12	-	2	8	-	7	27 - 14 41
	<u>6</u>	-	<u>3</u>	<u>12</u>	-	<u>9</u>	<u>22</u>	-	<u>15</u>	<u>57</u>	-	<u>31</u>	<u>97</u> - <u>58</u> <u>155</u>

0 - 5 years 2 of the boys had also Osteitis.

10 - 18 years one male had osteitis and three males had ulcers.

Adults 3 males had osteitis and one had ulcers.

" 2 females had osteitis and 2 had ulcers.

In these cases the osteitis was acute causing pain and the ulcers were multiple.

Yaws and Gangosa.

1925.	0 - 5	5 - 10	10 - 18	Adult Male	Female	Total.
Apr.	1 - 0	0 - 0	0 - 0	0 - 0	1 - 0	1
May.	0 - 0	0 - 0	0 - 0	1 - 1	1 - 1	2
June.	0 - 0	0 - 1	0 - 0	1 - 0	1 - 1	2
July.	0 - 0	0 - 0	0 - 0	1 - 0	1 - 0	1
Aug.	0 - 0	0 - 0	0 - 0	1 - 0	1 - 0	1
Sept.	0 - 0	0 - 0	0 - 0	1 - 0	1 - 0	1
Oct.	0 - 1	0 - 0	0 - 0	0 - 1	0 - 2	2
	1 - 1	0 - 1	0 - 0	5 - 2	6 - 4	10

Adult Males four had clavus.

" Females one had multiple ulcers.

Yaws and Osteitis.

1925.	0 - 5	5 - 10	10 - 18	Adult Male	Female	Total.
Mar.	0 - 0	0 - 0	1 - 0	0 - 0	1 - 0	1
Apr.	0 - 0	0 - 0	0 - 0	1 - 0	1 - 0	1
May.	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0
June.	2 - 0	0 - 0	0 - 0	0 - 1	2 - 1	3
July.	0 - 0	1 - 0	0 - 0	0 - 0	1 - 0	1
Aug.	0 - 3	0 - 1	1 - 0	0 - 1	1 - 5	6
Sept.	0 - 0	2 - 0	0 - 0	0 - 0	2 - 0	2
Oct.	0 - 0	1 - 2	0 - 0	0 - 0	1 - 2	3
	2 - 3	4 - 3	2 - 0	1 - 2	9 - 8	17

Yaws and Arthritis.

1925.	0 - 5	5 - 10	10 - 18	Adult Male	Female	Total.
Apr.	0 - 0	0 - 0	0 - 0	1 - 0	1 - 0	1
June.	0 - 0	0 - 0	0 - 0	1 - 0	1 - 0	1
July.	0 - 0	0 - 0	0 - 1	0 - 0	0 - 1	1
Aug.	0 - 0	1 - 0	0 - 0	0 - 0	1 - 0	1
Sept.	1 - 0	0 - 0	0 - 0	0 - 2	1 - 2	3
Oct.	1 - 0	1 - 0	0 - 0	0 - 0	2 - 0	2
	2 - 0	2 - 0	0 - 1	2 - 2	6 - 3	9

Yaws and Multiple Ulcers.

1925.	0 - 5	5 - 10	10 - 18	Adult Male	Female	Total.
Mar.	1 - 2	1 - 0	0 - 0	1 - 1	3 - 3	6
Apr.	0 - 0	0 - 0	0 - 0	0 - 2	0 - 2	2
May.	0 - 0	0 - 0	1 - 0	2 - 1	3 - 1	4
June.	0 - 0	0 - 0	0 - 1	3 - 2	3 - 3	6
July.	0 - 0	0 - 1	0 - 0	3 - 2	3 - 3	6
Aug.	0 - 1	0 - 0	0 - 1	1 - 2	1 - 4	5
Sept.	1 - 1	4 - 4	0 - 0	1 - 1	6 - 6	12
Oct.	0 - 1	1 - 1	0 - 2	2 - 3	3 - 7	10
	2 - 5	6 - 5	1 - 4	10 - 12	22 - 29	51

Yaws and Gummata.

1925 Oct. One case in a small female child.

1

After the end of October the Hospital became very busy and

it was impossible to find time to compile statistics. I went home in February 1926 before the annual report was made up, but on my return was stationed in Tamale where I acted as M.O.H. N.Ts. and M.O. Schools, Tamale, and so had no further opportunity to follow up the work in Yendi. Dr. Robertson very kindly sent me the figures for 1926 - 1927 as before quoted, and Dr. Daly who relieved me sent me his notes on treatment with Bis.Sod.Tartrate.

The above figures show that in 1797 Cases showing secondary yaws. 237 were already showing evidences of the third stage.

EFFECT OF ALTITUDE AND RAINFALL ON YAWS.

Yaws are supposed to be non-existent above certain altitudes. The District of Yendi is between 500 and 1,000 ft. above sea level. The town of Yendi itself is 680 ft. above sea level; Bimbila, the lowest part of the District is 571 ft. above sea level. The rainfall for the District is between 30 and 55 inches p.a. The rainfall for the town of Yendi during my stay was average 38 inches p.a. The rainfall in Bimbila is 55 to 60 inches p.a. The District of Kibi is 1,000 to 2,000 ft. above sea level. Parts which I visited went up to 2,420 ft. The rainfall for the District is between 65 and 70 inches p.a. and in some parts up to 75 inches. The town of Suhum, Kibi has a rainfall of between 55 and 60 inches. These figures give a wide variation both of altitude and rainfall. Both Districts are infested with Yaws. Apart from a variation in the development of the tertiary stage, and the effect of better living, clothes and education in lessening the incidence in the larger and more important centres, I found as far as the country people went the disease seemed to be universal. In

Begoro, a town up among the hills I had a good yaw clinic. Altitude and clothing go hand in hand, and the child who will sleep naked in Bimbila will be well wrapped in a cloth at night in Begoro, also skin activity and reaction vary with temperature and humidity. Given the opportunity yaws in a typical form can be found at high altitudes.

IMMUNITY.

(a) Permanent Immunity. It is generally conceded that an attack of secondary Yaws which passes fully through the florescent stage, developes in the individual an immunity to any further attack of secondary Yaws. That this is generally so, is evidenced by the fact that in a District like Yendi, where practically all the children were suffering from secondary Yaws, the majority of the adult population were free from the secondary stage, their history being, that they had had Yaws when they were small.

(b) Temporary Immunity. This immunity is not always permanent, and in the case of the young, may be very temporary.

Case. Woman. 30 years old from Osino attended with florid secondary Yaws. As a child she had had ordinary Yaws. They had gone away without treatment. The present attack she acquired from one of her children ^{whom} she brought with her for treatment.

Case. Son of Chief of Suhum. This case I shall describe at length later. He had been under my care for two years for a very bad condition of secondary Yaws merging into tertiary. Three years after I discharged him, he returned in 1936 with a typical florid secondary rash.

(c) Natural Immunity. That there is a natural

immunity must be conceded, as many people in a Yaw District never acquire the disease. Of course this may be due to their never having had a fracture of the epithelium when exposed to the disease.

Case. Two younger sisters of the above Son of Suhum. I quote these girls because I knew the children well, and saw them frequently apart from any attendance at the clinic. The younger was born in Hospital while her brother was in for treatment for his first attack. Both girls were continually with their brother and were naked except for a small cloth, so were exposed to any infection he may have had. They did not develop the disease although they came into town with their brother when he was covered with Yaws. I saw the elder girl in 1937. She showed no signs of developing the disease.

In taking histories I always ask about Yaws. Many patients deny having had the disease though it has been in their households and families.

(d) Destruction of Immunity in the course of Acquisition by Early Treatment.

The apparent magical effect of one injection makes it difficult for the patient to realise that any further treatment is necessary. He goes away expecting cure. Though often cure is effected, in many cases he returns some time later because his Yaws have come back. Here is a classical instance from Kwabeng.

Case. In 1932 a Mohammedan father brought his family of five children all suffering from secondary Yaws for injection. The younger ones were the more heavily affected. They had one injection each. Early in 1933 he returned with the three older ones whose Yaws had come back. They again had one injection each. In 1934 they returned and in 1935 the elder girl was brought alone. The old man came in 1936 to let me know that "the Yaws had died in his family." "I saw him again in 1937. His family were all well.

On each occasion the Yaws were typical and not aberrant. Sellars and Goodpasture in their experimental work in 1923 show that reinfection while immunity is developing generally results in one of the many aberrant forms of secondary Yaws. This point is rather difficult to prove in ordinary clinical work. But the way the

patients have described these conditions to me is, that they have had yaws and that either the yaws did not go, or that the Yaws are trying to come back. "I've got Yaws but not proper Yaws." is an often heard expression. I have seen few of these low grade Yaw cases who could not give a history of a definite efflorescent stage.

Early incomplete treatment especially with the Arsenicals may leave the patient open to an early attack of the tertiary stage, and so has an important bearing on treatment.

Case. Yendi. Child of three years attended with typical secondary rash, received one injection of N.A.B. The father brought the child back later to show that the condition was cured and refused a second injection. Six weeks after her injection she was brought back with acute osteitis of both ulnae and to a lesser degree of the tibiae. The limbs were tense, shiny and painful. The ulnae showed some degrees of curvature. Treatment was recommenced and she received in all, six injections, was put on to a milk and egg diet with tonic. She did extremely well. After three years there was no recurrence. // In apposition to this case I will now quote cases where there was no treatment and the individual developed what immunity he could.

The following type of case was very prevalent in Yendi District when I first went there:-

Case:- Yendi. Male 12 years had Yaws as Infant. Pres. Cond. Gangosa-Uvula hanging by tag. Palate long anteroposterior perforation. Tibiae both sabre. Left ankle deformed.

Case. Yendi. Child three years old. History. Had suffered from Yaws for one year. Some dried remnants of the secondary rash remained. Pres. Cond. Arthritis of both knees, both elbows and one ankle. Dactylitis of the fingers and toes and of the tarsus bones. Head square shape. Bridge of nose gone. Had lost power of walking. Fed on the breast and ordinary diet. This case in spite of definite Yaw characteristics (nose, dactylitis) was also strongly suggestive of deficiency disease. Injections were given but stress was laid on diet, and cod liver oil was given with the tonic. The child made a good recovery.

Case. Kibi Woman reported for sterility. Had had Yaws but healed without treatment. Condition on reporting. Healed Gangosa. Cervix Uteri enlarged and very hard.

Case. Awa School cook Yendi reported complaining of painful Clavus. On examination the Uvula was not

visible. When she swallowed a small uvula popped down from behind a very contracted velum, the pillars were very contracted - a case of incipient gangosa. She had had no treatment before I saw her.

Case. Kibi woman. Condition on reporting. Healed gangosa. Nose soft palate and a great part of the hard palate gone. Nares open straight on to a flat face. She came to me for fear of a recurrence. She had had Yaws but no treatment. I saw her in 1933. She is still going about the town with a cloth over her face and has an apparently healthy family.

My first visit to Bimbila (Yendi) was from a Saturday evening till Monday morning. As the patients were arriving all Saturday night work was begun at dawn on Sunday morning. 464 cases of yaws and every variation of tertiary Yaws were seen. Gangosa and multiple ulcers predominated. The names and notes were taken by some school boys who had cycled out in relation to School work, so apart from the number of cases taken and the nature of the work I make no use of them.

The presence of so many cases of tertiary Yaws in an untreated area raises the following points; - Does immunity acquired from untreated secondary Yaws extend to protection against the third stage? Is it only protection against a recurrence of the secondary stage? Is the third stage in all cases a true Yaw condition, or is it in many cases something that supervenes on devitalised or second-rate tissue laid down in the healing of either a second stage or a true third stage? One constantly meets early Gangosas, Osteitis, Dactylitis, Ulcerations which have healed without intervention. In face of minor injury the scar would be a localising site for the ingress of infection and a

simulation of a progressing third manifestation. Definite and lasting immunity in the third stage is open to question and can only be settled by a serum test. In my work except in very few cases this was impossible.

(e) Immunity in Yaws and Syphillis. The worker in a Yaw community, which syphillis may at any time invade, will find the question of one or two diseases carrying one or two immunities very urgent. The various view points to be considered are:-

1. If the two diseases are varying forms of one disease there is bound to be a common immunity, and to wipe out Yaws without taking steps to educate the community against theinvasion of syphillis, which, even if it is the same disease is still a more terrible form of it, carrying as it does heredity, is a matter for grave consideration.
2. If there is only a group immunity, however slow in developing, the wiping out of Yaws is still a matter to be considered.
3. If, as appears most likely, there is generally a homologous immunity, and the group immunity, if it does exist, is rare, we should find that in a determined and early treatment we are not only allaying the spread of Yaw infection, but also educating the common mind to prophylactic as against curative measures.

Referring once more to common immunity between the two diseases. In the part of the N.Ts. in which I worked I do not know that I saw any case of syphillis, except one which came over from the French side. This

was a typical hereditary in a small child. In the Colony though I have never seen a primary syphilitic sore, the reports state syphillitis and Yaws are co-existent, at any rate in the large Coast towns. Reports from other parts tend to show that the two diseases not only co-exist but are actually found in the same patient. I myself have no material on this point. It can be seen, however, that knowledge of a general immunity of Yaws against syphillitis would give a different outlook to the treatment of Yaws in a community bordering on civilisation.

PROGRESS OF YAWS.

Incubation and Primary sore. From purely clinical work it would be difficult to arrive, with any certainty, at the time between inoculation with the spirochete and the appearance of the primary sore. Times could easily be arrived at from experimental work. From my own observations the first sore begins to appear very shortly after inoculation, i.e. in a few days.

Description of Primary sore. The primary sore takes many forms. The following are those I have observed:-

(a) A large typical yaw, which may be surrounded by a field of smaller yaws, some of them may be only pin point in size.

(b) A large oval crateriform ulcer - 1" - 2" in length - The ulcer is not really deep but the heaping up of its edges with crusted yaw material makes it appear so. This is the form most often seen.

(c) The condylomatous form. This form appears where there are opposing surfaces e.g. the axilla, the natal cleft, on the vulva, etc. It consists of a dullish white plaque, raised slightly above the surface of the skin and tends to ooze. 1" - 1½" across.

(d) Circular or oval ulcer, varying in size, involving only the surface epithelium and with clean cut edges. It takes different forms. First. Resembling a tertiary ulcer, showing a tendency to heal and spread. Second. With a superimposed infection, it is apt to be purulent. Third. A small oval ulcer with a whitish fine clean edge and a clean base, either smoothly red or granulating. All forms yield the spironema and are followed by an outbreak of secondary Yaws.

(e) Persistent papule which does not take the form of a Yaw but yields the spironema and is a precursor of secondary Yaws.

Position of the Primary sore. Anywhere on the external surface of the body.

Case:- Boy 7 years. Cap of knee - pustular type.

" 8 " Knee - very large Yaw.

Child 1 " Typical Yaw point of nose - no other yaw present.

" 6 months Yaw centre of upper lip.

" 2 years Yaw corner of mouth.

" 8 " Crateriform ulcer middle of back. Typical secondary rash present.

" ½ " Large flat yaw inside Labia Majora. Not encroaching on mucous membrane.

Case:- Child 3 years. Large flat yaw in natal cleft.

Girl 7 " On outer side of left thigh very large yaw surrounded by a field of pin point yaws. Field over 4" in diameter. Small yaws closely placed. There were ordinary yaws on other parts of the body of the usual $\frac{1}{2}$ " dia.
 History. - Large yaw in existence and increasing for some weeks before other yaws appeared. This case is interesting from another point of view, because the field of crowded yaws would form an ideal locus for tertiary ulceration if treatment not persisted in till the fibrous tissue laid down by reaction to the second stage cleared.

Male Adult Persistent ulcer on adductor side of thumb of right hand. Locus suggests injury to epithelium from handling hoe or other implement of labour.

The existence of a primary sore is important because small children reporting with varying fever and malaise, even in the presence of an enlarged spleen, should be stripped and searched for an overlooked sore.

Case. 1937. Woman reported with two small children, one still breast fed, with the complaint that both children were becoming lean and had fever. I examined the children the usual way, chest, abdomen, etc., but could find nothing to account for the condition. On examining the lower limbs I found that both children had a small clean ulcer, which the Mother had been dressing with ointment. The older child had an undoubted early yaw rash. The Mother, a clean sensible woman stated that they had the small sores for some time, but could not account for contact with Yaws. Injection cleared up not only the general condition but the rash and the ulcers. In the case of a undiagnosed atypical rash before the Yaws have erupted or if the Yaws do not fully erupt, the presence of a large indolent ulcer is suggestive, and where microscopical examination is possible, Spironema will be found.

The Primary sore comes before the secondary rash and persists after the general rash has cleared. Atten-

tion should therefore be given not only to the clearing of the rash but also to the healing of a sore which may form a residual focus of infection.

Prodromal symptoms and secondary rash. The usual time elapsing between the appearance of a primary sore and the outbreak of the secondary rash is about a month.

(Experimental work gives monkeys 38 days mean time, rabbits 56 days). The time may be shorter or it may prolong itself into months. The cause of the frequency of histories in which the patient states that he had the sore a very long time before the Yaws came, may be, that yaws, which have a tendency to come out in crops, have been coming out in small unnoticed groups for some time before a wide-spread eruption occurred; or it may be the indolent nature of the sore itself which has delayed the scattering of the infection. Out of the thousands of cases which I saw it was only in a few that I was able to time the inoculation period.

Case. Sanitary Boy, Yendi complained of headache and general fatigue. I found no malaria in the blood and could find no reason for his illness. As he was in my own employ I had every opportunity of watching him. His temperature never went above 100. As the condition continued I was beginning to suspect some form of sleeping sickness. He suddenly, however, developed a full secondary rash. I had found no primary sore. Immediately the rash came out the boy seemed better and cleared up quite quickly under treatment. Between the first symptom and the appearance of the rash was exactly three weeks.

Case. Old man who came with primary sore and appeared one week later with a secondary rash. vide ante.

Case. Infant of 12 days with secondary rash. vide ante.

The spread of the infection is probably both through

the blood stream and by lymphatic spread. The enlargement of the glands which one finds in the region of the primary sore and also associated with some of the secondary sores indicates lymphatic distribution. The cases in which one large yaw is surrounded by a field of smaller yaws points to lymphatic spread. Contrary to the usual belief that this distribution is typical of florid yaws I have seen many more cases where the person is covered with solitary yaws of much the same size than this group distribution. The distinctness, spacing and contemporaneous outbreak of the yaws indicates spread by the blood stream. Yaws which come out in crops are often widely distributed.

Progress of Disease. During the time of incubation the history is that the child is not well and is getting "lean". As there are generally contributory causes, malaria, etc., it is difficult to give a true history of progress during this period. Immediately before the eruption the patient is definitely ill, complaining of malaise, nausea, fever and itching. In many cases there is a marked anemia. The highest temperature I have noted where other factors could be eliminated was 101, the average being 99 - 100.

Dryness of the skin and hair are often present, but I have noted numerous cases where parts of the skin close to, but not implicated by the rash have remained in good condition. The papules first appear like small pin points under the unbroken skin and might be mistaken

for a developing furunculosis. As they rise above the surface the skin cracks and a small flat yellow pustule emerges. Although the appearance suggests pus the pustule is solid and elastic to the touch. Presently serum oozes from it and dries and the heaping up of the Yaw begins. The average Yaw grows till it is about $\frac{1}{2}$ " across. But the Yaw may grow till it is very large.

Case. Yendi 1925. Middle aged woman reported covered with yaws, each of which measured 2" - 3" across. She appeared as though covered with large molluscs. The case did well.

If the outer crust is removed at an early stage a granular bleeding surface is disclosed; later it may be pale in colour. In any large yaw clinic, yaws giving the framboesial picture may be seen. On removing the outer crust the underlying projecting yaw is seen to be papillomatous, red and lobulated exactly like a strawberry or rasp. From the granular surface there is much serous discharge loaded with spironemata. The reaction is polymorphnuclear, plasma cells and later fibroblastic. vide ante.

The next stage is the drying up of the Yaw. As there may be fresh crops of Yaws this stage may be very prolonged. $2\frac{1}{2}$ - 3 years being an ordinary history where there has been no treatment centre.

Cases.	Young male adult.	2nd yaws and clavus	duration	3 years.
	Adult.	general Yaws plus	"	1 "
	Adult.	" face plus plus	"	6 months
	Young adult.	general yaws. face plus	"	2 "
	6 years.	general yaws. back plus	"	3 "
	Child.	general rash.	"	3 years.

Many cases gave long histories and the longer the history the more dried up the Yaws tended to be, and the

frank eruption might only be found after looking for it. Cases however varied. A Mother came with a frank rash very marked on her back. The history was for three years. The child had no signs of yaws.

Taking one family as typical of histories, where no treatment has been given:-

Father	Yaws like scales	Duration	3 years.
Mother	general distribution-large yaws	"	3 months.
Infant	" " "	" "	4 months.
16 years old"	" "	" "	2 months.

It is unlikely that the rest of the family acquired their Yaws from the father.

As the yaw dries it becomes more and more difficult to recover the spironema. These observations were made on untreated cases. Cases undergoing treatment were seen weekly or at longer intervals and it was impossible to say when the spironema disappeared from the yaw. I made special observations on the external aspect of the healing process on two children. The mother did not bring them till the eruption was fully out and they had been scrubbed - a native form of treatment. The yaws were of a large type. The week following the first injection the children appeared as if their skins had been swept clean and they were covered with a fine dust. The yaws now showed as reddish or purplish areas level with the skin and covered with a very fine epithelium like thin silk. These areas were firm to the touch as though one were pressing on a rubber pad. The rest of the skin was normal, soft and pliable. After another week these areas were disappearing, though here and there

a thinning of the skin where the larger yaws had been was noted. On their next visit there was absolutely no evidence that they had had Yaws. After two years there has been no recurrence. Healing where there is no treatment is along the same lines but slower.

After the yaws have completely healed, small circular light areas may mark the position of the Yaws. These may fade, being gradually replaced by normal tissue, or they may darken. Years after the Yaws have gone, darkly pigmented spots may remain. They are not raised above the level of the skin and apart from the pigmentation resemble true skin. In some few cases the pigmented skin is thinner slightly resembling scar tissue. I do not know if this type of thing is ever found after a syphillitic rash. I do not know of any record of it.

Distribution of Secondary Yaws. The eruption seems to come out more freely on certain parts of the body. The face is practically always involved. The framboesial face is not a rare thing as has been stated, but can be seen at any clinic where yaws attend. The face, the creases of the body, the arms, the thighs, the back, the scrotum, the penis and the vulva are the parts most often implicated. I have seen yaws of the eyelids, yaws blocking the nose, yaws of the lips, yaws of the vulva, but at no time have I seen Yaws whose origin encroached beyond the muc~~e~~-epithelial junction. Involvement of the mucous membrane does not belong to the true secondary Yaw but is a condition by itself.

Aberrant secondary Yaws. Yaws in themselves may not conform to type. Either the person has a natural immunity, which, while it does not prevent infection, does not allow of a definite eruption. The Yaws may then appear as small scaly areas or as blind pustules. A partial acquired immunity with a reinfection may produce the same type of thing. In these cases a thorough search may reveal one typical Yaw or a deep scraping from a likely spot may yield the spirochete. Failing both these one has to fall back on history and association.

Another fairly frequent type is the circinate yaw. This is a secondary rash horseshoeshaped or completely circular, $2\frac{1}{2}$ " - $3\frac{1}{2}$ " across. There is a normal area of skin, in the centre of a ring of flat scaly sores or pustules. The patient may or may not show evidence of true Yaws. The patches occur most frequently on the back and the shoulders, but I have seen them on the forearms and face. There may be a slight resemblance to leprosy, and in an area where the two diseases exist it is well to investigate any questionable case thoroughly. A young male adult from Anyinham leper area had this type of yaws so closely resembling leprosy that slides and a blood test were done before a definite diagnosis could be reached. He was an intelligent man and was ill from depression thinking he had acquired leprosy. The case made a good recovery. During the four years I ran a large leper colony in Yendi, I did not meet a really confusing case of circinate Yaws.

Simple Yaws is characteristic and the skin seldom shows signs of scratching as the yaw itself is not sensitive. When yaws is complicated by a generalised scabies the picture is entirely different. Owing to the intense irritation the skin is thickened and roughened and the Yaws appear as spots, with no heaping up, in an area of other spots due to low infection. The condition known as "craw craw" is a good example of this, and the name is applied by the native to chronic itch and to yaws complicated by itch. Yaws associated with leprosy may in the late second stage lead to some difficulty.

Confluent yaws clearing without treatment leave at a certain stage large copper coloured areas of skin which might be confused with leprosy. The distribution, the lack of a raised border, and the normality of sensation leave little doubt if taken together with the history.

Secondary Yaws which have not entirely cleared up may leave dried scaly areas over the back, the elbows and the knees, etc. If untreated these become the centres of very chronic ulceration. It is therefore necessary to be aware of the origin of this type of Yaw sore.

Heredity in the case of Secondary Yaws. I have no evidence to show that secondary Yaws is transmitted by the Mother to the offspring. The cases I have had in the antenatal clinic of efflorescent Yaws tends to prove that it is not so.

24/1/36. Multipara, 10 apparently approaching term with

the 11th. reported, literally covered with Yaws. It was not possible to examine or to give an intravenous injection. As the questionnaire was normal, an injection of Acetylarsan was given.

7/2/36. Yaws clearing rapidly. Examination normal. Further injection given.

14/2/36. Delivered a large female child. Both did well but the Mother refused any further injection.

The only objection to this case is that the injection may have had a salutary effect on the child as well as on the Mother.

Case. 22/2/36 Mother with baby of 2 months. Mother has a few yaws on the outer upper arm and under the axilla. Baby smothered in Yaws. History - Mother had plenty of yaws before the baby was born. The baby was all right till he developed Yaws recently. Treatment was required for the baby only. After one injection the child cleared. He was well sized and well nourished, and there was no reason to think he had inherited anything.

Case. Multipara 7.eight and half months pregnant, reported with Yaws plus 2/12/36. Injection given. 9/12/36 Fetus good heart sound position 2. N.A.B. given. 23/12/36 further injection. Delivered good baby at terms.

Case. Jan /36. Large Hausa woman, Multipara, reported covered with Yaws. Examination impossible. Injection Acetylarsan given. Ten days later she came bringing with her a large infant, who had been born immediately on her return to her village. Her Yaws were clearing and she thought there was no further need for treatment. She gave the injection credit for a quick labour; as the child was born within a few hours of her receiving the injection, the injection could have had no effect on anything the Mother might have transmitted to the fetus.

I would therefore submit that any quality transmitted by Yaws does not belong to the second stage, except in as far as the general health of the Mother may affect the fetus.

undoubtedly due to an existing Yaw infection. In a series of consecutive cases taken in 1925, the following is the order of the involvement of the bones. Vide ante pp. 13. frequency of secondary Yaws accompanied by Osteitis.

Tibiae	.....	66	Metacarpals	.....	4
Ulnae	.....	41	Mandible	.....	3
Dactylitis	.....	16	Sternum	.....	3
Radius	.....	6	Scapula	.....	2
Clavicle	.....	6	Femur	.....	2
Metatarsals	.....	5	Ribs	.....	1
Humerus	.....	5	Os Innominatum	.....	1

Since these figures were compiled I have seen cases of bony tumours of the skull, the maxilla and the condition known as Goundou, which were undoubtedly associated with Yaws. So while the Tibia, the ulnae and the fingers are more frequently affected, there is no bone in the body which may not be affected.

The acute stage of the disease is characterised by swelling of the limb, which appears tense and shiny. Pain and tenderness are great. There is heat in the limb, and the general temperature may be raised.

Case. 31/1/36. Middle aged woman, from Abomusu reported with marked swelling of the right forearm and hand. Temperature 103. I diagnosed a lymphangitis, and asked the woman to come into Head Quarters for treatment and probable incisions. She stated that she had recently had Yaws and that the arm and hand were due to Yaws. An injection of N.A.B. was given with instructions to come in if the condition did not at once improve. The following week I again saw her and the condition was much improved. Temp. Normal. When the swelling finally subsided, bony deformity, consisting of a splaying of the lower end of the ulnae and radius was left with slight deformity of the shaft of the ulna. As the woman no doubt considered herself cured she did not return. Last seen 14/2/36. In a large clinic this tense shiny condition of the limbs is frequently seen in small children and has to be diagnosed from a similar condition produced by rickets.

The baloon like enlargement of the digits in dactylitis gives some indication of the type of injury to the bony structure induced by Yaws. In cases of spontaneous fracture there is this same rarefaction of the bone with a certain amount of enlargement. I had two cases of spontaneous fracture in Yendi. One, a young male adult fractured his Tibia on the way to the clinic. The other case came because of the fracture. I had no opportunity to have X Rays of the condition taken. The description by Herman of X Rays, he had taken, coincides with what the clinical symptoms would lead one to expect. "In the majority of cases the lesions show "as rarefied areas, irregularly oval or elliptical in "shape, with the long axis parallel to that of the bone "in which the lesions are located."

Dactylitis. may heal of its own accord leaving little deformity, but the usual progress is absorption of the diseased bone, leaving little or nothing of the phalanx. As the terminal phalange is often unaffected, it is easy to diagnose this deformity from that caused by leprosy. The terminal phalange may however be absorbed, and a further deformity is caused by a complicating arthritis fixing the interphalangeal joints.

Case. Boy 10 years 24/2/36. Has had yaws for 2 years. Reports with Yaws and dactylitis affecting the mid-phalange of his third finger and the fifth tarsal bone.

Case. 1/1/36. Female Adult. Yaws plus. Injection given.

8/1/36. Injection.

4/3/36. Returned. Yaws Clear.

Arthritis of elbow and wrist. dactylitis of first finger.

Case. Girl age 8 years reported with Yaws which she had for 4 months and Dactylitis of 2 months duration.

Case. 6/4/35. Wangara woman had an injection of Sobita for frank Yaws.

8/6/36 She reported with Dactylitis.

Dactylitis may be a small portion of a much more serious condition.

Case. 1925. Young male Adult. History. Yaws as a child with osteitis and arthritis. Condition on reporting - right elbow badly involved. Cannot supinate right forearm, left middle finger dactylitis with deformity. Multiple ulcers right foot and leg. Clavus plus. Uvula partly gone. Inflammation of the pillars of the fauces. Nose very inflamed and painful.

Osteitis. in the long bones causes a retardation in growth, a curving and dwarfing of the bones together with a thickening and roughening of the outer table of bone as healing sets in. Owing to the weight of the body being borne on it, the Tibia shows more dwarfing, curving and deformity, yet the ulna may show curving and deformity solely due to the disease.

Arthritis. Number of cases showing order of joints involved.

Knee	..... 45	Wrist	..... 12
Elbow	..... 15	Shoulder	..... 4
Ankle	..... 16	Hip	..... 2

Where there is bony involvement there is early limitation which may become chronic. The elbow is a joint in which the bony structure is often involved and the condition is similar to that found in the wrist and ankle. There is pain and swelling. When this has subsided the bone entering into the joint and the epiphyses are found enlarged. There is limitation of

movement both as regards flexion and extension. Treatment is urgent. Cod Liver oil is indicated.

Case. Girl 13 years was treated for painful enlargement and stiffening of the right elbow. The case was first thought to be tubercular and was immobilised, then an attempt was made at movement. More than one doctor saw the case so there was real difficulty with the diagnosis. Two years later she became my patient. Now an adult she goes with a painless joint fixed in almost full extension. She brought a young sister to me who was rapidly developing the same condition. Having the advantage of the experience with the older sister, and knowledge of the District, I immediately instituted anti-yaw treatment, with good results.

Case. Boy 12. reported with painful clavus. On examination it was found that he had suffered from an arthritis of the right elbow in which only bone was involved. His extension was limited.

Involvement of the bones of the face and skull follow

definite lines. The angle and horizontal ramus of the mandible show swelling and a definite bony tumour.

At the junction of the nasal and maxillary bones the tumour known as Goundou occurs. This is a bony tumour and must not be confounded with a fibrous tumour sometimes found at this site. A large bony tumour may grow immediately above the root of the nose involving the junction of the frontal and nasal bones.

These conditions are common in the N.Ts. and in certain parts of the Colony.

That Goundou is associated with Yaws, I think, is undoubted. The acute stage resembles that found in other parts of the skeleton, and when this is over and healing sets in, as elsewhere, bone not properly organised and heavier than normal bone, is laid down.

Case. Boy 7 - 8 years. Skin over sides of nose extending down on to cheeks and up to eyes tense and shiny. Pain intense. Large bony swellings on each side of the nose. On his second visit it was possible, the pain having gone and the skin being crinkly where it had been tense, to examine and ascertain that the swellings were really bony. I handed over this case before it finished as I was going on leave.

Case. This includes a whole family from Osino.

Child of eight years - a mass of ulceration and cicatrization, following Yaws. After attending irregularly for two years she was healing.

Boy of five. Multiple ulceration following Yaws. He was brought early and the ulcers healed quickly.

Child with bony condition whom I did not attend.

Girl of 18 still under my care. She had multiple ulceration, a large bony tumour immediately above the base of the nose, goundou and tibiitis. History, The condition followed Yaws.

This family are fairly well off and the children are well cared for. There seems to be a lack of the immunity in the healing of the second stage which defends from the third stage. The ulcerative conditions were undoubtedly due to Yaws. There is therefore no reason to suspect the bony tumours of other origin.

Involvement of the soft Structures in Tertiary Yaws.

As in the bony tissues, vacuolation, enlargement, softening, healing with deformity and the laying down of abnormal bone follow a definite order of progress, so in the soft tissues there is a definite order of progress.

Gangosa. There may be an ulceration per se. The uvula extending towards the tonsils becomes dark red progressing to purple. Ulceration takes place involving the soft tissues and if treatment is given heals with little deformity. Destruction of the uvula and perforation of the pillars may take place. This is akin to true tertiary ulceration of the skin - a

phagedenic condition. Another and different condition exists and is more common. There is inflammation with infiltration of the mucous membrane of the throat and nose. A granular condition of the throat and posterior wall of the pharynx has been noted. The mucous membrane of the nose takes on a deep red colour. Especially in the nose there is intense pain at this stage. Natural healing takes place by a process of fibrosis. All stages and variations can be noted. Sometimes the nose alone is affected. Sometimes the throat and mouth. Contractions of the pillars, velum, uvula or its base may take place resulting in a pseudo-paralysis of the soft palate, and varying in its extent, and in all cases showing a local anemia. This may be only a blanching of the mucous membrane which takes on a lardaceous appearance. The larynx is often affected and the phonation becomes husky. Accompanying the injection of the nasal mucous membrane there is often a whitish discharge. The next stage is a denudation of the nasal septum. The floor of the nose and the turbinates may be involved. The disease may stop for a long period at this stage and is often remarked by the absence of pain. Should the softer parts of the nose and the cartilages be involved, there is first a pinching, followed by a flattening of the tip of the nose. Affection of the nasal bones leads to a flattening of the bridge of the nose. Perforations of the nasal septum and between the nose and the mouth occur.

Up to any of these stages the process may be slow and insidious. There may be quite an amount of contraction and destruction without outward deformity. When true ulceration sets in the whole of this bloodless area is swept away. The course is not only rapid but terribly devastating. The throat and nose, or the throat, or the nose may go. Septic pneumonia causing death is a common sequel to Gangosa.

Case. Schoolboy. In the course of routine examination it was noted that the uvula was inflamed. Treatment for the local condition was given. I went on leave, and on my return was informed that the boy had developed a syphillitic throat. There was supposed to be no syphilis in the District. On enquiry it was found that this type of throat was common in this boy's family, occurring after attack of Yaws. I went to his village and found that two other brothers were suffering from throats, one with loss of the nose and throat tissues. Treatment which had already been begun, induced healing.

Case. Male Adult. Condition on reporting - Yaws plus - duration 4 months. Clavus of the hands and feet, hands very painful. Mucous membrane of the nose swollen, very red and painful.

Case. Young female Adult. Yaws as a child. Pres. cond. arthritis of the left knee for five years. Teeth loose, many missing. Uvula inflamed. Denudation of nasal septum. Mucous membrane completely gone.

Case. Young married woman. Yaws as child. Pres. cond. Thickening of nasal bones. Denudation of right side of nasal septum. Left side normal. Clavus both feet.

Case. Adult female Konkomba. Yaws as child. Osteitis at 16 years both Tibiae. Pres. Cond. Firm swelling over left ribs, 5" x 2". Has been there for seven years. Does not fluctuate. Swelling of head size of walnut - 3 months - fluctuates. Fluctuating swelling of left ilium - 3 months. Inflammation of throat. Denudation of Nasal septum.

Case. Female Adult. No trace of tonsils, pillars or uvula to be seen. What appeared to be the post wall of the pharynx had a vertical slit the edges of which were close together. On examination this proved to be

a perforation of the soft palate. The soft palate disappearing behind the tongue showed very slight movement on swallowing. With the tongue depressor the lower edge of the velum could not be seen. This type of pseudo-paralysis of the palate is common and varies with the extent of the contraction.

Case. Adult female Konkomba. Yaws as a child. Multiple ulcers three years ago followed by gangosa. Nose-septum gone. Perforation between nose and soft and hard palate. Soft palate eroded. Pillars of fauces gone. No outward deformity. Laryngitis.

Case. Youth male. Yaws six years previously. After four years the rash cleared. Recent gangosa. Erosion of Mucous membrane of nasal septum. Ulcer of dorsum of tongue. Laryngitis. Pain in chest.

Case. Male 12 years. Has had Yaws two years. Sores on arms, legs and chest are of tertiary form. Has had goundou 2 months. Mucous membrane of septum gone. Nose very painful. Uvula and pillars of fauces dark red. No pain in throat.

For a time I examined every throat which entered the clinic. I saw numerous cases of less advanced gangosa showing various stages of contraction of the velum - Cases where the pillars of the fauces simply left a small triangular opening as they were tightly drawn down to the sides of the tongue. Cases of Laryngitis were common and as they cleared up with anti-yaw treatment the association could not be avoided.

I shall now quote a recent case to make another point. The treatment of gangosa cannot/^{at}any time be restricted to anti-yaw treatment.

Case. Young girl. Most of the septum and soft tissues of the nose gone. Rough bare edges of all bones entering into the formation of the nose protruding into the cavity of the ulcer. Intense oedema of the face. She remained in the clinic for some weeks. She received intensive anti-yaw and local treatment. Healing was very slow and she decided to go home. I then received the information that another doctor had treated her for six weeks four months previously, but "that it had got bad when she got home." An offer of

free local treatment brought her back from time to time till I left on leave.

In no case of gangosa do I think the healing so complete that the stick is sufficient for mouth cleanliness.

Other conditions found in the Mouth. Gummata of the buccal cavity are not common but are seen. The most common site is the roof of the mouth, but they are also to be found in connection with the lower jaw. Because of their initial almost bony hardness, they are to be diagnosed from periosteitis or bony tumours of the jaw.

Case. Young woman with gummata of the whole roof of the mouth, causing difficulty in closing the mouth and in feeding. Distinct history of Yaws.
 15/2/36 injection N.A.B. given.
 20/2/36 " " " Condition improved.
 27/2/36 Mouth practically clear. Mucous membrane intact except at one small spot where point of small probe could be inserted but did not reach bone. N.A.B. given. The woman did not return for further treatment.

In mouth cases I give N.A.B. not wishing to run the risk of Stomatitis.

Contraction of the base of the Uvula and loss of the Uvula.

Case. In course of ordinary examination it was noted that a schoolboy had a very contracted base of the uvula. By this time I was associating various contractions of the palate and throat with Yaws. Next day on reporting for injection it was found that he had swallowed the uvula during the night. There was no ulceration. Treatment was given and there was no further development of the condition.

In these cases I have tried to illustrate processes found in the progress of tertiary Yaws to the condition of Rhino-pharyngitis mutilans.

Geographical tongue, mucous patches, deep pigmentation are also met. How far these conditions are due

to a deficiency diet I have not been able to ascertain. Arsenical anti-yaw treatment with tonic and cod liver oil seems to suit them.

Odentitis causing loosening and falling out of non-carious teeth. The natives attribute it to Yaws. It is widespread among young adults and adolescents, chiefly males.

Skin, Subcutaneous tissues, Tendons etc. The progress in these cases is inflammation, healing by fibrosis with painful contraction leading to thickening and hardening of the tissues and the condition of para or hyperkeratosis, and in the tendons to limitation of the movements of extension both at the knees and elbows (often seen in children) The curving of the ulna, tibia, radius and fibula is often associated with contraction of tendons and is accompanied by intense marasmus and anemia.

The skin condition varies and may be general or localised. The patient complains of pain of the skin, worse and more boring at night. In uncomplicated cases there is often no temperature, but in cases accompanied by Malaria or other fever, the condition is aggravated and there is a temperature. In the earlier cases the skin over the affected parts may show no change. It is only when an attempt is made to insert a needle that the thickness and toughness of the underlying tissue is realised. Again the skin or superficial layer may be crinkled, resembling crinkly tissue paper. From this

it progresses to a definite hornified condition; in some cases fairly general, in others localised to sites which have been more densely affected by the secondary Yaws.

Clavus. The same condition of the feet and hands, deserves special attention because it is the most common of these localised conditions and because it is so disabling. Clavus has to be diagnosed from a true secondary yaw erupting through the thick skin of the palms and soles. True secondaries have the characteristics of yaws but owing to the sites especially on the soles are extremely painful, partly from pressure and partly because of the difficulty of eruption and are known as "crab yaws". A true clavus has also to be diagnosed from callosities. Pressure or friction gives rise to a heaping up of tissue, which the pressure hardens. Clavus in its most common form shows a different picture, arising as it does from a difference cause. On the parts subjected to greatest pressure the epithelial layers give the same impression as the worn out sole of a shoe. The worn part being more excavated on the balls of the soles and the heels and rising in tiers till the normal skin is reached at the edge of the sole. The next type is similar, only that there are smaller and more holes worn in the surface epithelium. Then comes the type where the whorls and fissures show very much more plainly than normal. There are cases with a spongy appearance but extremely hard on palpation. Again the soles and

heels may be covered with small pits looking exactly like worm holes. This I take to be the contraction of the underlying tissue causing various ducts to become visible. Small hardened plugs surrounded by inflammatory tissue is an intensely painful type. Lastly, a type resembling another form of tertiary manifestation is that in which the skin of the instep is involved. There is a "small type" rash forming a circle or oval embracing the lower side of the instep. The skin included is much thinner than normal. This often gives rise to an intractable ulcer.

As before noted clavus and all skin conditions become more painful at certain times of the year. In fact so painful does clavus become that the natives apply heat in some form, in some cases plantain skins made unbearably hot are applied to the soles of their feet. Though the hardening of the skin on other parts of the body may give rise to ulceration, clavus does not give rise to ulcers.

Contraction of tendons and involvement of soft tissues affecting Joints.

Contraction of the tendons is akin to hyperkeratosis, clavus and gangosa, an inflammation of the tendon followed by contraction. Contraction of the subcutaneous tissues and not involving the tendons, occurs on the flexer aspect of the joint, the skin being raised in a fold extending from the middle of the adjoining segments of the limb, and limiting extension. These conditions generally occur in young children and react to treatment. As they are

accompanied by marasmus and illhealth special attention to food and tonic are necessary.

Involvement of the soft tissues surrounding the joint, and the ligaments gives rise to a very enlarged, chronic, cold joint. The patient complains of weight and dull pain. The knee is most often involved. The condition reacts to prolonged treatment. Involvement of the synovial membranes giving rise to a fluid knee is met. It is also a cold condition, without great pain. It may be the precursor of the solid knee, (I do not know.)

Tertiary or multiple ulceration. These ulcers appear at any part of the body but are most frequent on the limbs; the arm and the thigh taking first place, on the shoulders, the buttocks and the groin. They are of phagedenic type, sloughing; healing at one part and breaking down at another place. If got early they heal easily, leaving little deformity and the scar tissue tends to be soft, pliable and elastic.

Nodes and Gummata are found in connection with the skin and subcutaneous tissues; ganglia and cysts in connection with the tendons. The nodes closely resembling J.A.N. are to be found in various parts, ~~—~~ over the ribs, close to the chondro-costal junction. These are freely movable under the skin and are not attached to bone. On the head - over the various bony sutures - the frontoparietal and frontal sutures being the most common sites. These are of the same nature as

the nodes over the ribs but are more subject to ulceration. This may be due to trauma owing to the carrying of head loads. When opened and scraped out, these nodes are found to contain a white cheesy material, which, when uncontaminated, was, as far as I could ascertain, sterile. Other sites are over the crest of the ilium and on the outer side of the arm. Some of these swellings were harder than others, and as it had been only necessary to open fluctuating ones, it was decided to excise one or two of the harder ones for examination. A series of cases was collected. A firm swelling was removed from the outer arm of a male adult. The lower end and bulk of the tumour shelled out easily, but the upper end of the tumour seemed to spread out into fibrous septa which were cut across. There was no muscle involvement. The other cases refused operation owing to the anesthetic. This, therefore, the only swelling I excised, was sent to Accra and the following is Dr. Burgess' report.

"Provisional diagnosis which I have recorded is, "Granuloma of doubtful nature!"

"The section made showed a necrotic area surrounded by granulation tissue, which contain large fibro-blasts. A few giant cells were found, but these were unlike tebercle and we could find no T.B.

"I am cutting some more sections and will let you know if the diagnosis is changed or amplified. Also if Dr. Hendrie has any more clinical details I should be glad of them, e.g. connection of tumour with bone, involvement of glands, state of patient, course, effect of treatment."

"I shall be glad to supply sections if wanted."

(Signed) A.S. Burgess.

Ag.D.M.R.I.

25/11/25.

I received no further information or sections.

This patient had other swellings some of which had broken down and were ulcerating. All cleared up on treatment. The wound healed on first intention. I thus came to the conclusion that these various swellings, the J.A. Nodes, the ganglia, the very large cold joints especially noted in connection with the knee are a gummatous fibrous condition, where sometimes the one element and sometimes the other element preponderates, but all responding to antiyaw treatment.

Case. Child of five years, very emaciated. Curving of all the long bones with no definite bony pain. Slight contraction of the hamstrings. Child unable to walk. Remained in Hospital Cpd. for about six months. Treatment. N.A.B. Pot.Iod., Hg., Quin. and cod liver oil. Discharged apparently cured.

Case. Woman with multiple ulcers and very emaciated. Recent ulcers punched out and circular. Two ulcers exposing the bone of the skull. Two tense swellings over the junction of the frontal and parietal bones, opened and white cheesy matter evacuated. Diagnosis of ~~the~~ third Yaws definite. At first anesthetic had to be given to render dressing possible. Donovan's solution was the only antiyaw treatment we had on hand. It was given intravenously every third day. She left after six weeks almost healed and looking well. She reported six months later so fat as to be unrecognisable. The emaciation had not been a food problem.

Case. Woman with active gangosa treated in 1933. She received three N.A.B. injections with Pot.Iod etc., and then disappeared. She had also had a large yaw ulcer over the left iliac crest.

Jan. 1936. She came back on the antenatal list. The palate was healed but tense and gave no reaction on swallowing. The scar from the old ulcer over the iliac crest was depigmented, but felt soft and elastic. She received a second course of treatment, the second injection of which was inserted through the lower part of the old scar. The needle went in quite easily. It met with no resistance, thus indicating the absence of any dense scar tissue. This case with several others I have treated, prove that these ulcers can heal with little or no after deformity or painful scar tissue.

Case. Son of chief Suhum, already referred to. 1931. When he first attended he was absolutely helpless. His legs were contracted on his thighs and his thighs on his abdomen. He could extend neither forearm. On examination the ham-strings, the humeral biceps and the flexors of the forearm were found to be involved. There was wide superficial ulceration of the right inner thigh, & the whole posterior surface of the right leg, lesser ulceration of the left thigh and leg, also a large ulcer of the lower part of the abdomen. There was a history of recent yaws. The boy was admitted to Hospital. The Wassermann reaction was plus plus. We had the active co-operation of his mother and grandmother, both as regards food and later with massage. Twice he had to have a blood transfusion. I did not encourage passive movement when recovery set in, as I thought active movement would limit itself by pain. The boy is now well grown and absolutely normal with the exception of a slight contraction of the right tendo-achilles due to scarring.

This case illustrates both the possibility of recovery and the possibility of death from these conditions.

I do not quote ^{cases} of hypertrophy of the skin and clavus. These are exceedingly common and require prolonged treatment.

Case. Child of about five years. He could not stand or lie down, but perched himself sideways on a stool which was carried about with him. He was very emaciated and had bony curvature. On examination it was found that the subcutaneous tissue of both the arms and legs was contracted and was producing a condition of almost acute flexion. The tendons were not involved. This case did well.

Pigmentation, variations in. Various degrees of patchy depigmentation are to be found in the West African, and if sufficiently marked produces the Albino. I had two of these children under my care for two years and saw several other cases, but was in no wise able to link the condition with Yaws. Directly connected with Yaws is the depigmentation of old yaw scars, and the

spat and glove distribution involving the dorsum of the hands and feet. This can be met in young people but is generally seen in older people. The skin in these cases is normal in texture and is not raised. The small spots of pigmentation left have such clear cut edges that they seem to stand out, but on palpation are found to be level with the depigmented areas and similar to the m to the touch.

The light coloured area on the nose resembling a butterfly and lighter coloured areas on the face and neck are often met. There is a suggestive association with Yaws, but in all cases which I have seen the question of avitaminosis also arose. Pigmentation and depigmentation following secondary yaws have already been discussed.

Below are tables of the recognised tertiary conditions showing numbers, etc., over nine months. The only remarks I would make on these figures are :-

1. The early age at which some of the se conditions are to be found, e.g. Clavus 17 cases under 5 years of age .

2. The sex incidence which seems to pre vail in certain of these conditions, even when complicated by other tertiary states, e.g. In clavus, osteitis and hardening of the skin the figures for male patients are greater. In destructive lesions such as Gangosa and multiple ulcers the female patients are more numerous.

Data collected Feb - Oct. 1925.

CLAVUS.

<u>Date.</u>	<u>AGE.</u>										<u>Adult</u>	<u>Male</u>	<u>Female</u>	<u>Totals.</u>		
1925	0	-	5	5	-	10	10	-	18							
Feb.	0	-	0	0	-	0	0	-	0	7	-	0	7	-	0	7
Mar.	0	-	1	1	-	0	3	-	1	12	-	2	15	-	4	19
Apr.	0	-	0	0	-	0	0	-	0	13	-	2	14	-	2	16
May.	0	-	1	0	-	0	0	-	0	13	-	5	13	-	6	19
June.	0	-	1	0	-	0	3	-	6	30	-	15	33	-	22	55
July.	1	-	1	3	-	2	7	-	3	37	-	16	48	-	22	70
Aug.	0	-	0	3	-	1	13	-	6	67	-	44	83	-	51	134
Sept.	4	-	2	7	-	8	4	-	5	78	-	36	93	-	51	144
Oct.	4	-	2	12	-	20	10	-	11	124	-	71	150	-	104	254
	9	-	8	26	-	31	40	-	32	381	-	191	456	-	262	718

Clavus accompanied by Ulcers.

Totals	0	-	0	3	-	0	4	-	3	22	-	16	28	-	19	47.
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One of these cases had also acute osteitis and gummata.

Clavus accompanied by Skin conditions.

Totals	0	-	0	0	-	0	1	-	1	22	-	19	23	-	20	43.
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"2 Cases had ulcers, one ulcers and acute osteitis and one had Gummata.

Clavus accompanied by Osteitis.

Totals	0	-	0	2	-	3	5	-	3	9	-	8	16	-	14	30.
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One case had secondary yaws and one arthiritis.

Clavus accompanied by Arthritis.

Totals	0	-	0	1	-	2	1	-	0	10	-	12	12	-	14	26.
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One had ulcers and two had osteitis.

Clavus accompanied by Gummata.

Totals	0	-	0	0	-	0	0	-	0	5	-	2	5	-	2	7.
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Clavus accompanied by Keratitis.

Totals	0	-	0	0	-	0	0	-	0	7	-	7	7	-	7	14.
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Clavus accompanied by secondary Yaws.

Totals	6	-	3	12	-	9	22	-	15	57	-	31	97	-	58	155.
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See ante for particulars of clavus with yaws pp 12. *Sanjosa* pp 51.

Data obtained Feb. - Oct. 1925.

OSTEITIS.

Date.	AGE.																							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Adult	Male	Female	Total.	
1925	0	-	5	5	-	10	10	-	18	Adult	Male	Female	Total.											
Mar.	0	-	0	1	-	0	0	-	0	4	-	2	5	-	2								7	
Apr.	0	-	0	1	-	0	0	-	0	3	-	3	4	-	3								7	
May.	0	-	0	0	-	0	0	-	0	2	-	1	2	-	1								3	
June.	0	-	0	0	-	0	2	-	0	4	-	1	6	-	1								7	
July.	0	-	1	1	-	2	2	-	0	1	-	5	4	-	8								12	
Aug.	1	-	1	2	-	1	2	-	2	6	-	3	11	-	7								18	
Sept.	2	-	1	3	-	2	1	-	1	8	-	5	14	-	9								23	
Oct.	2	-	0	4	-	8	1	-	2	11	-	15	18	-	25								43	

5 - 3 12 - 13 8 - 5 39 - 35 64 - 56 120
 Of the above one case had Gummata and one had Keratitis.

Osteitis accompanied by Arthritis.

Totals 2 - 1 2 - 1 2 - 2 7 - 4 13 - 8 21.

Osteitis accompanied by skin conditions.

Totals 1 - 0 2 - 3 1 - 0 5 - 6 9 - 9 18.

Osteitis accompanied by ulcers.

Totals 0 - 0 1 - 3 4 - 2 9 - 5 14 - 10 24.

Osteitis accompanied by secondary yaws.

Totals 2 - 3 4 - 3 2 - 0 1 - 2 9 - 8 17.

For Clavus accompanied by Osteitis and Gangosa accompanied by Osteitis vide ante. pp. 49 + 51.

Data collected Feb. - Oct. 1925.

GANGOSA.

Date.	AGE.										Total.		
1925	0	-	5	5	-	10	10	-	18	Adult Male	Female		
Mar.	0	-	0	0	-	2	0	-	1	7	-	15	22
Apr.	1	-	0	0	-	1	0	-	0	4	-	6	11
May.	0	-	0	0	-	1	0	-	0	2	-	6	8
June.	0	-	0	1	-	2	1	-	1	9	-	18	29
July.	0	-	0	0	-	0	1	-	2	15	-	16	32
Aug.	0	-	0	3	-	3	1	-	1	14	-	16	34
Sept.	0	-	0	0	-	1	0	-	4	9	-	26	35
Oct.	1	-	1	2	-	3	3	-	3	32	-	52	90
	2	-	1	6	-	13	6	-	12	92	-	155	261

Gangosa accompanied by Clavus.

Totals 0 - 0 0 - 4 2 - 4 38 - 33 40 - 41 81

Gangosa accompanied by multiple Ulcers.

Totals 0 - 0 1 - 1 0 - 1 13 - 15 15 - 19 34

Gangosa accompanied by Skin Conditions.

Totals 0 - 0 3 - 3 1 - 1 6 - 7 10 - 11 21

Gangosa accompanied by Osteitis.

Totals 0 - 0 2 - 2 2 - 0 9 - 14 13 - 16 29

Gangosa accompanied by Arthritis.

Totals 0 - 0 2 - 2 0 - 0 3 - 6 5 - 8 13

Gangosa and Secondary Yaws.

Totals 1 - 1 0 - 1 0 - 0 5 - 2 6 - 4 10



Data obtained Feb. - Oct. 1925.

MULTIPLE ULCERS.

Date	AGE						Adult	Male	Femal	Total.
	0	1	2	3	4	5				
1925	0	-	5	5	-	10	10	-	18	
Mar.	0	-	0	1	-	0	0	-	1	3 - 10 4 - 11 15
Apr.	0	-	1	0	-	1	0	-	2	6 - 6 6 - 10 16
May.	0	-	0	0	-	0	1	-	0	1 - 5 2 - 5 7
June.	0	-	0	0	-	0	0	-	1	3 - 3 3 - 4 7
July.	0	-	0	0	-	0	0	-	0	2 - 2 2 - 2 4
Aug.	0	-	0	0	-	1	0	-	1	1 - 2 1 - 4 5
Sept.	1	-	2	0	-	2	0	-	1	2 - 8 3 - 13 16
Oct.	0	-	0	2	-	1	0	-	2	13 - 18 15 - 21 36
	1	-	3	3	-	5	1	-	8	31 - 54 36 - 70 106

Multiple Ulcers accompanied by Arthritis.

Totals 0 - 0 0 - 0 0 - 1 5 - 6 5 - 7 12

Multiple ulcers accompanied by Secondary Yaws.

Totals 2 - 5 6 - 5 1 - 4 10 - 12 22 - 29 51

For full particulars vide ante. p p. 13

Clavus accompanied by Ulcers, Gangosa accompanied by
Ulcers and Osteitis accompanied by Ulcers vide ante.

p p. 49. 51. + 50.

Data collected Feb - Oct 1925.

SKIN CONDITIONS, i.e. Hyperkeratosis etc., associated with tertiary Yaws.

Date.	AGE.													
	0 - 5	5 - 10	10 - 18	Adult	Male	Female	Total.							
1925	0	5	5	10	10	0	3	2	3	2	5			
Mar.	1	0	0	0	0	0	3	2	3	2	5			
Apr.	0	0	2	1	0	0	5	1	8	2	10			
May.	0	0	0	0	0	0	6	8	6	8	14			
June.	0	0	0	0	1	0	10	13	11	13	24			
July.	0	0	0	0	2	0	6	5	8	5	13			
Aug.	0	0	1	1	2	0	3	11	6	12	18			
Sept.	2	0	1	2	1	1	7	6	11	9	20			
Oct.	1	0	0	0	1	1	12	11	14	12	26			
	4	0	4	4	7	2	52	57	67	63	130			

Skin Conditions accompanied by Arthritis.

Totals 0 - 0 0 - 0 0 - 0 5 - 4 5 - 4 9

Skin Conditions accompanied by Clavus. Gangosa etc.
vide ante. pp. 49, 50, + 51

ARTHRITIS.

Totals 0 - 0 5 - 1 2 - 3 9 - 31 16 - 35 51.

INTERSTITIAL KERATITIS.

Totals 0 - 0 0 - 0 0 - 0 8 - 13 8 - 13 21.

For Interstitial Keratitis actually accompanying Yaw conditions *no numbers recorded.*

GUMMATA.

unaccompanied by any other yaw lesion.

Totals 0 - 0 0 - 0 0 - 0 3 - 4 3 - 4 7.

In this series one child under five showed gummata accompanied by secondary yaws; one male and one female adult had gummata with multiple ulceration.

All these figures were taken at headquarters i.e. the Hospital in Yendi and do not include any work done or cases seen on trek.

Nerve Involvement. I was working for a considerable time on Yaws before I began to associate certain nervous symptoms with the Disease. There was no literature to go on, and therefore conviction grew slowly. The first type that I noted were cases reporting with a boring headache, that had no relation to temperature; now and again a case came with paresis of one or more limbs. These cases of paresis cleared up rapidly with anti-yaw treatment and Pot.Iod. Next type was a young married woman who had acquired yaws from her own child. The yaws had healed but the woman had developed some form of epilepsy. On examination I found traces of yaws with considerable hardening of the skin. As I was enquiring about the fits she had a fit in the office. If it was epilepsy, it was petit mal, and was so unexpected and over so quickly that apart from the transient unconsciousness and some twitching of the face, shoulders and hands there was nothing to note. She had a full course of antiyaw treatment with Pot.Iod. She had a second child but no further complaint of fits. Diagnosis from hysteria was not conclusive.

Case. Tamale school boy of 18 years had attended periodically for tertiary yaws. He suffered from clavus and osteitis, together with marked typical thickening of the skin. He generally reported with strong headache. The School Report showed that he was deteriorating mentally, and there was some talk of removing him from the School. Out of bounds one afternoon he was bitten by a snake.

Before he was found and I was sent for, he was bleeding from the nose, mouth and rectum. He died in a few hours in Hospital. The M.O. decided on a post mortem at which I was present. At my request the skull

was opened. There was a large blood clot over the upper surface of the brain and no doubt to the hemolytic venom. The meninges, both pia and dura showed considerable chronic thickening. Laboratory examination could not be obtained. Taking the history into consideration, the mental deterioration and continual headaches were no doubt due to chronic meningitis, which in its turn was more than probably due to the tertiary Yaw condition, coinciding as it did with marked scleroderma. I may note in this connection that like clavus and hyperkeratosis this type of headache is more common in men and in women, and more common in the N.Ts. than in the Colony.

Case. 1931 Young male adult from Kwabeng. Lack of power in the right hand and arm with altered sensation. The doctor who was treating the case, and handed him over to me could not get any history indicating syphillis; but was giving antisyphillitic treatment. The man himself stated it was yaws and had come on immediately after the eruption. Kwabeng is a heavily infected yaw District. The case did well. Two years later the power in the right arm and hand was good. Sensation normal.

Case. 8/2/36. Boy between 16 and 17 years. paresis of the right arm and right side of face becoming worse. Was receiving native treatment but as he began to lose power of speech they brought him to the clinic. He attended three times. When he received his third injection he was very much improved. He could speak audibly. His parents did not think it necessary to bring him back.

While acting as M.O. in 1933 a series of cases who were in Hospital at that time are of interest regarding this aspect of Yaws.

1. Steward Boy had been treated for some time for strong headache and emaciation. He was admitted. Wassermann plus 4 plus 4. He had some old yaw stigmata. Treated with N.A.B. he quickly regained health. He had an intolerance for Iodides. The treatment was persevered with and in 1937 he was still in good health.

2. Govt. Official, native, well educated, was admitted with headache and fever. He had been treated with quinine and atebriane for malaria. Blood showed no evidence of malaria. Wasserman plus 4 plus 4. When I handed him over he was improved but still undergoing treatment. Wassermann plus minus.

3. Clerk. G.O. admitted with strong headache. He had been treated for malaria and had been given glasses to

prevent eyestrain. At the time of his admission I had one of his children on my private list for paresis. Clerk's temperature four hourly normal. Wasserman plus 4 plus 4. When I handed him over he was much improved but the Wasserman was not negative. No history of yaws.

4. Male adult admitted for observation. Found wandering. Speech not coherent. Habits filthy, drooling, incontinence. History short. Had been normal till a short time previously. Old yaws stigmata present. Urgent anti-yaw treatment instituted, N.A.B. with Bis with massive doses of Pot.Iod. Wasserman plus plus. He improved and within a month was able to attend to himself and do light work in the Hospital grounds. When he was sane enough to demand money for the work he was doing he was transferred to the O.P.D. Two years later I met him in one of the larger villages, running a good business and apparently quite well and sane.

5. Constable. N.T. man suffering from depression and fits of maniacal insanity. Temperature, morning normal, evening 103 - 105. Doctor who handed him over to me thought the temperature due to Herxheimer reaction. He had been admitted for observation because of the depression. Slides showed tertian and subtertian malaria. Wassermann plus 4 plus 4. Quinine with weekly N.A.B. given. His temperature become normal but the patient continued depressed, and relapsed into a morose condition. Pot.Iod. was added to the treatment and the patient gradually cleared up. It was not found necessary to send him to Accra. As he had not only evidence, but a very good history of yaws, I concluded that while there may have been cerebral malaria, it was a side issue and not the true cause of the depression. His mental condition continued after his temperature was normal. When able to return to duty he was under observation. A transfer which was advised was obtained and in 1937 I learned he was doing well.

Malaria may influence but does not produce a Wassermann reaction. All sera were examined at the Laboratory in Accra.

In analysis of these cases I find that headaches associated with hyperkeratosis, and paresis associated with yaws are tractable if treatment is instigated early and persevered with. The schoolboy and several other cases I had, did not react to treatment but they were of long standing. There is a suggestion that some

forms of mental instability may be due to yaws. Cases 2 and 3 in the last series give no evidence of Yaws, and may have been syphillitic in their origin, especially as both men belonged to Coast towns. Again with the advance of education, which in West Africa is progressing at a much greater rate than Yaws are being suppressed, cases of mental instability and deterioration are bound to increase, partly because of the greater strain on the mental powers, and partly because people pass muster in a rural, uncivilised, uneducated community, who will not stand the test of contact with organised life. It is therefore essential that further work be done to ascertain the extent of the effect of Yaws in producing nerve traumas, and the best line of treatment should the case against yaws be proved. Also the last series of cases leaving in ones mind a doubt of neuro-syphillis leaves a doubt as to what advice the patient should receive.

Tertiary Yaws, its effect on Reproduction and Heredity.

The fertility and the case of child-birth of the bush woman is a byword. Those of us who have worked amongst bush women do not find it so. I agree with Medicos whom I have heard speaking about other parts of Africa where yaws are prevalent. The sterile woman forms a great part and the saddest part of every clinic. Where polygamy and polyandry are prevalent, the fact of sterility raises a question which cannot be answered entirely by Gonorrhoea, even if ^{that disease} ~~it~~ exists in a community. Leaving the absolutely sterile woman

out of count, I append data taken during the twelve months of 1936 for women who were pregnant and therefore capable of child bearing.

It will be noted that the average number in families are smaller than they should be in a community where every effort is made towards a high birth rate, as children are highly prized. If anything is thought to be for the welfare of a pregnant woman, and it is possible she will get it. Again the neonatal death and still birth rates are very high.

I took no note of deaths amongst children above infancy. The death rate after weaning is exceedingly high (see Cardinal's figures) but this does not enter into circumstances affecting reproduction.

During my first fortnight in Kibi I saw seven cases of ruptured uteri. Even in a large District with only one Hospital this is abnormal. I then noted that in a number of cases hardening of the Cervix Uteri was associated with clavus; pregnant women came to me at three months, the cervix showing no signs of softening and threatening abortion. From these observations the conclusion was drawn that tertiary yaws causes a hardening of the cervix and tissues of the uterus giving rise to sterility, prolonged labour and tendency to rupture.

In Bathurst labour followed the normal course and a caput was common. In Kibi long hard labours are frequent and a

caput unusual. I must also mention that pelvic diameters (external) are below normal; $7\frac{1}{2}$ " x $8\frac{1}{2}$ " x $9\frac{1}{2}$ " being the normal both in Bathurst and Kibi. Delay in labour is not however due to this but to some fault in the powers (vide caput) and whilst other factors undoubtedly enter into many cases, any hardening caused by Yaws would delay dilatation and retraction and lessen muscular effort, so becoming an important factor in producing a slow, painful labour. By active Yaws (see data) I mean conditions for which because of pain or some other reason the patient asks for treatment. It will be noted that Splenomegaly was far in excess of active Yaws. It could not therefore be ignored as a possible cause of, if not actual sterility, at any detriment to the fetus. This splenomegaly was accompanied (or caused) by intense anemia. There were many factors which might induce the condition. Malaria was prevalent, insufficient protein and overcooking of the food, the very grave anemia associated with tertiary yaws, and lastly hemorrhage at the time of previous parturitions - in the case of primiparas whose percentage of splenomegalies was almost as high as multiparas this last cause would not enter. The majority of these cases reacted quickly to N.A.B. which I considered the drug of choice.

That many women who have suffered from yaws show no hardening of the cervix or other demonstrable effects on the uterine tissues as a result of the disease is analogous with the condition of clavus and hyperkeratosis being not so frequently found in women.

Analysis of figures for Women attending Ante-natal Clinic in connection with my private practice in the Kibi District, Gold Coast Colony. for the year 1936.

-----c0o-----

Number of pregnant women who joined during the year 1936.....	793
Number of those who were Primipara	159
Number of Multipara	634

Histories of Multipara.

Number of previous live births	1875
" " " still births	298
Average number of live births per mother	3.115
Number of mothers with families of six and over	78
" " babies in those families	604
Average number of babies in families less than six	2.3
Percentage of still births	13.7o/o
Neonatal deaths in above families	26
Deaths within the first few weeks of birth.....	46
Percentage of deaths during the first few weeks	3.8o/o

Obviously it was impossible to obtain the postpartum histories in connection with the pregnancies for which the women joined. Some babies had not been born when I left on holiday. Most of the mothers who were due to deliver returned to their home village according to custom, and though many brought their babies to the clinic to let me see them, many more will not probably turn up till a future pregnancy.

Pathological history.

Practically all the women gave history or evidence of having had yaws at some time.

Cases of active yaws	Primips 5 cases.....	3.14o/o
	Multips. 21 with 2 of florid yaws	3. 6o/e
Splenomegaly	Primips. 17 cases	10.69o/o
"	Multips 71 "	11. 2o/o.

Heredity in Tertiary Yaws.

I have found no definite condition associated with tertiary yaws such as the hereditary stigmata of syphilis. The high percentage of still births, the small families indicating recurrent abortions are not assisted in any way by the lowering effects on the woman's organism of any form of the tertiary stage.

Case. 14/1/36. Primipara 4½ months. Threatened abortion. Splenomegaly. Early gangosa. Nasal septum denuded of mucous membrane. Antiyaw and usual treatment given.

18/2/36. Spleen no longer palpable. Fetus increasing. Proceeded to a normal delivery.

Case. History two babies died within the first week - both full time but too small. Condition - throat evidence of old gangosa, healed but distorted. Goundou. Clavus plus.

Case. Multipara. Had three still births. Pres. Cond. three months. Splenomegaly. clavus plus. Anti-yaw treatment given. After one slight hemorrhage the pregnancy proceeded on a normal course.

Case. Multipara 6. all born alive. No history of abortion. Pres. Cond. 7 months proceeded to a normal delivery. Clavus plus. Attended because of previous hard labours.

It will be seen that clavus tends to be associated with sterility and hard labours but viable babies; whilst splenomegaly, gangosa and ulcerative conditions tend to be associated with abortions and accidents to the fetus.

Other conditions which may be associated with Yaws and require Investigation.

Condition suggesting pulmonary fibrosis with acute exacerbations simulating pneumonia, but without temperature.

Case. 1931 Clerk from Kibi mines brought to Kibi Hospital acutely ill. The M.O. was on trek at the time and I was called in. Diagnosis widespread patchy affection of the lungs with tubular breathing. Temperature subnormal. On his return M.O. made similar diagnosis. Nothing in the shape of malaria had been found in the blood. He died during the night having been ill for less than 24 hours. People refused post mortem, stating they were satisfied it was yaws.

Case. I was called to a chief, whom I found in the same condition, apparently moribund, temp. subnormal. Remembering the earlier case I gave an intravenous N.A.B. the vein was very difficult. Leaving a nurse with him with instructions as to hot water bottles etc. I went on to a further village. On my return the man was decidedly improved. As he refused to come into Hospital I did not see him for a week and did not expect to find him alive. He now appeared out of danger and antiyaws treatment was continued. He has now been for five and a half years without further attack and in good health.

Since then I have not hesitated to give any obscure lung condition with a history of yaws the same treatment, N.A.B. and Pot.Iod. I have since noted that O'Reilly believes that Yaws attacks the lungs. Were this point established it would help to account for the ease with which N.T. labourers who go to work in the mines succumb to lung affection.

Heart Conditions. In boys of 9 - 12 and to a less extent in girls acutely dilated hearts with presystolic and systolic mitral murmurs are common. One case of a boy of 9 years succumbed to the condition. The history was carefully gone into. There was no history of acute fever or any illness except that the boy had had a recent attack of yaws and had not been well since. These cases are frequent, and I have had ample opportunity to realise the benefit they derive from one of the

arsenicals and Pot.Iod. Endocarditis following acute or chronic rheumatism might derive equal benefit from the same treatment. The following points have been noted; The sex incidence, the disability is not so great as the condition of the heart would lead one to expect, the invariable history of Yaws.

Keratitis. The N.T. natives associate keratitis with yaws. Interstitial keratitis is frequently met among young adolescents and growing children. Though the condition might be attributed to yaws other ophthalmic lesions must be taken into consideration and the fact that little is known of the ophthalmic condition of these people. Every Hamattan acute and chronic conjunctivitis are prevalent and whole villages are full of children with streaming or congested eyes and extreme photophobia. Till further investigation is possible antiyaws treatment deserves a trial. In a few cases I thought it successful, but not only is the usual precautions required with the injections but one has to be careful lest the native is at the same time continuing his own drastic counter-irritants, to which I am sure much blindness is due.

Familial and local distribution of various types of tertiary Yaws.

On first recognising that in different parts of the district, different types of tertiary yaws predominated, the presence of different strains of spirochaema suggested itself. In Bimbila as already stated gangosa and tertiary ulcer predominated, in Konkomba

country hardening of the tissues, hyperkeratosis and clavus were most frequent, in Chakosi country bony conditions and contractures, in Yendi tertiary yaws was not plentiful but osteitis among the children was the most noticeable. Families also showed certain types of tertiary manifestations. All these things seemed to point to distinct strains of the spirochaete. Tertiary yaws are, however, so associated with other lowering conditions, that the social and living conditions of the various tribes and families had to be considered. The Konkombas are a warlike race, hunters and accordingly meat eaters. In other places the people are yam growers and maize eaters. The Hausas consider themselves a strong race because they eat guinea corn instead of maize. In some places water and fish was easy and in others scarce during the dry season. Again though one type of tertiary yaws might predominate yet in no place was any type absent. This, together with the difference in the soil, i.e. the individual, his condition of life, his food and his own natural resistance gave sufficient reason for variations without the necessity for variation in the spirochaete.

Case. Two families in one compound developed entirely different types of tertiary yaws.

Cases with familial tendency to one type of tertiary manifestation already quoted:- The Abomusu sisters with elbow arthritis, the Osino family with multiple ulcerations, the schoolboy whose family developed gangosa.

Case. Yendi 11/8/25 Mother arthritis of elbow.
Daughter Dactylitis, arthritis.

Demon 9/8/25 Father, Mother, Child Gangosa.
" " Mother, Daughter Gangosa.

As against these it would be easy to quote families with varied manifestations, but the tendency to type is there and there must be a fundamental reason for it. Therefore enquiry into food, common parasitic diseases, general hygiene and hygiene of the mouth is necessary. It is known that scabies affects the type of Yaws, perhaps round worm does also, only more so. Certainly avitaminosis, especially in young children affects in particular the tissues which yaws affects. It is also certain that certain districts and certain families are infected with certain things, e.g. all school boys from a certain village had scabies.

Treatment. Of the spirillicides, Bismuth and Arsenic, Bismuth being the cheaper is probably the most desirable, from the point of view that where money is a factor in the case, a more exhaustive and thorough treatment can be given with the cheaper drug. This comes into count very strongly when dealing with large numbers of patients. However largely cost may figure in the possibility of treatment, it is well to have some idea of the relative values of the different drugs apart from a money basis.

At Yendi 1925 a limited enquiry was made into the relative value of Bismuth and Arsenic, Bismuth Sodium Tartrate and N.A.B. being the two drugs used. At the Dispensary, 944 injections of B.S.T. were given 0.5 for infants up to 3 and 4.5 grains for adults. As the majority of cases did not return after one

injection it was impossible to judge results. No abscess was reported and patients from the town of Yendi itself did well.

Extract from Report:-

"It was therefore decided to try a test in the village of Demon. One hundred cases of active secondary Yaws were collected in the village mostly amongst children between 3 and 6 years of age, too old to be carried and too young to walk into Yendi. 50 received N.A.B. injections varying between 0.1 and 0.2 grms. 50 received B.S.T. injections varying between 1 and 2 grains. A fortnight later a second visit was paid to Demon. Ten children seen on the second visit had been treated with B.S.T. and no trace of yaws was found on any of them... . The chief could not understand why I should wish to see children who were completely cured and there were plenty more yaws in the district..... No one was sick. The buttocks remained painful for three days."

1. In secondary Yaws N.A.B. has a close rival in Bismuth.
2. Awa School cook reported lame with painful clavus and unable to sleep at night. Two days after the first injection of B.S.T. the pain was relieved.

This relief of pain in Clavus, Acute osteitis and Arthritis was noted not only by me but by Dr. Daly when he continued this investigation. This relief of pain is superior to anything derived from N.A.B.

3. My report further goes into the cases of children with marked contractures, and multiple ulcerations, and all cases where intravenous injection is difficult. Owing to the intramuscular reaction of N.A.B., B.S.T. is superior in that with a lesser reaction it enables injection to be given weekly without fear of abscess. There are now Arsenicals on the market, Sulpharsenamin, Acetylarsan etc., which I prefer to Bismuth for these cases.

4 "Arsenic fast" cases Bawa a boy of nine attended hospital in 1923 with ordinary secondary yaws. He received N.A.B. treatment but the yaws did not yield. He returned in 1924 and again received treatment. During my absence in England 1924, he received a further 5 injections. In Feb. 1925 he was brought again with considerable bony deformity. Under B.S.T. treatment the spots cleared and the boy improved.

With the pentavalent arsenics we have another powerful instrument against yaws, I would therefore

give a short summary of my own impressions of the various values of the different drugs.

I consider B.S.T. as effective as Arsenic in dealing with secondary Yaws in the ordinary patient. It is therefore the drug par excellence in a large campaign against yaws en masse.

For very small children and infants I prefer M.A.B. Sulpharsenamin or Acetylarsan. For children of all ages with malaria, scabies, round worm, dysentery or summer diarrhoea, measles, whooping cough, chest or heart trouble, anemia, marasmus or general debility the arsenicals are preferable. These complications do arise in yaw cases. For pregnant women I prefer N.A.B. Cases of boring headache skin hypertrophy, clavus, osteitis receive one or two initial doses of B.S.T. followed up by, or combined with N.A.B. The combined treatment may be begun by an injection of N.A.B. and slight protein shock, obtained by drawing off 5 - 10 c.c.s of the patient's own blood and injecting it deeply into the buttock. Generally this has a tonic effect and accelerates recovery.

Gangosa and multiple ulcerations are better treated by one of the arsenicals. Sometimes the pentavalent drug acts better than the trivalent. If the patient can only be seen at intervals and the case is urgent it is sometimes better to give a full dose of an intramuscular drug to obtain a more continuous effect. In foul cases that are under observation, daily dosage

with intravenous Antrimony for a week accelerates the cleaning process. I have never gone beyond one third of a grain of the tartrate.

I have found Hallarsol a good drug in cases of paraplegia. Its cheapness enables one to give long and repeated courses which are necessary and it compares well in action to N.A.B.

Stovarsol and Orarsan I have had difficulty with. The patients cannot be trusted to take only the requisite dose. Twice I have been called to patients who, purchasing the drug themselves, have taken an overdose. I therefore do not use these drugs in country practice.

In all cases of tertiary and most cases of secondary yaws Pot.Iod. is an essential part of the treatment. To prevent stomatitis, which does occur at times with B.S.T. even when the greatest care is taken, routine alkalines are useful. Routine Mist Alba or a good alkaline mixture containing calcium and glucose is beneficial for pregnant women receiving treatment. For children, tonics, cod liver oil, alkaline mixtures, quinine, vermicides etc., and above all instruction as to proper diet. Ignorance rather than lack of ability or will is the general fault. Lack of individual treatment is to be deprecated as is also a fixed rule of treatment. If a case does not progress under the type of treatment usual to that type of case there is no hesitation in switching from, say, N.A.B. to B.S.T. or vice versa. Change of injection will often quicken

up an ulcer which has healed so far and become indolent, so I make no strict rule as to the drug I shall use in a specific case.

In Yendi I had some experience with other drugs. During a lack of either Bismuth or Arsenic, Donovan's solution was used (see Manson) in the strength of 1 to 2 in Distilled Water. Dosage 5c.c. for adults - 1c.c. for children and 0.5c.c. for tiny infants every five days. Yaws cleared up in about three weeks and did not recur. I considered this series of cases a success.

Failing any other drug Mercury was given a trial. Hydrarg Perchlor. 1-500,5 c.c. for adults and 2c.c. for all children. Reinforced by Pot.Iod. and Iodine this drug took about the same time as Donovan. Opinion is against Mercury, but although the course is not spectacular it certainly hastens natural cure.

Treatment with Pot.Iod. should in tertiary yaws be continued over a very long time. In secondary yaws I do not consider less than three injections in a tiny infant and six injections in all over two years adequate treatment of any drug whatsoever.

Inauguration of Treatment. Opinions vary as to whether treatment with spirillicids should be given early in yaws or should be delayed till an immunity is developed. I have discussed this question in connection with immunity where for the benefit of the community I think

early treatment should be urged. With regard to the individual the danger of reinfection is not so great as the danger from a tertiary manifestation and it is safer to have treatment before the disease has gained a footing in the human organism. Finally the immunity to secondary yaws is a questionable benefit if it does not imply immunity against all further manifestations, and is obtained at the risk of infecting one's whole household.

Syphillis and Yaws. This question has been raised again in the "Transactions of the Royal Society of Tropical Diseases and Hygiene, Vol. 31., No. 1. June 1927. Here Yaws, Bejel and Syphillis are put in series by Ellis H. Hudson, M.D.

Late in 1925 an enquiry was made from Accra to ascertain whether the tertiary cases that were recorded from Yendi as Yaws were not in reality Syphillis. I quote from my reply to this enquiry.

"Against the case being Syphillis there is,
 "First. The History. The history is taken in all
 "cases classed as tertiary Yaws, and almost invariably
 "there is some connection with an attack of secondary
 "Yaws.
 "2. There is no record of any primary syphillitic sore
 "in the District.
 "3. I have seen no cases that could be classified as
 "secondary syphillis, and there is no record of such.
 "4. There is no evidence of hereditary Syphillis.
 "Although I know there is much less of this than is
 "supposed, still in a large District one would expect
 "some cases.
 "5. When I first came to the District I classed these
 "cases as syphillitic but some experience of the people,
 "together with the services of a good interpreter,
 "led me to change my mind. I know of no way apart from
 "the history for distinguishing many cases of tertiary
 "Yaws from syphillis. I do not even know that a serum
 "reaction would give any information, as in secondary

"Yaws and in Gangosa (Manson) the serum gives a positive Wassermann probably also in other forms of tertiary Yaws. There is also the absence of neurosyphillis in the District. I have had cases having the signs of paraplegia, but no cases resembling G.P.I. or Tabes. (The absence of the former may possibly be due to malaria). However there is no reason why Syphillis should not exist in the District. Traders are continually coming in from other parts of the country where Syphillis is known to exist, but as yet there is no proof that it does exist in Yendi."

The differential diagnosis of Yaws and Syphillis and the possibility of prognosticating the course of the disease, and more than anything its effect on the race is important. As I have stated in the above report, history, both of the individual ~~of~~ the District, is important in the diagnosis of many of the tertiary forms. Many of the apparent diagnostic features of the two diseases require revising. The common belief that in Yaws the mucous membrane is not affected - in the third stage the mucous membrane is affected, and this stage may set in while the secondary is still flourishing. I note that Dr. Hudson gives cheloid scarring as a feature of the healing of secondary Yaws. There is no kind of scarring that is a necessary feature of the healing of the secondary stage, least of all cheloid. In an antenatal clinic one can easily appreciate how little, if any, outward effect Yaws may leave.

Re/visceral lesions and eyes. I have seen eyes, heart and lungs that were suspect of Yaws affection, and this point requires further investigation. The

point made by so many authors re the bony lesions being a rarefaction in Yaws, takes no heed of the natural healing of these conditions when hypertrophy and exostoses of the bones are often found.

In relation to the nerve affections which I have quoted, I would note that though I have never found amongst them the more serious affections affecting the parenchyma, these may have been absent owing to Malaria, racial disposition and the lack of that mental strain which accompanies education, civilisation and competition for existence with the world at large. Also the method of acquisition must not be forgotten. If neurosequellae are likely to develop in a community which has had non radical treatment, West Africa would present just such a problem when the factors restraining neuroinfection are removed, by the antimalarial campaign and loading up the people with education.

Whilst the third stage of the two diseases seem to raise a certain amount of difficulty in diagnosing and separating them, yet there seems to me to be a definite line of demarcation between the two diseases.

(a) In animal experiment each disease by inoculation produces itself.

(b) Secondary Yaws has a definite rash which does not intrude itself upon the mucous membrane.

(c) Atypical forms are either recurrences or are due to some modifying factor. The previous history gives evidence of a true Yaws in the patient himself or in

his immediate community.

(d) The primary sore is not always extra-genital in the true sense of the term. I have seen such a sore on the end of a penis, and I have quoted cases where such a sore occurred on the valva. The feature always noted is that it does not occur on the mucous membrane. u/

(e) Tissue selectivity. In the reaction to the secondary stage, and in the third, Yaws shows a tissue selectivity and a definite type of reaction. Inflammation of subcutaneous, submucous tissues, tendons, lamellae, synovial membranes, ligaments of joints, meninges and I suspect the sheath of nerves involved in the paraplegias followed by the laying down of fibrous tissue. In bony structures painful inflammation, vacuolation, erosion, swelling or enlargement, healing by absorption, hypertrophy and exostoses. A similar condition of the skin and throat is the tertiary phagedenic ulceration. However much similarity there may be between tertiary Yaws and tertiary Syphillis, this selectivity and course belongs definitely to Yaws.

(f) The absence of a Wasserman reaction in the spinal fluid in Yaws, I have had no opportunity to go into experimentally, but all workers are agreed upon it.

(g) There is nothing in Yaws resembling the stigmata of hereditary Syphillis.

If there is anything in Dr. P. Manson-Bahr's theory that the spirochaete of syphillis and yaws were originally the same organism, there is no knowing when with the

changing circumstances it may revert and become the forerunner of syphillis. Variation in tertiary type and in the virulence of Yaws itself in different countries and among different peoples has been noted. This difference in the incidence of the various manifestations of the disease, I myself, noted in the District of Yendi. However mild or virulent, the disease still ran along its own lines, and showed no indication of becoming another disease.

Clinically therefore, Yaws and Syphillis are two separate diseases. While the possibility of hereditary or neuro-Yaws need not at the moment be considered, the danger of insufficient treatment especially with the Arsenicals should not be lost sight of.

CONCLUSIONS.

1. Yaws is a childhood disease transmitted by contact.
2. It is detrimental to the productivity and working efficiency of a community.
3. It can cause death. It is also a very strong accessory factor in death from other diseases.
4. While Gangosa and other effects appear dramatic in their rapidity, they are really the end effects of a slow insidious process.
5. Yaws is
 1. A cause of sterility and hard labour.
 2. Definitely detrimental to the fetus in as far as the disease affects the mother.
 3. A cause of prolonged ill-health, and permanent deformity in young and growing children.
 4. Because of deformity so acquired, may cause obstructed or delayed labour in child-birth.
6. It has not been shown to be hereditary or to affect true nervous tissues.
7. Acquired immunity to the disease exists but is not certain.
8. Apparent cure is simple.
9. Sure and lasting cure is a long and expensive process.
10. Inadequate treatment may precipitate the tertiary stage, especially of the bony type in the patient, and may destroy or put a stop to the development of the immunising process.
11. Inadequate treatment may nevertheless render the patient noninfective to the community.
12. While individual treatment is the thing to be aimed

at, in Yaw communities mass treatment is often necessary, and should be carried out with a view to the hindrance of the spread of the disease in the first instance.

13. In this regard tertiary Yaws stands by itself as it is not infectious.
14. Treatment of the tertiary stage should be carried out not only with regard to Yaws, but also to the eradication of the conditions which the reaction in the tissues has brought about.
15. Treatment of co-existent diseases and morbid conditions in the patient greatly accelerates and assists in the effectivity of the treatment.
16. Choice of a spirillicid depends on the condition of the patient and the chance of prolonged treatment being carried out.
17. Eye conditions may not be due to yaws, but the treatment of cases showing eye symptoms must be carried out with discretion.
18. Yaws in its type and virulence depends not only on climate and altitude but on the hygiene and standard of living of the people. Special attention should therefore be paid to these things in any anti-yaw campaign.
19. Though allied to non-venereal and venereal syphillitis, under test it retains its own characteristics.

20. In its earlier stages it might be confounded with non-venereal Syphillitis as found among the Arabs, in its later stage with either venereal or non-venereal syphillitis, but its association, onset and progress should differentiate it.
21. Yaws of Syphillitis can co-exist but the immunising forces, and yaws being a Disease of the unclothed and Syphillitis of the clothed militate against it.
22. Clinically the differentiation between yaws and Syphillitis is:-
 1. For of usual acquisition Venereal and Non-Venereal.
 2. Age Incidence.
 3. Typical Secondary rash of Yaws.
 4. Tissue selectivity in Tertiary Stage.
 5. Spinal fluid reactions.

POINTS FOR FURTHER INVESTIGATION.

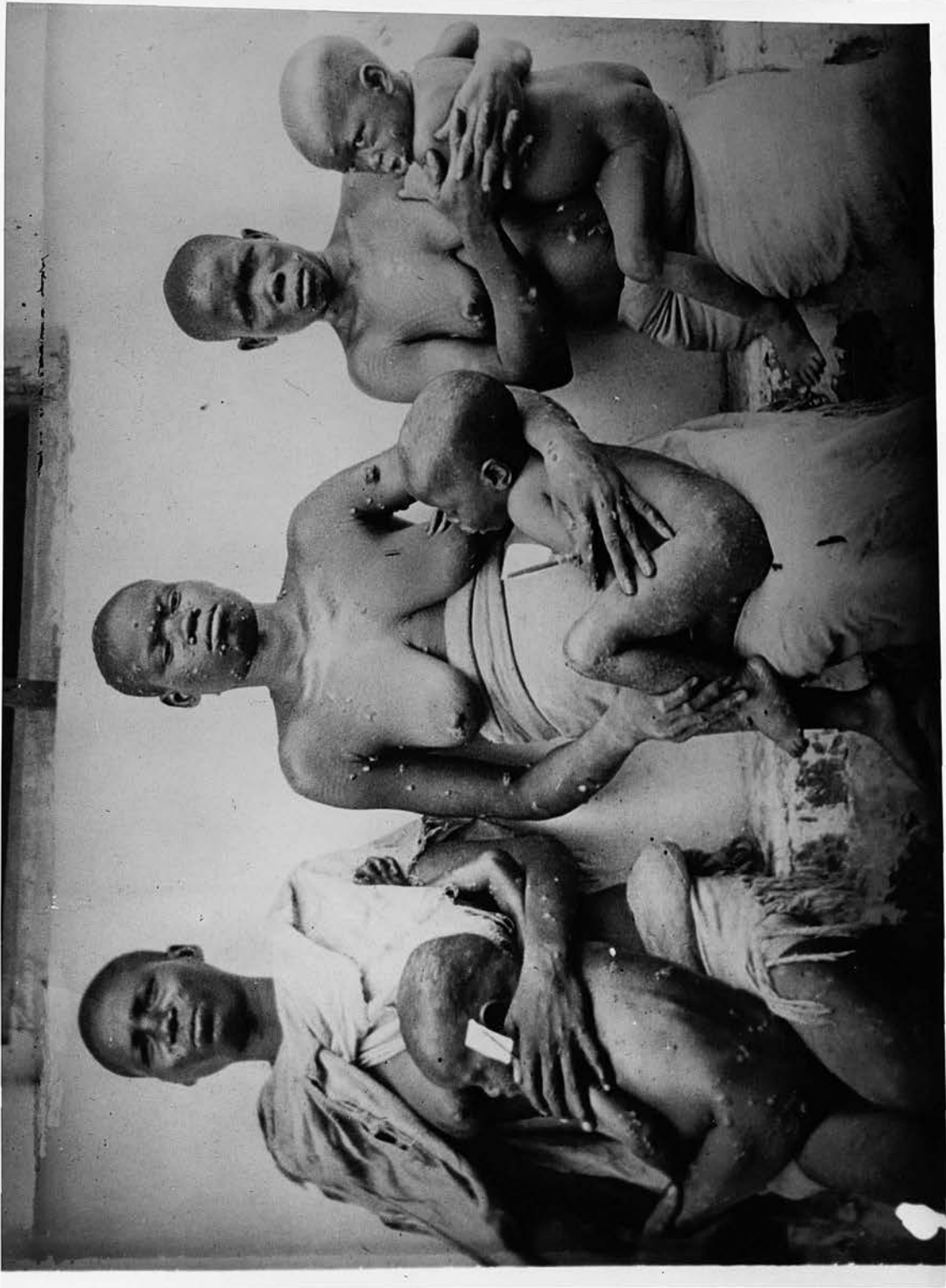
1. The effects, if any, of the imposition of clothing and education on the tertiary manifestations of yaws on those who have had yaws in childhood.
2. The reaction of the Spinal fluid in cases tending to show Central Nervous effects during the third stage, e.g. Headache. The paraplegias may easily be extra thecal.
3. How far supposed tertiary manifestations are really active yaws.
4. Enquiring into heart and lung conditions.
Whether these are a fibrosis following Yaws.
5. Further enquiry into the hard nodular placenta so often met with in the Gold Coast Colony after delivery of a healthy infant.



On the right large primary sore over the ischium.

On the left two large yaws behind the knees. It was claimed that both these sores appeared at the same time and were the first yaws to appear. This difficulty in deciding which is the primary yaw often occurs.

Taken 1923



Mothers and Babies suffering from secondary Yaws.

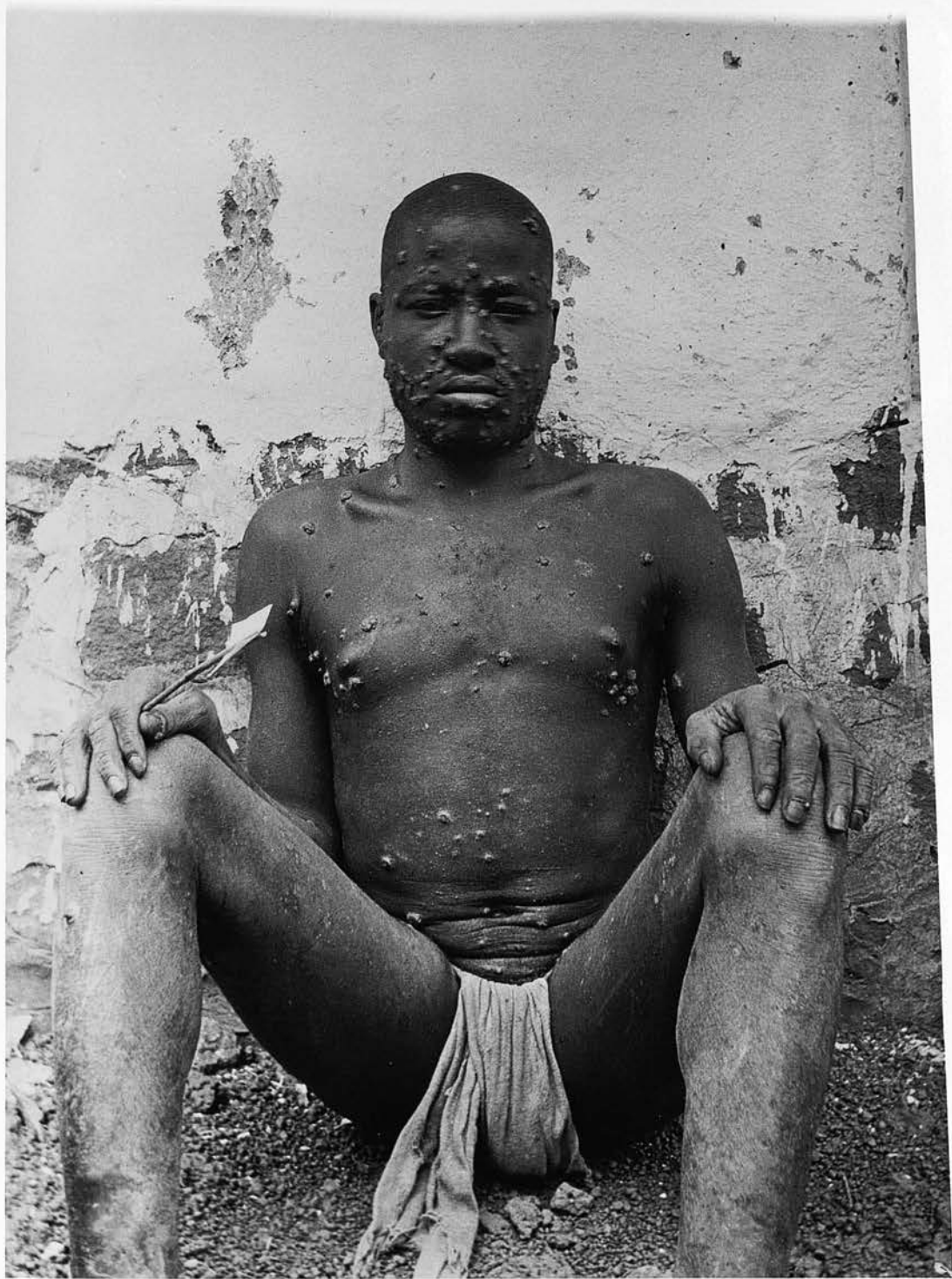


Large clump of yaws blocking the nostrils,
the only yaws which had as yet appeared.
These did not extend on to the mucous
membrane. 1923.

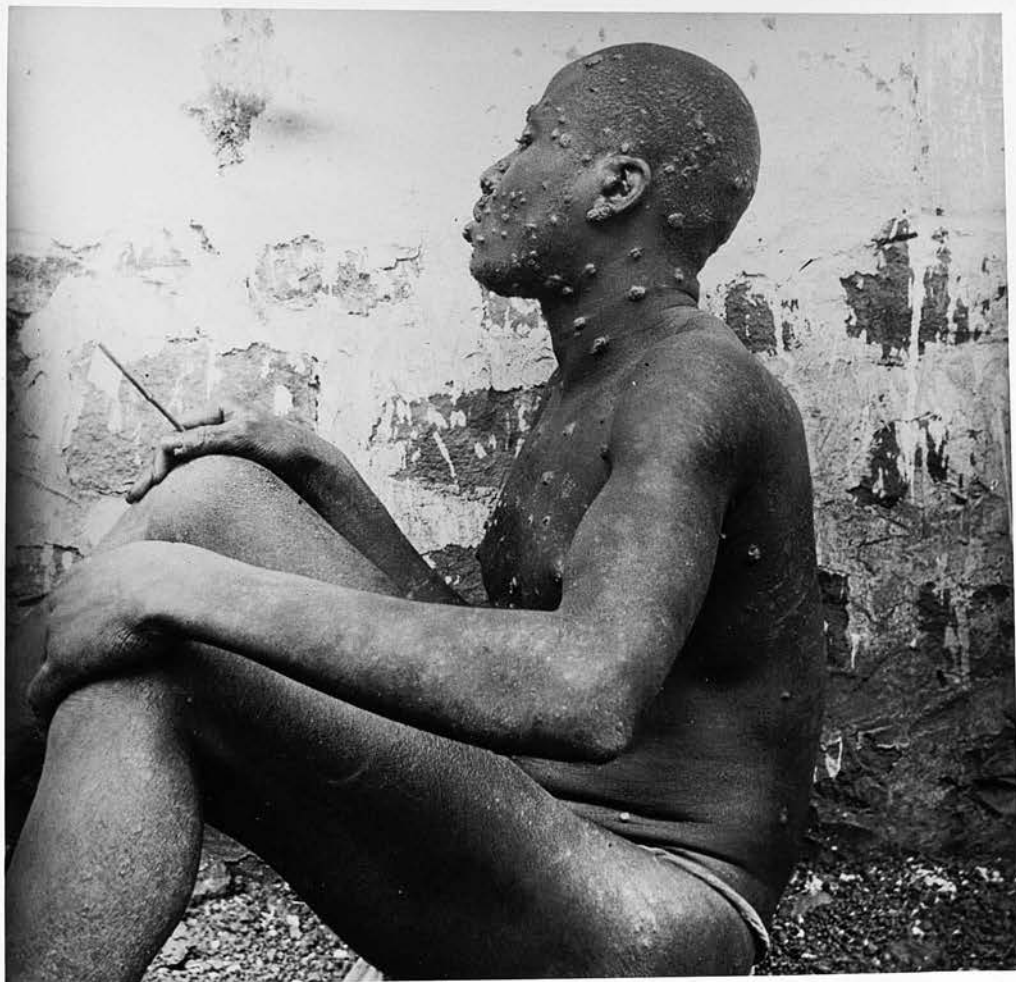


Case showing implication of the eyelids. This photo was taken after some treatment had been given. It demonstrates no true involvement of the mucous membrane. On the right side over the eyebrow is the remaining scar of an ulcerating yaw. This finally cleared leaving no trace.

1923



Case showing marked involvement of face. See side view which shows solitary distribution; this front view shows, over left breast, tendency to grouping. 1923



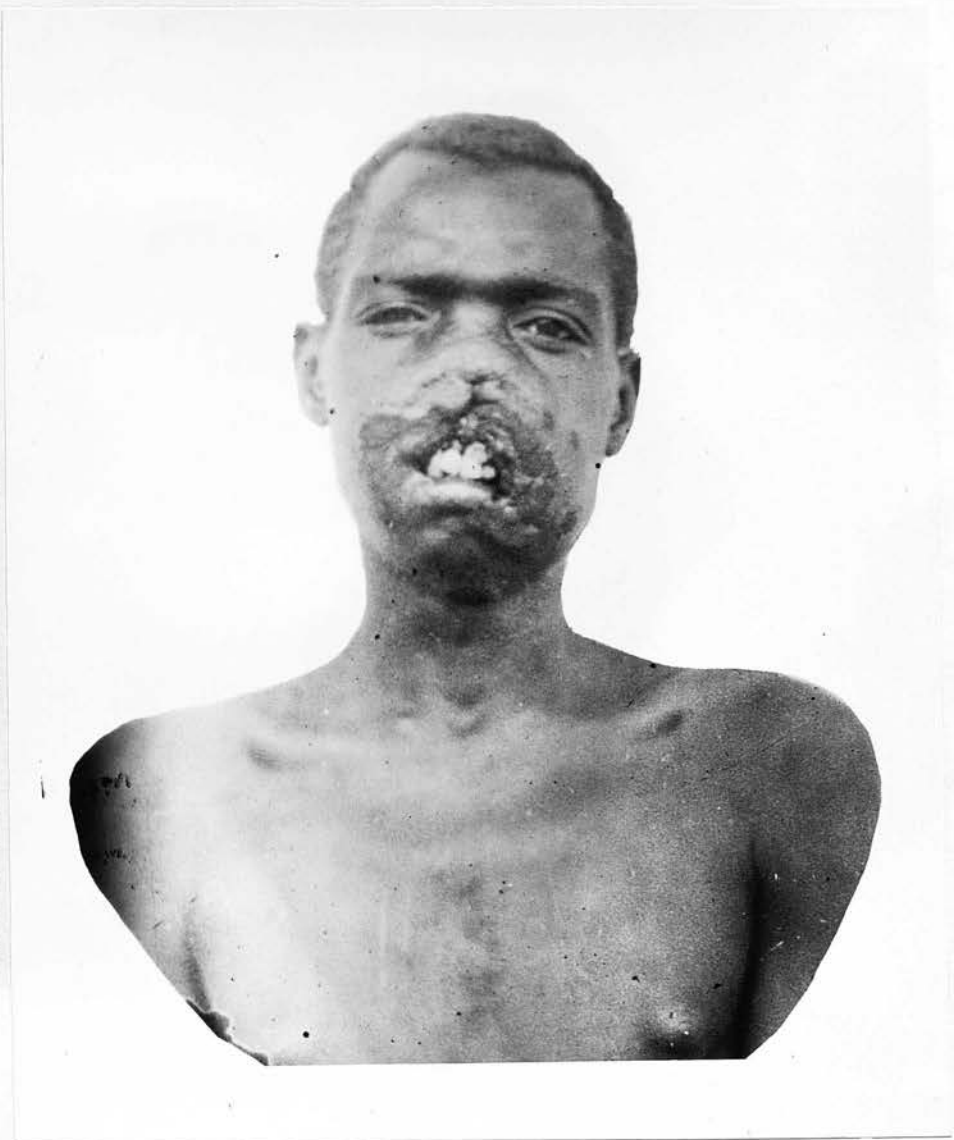
Case showing involvement of scalp and solitary distribution of yaws. Face heavily involved. 1923



Case on right shows true secondary yaws erupting through soles of feet. Primary over right ischium.
Case on left is clavus, a tertiary form.
Note method of identification, ticket on cleft stick.
Cases bringing tickets were seen before others.



Grandmother and grandson showing two stages of the same form of gangosa. The grandmother shows scars of healed ulcers. Her nose and throat had healed without treatment. Note pinching of the nostrils, flattening of nose where the septum had been destroyed and the nasal bones affected. She showed almost complete destruction of the soft palate. The boy shows secondary yaws with facial involvement. There was some pinching of the nostrils, with inflammation of the mucus membrane lining the nose and discharge. He was brought because the pain in the nose was making him ill. Note increased family resemblance owing to the affection of the nose. 1923.



Case of healing gangosa. The original condition was very bad. He came to live in the Hospital compound and so received regular treatment. He healed with much less deformity than could have been expected, but refused to have a second photo. The extent of the ulceration indicates the effects of the secondary infection. 1923.



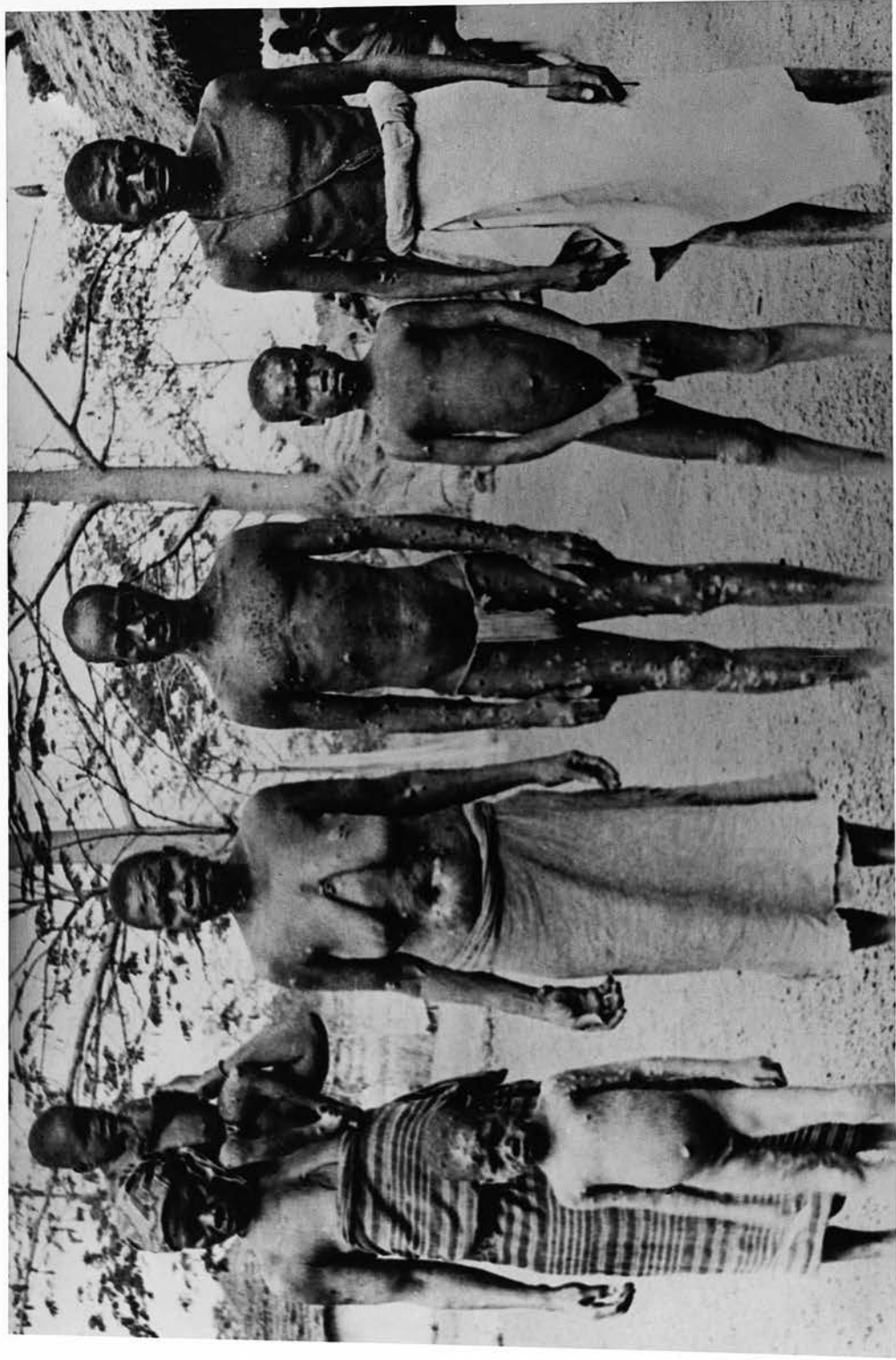
Case showing the results of untreated tertiary
ulceration over the lower part of the back and the arms.
The slight cheloid scarring higher up on the back is the
result of tribal markings. 1923.



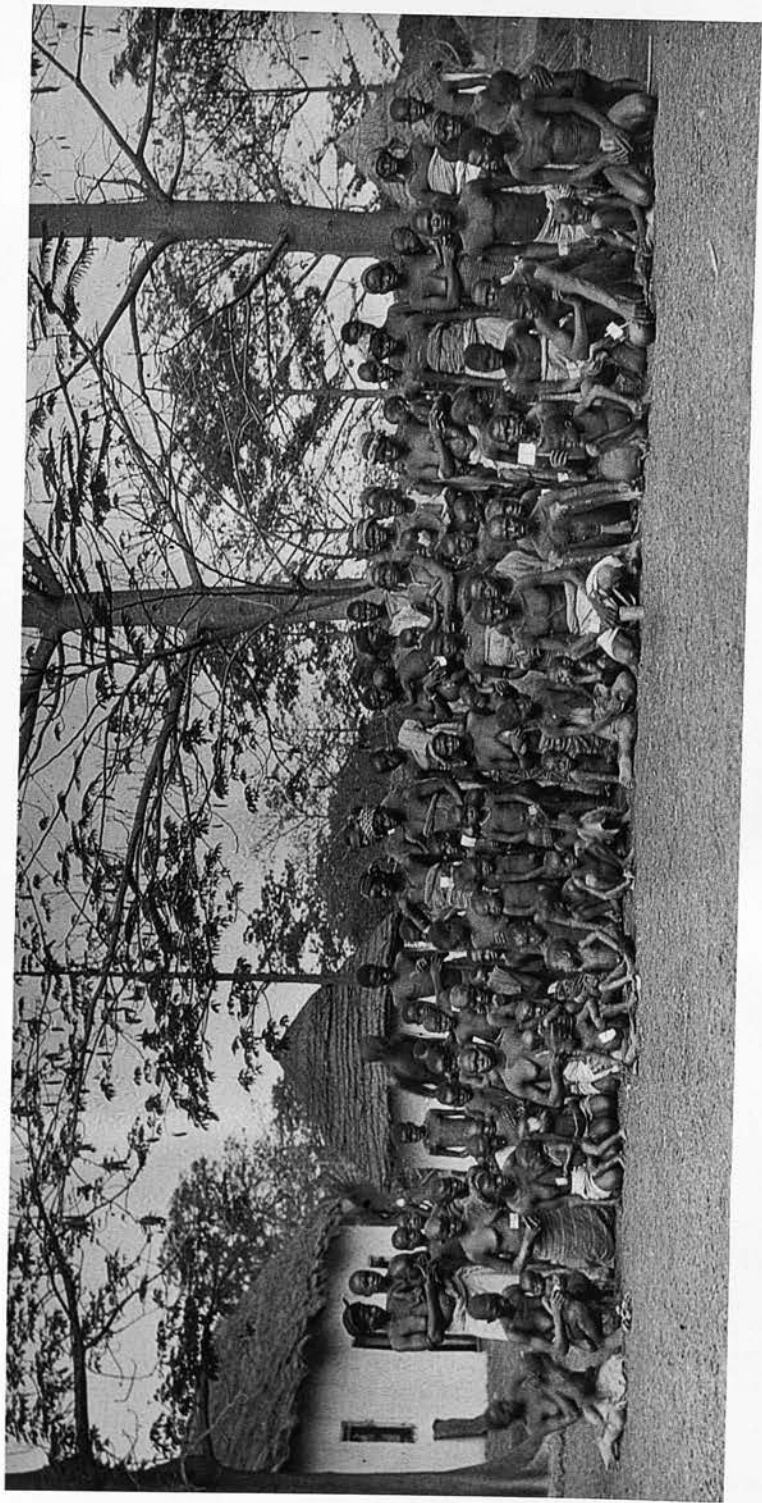
Case showing marked deformity as a result of tertiary ulceration. This woman received a prize from the D.C. for the cleanest compound in town. Her condition is not therefore the result of dirt or neglect. 1923.

TYPICAL GROUP OF SECONDARY YAW PATIENTS.

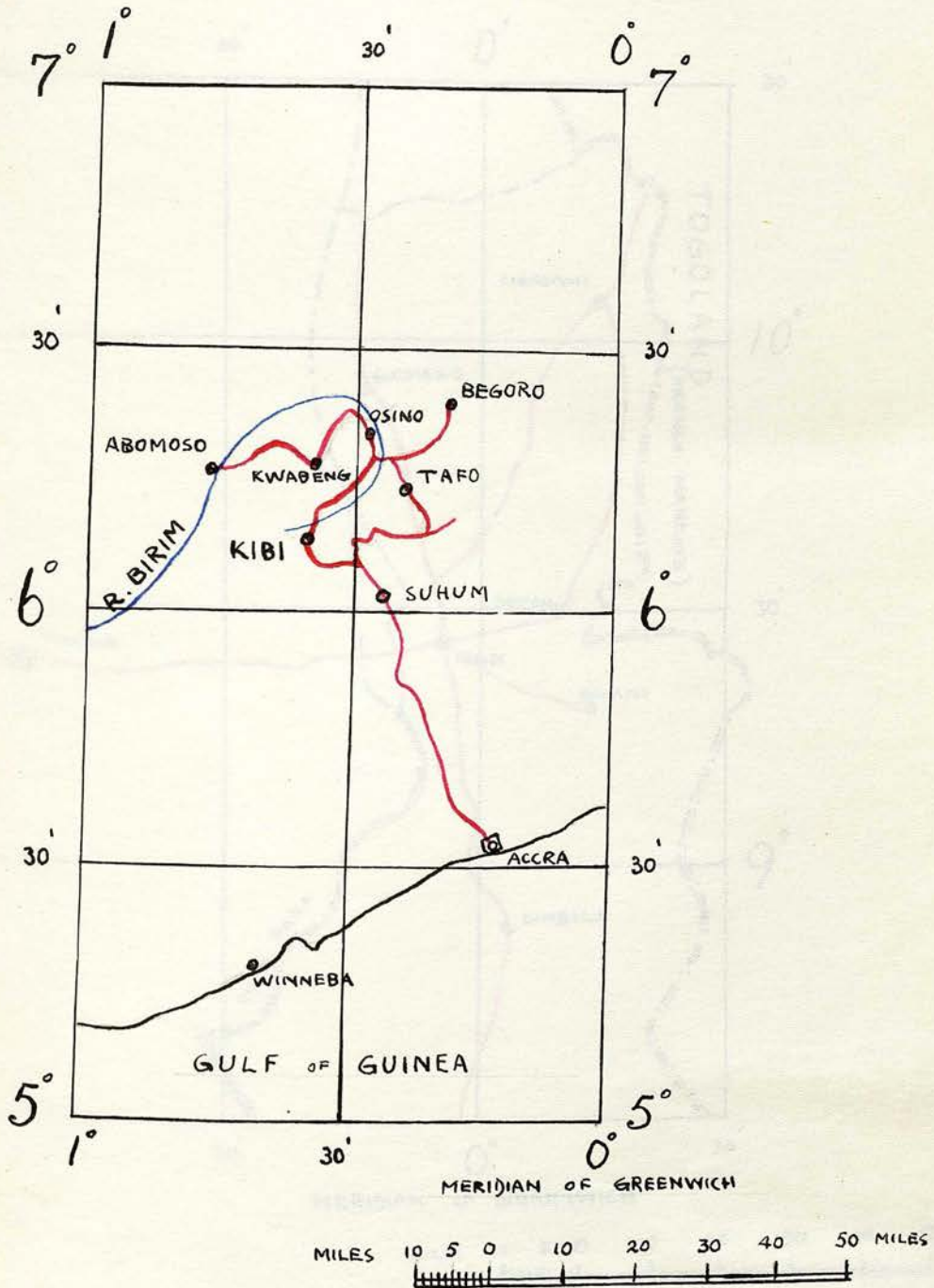
Note face involvement. 1923.



Small group of early morning arrivals at Yaw Clinic showing prevalence
of Mothers and Babies and presence of both sexes. 1923.

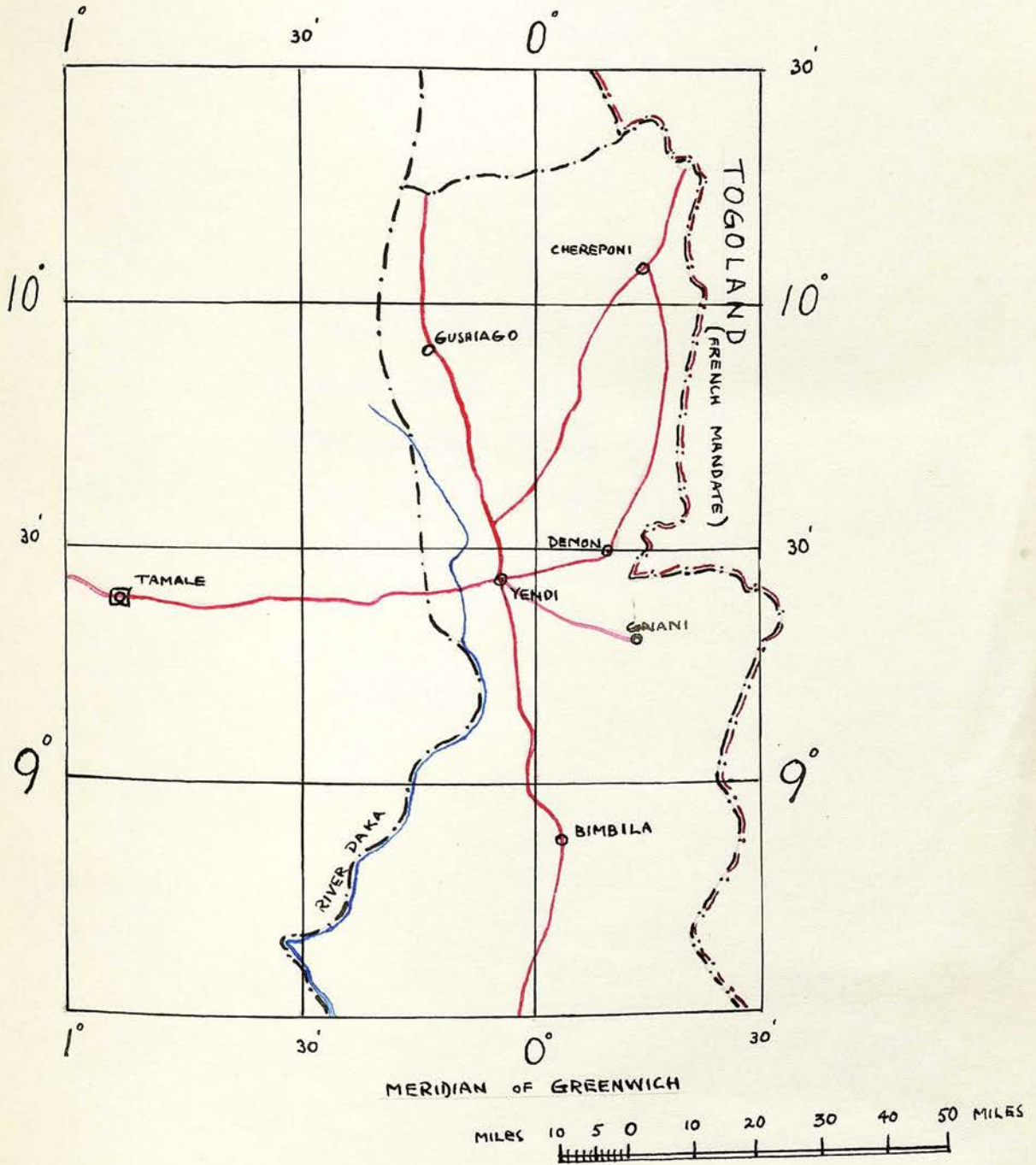


KIBI DISTRICT
GOLD COAST COLONY



YENDI DISTRICT

NORTHERN TERRITORIES, GOLD COAST



THESIS ON

Clinical Observations on Yaws
as studied on the West Coast of
Africa 1922 - 1936.

by

Helen McDougall Hendrie,

M.B., Ch.B., Edin. July, 1915.

L. M. CC. Canada, 1920.

D. T. M. & H. Edin. Dec. 1924.

M.D. Clinical Edin. Dec., 1924.

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