

A STUDY OF INDIGENOUS YAWS AMONGST THE LANGO.

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by

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Introduction.

This is a study of yaws amongst the Lango, a Nilotic tribe to whom the author was Medical Officer during 1934. Before being stationed amongst the Lango the author had had considerable experience of yaws amongst Bantu tribes of Uganda. These Bantu tribes were syphilised and the picture of yaws amongst them was obscured by co-existent syphilis in the community. In Lango syphilis is still practically unknown; yaws on the other hand is so common that nearly every person contracts it during childhood. Economic factors make it unlikely that Lango will long remain free from syphilis, so a study of yaws, uncontaminated by syphilis, seemed to the author to be opportune. Yaws has been prevalent amongst the Lango since time immemorial. The Lango have been shielded from outside influence. This tribal heirloom of yaws, therefore, may be expected to have developed peculiarities, and these the author will describe.

By many, yaws appears to be regarded as an unpleasant skin disease. This it undoubtedly is. But to one who works daily with a yaws infested population the later manifestations obtrude themselves, and to one with the welfare of such a tribe at heart the social consequences of the disabilities due to late yaws appear to require emphasis.

Treatment of yaws is, superficially, a brilliant triumph of chemo-therapeutics. It has not, however, eradicated yaws,

Treatment has now been available in Lango for fifteen years.

The author will endeavour to assess the value of treatment and give his experience in attempting to control the disease.

It is often said of writers on yaws that they confuse yaws with syphilis. In case the author should be accused of lack of familiarity with syphilis, a short account is given of syphilis amongst Bantu Uganda tribes. This description, the author hopes, will throw into relief the differences between these Treponeme diseases, as they exist side by side in the same country.

The author is conscious that this can only be regarded as an introductory study. It was undertaken in the midst of many other duties. The nearest laboratory was three hundred miles away. In every section of the thesis the need for more research is needed, and will be till this social scourge is abolished.

Historical.

Egyptian papyri, the Old Testament, Latin, Greek and Arabic writings have been searched by students and scholars for descriptions of syphilis. Some claim to have discovered references of syphilis in these ancient writings, but it is generally regarded that the suggestive passages are unconvincing.

Considering the close resemblance there is between yaws and syphilis it is not surprising that some suppose that suggestive passages in the old literature refer not to syphilis but to yaws. Chapter XIII of the Book of Leviticus is often quoted, and Hillary considers that yaws is the disease referred to there. "And the Lord spake unto Moses and Aaron saying..... when a man shall have in the skin of his flesh a rising, a scab on a bright spot.....then he shall be brought unto the priest. And the priest shall look, and when the plague in sight be deeper than the skin it is a plague of leprosy".

This chapter contains many instructions regarding the diagnosis of skin eruptions, and some descriptions could be construed as referring to yaws or syphilis, viz. "But if the scab spread much in the skin" could refer to an annular syphilide or framboesome. There also appears to be a reference to a generalised eruption such as occurs in secondary yaws and syphilis - "if the scab spread much abroad in the skin " etc. The original Hebrew word in the Bible is SARAAT, and this was translated to mean leprosy, at a time when medical knowledge

was limited. Leprosy would fit the description of the skin lesion mentioned in Lev. XIII, verse 43 - "reddish in his bald forehead" (eyebrow?) but the same term Saraat does not fit the description of the other lesions which are called Leprosy.

The Arabian physicians (2) of the tenth century mention a disease which they called SAFAAT, and which they treated successfully with mercury.

In Central America, amongst pottery representations of diseases offered as votive offerings at ancient shrines, archaeologists have unearthed models of faces with the characteristic knobs of Goundon.

The end of the fifteenth century however, produces the first authentic account of yaws, although the confusion of yaws with syphilis was simultaneously apparent. Three important events occurred about this time, which confuse the issue. Henry the Navigator sent his Portuguese sailors to explore the coast of Africa, and in 1493 the Portuguese had begun their long association with Mombasa. In 1493 Columbus returned from America, and, in 1495 the army of Charles the Fifth was involved in the epidemic of syphilis at Naples, which disease the army is credited with spreading throughout Europe.

The syphilis of this first epidemic in Europe evidently produced spectacular skin lesions, "the affliction was not known and was so frightful that those who saw it hastened to do much fasting and prayers" says de Isla (3) in 1539.

The name Bubas, a common synonym for yaws in various countries, is an interesting legacy from the Spaniards and Portuguese who at that time were enterprising colonists. The Spaniards got the word Bubas from the Spanish Moors, amongst whom it was an old Arabic word meaning a crusted sore (4).

The might of Portugal in East Africa was destroyed when Mombasa, their stronghold, was captured by the Arabs in 1653, but even to the present day in the Swahili language of East Africa, syphilis and yaws are called Buba.

Spanish colonists and travellers wrote much about the Americas which they had discovered and conquered, and Montejó y. Robledo (5), in his medico-historical researches has culled from these early Spanish authors much that framboesiologists regard as referring to yaws. GONZALO OVIEDO Y VALDES (1478-1557) who wrote the "General and National History of the Indies" is the best known and most frequently quoted of these authors. He described a prevalent disease in the West Indies which he called Bubas and which was treated with Guaiacum and Copper filings. From his descriptions the prevalent disease he encountered was yaws. He asserted that syphilis, which was then ravaging Europe, was the same disease as the Bubas of the Indies and he blamed Columbus for importing the disease to Europe.

de Isla called syphilis The Serpentine malady, and by common consent syphilis then caused very obvious skin lesions, so it is excusable to conjecture that Oviedo confused the

common annular framboesome and the annular syphilide which de Isla's Serpentine Malady seems to suggest as a prevalent manifestation in European Syphilis.

Las Casas, (6) amongst many others, corroborates Oviedo's descriptions of yaws in America, and Thevet, in 1558 says of American bubas that "it is none other than the pocks which rageth over all Europe".

There can be no doubt that the discovery of America and yaws, and the European outbreak of syphilis, led to much confusion.

Turning to Africa, the prevalence of yaws on the West Coast during the sixteenth century is referred to by Sydenham (8) in his treatise on syphilis. He says "I have been informed by men of great veracity who have lived in the Caribbel Islands that the slaves which are newly brought from Guinea, even before they land and likewise those that live there, are afflicted with the disease (innocently). Also that it seizes whole families - men, women and children.

And as far as I can learn this disease which so frequently attacks these miserable people does not at all differ from that we call the venereal disease with respect to symptoms, pains, ulcers, etc., allowing for diversity of climate. But it goes under a different name, for they entitle it the Yaws...

It seems to me that disease was brought into Europe by Spaniards who first contracted it from Negroes they had

purchased in Africa".

So prevalent did yaws become amongst the slaves in America that special hospitals were built to accomodate the cases.

About 1648 Bontius (9) reported Bubas as occurring in Java, Sumatra and other East Indian islands where it was called Amboyna Pox. Thus at this early date yaws was known to have a widespread distribution in the Tropics.

Reference to a present day map of the incidence of yaws shows that, except for the interior of countries then unknown, the distribution of the disease is similar to the reported distribution up to 1648.

It is asking much of one's credulity to believe that the few adventurous voyagers of the sixteenth and seventeenth centuries could disseminate from one focus what, by 1648, was known to be a disease with a tropic wide distribution. There were voyagers before the Spaniards and the Elizabethans. The Phoenicians coasted Africa and Arabs and Indians are known to have established communication with East Africa before the Portuguese arrived there. Ample opportunity existed for the dissemination of a disease such as yaws previous to European supremacy in world exploration, and it is most likely that yaws had a tropic wide distribution before the fifteenth century. In this connection it is of interest that Vasco da Gama reached India in 1498, and the Portuguese colonised at Goa. Yet yaws

did not occur in India till 1887, when, as Powell (10) recounts, the coolies of a tea garden in Assam became infected and, within ten years there were six hundred and fifty-three cases amongst six thousand people. The Portuguese are, however, credited with having introduced yaws to Ceylon, where the disease is called Parangi after Feringhi, meaning the Stranger.

The occurrence of yaws outside the tropics has been suggested on the evidence of the descriptions of the Sibbens (11), a skin eruption common in Scotland following on Cromwell's invasion in the mid seventeenth century. The Sibbens was prevalent in Scotland until the end of the eighteenth century. Button Scurvy in Ireland, and Radesynge in Scandinavia have also been suggested to have been yaws. With little improvement in the sanitary conditions of the rural populations affected by these diseases during the nineteenth century it is strange that the diseases disappeared when they did, had they actually been yaws. The description of the diseases is not convincing and one concludes that they were not yaws.

As early as 1587 G. Soares de Souza suspected flies of transmitting yaws, an interesting anticipation of Hippelates as a vector.

Paulet (13), in 1848, reproduced yaws by inoculating the juice of a framboesome into a susceptible individual. The experiments of Charlonis (14) are well known. In 1881 he inoculated thirty-four negroes with yaws, and of this number

twenty-eight developed the disease. A negro in full yaws eruption was inoculated with syphilis and he developed this latter disease.

McLeod (15), in 1902, described the microscopical appearance of the yaws lesions, and his description is accepted as standard at the present day.

In 1905, Castellani (16), working in Ceylon, discovered the causative organism, T. pertenue and he conducted many experiments in connection with yaws. This experimental work was the foundation on which Schlobl (17), Sillards and Goodpasture (18) based their recent inoculation experiments, with convincing success.

Treatment of yaws had advanced little, if at all, from the fifteenth century, until the introduction of Salvarsan, which was reported by Nichols and Castellani (19) as curing yaws. The discovery of this specific remedy had far reaching consequences. For example, in Africa, primitive suspicious tribes, heavily yaws infested, were treated with dramatic results with Salvarsan, and to this effect, in acquiring the natives' confidence, much of the British Administration's success is due.

Bismuth, introduced by Levaditi (20) as an antisyphilitic remedy was soon after adopted as a successful remedy for yaws, and Shircore's (21) discovery of the effectiveness of the cheap Sodium Bismuth Tartarate made possible in poor rural Africa

large scale Anti Yaws campaigns.

Disfiguring young children with its dreadful sores, and crippling adults with the tertiary manifestations, yaws is a social scourge of millions, and is only now receiving the attention it deserves, particularly in the field. In this connection the work of the Jamaica Yaws Commission (22) is worthy of mention.

The known medical history of East Africa is so recent that it has yet to be written. The pioneer Missionary doctor of Uganda, Sir Albert Cook, who arrived at Kampala in 1896, is still practising in the country. It is only since the war that the Government Medical Service has become primarily concerned with the Native's welfare, instead of as previously, a convenience for the European Officials. (23). The medical history of Uganda before the twentieth century is therefore conjectural, and our principal source of information is legendary. True, Speke (24), Stanley (25) and other explorers mention ulcers and sores as being common amongst the natives but there is in their writings no clear cut picture of yaws, a disease which, soon after the British occupation, was recognised to be widespread throughout the country. The Government Headquarters were established in the Buganda Kingdom and the Baganda were, naturally, the first to learn from the British, and having learnt were sent to teach in the other parts of Uganda, spreading European views with a Baganda bias. The superiority which

the Baganda assume over the other tribes of Uganda has to be seen to be appreciated, and, to the Baganda yaws, is a disease of the "barbarians", as rare amongst the Baganda as syphilis is common amongst them. I have been at pains to discover if yaws was ever common amongst the Baganda but all whom I have questioned have been definite that there is no legend of yaws even being prevalent. On the other hand, it is firmly believed that syphilis was introduced early last century by the Arabs. In the Baganda language the name KABOTONGO is applied to both yaws and syphilis, and the hyperkeratosis palmaris of yaws is called Bikate, and is recognised as being caused by Kabotongo. It is quite possible, even probable, that early syphilis in Uganda resembled yaws and was as spectacular as it was in Europe. Syphilis probably replaced yaws as an endemic disease and the old name Kabotongo became applied to the new disease of syphilis. Syphilis may soon have ceased to be so outwardly disfiguring, as Francastro states it early ceased to be in Europe, and the absence of yaws scabs may have become a cherished badge of the superiority of the Baganda over the less syphilised and more framboesised neighbours. Sir Albert Cook has told me that he had been two years in Uganda before he saw his first undoubted case of yaws when on safari in Bunyoro. The other tribes of Uganda are all more or less infected with yaws, and the Bantu tribes are syphilised in

addition. The Banyoro, Batoro and Banyankole call yaws and syphilis EBISONDE, hyperkeratosis palmaris is EBIKATE and they recognise tertiary ulceration as due to Ebisonde, and call it NKOKHORA. These tribes say that yaws has been endemic amongst them always. Colonel Greig I.M.S., who was in Uganda in 1902 with the Sleeping Sickness Commission, and who safaried through Bunyoro to Nimule has informed me verbally that he did not see much yaws on this journey through what is now a notoriously yaws infested district. The natives of Uganda used to conceal their children from European travellers in those comparatively early days, to avoid the "evil eye" however, and as the more obvious lesions of yaws are chiefly apparent in children, doubtless Colonel Greig's failure to remark the prevalence of yaws was due to the concealing of the cases. Amongst the Nilotics yaws is called NYATCH, and this same name is applied to tertiary manifestations. Indeed, I have heard old men refer to juxta-articular nodes as Nyatch.

For the disease of yaws to be named, and its manifestations understood, points to a long association between yaws and the people of Uganda.

The prevalence of syphilis in Buganda and other parts of Bantu Uganda gave rise to grave concern, and, when the Sleeping Sickness outbreak had been overcome the Medical Department next turned its attention to syphilis on the advice of Professor Simpson and Colonel Lambkin. (27). The supply of European

doctors was inadequate to deal with more than a fraction of the cases, so Africans were trained to give injections. These Africans were, at first, principally Baganda. Unable to diagnose syphilis from yaws, and in their own minds calling both diseases Kabotongo, these African medical attendants were sent to sub-dispensaries throughout Uganda where they were practically in independent charge. Able to diagnose yaws and syphilis, but unable to distinguish between them the diagnosis of these attendants is open to grave doubts, and militates against the accuracy of their returns from which the Annual Report of the Protectorate is compiled. The popularity of these sub-dispensaries in attracting patients led to a large increase in the number of cases reported, so much so that in the 1929 Edition of Manson's Tropical Medicine it is stated that "the disease appears to be spreading in East Africa".

The following table shows the numbers of syphilis and yaws reported as treated at these sub-dispensaries in Uganda, during the past eighteen years: (28)

	<u>Syphilis.</u>	<u>Yaws.</u>
1916	4,636	659
1917	4,383	-
1918	2,991	303
1919	2,497	207
1920	3,860	502
1921	4,798	1,284

	<u>Syphilis.</u>	<u>Yaws.</u>
1922	4,786	819
1923	11,007	3,376
1924	34,051	7,377
1925	36,589	5,871
1926	35,784	10,930
1927	52,032	26,629
1928	69,015	35,126
1929	74,722	37,378
1930	65,979	38,066
1931	64,591	47,598
1934	74,141	57,056.

The recent increase in the proportion of yaws cases treated is doubtless due to better diagnosis, but if the truth were known, it is more than likely that the proportion would be still higher. These figures by no means represent the incidence of the disease in Uganda.

In the foregoing history the main features of the known story of the social disease of Yaws is traced, commencing with the Saraat of the Israelites and finishing with the Ebisonde of the Bantu of Uganda. It is interesting that Bantu aristocracy have a strong admixture of Bahima blood, a race of non-Negroids who migrated from the shores of the Red Sea and whose ancestors were probably in contact with the Israelites in Biblical times.

The Lango and their country and customs.

The Lango are one tribe, numbering about two hundred and thirty five thousand, of the Nilotic sub-division of the Indigenous Population of Uganda. They take their name from Lango, the district which they occupy. Driberg (1), the authority on the Lango considers them to be an offshoot from the Nilotic races occupying the Southern Sudan, and that their arrival in Uganda was an event of the past two hundred years. Driberg also considers that the Lango were in process of slow migration South, through a poorly populated region, when British Administration reached their country and obliged them to settle permanently within the boundaries of Lango.

The Lango are tall and powerfully built, their frames are spare and their faces ugly. They are blacker in colour than any other race in Uganda. As a tribe they had no political cohesion before being Administered by the British. They live in small communities and prefer sites for their villages as far apart as possible and they show no wish to concentrate around Townships. They are regarded as being stupid, but loyal and brave, characteristics common to the Nilotics and recognised by their being recruited in large numbers for service in the Native Police Force of Uganda.

The country of Lango is now an administrative District, with its headquarters at Lira. The district is about five

thousand square miles in area. As will be seen from the map Lango lies to the north of lake Kyoga, and along the right bank of the Nile. The country is, therefore, low lying, swampy and hot.

Malaria, yaws and amoebic dysentery are the prevalent endemic diseases, nearly every Lango suffering from all three.

Compared to the Bantu, the Lango are moral. Prostitution and marital infidelity were practically unknown in the past, and at present occur only amongst the more sophisticated members of the tribe.

The Lango had been isolated from outside influence until their country was opened up by British Administration about 1919. In the North the Lango were separated by their warlike brothers, the Acholi, and by the arid Southern Sudan from slave raids and other depredations, in the East lay Karamoja, another arid district inhabited by fierce Karamojong who barred the way to penetration from the East Coast in that direction. In the South was the deserted land into which the Lango were percolating, and Lake Kyoga. Across the Nile, to the west, lived the Banyoro, a sophisticated Bantu nation who despised the primitive Lango, and feared their fever ridden country. The influence of the outside world reached Uganda first when Arab caravans approached from the South West. Between these caravans and Lango lay the Kingdoms of Buganda and Bunyoro, and the British had arrived in Uganda before these Arab Slavers and traders had succeeded in penetrating to Lango. This geographical and

social isolation of Lango, therefore, affords an excellent opportunity for the study of indigenous disease, and especially of yaws. Owing to the rapid opening up of their district, however, the Lango are losing their position of isolation, and this opportunity will soon have disappeared.

The district of Lango was found to be peculiarly suitable for the growing of cotton, and, after the Great War this led to the Government encouraging the growing of cotton by the Lango peasants. Prosperity was thus brought to Lango suddenly. Roads were made, Indian traders infiltrated the district and the need for cheap artisans clerks etc. was supplied by importing trained Baganda and other Bantu. Where contact between sophisticated immigrant Africans and the Lango is broadest it is evident that the social barriers between these classes is breaking down. Bantu prostitutes are now common in the district and it appears to the author to be only a question of time before syphilis becomes as prevalent amongst the Lango as it is amongst the Bantu, with the attendant confusion of diagnosis between these two diseases.

Prevalence of Yaws amongst the Lango.

The Lango name for yaws is Nyatch, a name only, and not a descriptive term, which corroborates the statement of the Lango that yaws has been prevalent amongst them since time immemorial. It is interesting to find the name Nyatch applied to the various manifestations of yaws - the primary Sore, the secondary eruption, the later bone changes, hyperkeratosis palmaris and even gangosa are referred to by the name of Nyatch.

In the past it would appear that every Lango contracted yaws at some time during his or her life. The constantly changing porters of the Lira Station gang came from all parts of the district. During 1934, one thousand were examined and all gave a history of having had yaws, and two hundred and sixty-three showed late manifestations of yaws. This prevalence is reflected in the hospital attendances; about 40% of all out-patients coming primarily on account of yaws. The Lango seem to regard it inevitable that every child will contract yaws. They recognise that the disease is infectious but they take no precautions to isolate infectious cases.

Age Incidence of Various Manifestations of Yaws.

There is a general agreement amongst Framboesiologists that the primary and secondary manifestations of yaws are practically confined to children. This is also the case amongst the Lango. The following figures show the age incidence of one thousand patients with yaws eruptions presenting themselves at the author's hospitals:

212 or 21% under two years of age - youngest five months.

563 or 56% between two years and five years.

221 or 22% between five years and fourteen years.

4 over fourteen years.

The parents prefer to wait until the eruption has been in full bloom for about two weeks or longer before coming for treatment. They seldom bring their children when only the primary sore is present, unless the primary sore is a large ulcer.

As regards other manifestations of yaws, commonly referred to as tertiaries, the age incidence is in some manifestations indefinite and in the case of other manifestations falls into certain decades.

Bone changes and periostitis are frequent accompaniments of the early secondary eruption. In some cases these early manifestations clear up with the eruption, but in other cases the bone changes are progressive. Bone pains, on the other hand, may appear at any time and appear to be most distressing during adolescence and middle age.

Hyperkeratosis palmaris and plantaris occur commonest about the age of marriage, when, presumably, social obligations compel the native to work harder and to walk more whether or no it makes feet or hands uncomfortable. Hyperkeratosis is sometimes seen in children soon after, or even during the secondary stage. As hyperkeratosis is a very chronic condition, lasting for years if untreated, it is met with in a very large proportion of the adult population.

Tertiary skin ulceration is not common, and, in all my cases occurred in females and in all cases it commenced during one of their early pregnancies.

Juxta-articular nodes, and enlarged bursae are very common, but never seen before the age of about forty-five years. After that age they become increasingly common.

Mode of Spread.

Castellani (30) gives a comprehensive account of how yaws is spread from case to case, either by direct contact or through the agency of fomites or flies; a form of direct transmission of the infective agent, *T. pertenue*, which gains entrance to the body through an abrasion of the skin. The Lango children, like all primitive Africans, go about naked. Their legs are always being cut and abraded by sharp grass and their bodies are exposed to the irritating bites of mosquitoes and other insects with which their homes abound. *T. pertenue*, therefore, never has any difficulty in finding a suitable skin abrasion through which to enter the body of a new host with which it is brought in contact. This tendency of the Africans to trivial injury is thus of far reaching consequence, as pointed out by Blacklock (31) in his book, "An Empire Problem". de Souza, as long ago as 1587 suggested that flies might transmit yaws, Schilling, in 1770, reported from Surinam a small fly called the Yaws fly, supposed to transmit the disease. Castellani carried out experiments with muscidae to prove this form of transmission and, recently conclusive proof has been offered by Kumm (32), Turner (33) and others that Hippelates pallipes, an Oscinid fly has a predilection for the juice of yaws sores and that *T. pertenue* can live in the gut of such flies and can be regurgitated in a viable condition seven hours later. It is probable

therefore, that *H. pallipes* is an important factor is transmitting yaws. The author did not collect specimens of the many flies which fed on yaws sores in Lango so he does not know if Hippelates Pallipes is present there or not.

It is of interest, however, that the larvae of one genus of the family Oscinidae are common parasites of the pigeon pea in Uganda. This legume is one of the domestic crops of the Lango and is, presumably, the adults of the flies are also domestic in their habits.

Not the least of the discomforts of the Lango suffering from yaws is the myriads of flies attacking the sores, and even young children go armed with a switch of twigs with which to brush away the flies from their yaws eruption.

The possibility of yaws being transmitted by an intermediate host is attractive. Such transmission would explain the prevalence of yaws amongst rural populations - presumably exposed to a rural vector, and the absence of yaws in neighbouring towns.

Epidemiology.

There is much remaining to be explained regarding the epidemiology of yaws.

Where yaws occurs as an endemic disease its incidence is high. It attacks rural populations, whilst town-dwellers apparently are spared. Young children, as the only non immunes in a yaws infested community, are principally affected by the early stages of the disease. These points are emphasised by the findings of the Jamaica Yaws Commission, and the same conclusion is reached wherever yaws is studied.

The Lango infant seldom leaves its mother until the next child arrives, about eighteen months later. During the daytime it is either sucking or slung on the mother's back in a small hammock and protected from the sun by a half calabash. At night-time the child sleeps with its mother. The Lango infant therefore, comes little in contact with persons other than its mother. The high incidence - 21% of a thousand cases secondary eruption - during this protected age period in the author's series is surprising, and would seem to indicate a very high infectivity of the yaws virus or a low immunity on the part of the child.

It has been mentioned that the Lango prefer to live in small, isolated communities - a custom which is beneficial in preventing epidemics amongst a people who take no sanitary precautions. In endeavouring to trace the source of infection in the case of young infants it was frequently found that older

children were the source of the infant's infection. In fact, amongst the Lango it is almost the rule for a whole family to become infected about the same time, when the oldest child of a family is of an age to go wandering on its own and so come in contact with yaws cases in neighbouring villages. The eruption is more severe in the infant than in the older child and so it often happens that the infants are brought for treatment whilst the far more dangerous older children are left at home. As yaws eruptions sometimes last for years in older children the menace of such cases and their importance as reservoirs of infection is easily understood. Nowadays small bush schools are being established in hundreds throughout the district, and they will be spreaders of yaws if their peculiar framboesial relationship is not grasped and the opportunity taken to use them as media through which to attack their reservoir children of school age.

In Lango there is no urban population. All the Lango live rural lives, and, around the few townships the majority of the people not living as agriculturists are immigrants. It is noteworthy that the incidence of yaws is markedly less in the vicinity of sub-dispensaries where treatment is available, than it is elsewhere in Lango.

There appears to be no seasonal variation of incidence of yaws in Lango.

The epidemiology of yaws amongst the Lango does not differ from the epidemiology as noted elsewhere, but the reservoir

child factor appears to be of great importance and readily amenable to remedy.

Pathology.

In 1902 McLeod (34) published his description of the pathology of yaws lesions, and recent descriptions, such as those of Fox (35) and of Cady & Engman (36) have little to add to his findings.

Summarised, McLeod found the following changes:

Blood Vessels - dilatation and tortuosity of those in the papillary and sub-papillary layers. No thickening of the vessel walls nor endothelial proliferation. Vessels are present in the granuloma.

Cellular Infiltration. (1) Plasma Cell infiltration at first most marked in the neighbourhood of the vessels, follicles and glands, rapidly becoming diffused; no definite arrangement in rows; no multinuclear cells.

(2) Mast Cells, Connective Tissue cells and small mononuclears; no tendency to organisation.

(3) Marked extravasations of polymorphs.

Fibrous Stroma.

Collagen attenuated where granuloma is.

Elastic fibres similarly affected.

Hair Follicles, Sebaceous glands and Coil glands seem healthy.

Changes in the Epidermis.

- a. Marked proliferation and downgrowth of the interpapillary processes.
- b. Basal layer uninterrupted.
- c. Oedema affecting prickle cells and inter-epithelial spaces.
- d. Disappearance of pigment in affected area.
- e. Transitional layers imperfect.
- f. Cornification. Marked hyperkeratosis and para keratosis, with deposition of leucocytes and debris between the horny lamellae.

In addition to the above Fox noted abscesses in the granuloma and also occasional giant cells. He also found that "vascular changes roughly suggested syphilis in one section, in all sections the intima and media were swollen".

Cady & Engman found miliary abscesses, and infiltration around the vessels, but did not find vascular changes.

Sections obtained by the author confirm these microscopical findings in secondary yaws, and drawings of the noted pathology

are offered instead of written description, see Plates I to IV.

The histopathology can be translated into clinical terms so as to explain variations in appearance of the lesions.

Clinically the outstanding features are:

(a) the crusting, (b) the thickening of the epidermis, due to the acanthosis, (c) the cornification and the oedema.

The clinical appearance of the yaws sore is dependent upon the relative predominance of one or other or combinations of these features. This will be referred to later in the section dealing with the secondary manifestations.

Gutierrez (37) has described the pathology of Hyperkeratosis and he says "The changes are found mainly in the corneal layer which may be five to ten times thicker than normal. Acanthosis is not so marked as that found in lesions of the secondary stage. The thickening is, however, sufficiently marked to call instant attention to it".

The author agrees with this and includes a drawing from sections made from his own cases. See Plate V.

The tertiary ulceration of yaws appears frequently to be confused with the ordinary "Tropical ulcer" to which Africans are susceptible. Some of these ulcers may be due to yaws but certainly in Uganda, in the majority of cases the etiology is different. The only tertiary ulceration which the author regards with any certainty as being due to yaws is the type

referred to by the Bantu as Nkokhora. This is a Lupoid type of ulceration, spreading slowly and with a narrow advancing edge. Behind the advancing edge, which is irregular in outline, healing takes place by the formation of scar tissue, showing that the ulceration involves all the layers of the skin. The scar is, however, pigmented well. The advancing edge is narrow and has a thick crust; on removing the crust the ulceration extending through the skin is seen, and there is invariably pus present. This type of ulceration will be referred to again later, as regards its framboesial cause suffice at present to say that it yields readily to Novarsenobillon and only occurs in people who have had yaws.

Microscopically this type of ulceration resembles lupus.

Clinical Features.

Powell, (38), Castellani (30) and others who have had the opportunity of observing the origin of the primary sore are agreed that, unless it is a secondary infection of an open ulcer, the primary of yaws commences as a papule. This papular origin is also noted by Goodpasture and Sellards (2) in experimental work on animals and has also been remarked during human experimental infection by Charltonis and lately by Lange. (39). The papule increases in size and Turner and Sanders state that it is similar to the secondaries in appearance, only larger.

Fitzgerald and Dey (40), and Manson Bahr, on the other hand say that the primary sore is nearly always an ulcer.

The author has never seen an early primary sore in an African, such a lesion being too trifling to make an African seek treatment. Primary sores in the later stage were, however, seen in nearly every case of eruption amongst the Lango. The primaries seen were of various types depending on which combination of pathological features predominated in the individual, and the author considers that they would begin as papules because of the constancy of acanthosis as a feature of the lesions seen. Where acanthosis predominated the lesion looked papillomatous, if oedema also were present this led to a softening of the protective crust which formed badly or not at all and so predisposed to ulceration. Such ulceration produced a shallow lesion, generally with sharp edges and a floor of small

pink granular looking material which owes its peculiar appearance to being composed of epidermis, so thick as to permit of considerable ulceration without exposing the underlying dermis. The ulcer looks as if it ought to bleed, yet it does not.

In other cases seen the primary had a thick scaly covering of stratum corneum - this in cases where oedema was slight and cornification marked.

In all cases healing left a scar indicating that, even though ulceration of the dermis was not apparent some permanent damage had been done to the deeper layers of the skin.

Phagaedenic ulceration sometimes occurred, with disastrous results, as a complication of the primary sore. This generally occurred in young debilitated infants and in every case the primary was on a toe or a finger. The phagaedena spread deeply and sometimes had destroyed half the foot or half the hand before treatment was sought. The mortality amongst these cases is high, but many escape death as is evidenced by the many adults whom one saw in Lango who had deformed feet or hands as the result of this terrible complaint.

The predilection for the lower limb as the site of the primary sore is agreed on by all observers, this site doubtless being decided by the frequency of traumatic lesions on the lower limb.

The following table shows the site of the primary sore in one hundred consecutive cases in Lango and the figures of

Noel and Cordes are given for comparison:

Site.	Noel	Cordes.	Author Lango.
Lower Limb.	46	57	61
Upper Limb.	18	5	12
Head.	12	2	6
Trunk.	12	-	13
Genitals.	12	1	8

Moss and Bigelow (43) reported one case with the primary on the genitals and Wilkinson, (44) working in Kenya says that the genital region is a common site. The author noted that genital lesions were as common in children of walking age as in infants attached to their mothers and he could not, therefore, attribute the genital site of origin to infection from the mother whilst the child was being carried straddlewise.

In two cases only did mothers show yaws sores which might have been contracted from contact with their infected children. This was in marked contrast to the author's experience elsewhere, notably amongst the Bakonjo, who live on the Ruwenzori Mountains and amongst whom mothers often have sores as the result of contact with their infected infants.

Prodromal Symptoms.

Manson Bahr, Stitt and Castellani (14) describe constitutional symptoms during the primary and the secondary stage. These are malaise, fever, joint pains etc. In Lango malaria, amoebiasis, scurvy and other diseases are so common that every child of over six months suffers from one or more of these conditions. The author never saw a case of yaws which was uncomplicated by some other disease, to which could be ascribed any constitutional symptoms. The author is inclined to think that, amongst the Lango, constitutional prodromata are slight, and rarely occur. This agrees with the findings of Powell (38) who, in India did not find prodromal symptoms.

Secondary Skin Lesions.

The secondary skin lesions are the most spectacular manifestations of yaws, and they receive, from authors and patients alike, more attention than they deserve compared with the attention given to the more important later manifestations. The rapid disappearance of the foul sores when treated with modern remedies, is, however, encouraging to doctor and to patient and has been of immense help in obtaining the confidence of subject native tribes.

Descriptions of skin lesions are tedious reading, and seldom give an accurate picture of the condition. In this section, therefore, the author proposes to use photographs, wherever possible, to illustrate his meaning.

In Byam and Archibald (46) the description of the secondary skin lesion is "About one to three months after the first appearance of the framboesoma minute roundish papules, often with a yellow point or minute yellow crust at their apex and about the size of a pin's head, appear on various parts of the body. Most of these papules remain stationary for many weeks and then disappear, occasionally leaving behind them some furfuraceous patches. Other papules increase in size, and coalescing together, form larger papules with a surrounding areola which is dark in natives and reddish in Europeans. Some of the larger papules increase in bulk and develop into the

characteristic granulomatous nodules varying in size from that of a large pea to that of a nut. These are covered by a honey yellow or brownish crust formed from their own dried secretion. Under this crust lies a raw surface, covered with red or yellowish excrescences and secreting a thin, purulent secretion which is the origin of the crust. These typical nodules appear on any part of the body. They are very rare on the scalp but are common on the upper limbs, trunk, and lower limbs. In the neighbourhood of the mouth, and of the arms, they may be arranged in rings enclosing areas of healthy skin, and thus give rise to that form of the eruption which is termed "ringworm yaws". The above is a fairly typical and descriptive account of the formation and appearance of the granulomatous form of secondary yaws. The ringworm yaws referred to in the last sentence is sometimes described as the annular yaw. The term granulomatous yaw is suggested by the naked eye appearance of the lesion, but microscopically, as has been indicated in the section dealing with the pathology, the lesion is seen to be due to thickening and hypertrophy of the normal elements of the skin. There is no wholesale destruction such as occurs in a Tuberculo-
ma or a gumma or other form of granuloma, and on healing no scarring results because healing means that the elements of the lesion subside to their normal dimensions and proportions. The author considers the term "Granuloma" to be misleading.

In addition to the "granuloma" and "ringworm" yaws, many

other kinds have been described. Schobl, Sellards (47) and Lacy list the following lesions as unusual:-

Depigmented patches.

Round areas of roughening and exfoliation.

Papular keratosis.

Serpiginous or Ringworm.

Suggestive of Crushed Cinders.

Eczematous.

Ulcerative lesions.

Gangosa.

Aars (48) describes a Corymbiform eruption, and le Bourhis (49) reports a lesion resembling Noma.

The commoner eruptions and many unusual forms of eruption are illustrated in E.C. Smith's (50) Atlas of Skin Diseases in the Tropics. Castellani refers to unusual types as Framboesides.

McLeod (15) says, "The squames, papules and tubercles - are stages in the evolution of a common histological process".

Clinically the important features of the histology of the lesions are

- (1) Oedema.
- (2) Thickening of the Rete Malpighii.
- (3) Keratosis.
- (4) Crusting.

The author would add two more features which help to understand the secondary lesions, viz:

(a) The tendency of the lesion to spread peripherally.
and (b) The local immunity possessed by an area which has once been in eruption, thus barring the way to spread over that area subsequently. Another clinical feature which the author hopes to demonstrate is the uniform nature of the lesion in any one patient. This uniformity is sometimes striking, as when some unusual feature of the yaws eruption is repeated in every lesion on an individual patient. In fact, if the syphilis eruption is polymorphic, then the monophorphic characteristic of the yaws lesion can be regarded as a diagnostic feature. The relative predominance of these features in the lesion account for variations in the appearance of the lesion.

Amongst the Lango the secondary rash is most commonly seen in young children. Over two thousand children attended the Children's Clinic at Lira hospital during 1934, and of that number 12% were brought for treatment for secondary yaws eruptions. Clinical notes were kept of one thousand, three hundred and forty-two cases of the secondary eruption - this large number being only a small proportion of the actual number seen throughout the district, and in this series the secondary eruption was only seen in two cases over the age of puberty. The usual time for children to be brought for treatment was when the eruption was in full bloom and the duration of the eruption stated to be about two weeks. The primary sore was generally still present unhealed, and the duration of the illness from the

appearance of the primary until the patient came for treatment varied from two to six months. In older children, about the age of nine years and upwards, the duration of the rash was sometimes given as two years or longer. In such cases the rash appeared indolent and was scanty with signs of recurrences.

The earliest lesions seen were small papules. Photograph No. 5 shows a profuse eruption of such papules giving a history of one week's duration. The subsequent development of such papules as did not abort and disappear, presented an interesting feature of yaws, namely the uniformity of the type of yaws eruption in the individual patient. It was possible to arrange the secondaries seen into three broad groups, and each groups could be subdivided into smaller groups according to the general appearance of the predominating lesion.

The commonest type seen was the ordinary crusted yaw. Differences in the appearance of such sores were dependent largely on the size of the sore and the nature of the crust. The size varied between diameters of $\frac{1}{2}$ " and 3". Figs. 10 and 11 are illustrations of the smaller form of this yaw, and Fig. 13 shows larger yaws. The crust varied in thickness, consistence and in colour. The crust, as shown in Plate II, consists of a lamellar structure composed on the outside of dried secretion enmeshing desquamated cells. The inside of the crust is thickened oedematous Stratum Corneum. These two zones merge into one another. Thus in very oedematous types of yaws the secretion is

so profuse as to interfere with the cohesion necessary to produce a proper crust, and in such lesions one noted either an imperfect crust or no crust at all - the Stratum malpighii being exposed as a moist raspberry looking sore. In other lesions the crust was much thicker, where the oedema was not so marked and the secretion given an opportunity to dry and consolidate itself. Sometimes the crust was very thick, and pointed, resembling a small horn. Such crusts were seen in debilitated children whose activity was limited, thus lessening the risk of accident to the crust and, also, by keeping the child indoors had predisposed to smoke curing of the secretion as the result of long exposure to the domestic fire. In many cases the crust appeared to consist mainly of stratum corneum, yellowish in colour, thickened and following closely the contours of the underlying stratum malpighii. A constant pathological feature of these common framboesomes was, of course, the greatly thickened stratum malpighii. The author proposes to refer to this type of sore as the "Common Framboesome".

The next most common type of lesion was the ringworm or annular yaw. Figs. 25 to 29 illustrate such lesions. They also commenced as papules, but they showed a marked tendency to spread peripherally, and to subside in the centre. An established Annular yaw had a raised edge about $\frac{1}{4}$ " wide and pale in colour. Within this edge was the healed centre, only its darker colour serving to distinguish it from normal skin. Microscopically the

spreading edge shows the common histological features of yaws - acanthosis and hyperkeratosis. As is seen from the photographs this type of yaw occurred anywhere on the body.

The third common type of yaws is really only a development of the second or annular type, and is given a type to itself on account of its frequent occurrence. In this type the features of the annular yaw are repeated, but the stratum corneum is poorly developed or separated by oedema from the underlying epidermis. When such an annular yaw reached a size of about $\frac{1}{2}$ " the stratum corneum commenced to separate around the edges and finally to fall off, leaving behind it a shallow moist ulcer. Such sores increased in area rapidly, dripped serum, and looked so like Impetigo that the author will refer to them as Impetiginous yaws. This type is shown in Fig. 22.

The relative frequency of these three types, the Common Framboesome, the Annular Framboesome, and the Impetiginous Framboesome is shown in the following table.

Age of Patient.	Common Framboesome.	Annular Framboesome.	Impetiginous Framboesome.	Total at ages.
Under 1 year.	2	-	-	2
1	3	3	1	7
2	12	6	4	22
3	11	1	2	14
4	10	1	2	13
5	10	1	2	13
6	6	3		9
7	2	4		6
8	4	-		4
9	-	1		1
10	3	-		3
11	-	1		1
12	2	2		4
13	-	-		
14	1	-		1
Total of Types.	66	23	11	100

In their extreme forms there appears to be little resemblance between a Common Framboesome and an Impetiginous Framboesome, and one asks oneself whether such dissimilar lesions can be due to the same organism or whether the difference is due to some constitutional difference in the patient. The author is convinced that the type of lesion is governed by some condition

in the patient's reaction to the infection. He has already indicated in the section on epidemiology that, owing to the peculiar isolation of Lango families it is often possible to trace the source of infection of a family to a single individual. The author has notes of many instances illustrating this occurrence, and amongst these groups of cases, traceable to one infecting source, it is common to find all three types of lesion represented. The Impetiginous Framboesome was only seen in young children under the age of five years, and it is more than probably that the tender skin of such young children is less capable of putting up a defensive reaction than the thicker skin of older children and adults. Conversely in older children and in adults the Common or Crusted Framboesome was the commonest lesion, generally sparse and indolent looking.

Contrary to what the author has stated regarding the uniformity of the lesion in secondary yaws, Hewer, (51) describing yaws in the Southern Sudan, across the Uganda boundary, says of the lesions, "many quite different forms are often co-existent. One saw people with a desquamating papular eruption on the trunk, moist circinate lesions on the face, dry crusted annular papules on the neck, and large, flat condylomatous papules in the axilla and perineum". In the region studied, Hewer admits that syphilis was also prevalent, thus making it difficult to diagnose an atypical case of yaws or of syphilis. Nevertheless, the author has also seen apparently polymorphic lesions in cases

of yaws, and such a discrepancy requires to be reconciled with his thesis regarding the uniformity of the lesion in a given case.

Hewer also says that he saw "every one of the secondary eruptions figured by Smith". The excellent photographs shown by Hewer in his article are perhaps only equalled by the pictures in Smith's book, and these photographs show lesions met frequently by the author in Lango and reproduced in photographs with this work.

It has been shown that the T. pertenue is mostly congregated around the blood-vessels of the papillae. Within forty-eight hours of an injection of N.A.B. the T. pertenue disappears. There is then a rapid subsidence of the distorted histology of the nodule to normal proportions. The excessive epidermis becomes cornified, thus increasing the keratosis temporarily and producing slight roughening and scaling, evident against the black skin of Africans as a superficial whitish patch. This scaliness has been noticed by many observers as has the subsequent darkening of the same patch which is noticed when the scaly stage has passed off. Smith has shown that there is sometimes disposition of pigment in the corium in yaws; the author has shown, in plate III, increased pigment cells in the epidermis, and these two factors account for the hyperpigmentation remarked by some authors, as factors of yaws. Occasionally, instead of hyperpigmentation one notices hypopigmentation when the lesion has healed. These paler areas are

generally seen after annular or Impetiginous Framboesomes and indicate a reduction in the pigmented layers of the epidermis probably as the result of ulceration.

Three other secondary skin manifestations - Dry scurfy rash, hyperpigmentation and depigmentation are thus satisfactorily accounted for as merely phenomena of healing.

Other types of sores, such as circinate and corymbiform, can also be ascribed to phenomena of healing. The author has never seen a yaws sore re-extend over a healed region. The growth of a yaw proceeds at a varying speed. Sometimes a yaw may spread as rapidly as impetigo, sometimes its growth occurs by fits and starts, a stage of partial healing being succeeded by a stage of renewed growth. Healing begins as a rule at the periphery of the sore. At one point one notices drying of the sore and a general subsidence of the tumefaction. This is noticed in natural healing and also in healing as the result of treatment. The healing process spreads, penetrating the yaw and also spreading round the periphery. If the healing is confined to one side of the sore therefore, or if it proceeds more rapidly on one side than another, a crescentic sore results - the circinate lesion as is shown in Fig. 30 and others. Should such a lesion, healing on one side only, recrudesce, either naturally or because of discontinuance of treatment, the spread continues on the convex side of the lesion, the concave side being healed and immune. This circinate strip of yaw may

now be broken into small pieces by penetration by the healing process and, each piece having rounded edges, and all the pieces being arranged in a group, so the Corymbiform framboesome is produced.

This process of healing is of great practical importance because, until all the lesions are seen to be healing all round their periphery one cannot be sure that healing will take place satisfactorily.

These circinate and corymbiform yaws can be recognised by their general aspect - old looking lesions set in surrounding skin which is altered in one or other of the indicated ways by healing.

The region in which the sore occurs explains the condylomatous type of yaw. Figs. 28, 31 and 32 show such condylomata in Lango. They are only found in flexures, such as the perineum and the axilla. Ramsay (52) in India, found that condylomata occurred in flexures during the cold season, and he noted that the lesions were more widespread over the body during the warm season. In Lango there is no great seasonal variation in temperature. It is always hot, the shade temperature seldom below 80° and often over 100°.

The absence of scarring, and the early return to normal of dyspigmented areas after healing was a striking feature of yaws. Devota (53) has noted in two cases retention of urine due to cicatricial phimosis after yaws. Genital lesions were common in

Lango, the prepuce especially being selected as a site, but no cases of such cicatricial phimosis came under notice.

Noma, remarked by de Bourhis, was only seen once, in a child debilitated by dysentery and malaria. A large part of the cheek sloughed away but the child made a good recovery after being given Sulfarsenol.

Stitt and Castellani mention onychia as a later feature of yaws. The experience of the author was that onychia occurs during the secondary stage. In some patients the vicinity of the nail seemed a favourite site for the secondary eruption with interference with the matrix and maldevelopment of the nail. In such cases several fingers were always affected, thus even in this peculiarity illustrating the uniformity of lesion in a given case.

Smith has reported yaws sores resembling crushed cinders. Such an appearance was often seen when large yaws were drying up and the crust disintegrating.

The secondary lesions are supposed to be insensitive (Manson-Bahr). This is so of the crusted common framboesome but if the crust were removed the raw surface impressed the author by its tenderness. One of the stocks in trade of the old Arab merchants was copper sulphate with which to cauterise yaws sores. alibone water is still a common remedy in Lango for yaws and the author has vivid recollections of children screaming with agony after their raw sores had been annointed with this lotion.

Crab yaws, or the metastatic yaws of Smith was often seen (See Fig. 54). These differed in no way from their described behaviour elsewhere. In one case, which had been treated for nine months with copper sulphate, a melanotic sarcoma developed (diagnosed microscopically) with fatal result.

Later Skin Manifestations of Yaws.

Hyperkeratosis palmaris and plantaris seldom receives the attention it deserves in descriptions of yaws. Guitierrez (55) found in Manila that "of the different late manifestations of the disease, this is the most common encountered in communities where yaws has been prevalent". In six hundred and fifty-eight of his patients suffering from late yaws four hundred and thirty one had hyperkeratosis. Castellani was the first to describe the condition and to ascribe it to yaws, and Howard (56) emphasised its importance in East Africa. As regards the etiology Howard says there can be no doubt. All his cases gave a history of previous yaws and the response to anti yaws treatment was prompt. Powell (38) on the other hand, points out that hyperkeratosis is common in some parts of India where yaws is not known. Another syphilologist however, Fox, supports the framboesial origin of the condition, and Ramsay (52) and McKenzie (58) are of the same opinion.

Guitierrez, in describing the pathology, points out that the essential features are great thickening of the horny layer, acanthosis absent or less marked than in the secondary lesion and infiltration of the corium. The same author describes two clinical types, viz:

(1) Commencing on the foot or the hand as a region of hyperpigmentation the lesion becomes hyperkeratised. It extends in area, cracking and pitting and eventually heals with

depigmentation - the Melung of Ziemann.

(2) This type also spreads peripherally from the original focus, but the spreading edge of it is raised and reddish and inflamed looking.

Hyperkeratosis palmaris and plantaris was very common in Lango, where the natives refer to it by the Framboesial Generic name of Nyatch. The author noted signs of it in about 20% of the adult population. Howard noticed a period of about ten years of apparent cure after the secondary rash before the appearance of hyperkeratosis. This means that hyperkeratosis began to appear about the age of fifteen or sixteen. This is the age at which African children begin to take their share of field work and it is probable the trauma of such work on hands and bare feet is responsible for the localisation of the condition to these regions. The condition is chronic, going on for years if untreated, and, when eventually healing does occur depigmented patches in otherwise apparently normal skin are evidence of previous hyperkeratosis. The condition is painful, interfering with walking and with handling tools. It seldom cripples but it markedly reduces the efficiency of the sufferer.

The needs of the Lango are few, but these few can only be supplied by hard work at the proper time. His house is built of mud and wattle and requires constant renewal because white ants destroy the supporting timbers within a few months. The type of husbandry requires the clearing of new land each season, and the

crops can only be planted and reaped according to the seasonal rainfall. The adult Lango with a family to feed has, therefore, to work hard at certain times of the year if he is to obtain a bare existence. Reduced efficiency on account of hyperkeratosis is a serious matter, and, by leading to a reduced standard of living is part of the vicious circle responsible for the backwardness of the Lango and, for that matter, of other primitive tribes. Figures 55 to 59 illustrate hyperkeratosis in Lango subjects. Fig. 57 shows the early stage of Guitierrez's type I, Fig. 56 shows a later stage of the same. Fig. 59 illustrates Type II. The red inflamed edge is not evident in the photograph. This type was sometimes seen extending up to the elbows and the knees. Plate III shows a section from the edge of such a lesion.

This hyperkeratosis, although commonly seen in adults, was occasionally seen in children, and, in one case, in a child aged five years who had a secondary eruption of one year's duration. There was a well marked hyperkeratosis palmaris. This condition was only met with amongst the peasants. Amongst chiefs and clerks and others who wore shoes and who did no manual labour the condition was never encountered.

Late Ulcerative lesions.

Manson-Bahr describes as a tertiary manifestation of yaws a deep form of ulceration chiefly affecting the leg and ankle and occurring in 8% of cases. Castellani mentions large irregular ulcers, sometimes covered with papillomatous masses occurring as sequelae of breaking down yaws.

Tropical ulcer is now emerging as a clinical entity, affecting chiefly debilitated and under nourished natives. In appearance it corresponds with the above descriptions, and it is now not regarded as being caused by yaws. The Lango suffer much from Tropical Ulcer, but the framboesial origin is doubted by the author.

Daniels (60), in Fiji, noted cutaneous lesions resembling lupus, which he ascribed to yaws however, and this form of skin lesion has much to support the belief that it is due to yaws. This form of ulceration is often seen in outlying parts of Uganda where yaws is common. The natives regard it as a manifestation of yaws and the Bantu call it "Nkokhora". There is invariably a history of previous yaws and the condition yields to N.A.B.

The author met five cases of this condition in Lango. All the cases were in women and all had started during an early pregnancy, co-incident which makes one speculate whether or not the endocrine changes of pregnancy and the drain on the mother's mineral reserves may not have some connection with the etiology.



The appearance of the condition is shown in Figures 46 to 53. In one patient, Fig. 59A, an early lesion was present as well as a more extensive one. This early lesion was sectioned and Plate IV shows the nature of the ulceration. The whole thickness of the skin is affected. The corium and subcutaneous tissues are undermined by pyogenic infiltration. The blood vessels are thickened, probably as the result of the pyogenic infection. The epidermis is thickened. Acanthosis is absent. The ulcerative process is spreading into healthy skin and in its track healing takes place by fibrosis. The healed areas show marked fibrosis and they are covered with thin epithelium. Blood vessels and skin glands are obliterated by the sclerosing process. No giant cells are seen.

This lupoid ulceration is very chronic. The Bantu term Nkokhora means incurable. In its fully developed form it was seen to have an ulcerating edge, sometimes punches out and gummatous looking and sometimes, in the same patient, a narrow crusted fissure. The edge looked indolent. This ulcerative process spread peripherally in a serpiginous manner and it left behind sclerosing skin and subcutaneous tissues. This sclerosis led to severe deformities resembling the effects of burns, as are shown in the photographs.

This lupoid ulceration bears a strong resemblance to the type of ulceration known as Gangosa or Rhinopharyngitis Mutilans, in its destructiveness and in the mutilated appearance of

the affected region after healing. The experiments of Schobl (61) have proved the framboesial etiology of gangosa, thus supporting the previous opinion based on the common distribution of yaws and gangosa. The prevalence of Gangosa varies with the district. Chesterman (62) in the Belgian Congo saw only one case, Wilkinson (63) found gangosa to be rare amongst the Kisii in Kenya Colony and he thinks that gangosa predisposes to respiratory disease from which the patients die. In Liberia, on the other hand, Maas (64) reports gangosa to be very common, 1% of yaws cases developing gangosa. The author only encountered four cases of gangosa in Lango and he concludes that the condition is rare amongst the Lango.

Bone lesions in Yaws.

Stitt, in discussing the tertiary stage of yaws, says "Joint and bone lesions seem more frequent than was formerly stated. In addition to a form of multiple dactylitis a yaws onychia is well recognised".

Dactylitis, periostitis and epiphysitis are also included as tertiary manifestations by Manson-Bahr. Castellani however, says that bone and joint lesions occur during the secondary stage and he says that about 20% of yaws cases develop bone or joint changes at some time or other.

Clapier (65), in describing the bone lesions observed in French Equatorial Africa, says "L'origine pianique de lésions que nous décrivons n'est pas admise par tous... nous avons examiné.... plus de 600 pianiques, nous avons recherché chez ces malades les signes d'hyperplasie osseuse, nous en avons trouvé beaucoup, et nous avons acquis, non pas la certitude mais la conviction de leur origin pianique". In the Oubangi region of French Equatorial Africa bone lesions are common and Clapier observed them occurring during the stage of the eruption, as well as during the decline of the eruption and also after the eruption had cleared up. There were twelve cases of goundon in his series of six hundred cases. This indicates a remarkable prevalence of this condition and resembles its frequency on the Ivory Coast as recorded by Boitreau Roussel (66).

Clapier notes painful periostitis of the coracoid, and of small bones of wrist and ankle. Irregular enlargements of the epiphysis of long bones caused irregularity in the growth of these bones and consequent deformity and interference with movement. The diaphysis of long bones were affected by localised tumefactions or by generalised diffuse periostitis. These changes were easiest seen in the case of the ulna and the tibia as they are subcutaneous bones. Sabre tibia were common. Especially common was dactylitis in children, resembling Spina ventosa. The muscles supplying diseased joints were atrophied.

The lesions caused much disability and many exemptions from military service were due to this cause. Signs of congenital syphilis were never seen in these cases.

Van Nitsen (67) has seen bone changes in children eighteen months old during the eruption. He considers that the so called tertiary stage of yaws may begin immediately after the secondary stage or its appearance may be delayed for twenty-five years.

In six hundred and ninety-nine cases of yaws in the Belgian Congo Van Nitsen found bone or joint lesions four hundred and thrity-one times.

viz:-	Joint lesions	Pain	178
		Clinical arthritis	74
	Bone lesions	Severe pain	72
		Hypertrophic changes	42
		Exostosis	12
		Dactylitis	23
		Necrosis	27
		Rarefaction	3

Hunt (68) and Johnson consider that 20% yaws cases develop bone lesions. Maul (69) agrees with this percentage and he has

described the radiological appearance of yaws. The predominant radiological feature is rarefaction of the affected bones. In the case of sabre tibiae the rarefaction is generalised and in localised swellings there is localised diffuse rarefaction unlike bone cysts and myelomata. This feature of rarefaction is quite different to what is seen in syphilis of bone when sclerosis is predominant.

Bone lesions were very common in the author's experience in Lango. It is commonplace amongst doctors of East African experience that one of the most frequent complaints of outpatients is Bone Pains. Usually no bone changes are evident on clinical examination but the patient insists on his or her complaint and demands an injection. One or two injections of N.A.B. or of Bismuth stops the pain and no more is seen of the patient for months or years until the pains recur and the patient returns and more injections are sought. So it is in Lango, bone and joint pains are common complaints and, from their rapid response to N.A.B. and Bismuth - they do not respond to mercury; the author, in common with his colleagues, regards this as due to yaws. Generally the patient is an adult, but often the author has seen children and adolescents, thin, inactive and in obvious pain from this cause.

In a hundred consecutive cases of children with the secondary eruption the occurrence of co-existent bone or joint lesions is shown in the following table:

Type of secondary lesion.

Secondary Bone or Joint lesion.	Common Framboesome.	Annular Framboesome.	Impetiginous Framboesome.
Uncomplicated.	43	13	8
Dactylitis.	13	5	1
Periostitis.	6	3	1
Arthritis.	2	-	-
Arthritis and Periostitis.	1	-	-
Dactylitis and periostitis.	1	2	1
Total	66	23	11
% each group	53%	44%	27%
% of whole series	36%		

The above series is too small to admit of accurate conclusion regarding the incidence of bone and joint lesions accompanying the three common types of secondary framboesomes. However, it reflects the author's impression gained from seeing thousands of cases, that bone and joint lesions, and especially dactylitis, are more commonly seen in association with the common or granulomatous framboesome than with any other type.

The age incidence of bone and joint lesions is shown below:

Age.	Under 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Dactylitis.		3	7	2	3	3									1
Periostitis.				2	2		1	3				1			
Arthritis.						1		1							
Arthritis & Periostitis.						1									
Dactylitis & Periostitis.			1	1		1	1								
Uncomplicated	2	4	13	10	9	7	6	4	1	1	2	-	4	-	1

During the first five years 30% of seventy-two cases had dactylitis, whilst the percentage of dactylitis for the whole series of a hundred cases was only 19%. The author has been unable to find a reference to such a high incidence of early dactylitis in any other part of the world, nor has he observed such an incidence elsewhere in Uganda, and he concludes that the Lango are peculiar in this respect. Photographs Nos. 60, 61, 62, 64 and 65 illustrate the appearance of the dactylitis of infants. The condition was generally bilateral and several fingers of each hand would be affected. Pain and tenderness were not marked and the dactylitis responded rapidly to treatment. Similar swellings of the metatarsals were occasionally noted, but never of the phalanges of toes.

Periostial swelling of the long bone, such as is shown in Photograph No. 63 were frequently seen.

In some cases these early bone changes did not clear up with the disappearance of the rash. Permanent thickening of the phalanges resulted with consequent interference with the function of the neighbouring joints and ankylosis. Such patients were pitiable objects as a rule. They looked thin and "withered", in obvious pain when they moved and doomed to an unhappy childhood. Such an individual is shown in Photograph No 67. Treatment relieved the pain but did not, of course, restore the function of ankylosed joints. The disused members did not develop normally and such children who survived to adult age were permanent cripples.

Sabre Tibiae, as shown in Photographs 66-71, were very common in Lango. The earliest cases with only slight bending and thickening of the tibial crest were seen in adolescents and the severity of the condition met with increased with the age of the patient. The condition would thus appear to be a progressive one, commencing about the age of adolescence, say ten years after the onset of yaws, and continuing throughout the life of the patient. These sabre tibiae did not appear to be painful and were noted when the patients presented themselves for other complaints. Sabre Tibiae were noted in 5% of adult males claiming exemption from Poll Tax. Four cases were seen presenting localised swelling of the ulna, clinically resembling myelomata.

Clavicular periostitis, a common bone lesion amongst Bantu, and referred to by Manson Bahr, was never seen amongst the Lango.

Bone changes amongst the Lango were so common as to constitute a peculiarity of yaws amongst the tribe apart from the

permanently crippled on account of deformity, a very large proportion of the adult population suffer from bone pains which considerably reduce their efficiency, and, as has been pointed out in discussing hyperkeratosis, this reduced efficiency is of far reaching consequence.

Treatment, as pointed out by Maul, produces symptomatic relief before signs of healing can be detected radiologically and clinically.

Scurvy is common amongst the Lango. The majority of the population, and especially the children, eat a diet deficient in Vitamin "C". This may be of importance in influencing the localisation of the disease in the periosteum.

Goundon was only seen three times. One case is shown in Photographs 72 and 73. The Lango regard Goundon as a manifestation of yaws. Its rarity, amongst a tribe so liable to bony lesions, is as remarkable as its reported prevalence on the Ivory Coast.

Juxta Articular Nodes.

In 1920 Silva (70) claimed for Lutz priority in describing Juxta-Articular nodes, a credit previously accorded to Sir William MacGregor (71). Lutz published his account in 1892, and MacGregor reported his cases in 1900. Independently of Lutz and MacGregor, Jeanselme (72) in 1904, described the same tumours, and to them he gave the name of Juxta-Articular Nodes. They have now been reported as having a widespread distribution in the tropics, and their etiology is still not certain. Jeanselme's description is still a classic. He found them commoner in men past middle age, subcutaneous nodules, not adherent to skin nor to deeper structures, situated above or below joints, commonest about the olecranon, seldom bigger than an egg, generally multiple, painless and not tender. The tumours were hard and did not disappear spontaneously.

The etiology of Juxta-articular nodes has been the subject of controversy. MacGregor thought they might be caused by pressure by exposed bones in people who slept on the hard floor. Currie (73) and Hollman, in Hawaii, cultivated an aspergillus from the nodules, confirming previous work by Fontoynt and Carongeau (74). French authors, amongst them Poupelain, reporting cases from Indo-China produced evidence in favour of a syphilitic origin. Howard Fox (75) has also shown that syphilis can cause identical lesions in Europeans. Ouzilleau (76) considered them to be a manifestation of O. volvulus infection.

Davey (77), in Nyasaland, noted the association between yaws and Juxta-Articular Node in the same patients. Monchet and Dubois (78), from their observations in the Congo consider the nodules to be due to yaws.

Mendelson (80) suggested the name of Xanthoma tropicum for the lesions and offered the theory that they were caused by some metabolic disturbance.

Recently Coste, Saenz and Costil (79) have reported finding acid fast bacilli in a caseating Juxta-Articular node, but whilst they consider that the organism caused the caseation they do not claim that it caused the original node.

In general, on consulting the literature, one finds that Juxta-Articular Nodes are reported as rarities from countries where yaws does not occur - e.g. from North China Chu'an - K'uei Hu and Frazier (82) report five cases, and Frolich (84) reports five cases from Breslau, and these cases have as a rule, a positive Wassermann, and are regarded as syphilitic. On the other hand, when Juxta-Articular Nodes are reported from yaws infested regions their incidence may be high, e.g. from Liberia Harley (83) reports an incidence of 6.2% Juxta-Articular Nodes. There appears, however, to be wide difference in the incidence of Juxta-Articular Nodes in different yaws infested regions. Acheson (85) found Juxta-Articular Nodes to be rare in Northern Rhodesia, and Fiera (86), describing yaws in Somaliland, does not mention Juxta-Articular Nodes. Incidences which are at variance with that already quoted for Liberia Margeridon (81) during a motor journey from Cairo to the Cape, kept a look out

for Juxta-Articular Nodes, and he says that he saw cases at Melut and Adok in the Sudan, at Lira in Lango, at Kabalo and Bukamba in the Congo, at Tinde in Tanganyika, and he quotes Marsault and Dupins that Juxta-Articular Nodes are common in the Congo. Yaws occurs at all these places.

As shown by Jeanselme and Eliascheff (87), the histology of Juxta-Articular Nodes is that of a simple fibrous nodule, poorly vascularised and with a tendency to central areas of necrosis. Spirochaetes have been demonstrated in syphilitic cases by Frazier. There is nothing in the histo-pathology to indicate definitely either a syphilitic or a framboesial origin. Brumpt (88) found onchocerci in some nodules sent him but they were probably *O. volvulus* nodules which bear a superficial clinical resemblance to Juxta-Articular Nodes.

It appears to the author to be important that the connection between Juxta-Articular Nodes and yaws should be established. These nodes, it is agreed, do not begin to develop until middle age, and, after that age, appear with increasing frequency. If due to the virus of yaws contracted in infancy then their occurrence after an interval of forty-five years points to a long persistence of T. pertenuis in the tissues.

Margeridon has been quoted as noting Juxta-Articular Nodes in Lango. Dribery (29), a layman, also notes the prevalence of these swellings in describing the characteristics of the Lango.

The incidence of Juxta-Articular Nodes in Lango could not be ascertained with any accuracy because of the difficulty of

assembling a representative sample of adult natives. The older men are not usually recruited as labourers and are seldom seen in hospitals - "new fangled contraptions" to them. In prisons however, the author found Juxta-Articular Nodes in every old man, and he noticed them throughout the district in such old men as he encountered. So constant was their incidence in those over middle age, that the author came to use their presence and development as a means of telling the age of the patient. Small Juxta-Articular Nodes indicated a man of forty-five to fifty, and, with the increasing age of the patient the number of Juxta-Articular Nodes increased and the older Juxta-Articular Nodes increased in size. The favourite sites for Juxta-Articular Nodes were Olecranon, region greater trochanter, region of head of fibula and region external malleolus. These old Lango still sleep on the hard ground, and the regions mentioned are, of course, exposed to pressure. If pressure were the cause of these lesions one would expect ulceration to be produced sometimes, but this the author never encountered.

The author could not establish any difference between the incidence of Juxta-Articular Nodes in old men and in old women - both classes seemed to be equally affected. No cases were encountered in young persons. No case came to hospital complaining of pain or discomfort as the result of Juxta-Articular Nodes.

Accompanying Juxta-Articular Nodes in these old Lango, one found that prepatellar and olecranon bursitis was extremely common. These bursae sometimes became as big as grape fruit and

showed a tendency to pedunculation. They felt semi-solid and did not fluctuate. They were non adherent, and easily shelled out at operation. They contained reddish necrotic looking material. Wilkinson (63) noted bursitis as common amongst the Kisii and ascribes the condition to yaws. Powell (10) and Burke (89) also note the association of prepatellar bursitis and yaws infested people.

Gutierrez (70) found that all his cases of Juxta-Articular Nodes responded slowly to N.A.B. The author never had an opportunity of treating a case of Juxta-Articular Nodes with adequate continuous doses of N.A.B.

Mucus Membrane Lesions.

In text books, for instance, Manson's Tropical Diseases, the absence of mucus membrane lesions in yaws is given as a distinguishing feature between that disease and syphilis. In spite of this mucus membrane lesions are constantly being reported in cases of yaws. Blacklock (91), in his critical essay, quotes Charlonis as finding confluent tubercles in the nostril, on the septum, ala and floor, and Castellani is quoted as reporting small granulomatous nodules at the base of the tongue. Blacklock suggests as a reason for the infrequent lesions of the mouth that it is because irritation from smoking and from alcohol is less likely amongst primitive yaws infected races than amongst more sophisticated races who have syphilis. This theory Van Nitzen (92) controverts by pointing out that native races smoke heavily and are anything but temperate.

Hewer (53) found amongst two hundred and fifty-six cases, sixty-two with some lesion of the mucus membrane of the mouth or throat, viz. sore throat thirty-five, twenty-one hoarseness, twenty-nine mucous patches inside the lips and seven with mucous lesions inside the cheeks. The people he studied chew tobacco and give their infants tobacco to chew. Hewer admits that syphilis was common amongst the tribe he studied, therefore one accepts his findings with reserve.

Fiera (93) found, in Somaliland, a few cases of yaws with lesions in the mouth. Miyao reports one case when the lesion at

the angle of the mouth extended on to the mucus membrane inside the cheek, another case with lesion on the glans penis and another case with a lesion on the labium majus. Commenting on this report Stannus (94) says "Most of what has been written in the past on the question of secondary yaws lesions affecting mucous membranes cannot be relied on: many such observations really refer to lesions about muco-cutaneous junctions, and some, as in the present case, depend upon the non recognition of what is skin and what is mucous membrane". Stannus (95) also says "Lack of opportunity for continuous observationalso accounts for the failure to trace..... what would appear to be isolated yaws lesions of the mucus membrane in the nasopharynx. Schobl has shown that a lesion starting in the skin may creep along the mucus membrane, spread forwards, being attended by healing behind, so that eventually the lesion appears to be isolated on the mucous membrane".

Amongst the Lango, during the secondary eruption the author frequently noted that, where the eruption was near a muco-cutaneous junction, such as at the angle of the mouth, or near a nostril, that, in its peripheral spread the margin of the framesome would invade the mucous membrane. Photograph 41 shows a child with both nostrils blocked with secondary yaws. Photograph 42 shows a child with extensive invasion of the mucus membrane of the mouth by a yaw commencing in the skin at the angle of the mouth. In the same photograph the left nostril will be noted to be blocked with a yaw. The case illustrated in

Photograph No. 43 is interesting in view of the criticism of Stannus and the finding of Schobl regarding such lesions. The child was seen first when the author did not have his camera with him. There was then a secondary yaw on the lower lip and the hyperpigmented area over which this yaw had travelled on the under-lip adjoining the sore. Inside the lower lip and continuous with the above sore was a yellow lesion, like a piece of wash-leather under the shining mucous membrane, and extending right down to the alveolar fold. The child was given an injection of sulfarsenol, and, being considered of considerable interest, was told to come back the following day to be photographed. The child was not brought, and, two days later, i.e. seventy-two hours after receiving the injection, the child was obtained to be photographed. The lesion had then healed to the dimensions shown. Had this case been seen for the first time at this stage one might have considered it a true lesion of the mucous membrane.

Granulomata of the base of the tongue were never seen. Yaws sores inside the prepuce and about the labia were frequent; if mucous membranes were impinged on in these regions it was only as the result of marginal spread from a lesion on adjacent skin. Lesions around the eye, and spreading right up to the conjunctival margin were common, but in no case was the conjuction seen to be involved.

No true lesions, arising primarily in a mucous membrane were seen. No lesions resembling a secondary syphilitic lesion of the mucous membrane were seen.

Treatment.

In Africa the Arabs used to treat yaws by cauterising the lesions with copper sulphate, and this method is still practised by native doctors at the present day.

Castellani's (30) Mixture was the first remedy which appeared to have a beneficial effect on yaws. The prescription is

Tartar Emetic	gr. 1	
Potass. Iodide	3j	
Sodii Sal	gr. 10.	
Sodii Bicarb.	gr. 20.	
Aqua ad.	3j	t.d.s. for ten

days, then stop for a week, then repeat for ten days. Castellani claimed that this mixture had a specific effect. Thomson (96) reported that, in Jamaica, he found that Castellani's Mixture produced improvement within ten days, and cured after six weeks. These favourable reports were also supported by Guerrero (97) and by Beurnier and Clapier (98). This remedy was coming into general use when Salvarsan was discovered. H.J. Nichols (99) claims to have been the first, in 1910, to use six hundred and six in the treatment of yaws. His example was rapidly followed by others and by 1912 the remedy was in widespread use, and its specific effect was recognised. The more easily administered nine hundred and fourteen greatly increased the use of Salvarsan in rural areas, and its simplicity of administration greatly accelerated the employment of native

Medical assistants and, contingently, the institution of Medical Schools such as Mulago in Uganda. The subdispensary system, as described by Webb (100) was the direct outcome of this convenient discovery. These subdispensaries are of inestimable value, not only in treating diseases, but in obtaining the confidence of natives.

The cost of synthetic arsenicals was a limiting factor in the large campaign necessary against yaws and the discovery of the effectiveness of the much cheaper Bismuth preparations was an important event. As yaws is an endemic disease of backward poverty-stricken races, people who individually take little interest in their diseases except for the physical discomfort occasioned thereby, the control of this disease has largely been the concern of the European Government of such races. The object therefore, in large scale operations against yaws, has been to concentrate therapeutic measures on infectious cases, and to heal their lesions as rapidly as is economically possible, so as to prevent the spread of the disease. Cheap Bismuth preparations have been of inestimable benefit in such campaigns, especially in Africa.

Although large numbers of cases have now been treated for yaws, the precise effect of treatment is still incompletely understood. This unsatisfactory state of affairs will be readily appreciated by anyone with experience of dealing with natives. Such patients like to decide for themselves when to have treatment and when to stop, and their co-operation cannot be obtained

in any follow-up research.

Broadly, the aim of treatment nowadays is to render infectious cases non infectious as quickly as possible, and to keep them non infectious in an endeavour to prevent the occurrence of new cases. A minor aim, at present possibly only on a small scale, is to cure such patients as are willing to submit to treatment, and one other aim is to provide treatment for the symptomatic relief of non infectious cases suffering from the later manifestations of yaws. In dealing with native races the question of cost of remedies is of prime importance, so the form of treatment adopted in fulfilling these three aims has its economic as well as its therapeutic aspect. On the grounds of cost alone Bismuth is preferable to salvarsan. For instance, in East Africa, ten injections of Sobita cost one penny, whilst N.A.B. costs roughly one shilling for each 0.1 Gm. used.

There are good reports of the efficacy of Bismuth as a remedy at all stages of the disease, but it is less rapid in clearing up the secondary manifestations - the real infectious period - than is N.A.B.

Miguens (101) gave a thousand cases one injection of a 10% suspension of Dermatol, seen eighteen months later 85% showed no clinical signs of yaws. The same writer (102), in reporting another series of cases says that one injection of 10% Dermatol is often followed by a cure, but he prefers to give ten injections at four day intervals. On the Gold Coast (103) it was found that twelve injections of Sobita were necessary to produce

freedom from symptoms for any length of time. In Kenya (104) a minimum of 6 - 8 injections Sobita were considered necessary to clear the eruption and prevent recurrences; Carman (105) considered that ten injections Sobita should be given to obtain such a result. The use of insoluble Bismuth produces more satisfactory results, although insoluble Bismuth preparations are more expensive than Sobita. Further, insoluble Bismuth preparations are liable to precipitation and clogging of needles, factors which militate against their efficient use by African assistants. Carman reports an average of 8.1 injections of insoluble Bismuth as necessary to clear yaws cases, and Gillan, (106), to achieve the same end, found that 6.47 injections were required. The varying response of yaws to treatment is well recognised, and some cases appear to be Bismuth resistant. The latest reports of the Jamaica Yaws commission (107) shows that when a high standard of treatment is arrived at the effect of Bismuth is not much inferior to Neoarsphenamine.

The effect of salvarsan in clearing up skin lesions is remarkable. The usual experience is that one or two injections is sufficient to abolish skin lesions. Gillan's cases required an average of 1.9 injections .6 N.A.B. for an adult; Barlovatz (108) had a similar success after .3 Gm. to .6 Gm. N.A.B. Van Nitzen (109) concludes that the arsenicals are by far the best remedy in clearing up infectious yaws - the "Blanchissement" of the French.

Stovarsol given by the mouth is also an effective and easily administered Arsenical. Bonffart (110), after treating nine thousand cases concluded that the following doses should be used:-

Infants to eight years old - 3 tabs. Stovarsol each of two successive days.
" eight - fifteen years - 4 tabs. Stovarsol each of two successive days.
" fifteen - upwards - 4 tabs. Stovarsol each of three successive days.

Used in this dosage he found that secondary yaws lesions could be made to heal. Resistant cases were rare and only 5% cases relapsed. Dyoce Sharp (111) also considers Stovarsol to be safe and efficacious. Another convenient preparation is Halarsol, a ready made solution in ampoules, which can be injected subcutaneously. Todd (112), in a series of sixty-nine cases, found that it cleared the eruption in single doses of 2 c.c. of 2.5% solution. Others, notably Turner and Saunders (113) found Halarsol uncertain in its result.

Daily intravenous injection of 10 c.c. of .6% solution Copper Sulphate has been reported to produce Blanchissement of secondary yaws in ten to twenty-five days. (114).

To clear up the secondary eruption of yaws therefore, it is apparent that the favourite remedies are N.A.B. which is generally effective after a minimum of two doses; next most effective is insoluble Bismuth requiring six to eight doses, and the cheapest popular remedy is soluble Bismuth requiring ten doses.

In circumscribed endemic regions or outbreaks of yaws

N.A.B. and Bismuth are the favourite drugs. Fitzgerald and Gupta (115) found that the best results were obtained when each case received two or three injections N.A.B. plus eight injections of Bismuth (total 1.4 Gm). Scott, (116), reporting an isolated outbreak amongst mine labourers recommends four injections .4 Gm. N.A.B. plus four injections 4 grains Sobita. These authors cleared up small localised outbreaks, and it is presumed that staff and remedies were adequate for the emergency. Relapsing and obstinate cases were amenable to immediate treatment and so were not dangerous.

Treatment of yaws on a larger scale are less satisfactory in their result, and the following are representative accounts of such endeavours.

Lopez-Rizal (117), in the Philippines, treated one thousand, one hundred and fifty-one cases during three years to October, 1924, each case getting ont to three injections N.A.B. In October 1924, there were no infectious cases known to be in the district. Yet from April to July 1925, thirty-four new cases occurred. In West-Samoa units under the control of Armstrong (118), conducted an anti-yaws campaign. Travelling clinics visited yaws areas and each year every case of yaws got three injections N.A.B. at weekly intervals. 61% of a population of thirty-five thousand were treated. During the second year of this regime there were three thousand, six hundred and ninety-five new cases and two thousand, and sixty-six relapses; during the third year there were one thousand, eight hundred and seventy-eight new cases and

one thousand, nine hundred and fifty-five relapses. Armstrong reports that 50% were serologically cured after one injection, that two injections did not much increase the number of serological cases, but that three injections markedly improved the figures.

Buxton (119) quotes the result of an anti-yaws campaign in Samoa, where three injections N.A.B. were given to all cases of yaws. The reduction in the incidence of the disease is reflected in the number of injections given,

1923-24	32, 366 injections given.
1924-25	21, 222 injections given.
1925-26	12, 012 injections given.
1926-27	9, 981 injections given.

Buxton also says that subsequent to this campaign there was a "Magical disappearance of ulceration and disfigurement amongst the children", and that there was a striking reduction in the infantile mortality.

At the end of 1926 very few of the six thousand children in Samoa under four years of age had to be treated for yaws. Unfortunately, political disturbances which began the following year put an end to these measures, and by 1931 the disease was again widespread. The International Health Division of the Rockefeller Foundation re-commenced the campaign in 1932. Of thirty-nine thousand and forty-nine persons examined, twenty-two thousand, six hundred and seventy-nine, or 58% had open yaws lesions, and in one district infection was as high as 91%.

Treatment with Neoarsphenamine was given and, after one year, there was a decided improvement in the situation. The report of the campaign (120) concludes with the statement that "Mass treatment is a valuable factor in reducing mass infection, but it must be supplemented by the treatment of individual cases as they occur. Among this isolated population yaws must be kept under control by natives who have been trained for medical service among their own people. The final solution of the yaws problem will probably come when there are enough of these native practitioners to ensure adequate medical care for every family in the islands".

The work of the Jamaica Yaws Commission for 1933 (121) also shows that therapeutic measures are effective in controlling yaws. This Commission surveyed a population of six thousand, three hundred, and found that six hundred and fifty-two, or 50% gave a history of yaws, amongst whom 5.2% were considered infectious. 96% of the infectious cases were treated, and, three months later, only 17.5% of the number of infectious observed were found. The conclusion regarding treatment was, "Preliminary observations indicate that the beneficial results of treatment with the latter (Neoarsphenamine) increase rapidly with the number of injections up to three, and slowly thereafter". In the report for the year 1934, the Jamaica Yaws Commission (122) again show that treatment of infectious cases reduces the incidence of the disease. By the end of the year the number of infectious cases was only 14% of what it had been in the begin-

ning of the year, and the number of new cases was only 8% of what it had been during the previous year. The corrected figures for the remedies used indicate that N.A.B. is superior to Bismuth, but its superiority is not as marked as was once supposed, when rapidity of clearing of the secondary yaws was the criterion.

These references show that, in circumscribed areas, the use of N.A.B. and Bismuth on a large scale markedly influence the incidence of the disease. Three injections of N.A.B., with one without Bismuth in addition, appears to be the minimum effective dose and the combination of N.A.B. and Bismuth is superior to the use of either alone.

Dealing with yaws on a Continental scale, such as is the problem in Africa, has been less encouraging. Shircore (123), in 1921, impressed by the efficiency and cheapness of Potassium-Bismuth-Tartarate, thought that yaws could be eliminated from Tanganyika within six years. In spite of vigorous campaigns in Tanganyika Territory and elsewhere in East Africa, this ideal has not been realised. Local successes on a minor scale have been reported, and the incidence of yaws is markedly less around treatment centres than it is elsewhere. Africans do not lend themselves voluntarily to adequate mass treatment and the quantities of N.A.B. necessary, as shown from experiences elsewhere, are beyond the financial scope of East African Colonies. Too high a number of infectious cases escape treatment and inadequate treatment leads to a high relapse rate, thus interfering

with the success of anti-yaws campaigns amongst Africans.

The amount of treatment necessary to effect a complete cure is still unknown. The criterion of cure would, one supposes, be a persistently negative Wassermann and an absence of active symptoms and signs.

In Jamaica the following table (121) shows the results of treatment on the serology, after an interval of one year.

Drug used.	Clinical Diagnosis.	No. Cases.	Failed to heal or relapsed.		Wassermann + %.
			No.	%.	
N.A.B. Six weekly doses.	Infectious Type.	40	3	7.3	21.6%
	Other.	64	7	10.9	54 %
	Total	104	10	9.6%	42 %
Bismuth. Six weekly doses.	Infectious Type.	63	27	43	68 %
	Other.	69	13	18.8	57 %
	Total	132	40	30.1	63 %

Navarro (124) reported that, out of one hundred and one cases each receiving one injection N.A.B., forty-three were Wassermann Reaction negative three months to three and a half years later.

Using Sobita, three courses each of a total of Gr.10, on the Gold Coast (125) in

67.9% Wassermann Reaction was unaltered.

32.1% Wassermann Reaction improved.

8.6% Wassermann Reaction was negative. soon after the

end of the last course of treatment.

Armstrong (118), in Samoa, found that 50% of his cases were serologically negative after one injection N.A.B. Fitzgerald and Gupta (126), using three injections N.A.B. and eight injections Bismuth, in a group of cases at all stages, obtained only 50% serologically negative after two years interval.

The conclusion, therefore, appears to be that, in the doses usually employed, only 40-60% cases will be permanently cured. The figures of the Jamaica Yaws Commission further show, that, in the early infectious stages when six injections N.A.B. is used, only 7.3% cases fail to respond and that the Wassermann Reaction is rendered negative in 79% after this treatment. In the later stages of the disease, however, N.A.B. failed in 46% cases.

Bismuth, on the other hand, was less effective in the early cases, failing in 43% cases, but, in the later stages it was more effective than N.A.B., rendering 23% Wassermann Reaction -.

It is chiefly in the treatment of these later cases that Bismuth is used in East Africa.

The author had had considerable experience of yaws in Uganda before going to Lango. Yaws is prevalent in Ankole and in Toro, previous districts in his charge. For instance, in Toro, during 1930 and 1931, about ten thousand cases of yaws were treated in the author's hospitals and dispensaries. Ankole and Toro are Bantu countries and their falling birthrates, supposed

to be due to syphilis, were occasioning alarm. The Batoro and the Banyankole are heavily infested with helminths, and malaria and tick-fever are very common. Yaws was, therefore, merely an extra burden for these races. With only one Medical Officer for each of these large districts, (each the size of Wales) and with a small staff of partially trained Africans, the Medical Department's policy was to establish subdispensaries throughout the district, where all of the prevalent and killing diseases could be dealt with, leaving it to the patients to come and seek treatment, who did, in large numbers. No attempt could be made to conduct a campaign against any one of the diseases asking for such a measure, for such a campaign, over such a large area, would have absorbed all the resources of the local Medical Department, and the other diseases would have had to go untreated. Undoubtedly the spectacular effect of specific treatment of yaws was the main reason for the great popularity of the centres provided. I doubt whether these measures reduced the incidence of yaws throughout the districts as a whole, but yaws was noticeably less in the ten miles or so surrounding each dispensary than it was elsewhere, due to the facility with which cases could obtain treatment.

The remedies used against yaws were, Sobita, Bismuth Oxide suspension in Olive Oil, N.A.B., Sulfarsenol, Neotreparsenan, and Halarsol.

Cases came for treatment at all stages of the disease. They only returned for second and third injections when they

felt like it, and generally they prescribed their own treatment. N.A.B. was the favourite with adults, and was given on a small payment, but even this small charge was too much for the majority to afford. Neotreparsenan externally resembled N.A.B. and was put up in similar ampoules. It was issued free, being a much cheaper preparation. Its use was rather a harmless deception as it encouraged natives to come for the yellow intravenous injection, and the patient also received Bismuth at the same time. Halarsol was used for a time, but its use was discontinued as the author did not consider it so effective as other remedies, an opinion shared by the patients and freely offered to the author by them. Sulfarsenol was given intramuscularly in children. Bismuth Oxide suspension was free, and caused little or no pain; Sobita was also free and caused pain. Both these injections were well known by the natives. One section of the community liked the injection which gave them pain, thinking it must be good, the other section did not like pain, generally they tried both. When a native demanded an intramuscular injection he was given his choice. In such free and easy circumstances it was impossible to collect any records of the result of treatment, but by seeing so many patients the author formed opinions in accordance with the careful controlled experiments of others.

Intravenous injections of N.A.B. were superior to any other form of treatment at all stages of the disease: one injection producing a marked effect, and few patients considered it worth

while to come back for a second injection during the course of the next three weeks. Sulfarsenol in children was less satisfactory, most children needing four injections to clear up the lesions. The doses given were purposely small, but even when the dose was increased, healing was slower than with intravenous N.A.B. Bismuth was seldom used with secondary lesions. Its use was principally confined to treating such tertiary manifestations as bone pains and hyperkeratosis. In these conditions few patients came for more than two injections at a time, although its efficacy in easing the pains of these conditions was evidenced by its popularity. Neotreparsenan, the author considered inferior to Bismuth at all stages, but its psychological effect was valuable.

Stovarsol was never used as one never knew to what use an African would put the tablets.

In Lango the birth rate was not falling, and such vital statistics as were available were favourable. Syphilis was rare and the people were moderately prosperous for an African race. The adult males could earn what money they needed by growing cotton at home and they were not obliged to neglect their families and homesteads by going elsewhere to work for wages. The policy of the medical department was slightly different in Lango. Instead of a large number of poorly staffed and poorly equipped subdispensaries, the aim had been to utilise available means to build permanent hospitals, adequately staffed and under the charge of a Senior African Medical Assistant. (These are

highly trained Africans, the product of Mulago Medical School, and Registered Medical Practitioners). Such hospitals were able to deal with the more serious diseases of the surrounding district. Because of their cost these hospitals were few in number. There were only four in the whole five thousand square miles of Lango. They were therefore long distances apart, and only a small proportion of the population was within easy reach of any of them. Whilst the Lango considered it worth while to go to these hospitals when seriously ill, they were less ready to walk miles to the hospitals for treatment of trivial ailments. As yaws was and had been a universal complaint amongst the Lango since time immemorial, it was considered of little importance by them, worth having treated if such treatment were readily available, but not worth having treated if such treatment necessitated a twenty mile walk, there and back, every week. Thus, although specific treatment had been available for years at these hospitals, its effect on the incidence of the disease had been negligible.

By the time the author went to Lango, finances enabled the Medical Department to provide N.A.B. free to all necessitous cases and at a small charge to others. Sulfarsenol was also available free. The use of neotreparsenan was, therefore, discontinued. Bismuth Oxide and Sobita injections were also available free.

Cases of yaws were treated as out-patients, and no compulsion could be employed to make cases attend for treatment. Persuasion was employed, but unsatisfactorily. Cases coming from a

distance were catered for by providing sick lines of round huts where a whole family could stay as long as it liked, food being provided by the native administration. In these circumstances the effect of treatment was never accurately discovered. The Africans' idea of sufficient treatment being enough to abolish actual discomfort in themselves and the disappearance of most of the secondary lesions from their children. In the majority of cases, therefore, treatment was totally inadequate and relapses and recurrences were common.

In cases coming back for treatment it was often difficult to find what treatment had been given previously. Records were kept on cards at the hospital, a separate card for each case, and each with a serial number. The patient received an out patient slip of paper bearing the serial number and notes of treatment also. Some treasured these slips, but in the majority of cases the slips were soon lost. To facilitate record keeping and to provide some means of follow up in years to come, therefore, the author gave all children with secondary rashes an aluminium disc bearing the serial number of their case. Notes and records were kept at the hospital, and the aluminium discs, popular as ornaments, were hung round the child's neck. It is to be hoped that a sufficient number of these cases will retain their discs so that in years to come, the progress of the case may be followed up. These identification discs can be seen in the photographs. Their use greatly facilitated the administration work of dealing with large numbers of cases.

The case cards of five hundred and sixty-three children suffering from secondary yaws lesions were reviewed, showing the following results:

Total cases.	563.
Number attending once only.	183.
Number attending twice.	134.
Number receiving three or more injections.	246.
Number obeying instructions, and recorded as being discharged cured.	5.

The interval between injections in those receiving more than one injection varied widely from one week to three months.

Except in five cases, the result of treatment was not known, but it can be assumed that in the majority of cases more or less desultory treatment would be pursued until the child was clear of sores. The small proportion apparently clear after one injection is at variance with what is generally the case. This may have been due to the low age of the patients, 5% were under the age of one year, and the difficulty of giving adequate doses to such young patients.

The remedies used in this series were:

Intramuscular Sulfarsenol	303
Sulfarsenol + Bismuth	94
Bismuth alone	24
N.A.B.	142.
Total	<u>563</u>

In this series sixteen cases were resistant to treatment. Of the others, the average number of injections the patients came for were:-

I.M. Sulfarsenol	2.8
Sulfarsenol and Bismuth	2.1
Bismuth alone	4.2 (min. 1, max. 11)
N.A.B.	1.6

The five cases discharged cured (ie. clear of the rash) received the following treatment:

	S.S.	N.A.B.	Bi.	Duration of treatment.
Case I 6½ years old.	4x0.2Gm.	-	3x½cc.	1 month.
Case II 2 years.	3x0.1Gm.	-	-	1 month.
Case III 2 years.	7x0.1Gm.	-	-	6 months.
Case IV 5 years.	4x0.2Gm.	-	4x½cc.	13 months.
Case V adult	-	3x.45	-	1 month.

The sixteen resistant cases attended at irregular intervals for an average period of five months. Only one case attended regularly; her treatment consisted of:

S.S.	Bi.	Duration.
8 X 0.2 Gm.	3 X ½ cc.	6 weeks.

She was still incompletely healed when last seen. No cases treated with N.A.B. intravenously were resistant.

These results are not so satisfactory as what is generally reported regarding the efficacy of specific treatment in clearing up the rash. The author noted, however, that intravenous N.A.B. was more effective than intramuscular S.S. So superior

was intravenous N.A.B. that this route was latterly employed whenever possible. African dressers can develop an amazing artistry in intravenous injecting, using veins in the feet and in the hands if the median cephalic cannot be employed. The sagittal sinus was injected twice by the author through the anterior fontanelle with satisfactory results, but this route was not adopted for use by dressers.

The author's conclusions were that intramuscular sulfarsenol was satisfactory if persisted with but that it was inferior to intravenous N.A.B.

In estimating the effect of treatment, and in spotting those liable to recurrences, he found it valuable to examine all the sores. If all the sores were healing all round, all was well, but if any sores still showed a tendency to progress, and were not completely healing all round, then a relapse could be expected. The relapse consisted of an extension of incompletely healed sores, producing the circinate yaws. The author never saw a yaw spread back over a healed area, not did a new yaw ever develop in the site of an old healed yaw. This seems to indicate a certain degree of local immunity.

It has been said often that treatment must be taken to the yaws cases, and this was true also in Lango. For instance, at Aboki subdispensary, only about thirty new yaws cases were coming per week, although in the surrounding district there were very many cases of yaws. As an experiment the author and his assistant went on pre-arranged Sundays to surrounding villages

about twelve miles away from Aboki and each Sunday treated about a hundred and forty cases of yaws. By going to the villages there was no difficulty in getting children for two injections, though it was very difficult to get them for a third. The author found that the Optimum effect of one injection was not apparent until ten days after the injection, and so fortnightly visits were paid to each place. One other advantage of this scheme of visiting was that the older children with scanty yaws, the reservoirs of the disease, were encouraged to attend.

This system of visiting clinics has been found necessary elsewhere.

The effect of treatment.

The author's conclusions regarding the effect of treatment in Lango were

(1) Its effect on the incidence of the disease was practically nil.

(2) Clearing up the rash relieves the patient of discomfort and suffering. Most of the patients at this stage are young infants with malaria, dysentery, etc, and the removal of one of their prejudiced conditions is beneficial.

(3) Judging from the number of young adults with bone pains and hyperkeratosis who had received "Blanchissement" dosages years before, the author considers that such treatment does not prevent "tertiary" yaws.

(4) Symptomatic treatment of tertiary discomforts in adults

is valuable in allowing them to carry on with their duties with benefit to the important younger generation dependent upon them.

(5) Treatment by itself will not stamp out yaws until sufficient African Medical Assistants are available to ensure prompt and convenient treatment for all cases.

The relationship between Yaws and Syphilis has for long been of academic interest, says Blacklock (127), before going on to show how recent developments have given a "fresh and practical impulse to the subject". On the analogy of inadequate treatment of syphilis he points out that inadequate treatment of early yaws may result in a neurotropic effect. He also quotes the experiments of Sellards and Goodpasture which indicate that immunity to T. pertenue is developed late in the secondary stage, thus, "adequate but premature treatment" whilst curing the yaws may remove a beneficial immunity to later venereally acquired syphilis.

These arguments, raised ^{by} one of Blacklock's eminence, are so important as to require careful consideration before embarking on an anti-yaws campaign in a region where there is the likelihood of syphilis being imported later.

As regards the nemotropic risk to inadequately treated cases of yaws, the author considers that sufficient cases have been inadequately treated by now to remove the element of speculation. Harper (128) and others say that G.P.I. occurs amongst the Fijians and that these people do not suffer from syphilis, yaws, on the other hand, being common amongst them. Powell, however, has pointed out that the absence of syphilis is most unlikely because thousands of Indians, whom he knows to be syphilised, work in Fiji and co-habit with Fijians. On the other hand, in regions where yaws is common, and has been inadequately treated, there are no reports of parenchymatous

nervous lesions due to yaws. Lango has had inadequate yaws treatment now for about seven years. All claimants for Poll Tax exemption on the grounds of ill-health are medically examined. In the thousands seen by the author during 1934 there was not one case of disease of the Central Nervous System which resembled treponematous infection. The risk therefore, of making the T. pertenue neurotropic can therefore be dismissed.

The other consideration, namely, does yaws confer immunity to syphilis, and vice versa, is no less important than the possible neurotropic tendency of inadequately treated T. pertenue infection.

Charlonis (129) reported a case of a man who, whilst suffering from secondary yaws, acquired a Hunterian chancre and later developed a secondary syphilitic rash. Powell (129) and Mackenzie (130) have also reported co-incident primary and secondary syphilis and yaws in the same patient. These clinical observations would appear to indicate a lack of cross immunity, but experimental animal infections indicate that such a deduction is open to question. Schobl's experiments (129) show that immunity to yaws develops slowly and that the speed of its development depends on the extent of the eruption. Thus, in Philippine monkeys, he found that animals were susceptible to superinfection up to six or seven months after inoculations which produced only a single yaw. Further work showed that immunity generally appeared about two months after the appearance of the secondary eruption, and that the immunity was at its height after five months. Therefore the clinical observations of Charlonis, Powell and others regarding co-incident secondary

yaws and early syphilis in the same patient can be explained by the syphilis or the yaws being acquired and the manifestations developed during this comparatively long latent period before immunity develops in yaws.

Schobl and Miayou (131) conducted a series of carefully controlled experiments to test the cross immunity of syphilis and yaws. Thirteen monkeys which had recovered from yaws and which had been proved immune to reinfection with yaws, were inoculated with syphilitic material. At the same time five normal monkeys were similarly injected as controls. The five control monkeys developed syphilis, but syphilis could not be demonstrated in any of the monkeys who had previously had yaws.

That the strain of *Treponema* may have something to do with the success of cross infection is suggested by the work of Lange and Jahnel (129). In 1925 these authors, using a strain of *T. pertenu* obtained from America were unsuccessful in inoculating cases of General Paralysis of the Insane. Two years later, this time using a Sumatra Strain of *T. pertenu*, they successfully inoculated G.P.I. patients and produced yaws in them.

In view of these conflicting results the author feels justified in recording his clinical observations. In a previous section he has indicated that the Lango are recruited for service in the Uganda Police, and, as serving Askaris they are stationed throughout Bantu Uganda, where they cohabit with local prostitutes. Venereal disease is prevalent amongst the askaris

and all are medically examined once a month for signs of venereal disease. The author has no records of the number of Lango whom he has thus found to be suffering from early syphilis, but the number is considerable, and, of course, the majority of cases had yaws in childhood. As an instance of the type of case referred to, one case is quoted. An Askari presented himself complaining of a severe headache. His face was covered with roseolar syphilides, which rash was also present on his body. He gave a history of having had a sore on his penis one month before when he was on safari, and was not medically inspected. The Wassermann Reaction was+++ . He could remember having yaws in childhood in Lango and he had the scar of the yaws primary sore on his leg. The case shown in Photograph No. S.4 was the child of a Lango Askari stationed in Kampala. The child had syphilitic epiphysitis and no rash. Both mother and father had had yaws in childhood.

Naturally only physically sound Lango are recruited for service in the police. No Wassermann Reaction is done prior to enlistment, so the author does not know if these cases he quotes were cured cases of yaws, and therefore liable to Treponematous infection, or not. This, however, in his opinion, is only of minor importance. His observations are construed by him as meaning that in a yaws infested community, such as the Lango, there are many who, in spite of suffering from yaws in childhood and curing themselves naturally (these askaris are of an age to have had yaws before treatment was available in Lango) are

susceptible to later venereal infection with syphilis. In the opinion of the author, therefore, saturation of a tribe with yaws in childhood will not protect that tribe from later venereally acquired syphilis, and, conversely, natural or therapeutic cure of yaws will not make the individual more susceptible to syphilis than an uncured case.

With so many Lango Askaris contracting syphilis the question suggests itself why, on returning to Lango on leave and on retirement, these askaris have not disseminated syphilis throughout Lango. In the first place, syphilis is generally contracted early after his enlistment, whilst the recruit is sowing his wild oats in Kampala depot. Some years elapse before the Askari returns to Lango. In the meantime his syphilis has been adequately treated and this treatment, plus the bodily resistance to the diseases developed during this interval, renders the Askari unlikely to transmit syphilis venereally.

The argument that inadequate treatment of yaws may predispose to later neurotropic results, and for that such treatment may remove a beneficial immunity to syphilis is not considered by the author to be strong enough to justify restricting an anti-yaws campaign on these grounds.

Syphilis in Uganda.

The author has repeatedly referred to the comparative absence of syphilis in Lango, and to its high incidence in Bantu Uganda. The reader is entitled to ask some proof for these statements, and for a description of the salient characteristics of syphilis in Uganda.

The introduction of syphilis into Uganda by the Arabs, and, probably by the Sudanese, early in the Nineteenth century has been mentioned already. Venereal Disease was rife in Buganda when the British Administration commenced. Such Medical facilities as were then available were early occupied in dealing with the famous sleeping sickness outbreak, and it was not until this had been dealt with, about 1906, that Venereal Disease could be tackled. Col. Lambkin was appointed advisor and he estimated that at that time 90% of the Buganda were suffering from syphilis. Such statistics as were available indicated that the infantile mortality was about six hundred per thousand. The death rate was greater than the birth rate. Syphilis was regarded as the primary cause of this appalling situation. Measures undertaken to combat Venereal Disease were interrupted by the Great War. In 1919 Dr. Webb and Major Keane established the first V.D. centre at Mulago near Kampala. Mulago has now outgrown its primary function and is now a big General Hospital and Medical Training Centre.

Dr. Webb and Dr. Holliday, in 1927, reviewed seven thousand

seven hundred and eleven cases of late syphilis seen by them at Mulago. These were all cases with a Wassermann Reaction and their tables showed the common complaints for which these people attended. The majority of the complaints cannot be ascribed to syphilis, but amongst cases complaining of syphilitic manifestations were the following:

Generalised pains in Bones.	1,578
Joint Pains.	760
Interstitial Keratitis.	14
Hutchinson's Teeth.	16
Sabre Tibiae.	22
Paraplegia & Paresis and Hemiplegia.	59.
Vertigo.	30
Mitral Disease.	2
Aneurysm.	3
Aortic Disease.	6

Surprisingly little has been written about syphilis amongst the people of Uganda. The prevalence of the disease has been taken for granted and its manifestations, apart from the absence of Tabes and the comparative rarity of G.P.I., are similar to its manifestations elsewhere.

In this section the author does not wish to describe syphilis in Uganda fully, but merely to indicate its manifestations to justify his conclusion that the same disease is very rare in Lango. He also wishes to establish his familiarity with

syphilis in case of questioning as to his ability to diagnose syphilis in bulk from yaws in bulk. He has met much African syphilis in Ankole and in Toro. At present he is stationed at Mulago. The syphilis seen at Mulago is similar to syphilis he has seen elsewhere, so he will confine his description to syphilis seen at Mulago, because laboratory facilities for diagnosis are available there.

The following table shows the number of cases of syphilis treated at Mulago during 1935, and the incidence of certain diseases generally regarded as due to syphilis is also shown.

Statistics of Syphilis. Mulago Hospital 1935.

Primary Syphilis.	575
Secondary Syphilis.	740
Tertiary Syphilis.	1,311
Hereditary Syphilis.	128
Syphilitic Meningo-Vascular disease.	33
Paralysis ascribed to Syphilis.	71
G.P.I.	2
Aortic Valve Disease.	89
Aneurysm of aorta.	9
	<hr/>
Total	2,948
	<hr/>
Total admissions all causes.	34,273
	<hr/>

Syphilis. Mulago Hospital. January - June 1936.

Primary Syphilis.	169
Secondary Syphilis.	672
Congenital Syphilis.	67
Aortic Disease.	16
Aneurysm.	4

Clinical Features.

Primary Sore - All cases seen by the author have been on genitals.

Clinically identical with such sores as generally described.

Dark ground examination by microscope done in doubtful cases.

Secondary Stage. - This is the common stage at which the disease is recognised clinically. Well recognised by the African; he or she generally comes to hospital to be treated for this complaint.

The author found a roseolar papular rash to be much the commonest type of lesion. The papules frequently developed a pustular appearance and some papules appeared scaly. Papules becoming annular in shape were also seen frequently. Such annular syphilides had irregular margins and were irregular in shape, unlike the uniform rounded appearance of the annular yaw. Occasionally syphilides like the annular yaw were seen, but such lesions were invariably situated at the angle of the nose, a characteristic which, taken in conjunction with diverse lesions elsewhere on the body, was regarded as diagnostic. Framboesiform syphilides were looked for. In three hundred and sixty cases of secondary eruptions seen personally by the author during 1936, there were five framboesiform eruptions. In four cases the patients were immigrants from yaws infested regions, and in only one case with an eruption resembling yaws could intimate contact with yaws not be excluded. The case is illustrated in Photograph No. S.16., and the author is doubtful regarding his diagnosis of syphilis in this case.

Nogue and Zimmermann comment on this frequency of the papular rash in negroid syphilis, and Blacklock quotes Hazen who, in negroes found follicular, annular and framboesiform syphilides to be common. Condylomata are an almost invariable accompaniment of secondary syphilis amongst Baganda. Their appearance is typical and their frequency is of diagnostic value in the case of an unusual rash elsewhere on the body.

Accompanying the rash such other manifestations as adenitis, headache and mucous patches inside the mouth, and sore throat are common.

Congenital Syphilis is generally seen in its early stages when the child has a rash and/or epiphysitis. Congenital syphilitic rashes seen were frequently annular in shape, but more irregular in outline than annular yaws. Further, the skin between yaws sores is healthy looking, but the skin of congenital syphilitic babies was often red, glazed and cracked, and peeled easily. Later congenital manifestations were seen occasionally and Photographs of Hutchinson's Teeth, sunken nose and bossed foreheads are shown.

Definite tertiary syphilitic manifestations are difficult to diagnose with certainty, but some diseases, such as aortic aneurysm and aortic disease are easily diagnosed, and are definite indications of tertiary syphilis. The tables show that such conditions are relatively common. The medical wards are never without cases of paresis and other disease of the Central Nervous System. These, as a rule respond well to antisyphilitic

treatment and their Wassermann Reaction is generally positive. One common nervous disease is a partial cerebellar syndrome, viz. vertigo, ataxia, dysdiadekokinesia etc. These cerebellar syndromes respond very rapidly to antisyphilitic medication. The syphilitic diagnosis is frequently confirmed by Post Mortems and at Post Mortems it is common to find, in cases not showing clinical signs of syphilis, such syphilitic manifestations as syphilitic aortitis and syphilitic meningo vascular changes.

As regards the incidence of syphilis in Buganda, the author's anti-natal clinic affords a useful index. Anti-natal supervision is popular amongst the Baganda and all cases attending have Blood Test done on them.

In one thousand consecutive mothers attending the following were the results:

B.T. + (Kahn or Wassermann Reaction)	B.T. -	Doubtful.
722	226	52

With the exception of a few immigrant women these cases had not been in contact with yaws cases and gave no history of having had yaws. The high proportion of positive reactions can only be accounted for by syphilis.

The fate of the pregnancies of these women is shown by the following table, compiled from the previous pregnancies of consecutive patients.

Total Pregnancies	Children Surviving 1 month	Abortions.		Still Born	Died soon after birth.
		At under 4 months	At over 4 months		
1,000	586	102	162	98	52

Comparable figures are not available for Lango. The nearest laboratory was three hundred miles away, so Wassermann Tests were out of the question. Lango women are so ignorant that to question them on their previous pregnancies would not elicit any information worth having.

The author's point at present is that in Uganda, amongst the Bantu, there is syphilis, resembling in its manifestations, and in its effect on the population, syphilis as it occurs elsewhere. The disease shows itself and can be recognised clinically by its primary sore, its secondary rash and some of its tertiary manifestations. At Post Mortem the disease can be recognised by syphilitic Aortic Scarring, and by the adhesions of Syphilitic Meningitis.

In Lango the author met twelve cases of secondary syphilitic rashes, all in immigrant Bantu people. He never saw a rash resembling a secondary syphilitic rash in a Lango. He never saw a case of Aortic Valve disease and he never saw a case of Aortic Aneurysm. The only cases of nervous disease seen were two cases of Anterior Poliomyelitis from cases of Parkinsonism after Encephalitis Lethargica, and one case of hemiplegia.

During 1934 the author performed sixty-four autopsies and he did not encounter one case showing syphilitic aortitis nor syphilitic meningitis.

The author, therefore, feels justified in assuming that syphilis is rare amongst the Lango.

Summary.

- (1) A clinical study of indigenous yaws, in an isolated Nilotic tribe is presented.
- (2) An endeavour has been made to establish that yaws is common in this tribe, and that syphilis is rare. The past history of adjoining tribes is reviewed and it indicates that syphilis should become common amongst the Lango.
- (3) With improving economic conditions, better standard of living and more treatment, yaws will disappear from Lango.
- (4) The possibility of a fly vector is suggested.
- (5) The cutaneous manifestations of yaws are discussed, and the clinical appearance of the lesions has been shown to be dependent upon the relative predominance of combinations of typical histological features.
- (6) A classification of Common Framboesome, Annular Framboesome and Impetiginous Framboesome is shown to be adequate for the Lango lesions.
- (7) Unusual looking lesions have been encountered and are explained as being caused by reparative processes.
- (8) The uniformity of the lesions in a given case is emphasised.
- (9) Late skin lesions, such as Hyperkeratosis Plantaris and

Palmaris have been referred to and their frequency commented on. The Lupoid type has been discussed at some length.

(10) The importance of bone lesions has received attention. The remarkable prevalence of dactylitis and periostitis in children during the acute stage of the eruption is introduced.

(11) The sociological effect of the disablement of parents by late yaws lesions has been pointed out.

(12) Treatment has been discussed, in general and also with particular relation to the results achieved in Lango. The importance of "Reservoir Cases" is mentioned.

(13) Immunology, particularly the immunological relationship between yaws and syphilis, has been studied, and the author offers his clinical observations in this connection. In his opinion yaws does not protect against venereal syphilis.

(14) Syphilis amongst Bantu Uganda tribes has been described briefly.

(15) The absence of visceral changes amongst the Lango, resembling those caused by syphilis is alluded to.

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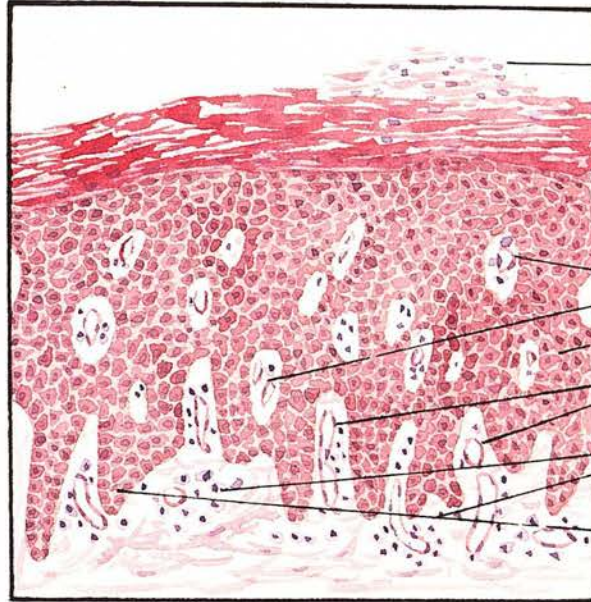
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PLATE NO 1



SMALL PIECE OF CRUST

THICK CORNEUM.
HYPER KERATOSIS.

GREAT THICKENING OF S.
MALPIGHI + ACANTHOSIS.

ISLAND INCLUSIONS OF
PAPILLAE
MODERATE INTER CELLULAR
OEDEMA.

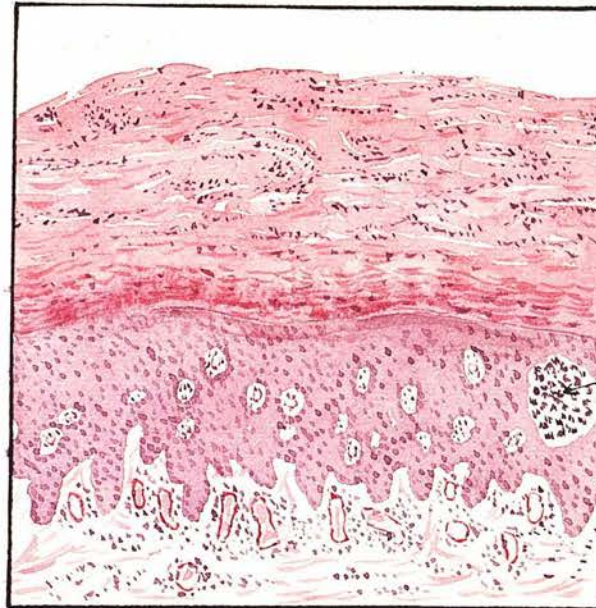
BLOOD VESSELS NOT
THICKENED.

PLASMA CELL INFILTRATION
CHIEFLY AROUND VESSELS

PEG DOWNGROWTHS OF
CORIUM.

SECTION FRAMBOESOME :- ACANTHOSIS AND HYPERKERATOSIS
PREDOMINATING.

PLATE NO 2.



THICK CRUST, CONSISTING
OF LAMELLAR LOOKING DRIED
SECRETION, ENMESHING
DESQUAMATED EPITHELIUM
AND LYMPHOCYTES AND
PLASMA CELLS.

HYPER KERATOSIS

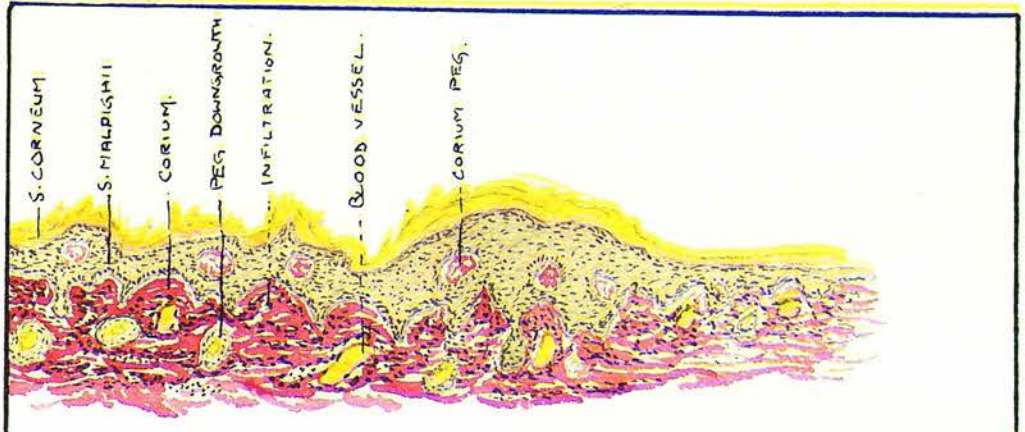
ABSCESS IN SKIN

ACANTHOSIS. MARKED
OEDEMA

DISTENDED VESSELS WITH
PLASMA CELL INFILTRATION
SURROUNDING.

SECTION FRAMBOESOME :- ACANTHOSIS AND HYPERKERATOSIS
PRESENT, BUT OEDEMA AND CRUST
FORMATION PREDOMINATING.

PLATE No 3



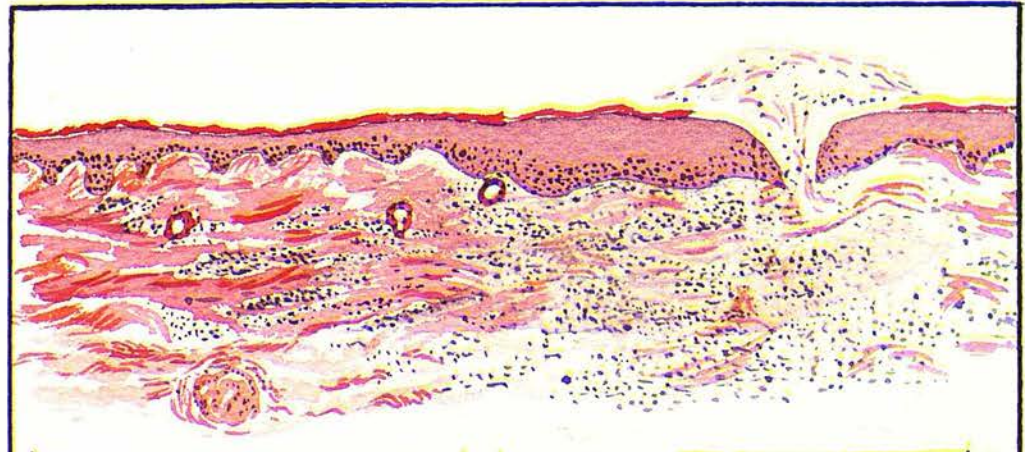
REGION OVER WHICH THE ADVANCING EDGE HAS PASSED. NOTE HYPERKERATOSIS AND DYSKERATOSIS. ACANTHOSIS MODERATE BUT PEG LIKE DOWNGROWTHS EXTEND FAR INTO CORIUM. THE CORIUM IS THICKENED AND CONTAINS A PROMINENT INFILTRATION OF PLASMA CELLS AND LYMPHOCYTES. BLOOD VESSELS FEW IN NUMBER ENGORGED WALLS NORMAL.

ADVANCING EDGE NOTE HYPERKERATOSIS, ACANTHOSIS, DENSE CORIUM CONTAINING INFILTRATION AND DISTENDED BLOOD VESSELS

SKIN ABOUT TO BE INVADDED. CORIUM MODERATELY INFILTRATED BY LYMPHOCYTES AND PLASMA CELLS.

HYPERKERATOSIS PALMARIS

PLATE No 4.

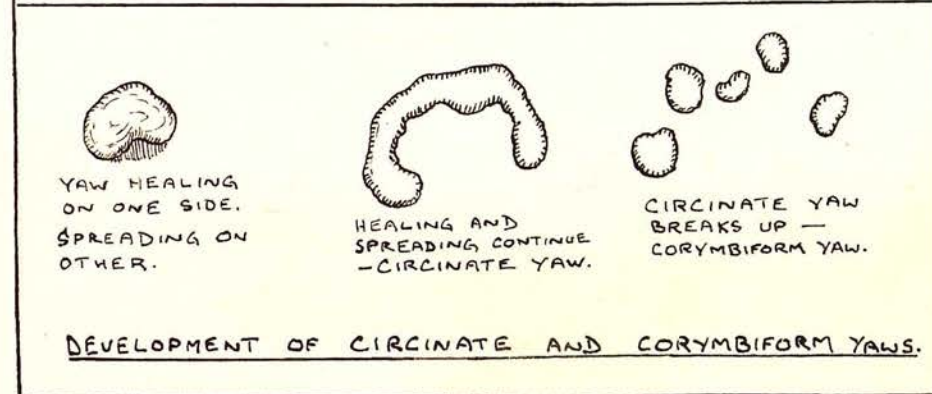
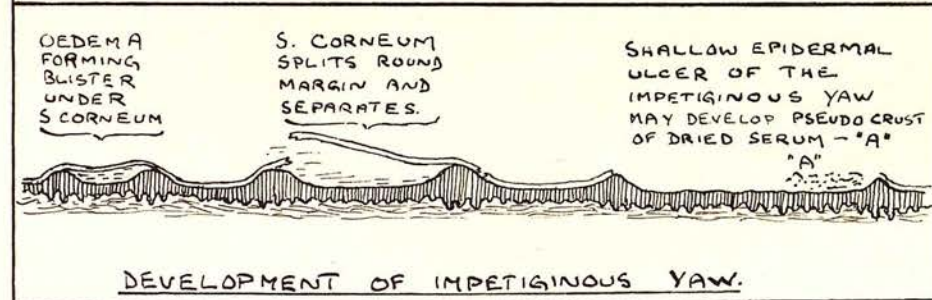
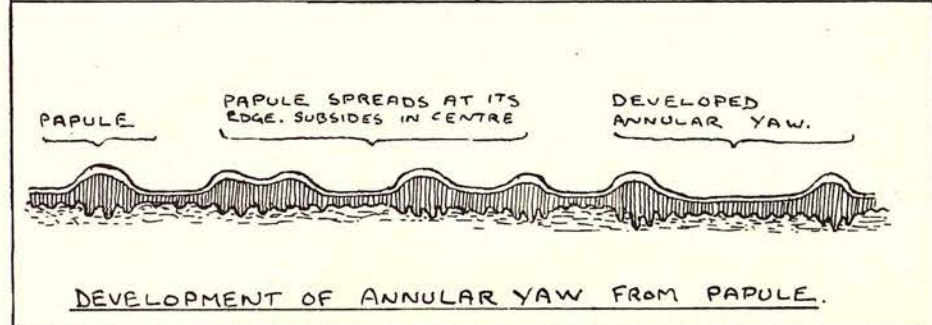
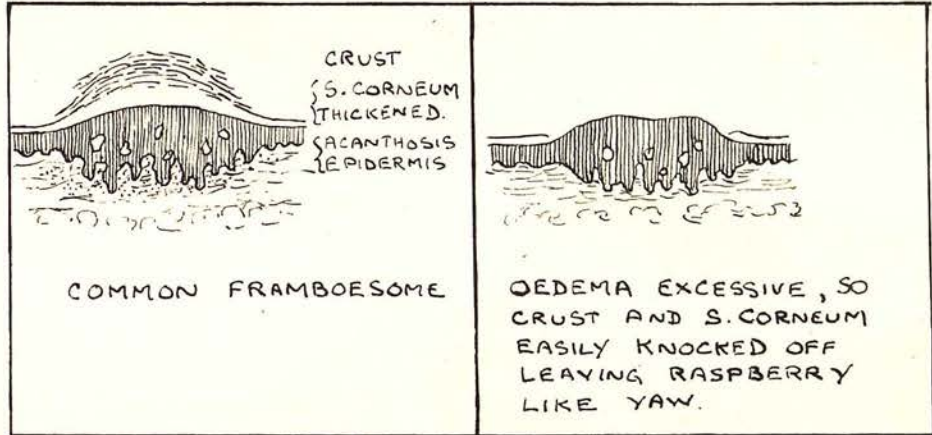


HEALED SIDE OF CREEPING ULCER. S. MALPIGHII THIN, PIGMENT CELLS NUMEROUS. CORIUM THICK AND FIBROSED, AND, TO RIGHT NEAR ULCER, MANY YOUNG FIBROBLASTS. INFILTRATION OF LYMPHOCYTES BLOOD VESSELS THICKENED. SWEAT GLANDS ETC. FIBROSED.

REGION OF ULCER. EDGES UNDERMINED. CORIUM DESTROYED AND REPLACED BY PURULENT MATERIAL, ESCAPING TO SURFACE AND FORMING CRUST S. MALPIGHII THICK AROUND ULCER, AND OPPOSITE EDGES TRYING TO UNITE.

"NKOKHORA". LUPOID TERTIARY

DIAGRAMMATIC REPRESENTATION OF HISTOLOGICAL FEATURES OF VARIOUS TYPES OF FRAMBOESOMES. PLATE 5.





(1) Impetiginous Framboesiform. Primary. Scanty secondaries, same type on chest and arm.



(2) Primary. Framboesiform. Impetiginous - early stage. 2 weeks' duration.



(3) Common Framboesiform primary on elbow. Secondaries on body, healing after 2 injections N.A.B. 0.3 Gm.



(4) Primary, inner side thigh. Secondaries on pubis and perineum. Furfuraceous rash on abdomen.



(5) Youngest child of 3 with yaws. Profuse papular eruption. Primary on finger.



(6) Papules becoming common framboesomes. Duration - 3 weeks.



(7) Framboesomes beginning to heal. Note similarity of all sores.



(8) Common framboesome type. Recurrence (2nd crop) on buttocks. Reactivation of edge of earlier crop forming early circinate type. Had 1 injection S.S. 2 months before and did not re-attend.



(9) Framboesomes on Scabies.



(10) Common framboesome type, invading nostrils, very oedematous. Tendency to ulcerate.



(11) Common framboesome type around mouth. Later crop of papular lesions on forehead and body.



(12) Smith's "Crushed Cinder" type. A healing, dry framboesome.



(13) Large framboesomes. Shows similarity of lesions in same case.



(14) Same case as (13). Showing large healed primary on leg.



(15) Framboesiform secondaries showing tendency to ulceration, and scarring on healing. Resembling tertiary skin lesion.



(16) Old, indolent framboesome, 2½ years duration. Sores of such duration tend to be scanty.



(17) Framboesome type, showing circinate form (on breast) of recurrence in partially healed lesion.



(18) Framboesomes healing one side, spreading crescentically other side. Scourfy hyperkeratosis on healed region.



(19) Primary. Roughly annular in type, ulcerating in centre.



(20) Rapidly spreading Impetiginous type of lesion.



(21) Impetiginous lesion.



(22) Impetiginous type.



(23) Commencing as papule,
becomes crusted. Crust
falls off leaving an ulcer.



(24) Healing Impetiginous.
One week after one
injection N.A.B.



(25) Annular type. Primary on left wrist. Secondaries on right.



(26) Annular secondaries. Stratum corneum remains attached.



(27) Same as (26).



(28) Annular secondaries.



(29) Annular secondaries.
Tendency for stratum
corneum to peel off
as at X.



(30) Healing of annular lesions.



(31) & (32) Woman aged 35. Did not have
yaws in childhood. Sores
vulva, axilla and chin, all
similar. Primary. L. Majora.



(33) Same case as (32) showing rapid healing ten days after N.A.P. 0.45.



(34), (35) & (36) Sores of one patient, showing essential similarity - Framboesome tending to ulcerate. Primary on big toe similar in general appearance to secondaries.





(37) Scanty indolent dry sores in adolescent. Common type at this age. (Note similarity of all sores).



(38) Healed sores. Depigmented regions at elbow. Hyperkeratotic scaly skin, annular in form, on forearm.



(39) Depigmented regions of healed sores on arm. Crop of papules (Recurrence) on face. First crop healed after 2 injections N.A.B. Recurrence 2 months later.



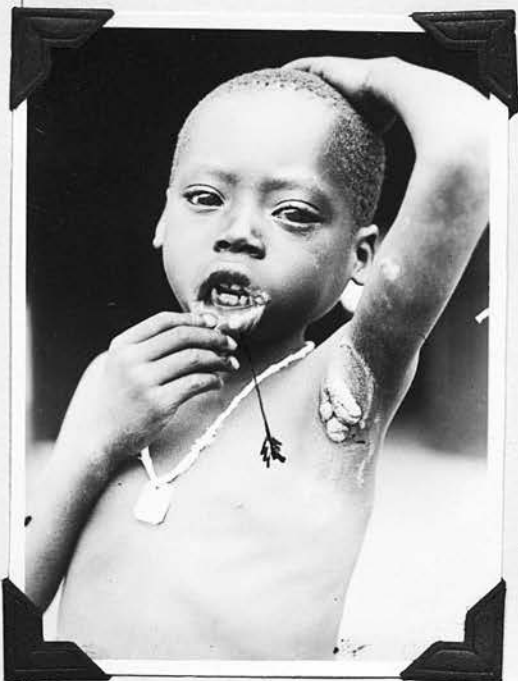
(40) Naturally healing yaws. The sores are dry and hard and healing all round. No circinates. There is also a branny rash of surrounding skin.



(41) Nostrils blocked with Yaws.



(42) Yaws in buccal mucous membrane. Direct extension. Nostril also blocked.



(43) Mucus membrane lesion on lower lip.



(44) Corymbiform framboesomes caused by circinate lesions breaking up during healing.



(45) Impetiginous framboesome. Fresh crop on abdomen are still papular.



(46), (47) & (48) Tertiary Lupoid skin ulceration. 5 years duration. (46) shows ulcerative edge, scarring on healing and depigmentation: history of yaws in childhood.

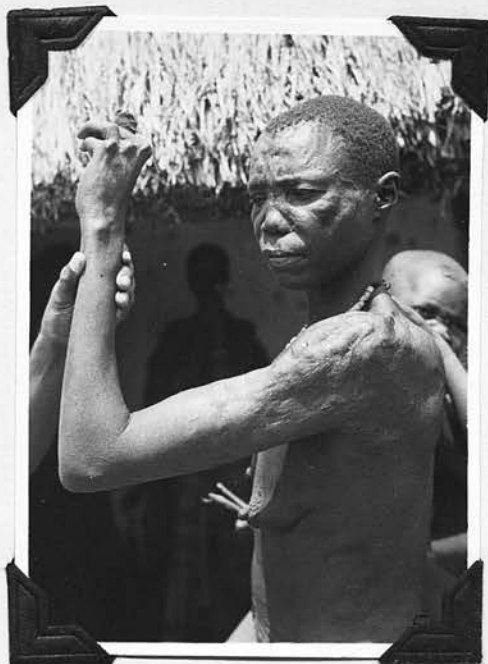


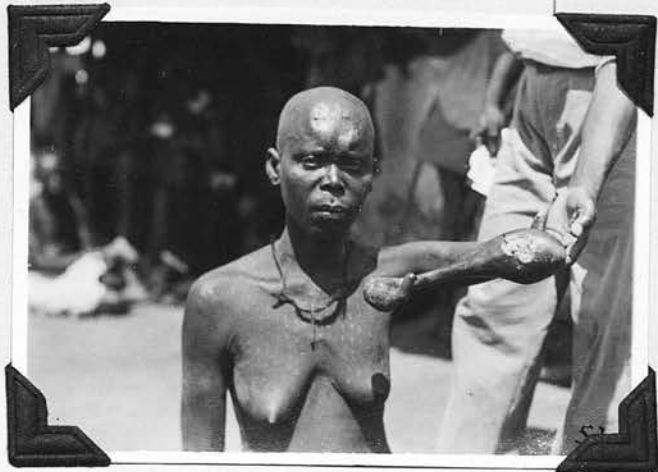
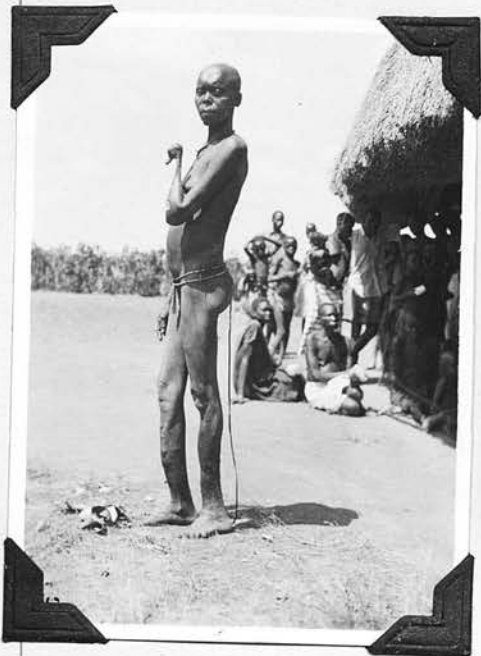


(49) Scarring after Lupoid tertiary ulceration.

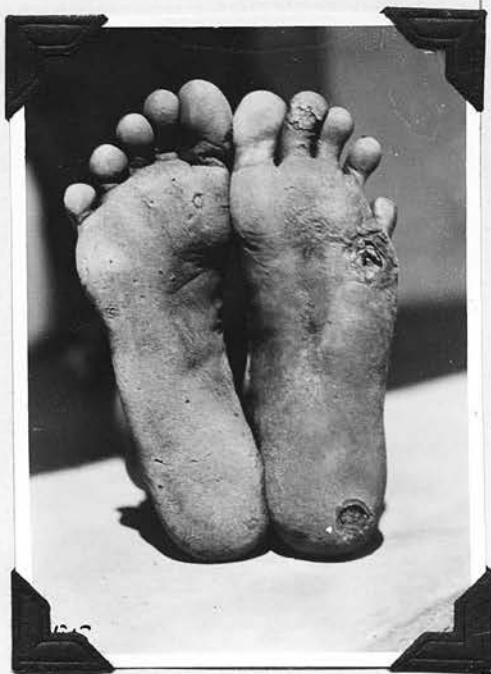
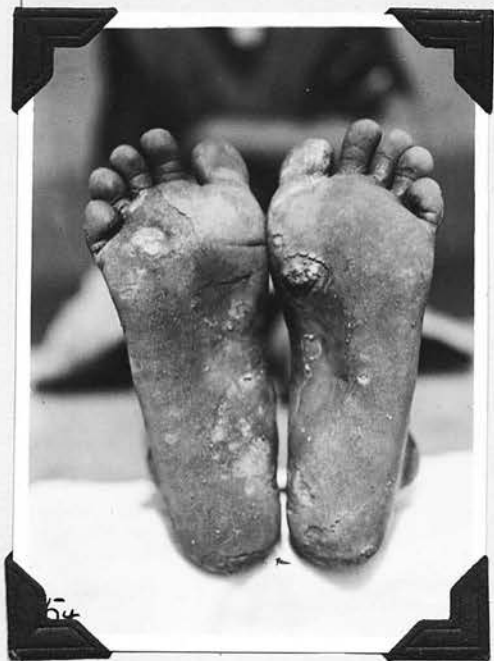


(50) & (51) Scarring face and arm. Lupoid ulceration commenced when carrying first child, now about 14 years old. Healed 3 years ago after N.A.B. Child in photograph has periostitis ulna, radius and tibia, also secondary yaws of face.





(52) & (53) Mother of four children.
Deformities due to yaws. Lupoid
ulceration and contractures of arm.
Active ulceration Left elbow. ten
years duration. Sabre Tibiae.



(54) Crab yaws, and Dyskeratosis plantaris. Secondary eruption appeared five years
previously. (55) Hyperkeratosis plantaris.



(56) Hyperkeratosis palmaris
showing peeling.
Gutterrez's Type I.



(57) Hyperkeratosis palmaris.
Early stage.



(58) Hyperkeratosis palmaris.



(59) Hyperkeratosis palmaris,
showing spread to back of
hand and up wrist.
Gutterrez's Type II.



(59a) Early Lupoid of neck.



(60) Dactylitis.



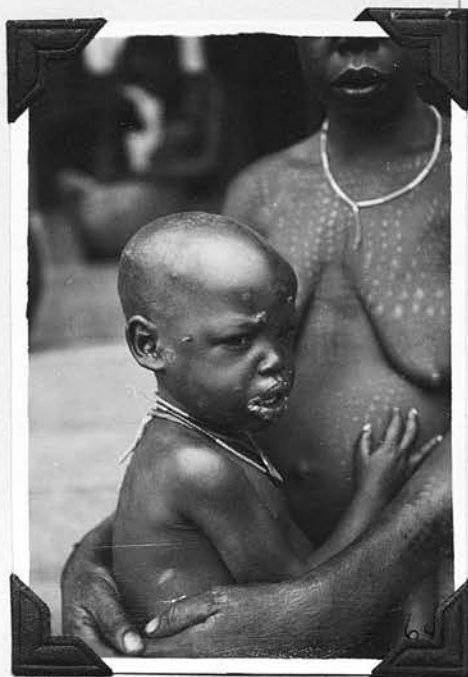
(61) Dactylitis.



(62) Dactylitis. Secondaries also shown.



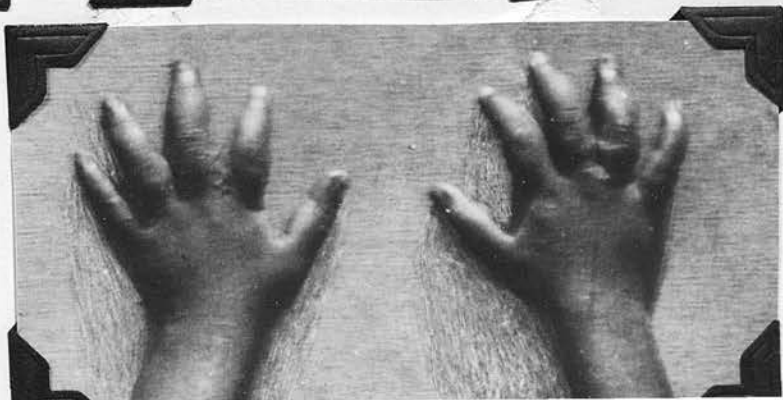
(63) Periostitis ulna and radius, and lesion angle. Mouth invading mucus membrane.



(64) Dactylitis thumb and secondary sores. (Framboesial type).



(65) Dactylitis.

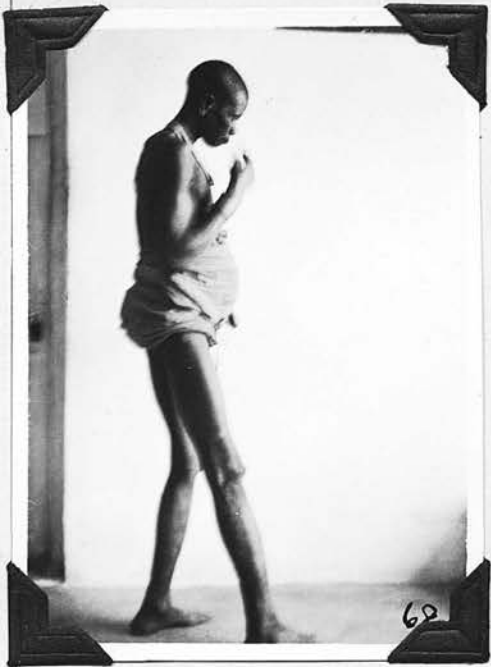




(66) Sabre Tibiae. Yaws in childhood and dactylitis during secondary eruption.



(67) Dactylitis fingers and toes and inter-phalangeal arthritis. Secondary eruption 4 years before. Typical thin boy with such lesions.



(68) Sabre Tibiae and Juxta-Articular Nodes knee.



(69) Sabre Tibiae and thickening of maxilla.



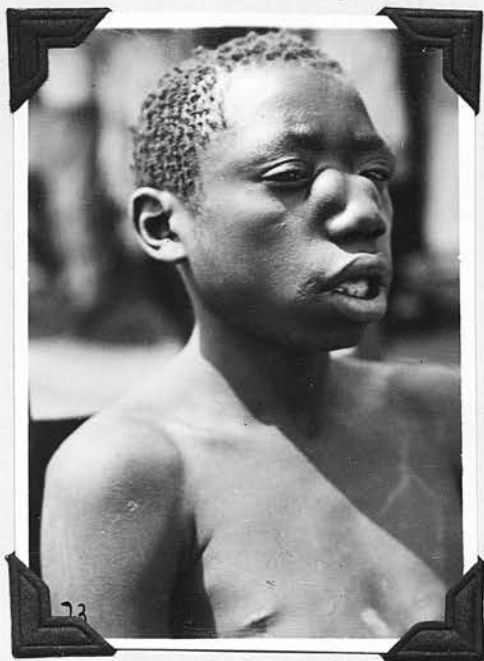
(70) Sabre Tibiae.



(71) Sabre Tibiae.



(72) Goundon.



(73) Goundon.



(74) Commencing
Gangosa.
Duration one
year.

Syphilis.



S.1. Macula papular rash -
buttock of infant 3
months old.



S.2. Profuse Annulo-Squamous
rash. Intervening skin,
dry, shining and reddish.



S.3. Annulo-Squamous rash.
Tendency to ulceration
around buttocks.



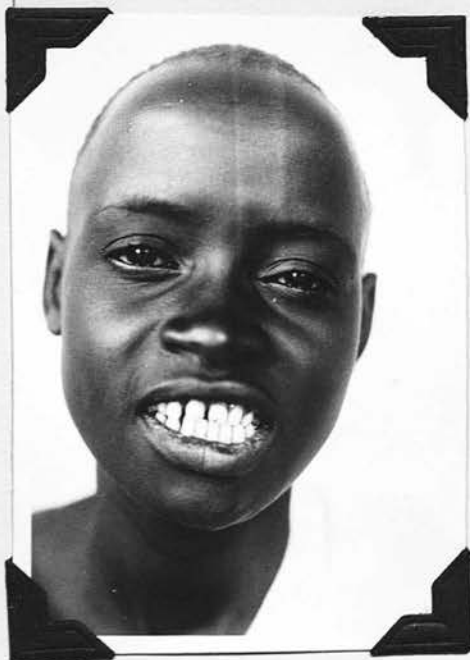
S.4. Syphilitic Epiphysitis.



S.5. Sunken Nose.



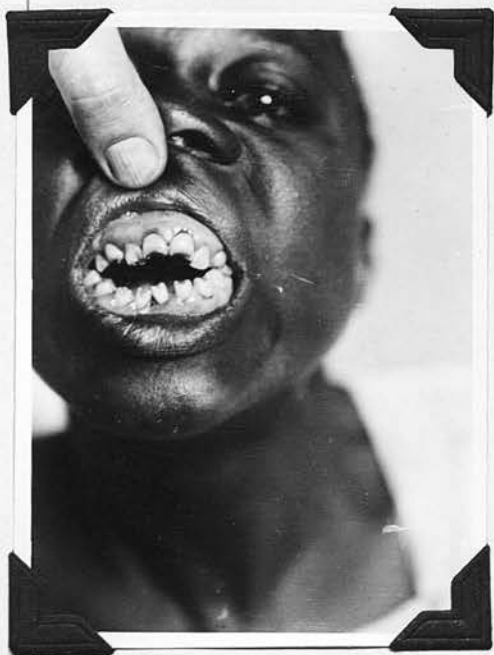
S.6. Syphilitic Facies.



S.7. Peg-shaped, notched
incisors.



S.8. Bossed Forehead.



S.9. Teeth of S.8.



S.10. Squamous rash on forearms.



S.11. Condylomata Vulvae.
Annular Syphilides.
Pustular Syphilides.



S.12. Annulo papular and
papular syphilide.



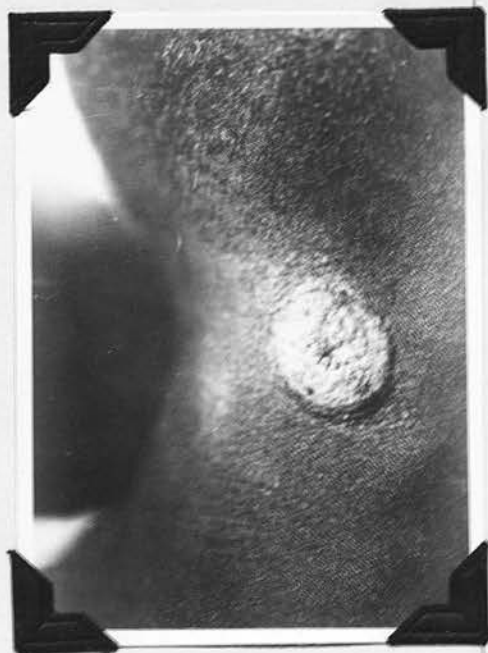
S.13. Profuse papular syphilide.



S.14. Annular syphilide in unusual place.



S.15. Irregular annular syphilides.



S.16. Framboesiform syphilide.



S.17. Papular syphilides.



S.18. Scaly, Depigmented,
Squamous rash.



Primary yaw, a punched out looking ulcer.



Large scaly looking healing
primary yaw.