FRAMBOESIA TROPICA
IN
THE CACHAR DISTRICT
OF ASSAM.

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M.D. 1924.
A General Description

of

The Cachar District.

Cachar is a district in south-eastern Assam which derives its name from the indigenous Cachari tribe. The district lies between 24° 12' and 25° 50' N and 92° 26' and 93° 29' E covering an area of 3767 square miles. On the north it is bounded by the Kapili and Doiang rivers, which separate it from the Nowgong District of the Province, on the east by the Naga Hills and Manipur State, on the south by the Lushai Hills and on the west by the District of Sylhet and the Jaintia Hills.

The District falls into two natural divisions, the plains and the hills. The administrative headquarters is Silchar a flourishing town with about 12,000 inhabitants. The plains form the upper portion of the Surma Valley and consist of a level plain broken up by isolated hillocks and low ranges of hills which project from the surrounding mountains. The hills surrounding the valley vary from 2000 to 6000 feet in height and on the northern boundary form the line
of demarcation between the Surma and the Brahmaputra Valleys.

The Surma Valley is very low lying, the northeastern or most remote corner which is over 200 miles from the sea averages only about 70 feet above sea level.

The chief river is the Barak or Surma which enters the district from Manipur State at its extreme south-east corner. The bed of the river is from 100 to 200 yards in width and in places is over 70 feet deep. The course of the river is very tortuous and during the Monsoon Season is always liable to overflow its banks often causing serious inundation of the surrounding country. The plains form an alluvial tract, the constituents of the soil being clay, sand and vegetable matter.

The Surma Valley is extremely picturesque and is typically subtropical, the surrounding hills are covered with dense evergreen forest and bamboo jungle, the grassy plains being dotted with rice fields and tea gardens interspersed with clumps of bamboos, rivers, woods and swamps.
The climate is characterised by excessive humidity and the valley shut in by ranges of hills becomes markedly oppressive during the Monsoon Season. The hottest months are June to September with an average mean temperature of about 33 degrees, the coldest month is January with a mean of about 65 degrees. The annual rainfall on the plains averages about 120 inches with liability to floods from June to October.

The population as recorded at the 1921 Census was slightly over half a million. The majority of the inhabitants live on the fertile plains and consist of the Cachari and Manipuri tribes, Bengali settlers and tea garden coolies who have been recruited from practically all over India, the hills being sparsely populated with Naga, Kuki and Lushai tribes.

The prosperity of the district depends mainly on the tea industry, the staple food crop is rice but maize, pulses, mustard and sugarcane are also grown to a fair extent.

The Valley is decidedly malarious,
helminthic infections (hookworm, roundworm and whipworm) abound, cholera is endemic, respiratory affections (pneumonia and phthisis), the dysenteries (especially bacillary) and venereal diseases are prevalent, leprosy is common, yaws is rampant amongst the hill tribes and affects certain tea gardens to a moderate extent, epidemics of conjunctivitis and Naga or Cachar Sores (ulcus tropicum) coincide with epidemics of "eye-flies" (Siphonella funicola), water itch and epiphytic skin diseases prevail during warm steamy weather, filariasis usually imported I have seen contracted locally, sporadic cases of "blackwater fever" occur but except for a focus in the North Cachar Hills the district is apparently free from Kala-azar.

Apart from a few isolated efforts, conservancy arrangements throughout the district are conspicuous by their absence, the water supply being drawn from rivers, open tanks or surface wells exposed to every form of pollution.
The Origin of Framboesia Tropica in Assam.

In describing the geographical distribution of framboesia, Manson-Bahr in the latest edition of Manson's Tropical Diseases writes "It is very difficult to say to what extent it exists in India; some deny its presence there altogether, but Powell has recognised and described it as occurring in Assam."

In his Manual of Tropical Medicine Castellani states that yaws is common in Assam.

Castellani informs me that this statement was based on oral communications of doctors who had been there.

Through the medium of the Assam Branch of the British Medical Association which has over fifty members, while acting as Honorary Secretary and in close communication with my colleagues I attempted to estimate the prevalence of the disease in the Province.
The replies to my enquiries were indefinite, the majority had not recognised the disease, a few thought they had seen an "occasional" case but Forsyth in the Tezpur District, McCombie and McLaren in the Lakhimpur District and Winchester in the Sibsagar District definitely state that they are familiar with the disease amongst tea garden coolies under their care. I personally have seen the disease in the Nowgong and Cachar Districts.

The Director of Public Health of the Province in an official communication writes "No statistics with reference to the prevalence of yaws in Assam are available in this office, nor was I aware of its presence."

Powell first recognised yaws amongst tea garden coolies at Digabar tea estate in north-west Cachar in 1889. Glover who had seen Powell's cases made the same observation about ten years later at Binnakandy tea estate in south-east Cachar.

In my own practice which consists of fourteen tea gardens employing about twenty thousand coolies,
the disease occurs in four small tea garden villages each with a population varying from fifty to three hundred inhabitants. A tea planter who had been resident here for over forty years informed me that the disease now recognised as yaws was common amongst his coolies in one of these villages at least thirty years ago but that the disease was believed to be syphilis. Glover who was my predecessor in this Practice also recognised the presence of yaws in these infected villages but unfortunately neither published nor as far as I can ascertain left behind him any notes or records on this disease here.

In an adjacent Practice which was recently for a few months under my charge there are five gardens employing about seven thousand coolies. In this latter practice two gardens each employing about fifteen hundred coolies are highly infected. It was in one of these gardens (Binnakandy) that Glover according to Powell first realised that the labour force under his care was infected with yaws.

Cases outside these foci in the other tea
gardens of these two practices are only occasionally seen.

Powell in 1896 read a paper on yaws in India before the Dermatological Society of Great Britain and Ireland. In this paper he stated "How the first case came to be inoculated I have never been able to satisfactorily make out. At first I was inclined to attach importance to the fact that some cast-off tunics of a West India regiment had been worn in the lines; but considering the free inter-communication in Madras of coolies migrating to and from the tea districts of Ceylon, where yaws is endemic, and those of Assam, we need not go so far to find the source of the outbreak. Dr. Pilgrim who lived for many years in the West Indies and is well acquainted both with yaws and the literature on the subject, showed at the Calcutta Medical Society in July last four coolies returned from Fiji where they had contracted "koko" and he declared that disease was typical yaws. Huillet mentions the disease in Pondicherry and since I drew attention to the subject cases have been observed in
India by Maitland, Hare, Haffkine, Pilgrim and Nolan."

The coolies principally affected with the disease in my own practice belong chiefly to the Dravidian Races (Kols, Santhals and Mundas). All the infected state that they have contracted the disease locally and that yaws has not been imported by either themselves, their parents or their relatives from their native districts.

According to Castellani in his Manual of Tropical Medicine yaws or buena is common in Upper Burma. The only literature I had read with reference to framboesia in Burma up to this period (June 1922) was an article "Bone affections in Yaws" written by Captain C. Barry I. M. S., of the General Hospital Rangoon in the Indian Medical Gazette of January 1901.

He wrote "I have had under my care for the last seven months a case of chronic enlargement of the bones of the hands which appears in some respects to resemble that of two cases published by Dr. Powell in the August number 1898 of the Indian Medical Gazette. The patient is a young Shan, male, aged 22 years, cause
of death of parents unknown, has since he was an infant been brought up as a priest in a "Kpyongee Cheung" and in consequence has led a strict and celibate life. The etiology of the disease is, I think, somewhat obscure. He himself and a native doctor believed him to be suffering from kwe na bow a variety of a well known disease called kwe na resembling closely or identical with yaws, and prevalent in certain parts of Upper Burma."

Captain Barry concludes his article by saying "I am inclined to believe the affection the patient is suffering from is probably due to congenital syphilis and if such is the case, would appear to be of interest as throwing some light on the etiology of the disease kwe na which as I mentioned above, strongly resembles the malady known as yaws."

On the assumption that the natural channel for importation of framboesia into Assam would be from Northern Burma I decided to investigate the presence or absence of yaws amongst the local tribes and other settlers resident outside the tea gardens of the
district. A missionary who was employed amongst the Kuki tribe, told me he had never heard of yaws but that "saighree" or syphilis was rampant amongst the Kukis and Lushais and that this fact was usually recorded in books relating to these people.

A few days later accompanied by the missionary I visited Kuki villages in the adjacent hills and found practically every person in these villages was suffering or had suffered from framboesia. I brought thirty of the worst cases back with me and gave them a course of intravenous injections of novarsenobillon. Within a month I was literally inundated with infected Kukis from the surrounding hills as the news of the successful treatment rapidly spread.

I then later investigated the presence of the disease amongst the other tribes and found yaws was as equally prevalent amongst Lushais and Nagas as amongst Kukis, that it is also fairly common amongst Manipuris but is only occasionally seen in either the indigenous Cachari tribe or in Bengali settlers.

To confirm my opinion that the disease these
Hill tribes was suffering from was Yaws I sent a dozen cases to the School of Tropical Medicine Calcutta as up to this period doctors, planters and Government officials like the missionary all believed these tribes to be "riddled with syphilis."

Knowles and Chopra published an article on these cases in the Indian Medical Gazette October 1923. Since this article was published I have sent to the School of Tropical Medicine Calcutta further cases of framboesia from Manipur State and the Lushai Hills to demonstrate the widespread nature of the disease amongst people who are resident far remote from any tea gardens.

The history of the infected tribes is extremely interesting as indicating the origin of yaws in Assam. Hutton of the Indian Civil Service in his monograph on the "Angami Nagas" says "the history of how the Naga tribes, came precisely to occupy their present position has, of course, passed into the dim obscurity of vague traditions. But enough of them remain to give some indication of the course which
their migrations took. Where the Nagas came from before they reached the country near Manipur is a much more difficult problem. All sorts of origins have been ascribed to the race. They have been connected with the head hunters of Malay and the races of the Southern seas on the one hand and traced back to China on the other. It is undeniable however that for some time migration in this part of the world has been from south to north, but it can not be said how long this has been going on."

According to the journal of the Royal Anthropological Institute Vol. XLIV P. 57. "In any case, the Nagas have very strong cultural affinities with the natives of the Asiatic Islands, notably Bornea and the Philippine Islands, and perhaps physical affinities with some of them."

Col. L.W. Shakespeare an authority on the hill tribes of Assam suggests that the Naga fancy for marine shells may point to a byegone home on the sea (History of Upper Assam P. 197) and again in his monograph on the Lushai-Kuki Clans states that "there is
no doubt the Kukis, Chins and Lushais are all of the same race. The existing Lushai chiefs all claim descent from a Burman." According to Mr. J. E. Webster C.S.I. C.I.E. Commissioner, Surma Valley & Hill Tracts "The Lushais are comparatively new comers into this Province having entered from the Chin Hills in the XVIII th Century but the older Kuki clans have been in Manipur and Assam for several hundred years."

The Chins live in the Hill Tracts around Chittagong and on the borders of Burma. These tribes all resemble each other very closely in appearance with their typical mongolian features.

The infected tribes inform me that yaws has always been prevalent amongst their ancestors and that every one sooner or later contracts the disease at some period of their life but usually in childhood.

Since these observations were made Powell again read a Paper on the origin of yaws in India before the Royal Society of Medicine. His paper is published in the Proceedings of the Royal Society of Medicine (Section of Tropical Diseases and Parasit-
(15)

ology) June 1923.

He writes "The history of yaws in India taken alone seems to me sufficient to prove that syphilis and yaws are two distinct diseases.

Syphilis has existed in India for centuries and is especially prevalent among the coolies recruited from distant parts of India to the tea estates of Assam. In the estates under my care from 7 to 10 per cent. of the population were syphilitic.

Although prevalent in the Dutch Indies, Malay and Ceylon, no case of yaws had been observed among the three hundred million inhabitants of British India till in December 1699 ( ? 1689 ), after a residence of one and a half years in Assam, I met my first two cases. From these two the disease spread by direct contact till in ten years I personally observed and treated in a narrow strip of land 22 miles long, by 4 wide, 653 cases in a population of about 6000.

In 1887 a coolie woman came from Ceylon with three daughters, the youngest being infected
with yaws. The other two girls in turn became infected, and were constant visitors to the lines in which cases were first seen by me. These four women called the disease "faranghi" while all the other coolies called it "The New Disease." Powell then attempts to trace the spread of the disease throughout the Province of Assam from this infected coolie girl who arrived in Cachar in 1887. He writes, "Haffkine, who had seen many of my cases, recognised the disease in 1895 in a Chargola tea estate (District Sylhet), in coolies who were probably deserters from my district. In 1897 Dr. Chartres showed me some cases at Naraincherra and at Barkhola where I identified the mother of one case as a coolie from Digabar, 15 miles distant. In 1898, Hare, who had seen many of my cases, met three cases of yaws in Upper Assam, to which a railway had recently been opened. In 1900 Sir Walter Buchanan wrote me that he had admitted to Bhagalpur Jail a prisoner suffering from yaws from an Assam Tea Estate. The prisoner would not say from what garden he came. In 1906 Powell Connor reported cases to the south-west corner of Manipur, the
corner nearest to my district. I may point out that the little Manipuri settlement is between my three most infected gardens. Many hundreds of Manipuris came to me for surgical treatment from Manipur and lodged in these houses while waiting for admission to hospital. I think all the above cases may fairly be looked on as originating from the Digabar focus. In October 1894, Nolan reported an epidemic in the Lower Chindwin district of Burma. Although as the crow flies this is only 500 miles from Digabar, I feel sure the two epidemics arose independently, as in those days there were no roads or communication between the two districts. Swamps, rivers, and especially the Lushai Hills inhabited by head-hunting savages, intervened. In 1906 M'Carthy reported 431 cases in the Lower Chindwin district."

With all due deference to Powell yaws has no doubt been introduced into Assam and probably elsewhere into India by infected coolies who have returned from yaws infected countries but considering that the disease is comparatively uncommon amongst tea garden coolies and rampant amongst the local hill tribes it would ap-
pear to me that the origin of yaws in Assam is mainly dependent on the origin of these highly infected races.

On investigation in the other yaws infected districts of the Province I find that as in Cachar all the yaws infected tea gardens are situated near Naga, Kuki, Lushai or Manipuri settlements or where the tea garden bazaars are visited by these tribes or where these tribes are employed in cutting jungle or other tea garden work and this in my opinion is the source from which tea garden coolies have been and are still being chiefly infected.

In the Binnakandy tea estate where Glover first recognised yaws Lt-Col. Palmer R. A. M. C. (ret) who is at present in charge of this garden informs me that his Indian Medical Subordinate attributes yaws amongst the coolies to infection from Nagas.

When in the Nowgong District of the Province I only saw the disease amongst Kukis and Nagas.

The chain of evidence of the origin of yaws in Assam, historically, geographically and racially points to the disease as being of Mongolian origin and
the "saighree" of the Kukis and "sakaura" of the Nagas is undoubtedly an extension of the purru of Malay & the kwe na bow or buena of Burma.

My own opinion based on the intensity of infection and the history of the tribes is that the Lushai, Kuki & Nagas brought the disease with them at the period of their invasion into this Province that the Manipuris were subsequently infected by the invaders and that in later years the disease then spread to the indigenous Cachari tribe, to Bengali settlers and finally to tea garden coolies.

To me the Manipuri village situated in the midst of Powell's gardens would appear to have been a possible source of infection in his own district and the importation of an infected coolie girl from Ceylon a coincidence.

Yaws accordingly to Castellani is common in Burma, the Malay Peninsula, Siam, Java, Batavia, Ceylon, occurs in certain parts of China, is present in the Phillipine Islands, Samoa, New Hebrides, New Caledonia & Fiji.
Investigations into the migrations of the yaw infected races of Oceania, Indo-China, Malay, Burma & Assam would in my opinion point to a common origin of framboesia tropica in the Far East.
The

Lesions of Yaws

as seen in Cachar.

In text-books, yaws like acquired syphilis is usually described in different stages dating from the period at which infection was contracted.

Although this method may be excellent for descriptive purposes the distinction between the different stages of yaws is much less marked than those of syphilis inasmuch as the predominant lesion of yaws, the typical yaw or crusted exo¬s¬c¬e¬n¬c e occurs in all stages. The crusted lesions of framboesia, as demonstrated by either dark ground illumination, Burri's Indian Ink or Fontana's methods, teem with the spironema pertenue. With the exception of the primary sore in syphilis this preponderance of spironemata in the crusted cutaneous lesions of yaws as compared with the raised cutaneous lesions of syphilis is very striking and coincides with the respective channels by which the two diseases are propagated.

Adopting the usual convenient descriptive methods the lesions of yaws as I have seen them in Cachar are:-

The Primary Stage;—The primary lesion has
been in all my cases with three exceptions extra-
genital.

The exceptions were two Haga boys about five
and eight years of age respectively and a Kuki about
forty years of age. All were highly infected with
scabies and all had the mother yaw on the scrotum.

Considering the exposed nature of the
genitalia in the children of primitive races, the
prevalence of scratches from scabies and the frequency
with which these organs come into contact with the
infected fingers of parents and infected flies, it is
remarkable that the primary lesion is not more often
genital than is usually recorded.

The usual site of the mother yaw in Cachar
is the leg (usually the lower third) which in coolies
and hill tribes is always exposed and is most liable
to abrasions and ulcers due to injuries from bamboo
jungle, tea bushes, leech bites, spear grass or indige-
ous agricultural implements but the primary lesion may
develop anywhere on a breach of the skin surface and the
face, lobule of the ear, hands, breasts, loins of nur-
sing mothers, buttocks, forearms, fingers and toes have all
been primary sites in my own series.

The mother yaw when it develops on a small abrasion is generally about an inch in diameter and consists of a raised yellow crusted scab usually engrafted with dirt which when separated off exposes a smooth fleshy pink granulating raspberry-like excrescence.

When a pre-existing ulcer such as a Cachar sore (ulcus tropicum) is the primary site the lesion may be from two to three inches in diameter and consists of fungating yellow crusted granulations. The mother yaw is usually present during the secondary eruption and frequently persists for six to eight months but in a few cases fades away early in the secondary stage living a pigmented tache to mark its site.

The Secondary Stage;— This is the characteristic stage of the disease. From a month to three months after the appearance of the mother yaw the secondary lesions appear. The minute yellow pointed papular eruption, the furfuraceous desquamation, the crusted excrescences, the warty ringworm or circinate yaws and the velvety nutmeg grater patches are the secondary lesions with which I am familiar.
The crusted excrescence or typical yaw may appear anywhere on a cutaneous surface from the crown of the head to the sole of the foot. I have seen them on the scalp (on one occasion only), eyebrows, eyelids, ears, face, on the upper lip at the entrance to the anterior nares, at the angles of the mouth, point of the chin, neck, trunk, buttocks, arms, palms of the hands, fingers, legs but especially on the inner aspect of the elbows, front of the knees and outer surfaces of the ankle joints. The soles of the foot are also a frequent site.

In the latter situation they are exceedingly painful due to the yaw cracking and fissuring the thickened epidermis when forcing an outlet to the surface.

Plantar yaws in Cachar are exceedingly common during the monsoon season. I was originally inclined to believe that owing to their painful and incapacitating nature the demand for treatment by the sufferers was primarily to enable them to cultivate their land making the preponderance of "crab yaws" at this period
of the year more apparent than real but continued investigations during the cold dry seasons soon eradicated this idea and it undoubtedly appears that the warm steamy soil during the Monsoon Season determines the frequency of these lesions in barefooted people.

The framboesial outgrowths when they occur in the moist flexures of the axilla, under pendulous breasts, in the groin or in the anal cleft are atypical presenting a sodden attenuated crust and extremely difficult to differentiate from the condylomata of syphilis.

Rheumatic-like pains especially of the knee and ankle joints are frequently complained of during the secondary stage but swelling of the joints is uncommon and if seen is only slight.

Lymphatic glands are often found to be slightly enlarged but have never the hard shotty feeling of syphilitic glands.

Tertiary Stage:- In an experience of over one thousand cases tertiary lesions with the exception of desquamation of the soles of the feet are comparatively uncommon,
the tendency of the disease being apparently towards spontaneous cure assisted probably by repeated attacks of malaria.

"Recurrences" of the secondary stage in the form of typical yaws, condylomatous-like lesions and plantar yaws are frequent and may recur from ten to twenty years after the date of primary infection.

The lesions which I have seen in patients suffering from "reminders" or in patients with a history of framboesia have been:

1. Skin Lesions.

(a). Desquamation and exfoliation of the skin on the soles of the feet. This is by far the commonest lesion in tertiary yaws.

(b). A chronic dermatitis of the palms of the hand.

(c). A pitted worm-eaten appearance of the soles of the feet.

(d). Deep Fissures on the soles of the feet.

(e). Chronic ulcers with yellow crusted granulations usually on the legs, ankle, dorsum of the foot, forearms, sometimes
in the region of the elbows, wrist and knees, occasionally in the axilla or between the nates. These ulcers are invariably found to be infected with cocci sometimes leading to a spreading superficial eczematous ulceration. In the case of the legs a superadded infection of the ulcers with Vincent's bacilli and Schaudinn's spirochaetes is not uncommon converting the characteristics of the framboesial ulcer into those of tropical sloughing phagedaena which unless appropriate treatment is forthcoming may expose tendons, bones and joints.

2. Joint Lesions.

Arthritis is seen in about three per cent of tertiary cases.

The phalangeal joints of the fingers are most frequently involved, then in order of frequency the metacarpal-phalangeal, metatarsal-phalangeal, the ankle, wrist, elbow and knee.
The shoulder, hip and other joints I have never seen involved.


I have only seen lesions of bone in six patients who were apparently suffering from framboesia and where no history of concurrent syphilis was forthcoming. All were adults, one patient had dactylitis of the right ring finger, three had a diffuse thickening of the lower ends of the radius and ulna and two had diffuse periosteal thickening of the lower third of the tibia.

4. Juxta-articular nodules over the external malleoli were seen on two occasions. The patients were Kukis with a history but no other evidences of framboesia.

In none of my series of cases have I seen the typical gummata of syphilis. So closely to tertiary lesions of framboesia resemble syphilitic lesions of the same structures that unless the patient has sec-
ondary "reminders" and syphilis can be definitely excluded a differential diagnosis is impossible. I have made repeated efforts to see the many severe tertiary lesions attributed to yaws by Spittel (Study of Parangi in Ceylon) and others but without success. The very severe lesions seen in yaws patients in this Practice have all been due to tropical sloughing phagedena. The diagnosis of tertiary yaws is entirely a question of evidence. A careful study of the literature shows that most of it is based on "personal histories" given by patients. This perhaps may be responsible for the conflicting literature for "syphilis the shameful disease" is invariably denied by the eastern communities with which I have come in contact.

The so-called quaternary lesions gangosa and goundou, and cases of "neuro-framboesia?" resembling General Paralysis of the Insane and Tabes Dorsalis do not occur in Cachar.

Yaws as I have seen it in this District is essentially a dermatrophic disease and such is to be expected as the superficial structures and especially
the cutaneous are those destined by Nature as the habitat of the spironema pertenue to enable it to be readily transmitted to the same structures of a similar host.

A few photographs demonstrating the lesions of framboesia as seen in Cachar are appended.
Subjective Symptoms.

In the primary stage patients often complain of itching at the site of the mother yaw.

The secondary stage is usually ushered in with a slight rise of temperature, headache, pains in the back, joints and limbs and as with the primary yaw, itchiness is also a frequent symptom of the characteristic secondary excrescences. Scratching the yellow crusted lesions to relieve itchiness fulfills Nature's requirements in transmission. These lesions teem with spironemata so when the yellow crusts become broken or separated, fingers and flies are readily infected from the serous exudate.

Again though this medium (fingers, flies and lacerated lesions) lies the danger of infection with the organisms of sloughing phagedena leading to the ulcerations, contractures, and deformities possibly depicted as tertiary lesions of framboesia elsewhere.

But perhaps the commonest cause for patients seeking treatment is pain from incapacitating plantar lesions.

In the tertiary stage rheumatic-like pains in the joints are probably the commonest complaint.
It is remarkable however that many patients throughout the course of the disease never complain of any constitutional symptoms whatever and in the majority, symptoms are so mild that they are able to continue at work. It is only when rheumatic-like pains in the joints, crab yaws or superadded secondary infections supervene that patients really complain.

Anaemia is sometimes seen but this I have attributed to concomitant infection with malarial parasites and hookworms the predominant causes of anaemia in Cachar.
Yaws and Syphilis.

The sceptical who share the belief that yaws is stone age syphilis or syphilis modified by race or climate would in Cachar find sufficient clinical material to eradicate their doubts although syphilis in Assam is rarely the severe disease as seen in Great Britain.

Yaws when prevalent in a district is very typical.

The extra-genital mother yaw, the crops of yellow crusted framboesiform excrescences, the extraordinary prevalence of the disease in an infected community and especially amongst children with frequently apparently healthy parents, the healthy offspring born of infected parents and the typical plantar lesions commonly called "crab yaws" from a picture which is readily recognisable. On the other hand among the same people, syphilis, although usually a milder disease than one sees in Great Britain, is at the same time quite characteristic.

Manipuris and tea garden coolies readily
differentiate the two diseases and are highly indignant if when suffering from yaws it is suggested they have contracted syphilis as the latter disease here as elsewhere is regarded with a certain degree of shame, albeit in the past a tea planter informed me, despite protestations of innocence, respectable coolie husbands have been castigated on medical advice for having contracted their disease through supposed immoral habits.

Those infected all recognise the non-venereal nature of the framboesia and invariably point to the site of the "ma gau" or mother yaw with the usual history of an ulcer or abrasion at the site where the primary lesion developed.

The distinctive local names for the two diseases at once attracts attention.

Yaws to the tea garden coolie is "suah (contact) bow (air)" while syphilis is "gurmee (heat)". The Manipuris adopt the local coolie name "gurmee" and the Bengali name "takee" for syphilis but yaws to them is distinguished as "chako". From the fact that the Manipuris have adopted the Indian names
for syphilis and from investigations into the history of its introduction into this tribe it would appear that syphilis was a disease unknown to their ancestors and that it has reached them through Aryan sources.

The Manipuris live on the plains with their villages intermingled amongst tea gardens and Bengali settlers and having during the past century adopted Hinduism and Islamism as their religions they daily come in contact with their religious Indian confreres.

Amongst the Hill tribes I have only seen one definite case of syphilis which occurred in a Kuki. The patient himself called the disease by its hindustani name "gurmee" and stated that he had contracted his chancre while living in Manipur State. There are doubtless others as there are ample local opportunities for infection.

Before the days of salvarsan and its derivatives the distinction between the two diseases was quite apparent therapeutically. On tea estates where both diseases occurred the tea garden Indian medical subordinate administered mercury to his "gurmee" patients with confidence but was well aware of the limitations of this drug on "suah bow".
The clinical differences however between the two diseases are not always very apparent. Apart from the primary lesion which is usually extra-genital and not hard as in syphilis there is only one definite lesion which above all others distinguishes the two diseases and that is the "yaw" the characteristic lesion from which the disease derives its name. It is the pathognomonic lesion of framboesia tropica. The nearest approach to the yaw is the vegetating syphilide and this is my experience rarely presents much difficulty in diagnosis.

In the tertiary stage in Cachar gummata are never seen in Yaws, finally a patient suffering from untreated yaws can contract syphilis as the following case testifies.

A coolie living on one of my yaw infected gardens whilst suffering from framboesial excrescences, was sent to his Native District as a recruiting sirdar. He was absent for about three months and returned with a definite hard chancre on his penis.

On his return he infected his wife and another coolie woman with syphilis.
This interesting case was seen by my neighbouring colleagues Lt-Col. Palmer & Dr. Donald Meek.

I intended keeping the patient under observation for a few weeks to study the progress of the two diseases but as he was becoming anxious about his newly acquired disease I administered the appropriate treatment for his combined spironemal infections.

The study of yaws and syphilis in Cachar has been to me during the past four years one of absorbing interest as much of the literature on these diseases does not coincide with my own personal experience.

In the article on syphilis in Thomson and Miles' Manual of Surgery we read that malarial and other fevers and the conditions attendant on life in tropical countries from the debility which they cause tend to aggravate and prolong the disease which then assumes the characters of what has been called malignant syphilis.

This may refer to syphilis in "unacclimatised" Europeans, but certainly does not apply to tea garden coolies or to the indigenous population in Cachar and my experience is shared by those with whom I have discussed this subject not only in Assam but in other
parts of India.

Major Knowles Professor of Protozoology at the School of Tropical Medicine Calcutta writes "Your point about the general mildness of syphilis in Assam is very important. Unfortunately most I.M.S. men's experience of the disease is in Indian troops and treated cases. In the pre-salvarsan days, when civil surgeon of Jhansi, I once saw a fatal case of tertiary syphilis in an Indian who had numerous gummata of bones, and also a gumma of the liver, but it is the only really severe case that I can recall in 15 years in India.

Baptist who had many years as a civil surgeon in Orissa says that the only severe case of syphilis that he has ever seen in an Indian was a fatal case many years ago in the Medical College Hospital in Calcutta. Acton says that syphilis in the Indian is especially cutaneous rather than visceral in type whilst Lloyd as Imperial Serologist says that the only case of neuro-syphilis in an Indian that he ever saw was a supposed case of juvenile G.P.I. where the diagnosis was doubtful and based on a positive Wasserman result."
I have only seen one case of syphilis here in an unacclimatised untreated European. The patient contracted his disease locally from an Indian and had mucous patches in the mouth, and a papular rash. He had such an insane dread of the results of "Black Syphilis" that after a course of treatment he had to be invalided to England. All my other European cases in Assam have been in acclimatised treated patients who showed no signs whatever of ever having had the disease.

At least 3% of the twenty thousand coolies under my care in Cachar are syphilised.

The primary stage is certainly usually worse than one sees in Great Britain owing to the frequency of superadded infection of the primary sore but in the secondary stage alopecia, mouth, throat, and eye lesions are very rarely seen while the percentage of cases showing tertiary lesions is comparatively small and the lesions as a rule less severe; gummata of the tibia being the most frequent lesion. Abortions are common and the mortality in congenital cases extremely high. In my search for congenital adults I have come across fifteen cases with the typical facies and teeth.
Parasyphilitic lesions I have never seen, my predecessor believed he had seen a case of tabes dorsalis in a Bengali villager. I made it my business to see this case but found the patient to be suffering from spastic paraplegia.

I have tried to account for the general mildness of syphilis in Assam amongst coolies. Like others I have thought of racial immunity, less virulent strains of spironemata, and of the effects of climate. As is pointed out later, climate certainly affects the course of framboesia tropica but in the case of syphilis investigations indicate than in many cases coolies who have been recently imported into this District contract this disease in a much more severe form than those who have been born and brought up locally.

Cachar is highly malarious and with all due deference to text-books it would appear that those born in this District, who survive malaria in youth and contract syphilis later in life are to some degree immunised against the toxins of the spironema pallidum and probably also against the toxins of spironema pertenue for severe tertiary framboesial lesions and the so-called para-framboesial lesions are also absent in Cachar.
Again the absence of General Paralysis of the Insane and Tabes Dorsalis in malarious Assam and the Vienna treatment of these diseases by plasmodia has rather tended to confirm this belief.

No other theories which have been propounded as far as I can see, offer a better explanation to this problem. The late Dr. Ford Robertson's theory of neurotoxic diphtheroid bacilli as the cause of G.P.I is according to Acton not convincing as Koch's postulates are not complied with. Knowles mentions Levaniti and Marie's theory of two strains of spironema pallidum a dermatrophic and neurotoxic but this in my opinion does not explain the absence of tabes dorsalis in Cachar as about eighteen years ago a young European tea planter after a short residence in this district contracted indigenous syphilis. Shortly after contracting his disease he returned permanently to England where, according to his brother a local tea planter, he is now suffering from Locomotor Ataxia. To me it would seem strange that the so-called dermatrophic strain of the Aryan should become transformed into a neurotoxic strain for the European!

That this patient who subsequently developed locomotor ataxia never according to his brother con-
tracted malaria during his short residence here adds interest to the malaria-syphilis prophylaxis theory.

Major Owen Berkeley Hill, Superintendent of the European Mental Hospital Ranchi writes that he is inclined to agree with the malaria prophylaxis theory as he himself has never seen a case of either G.P.I. or Tabes in India and that from his recent investigations into the incidence of these diseases in this country, cases have evidently been very rarely recorded except in the United Provinces where Col. Overbeck Wright states that General Paralysis of the Insane is much more prevalent than it generally believed.

On searching the literature on this subject I find my observations are not entirely new for Powell in his article "Yaws in India" which he read before the Dermatological Society in 1896 remarks on the effect of pyrexia on framboesia. He writes "One of the most striking characteristics of framboesia is the disappearance of the eruption during or after a febrile attack. So remarkable is this that the coolies themselves observe it, and usually mention the fact when describing the disease to an inquirer."
The cases in which malaria is the curative agent are so numerous that I shall only refer to some of the most recent."

He then mentions cases of yaws where the framboesial eruptions rapidly subsided after contracting severe remittent fever and again remarks that yaws is most prevalent on gardens where the incidence of malaria is least.

Powell however does not confine his belief entirely to malaria but believes fever due to other causes has also a beneficial effect, and in his conclusions on the effect of pyrexia writes "The fever, to produce satisfactory results, should be of some days' duration.

As far as pyrexia in general is concerned I have not been able to confirm Powell's observations of noting rapid cures in framboesia but the general mildness of syphilis in this District undoubtedly appears to me to be due to the protective influence of anti-bodies formed by plasmodia against the toxins of the spironema pallidum and if the severe tertiary lesions attributed to yaws elsewhere are genuinely produced by the spironema pertenue then plasmodia probably also account for the general mildness of framboesia in Assam.
In Byam and Archibald's Practice of Medicine in the Tropics Castellani writes "framboesia is essentially a tropical disease, as few, if any, genuine cases have been reported from places outside the tropical and sub-tropical zone, and in the tropics it is never found on the mountains or in the cold districts, e.g. Manson-Bahr states that it is rare to find a patient who has contracted the disease at a higher elevation than 800 feet. Nevertheless at the present time a skin disease not unlike yaws has been reported from Greece by several writers. Usually framboesia is an endemic disorder, but at times it may become epidemic, as has occurred in Dominica".

The hills surrounding Cachar vary from 2000 to 6000 ft in height and are inhabited by the Kuki, Lushai and Naga tribes.

The Missionary who introduced me to the Kuki tribe when on our way to Kuki villages on the lower ranges of hills remarked that "saighree was less prevalent and a much milder disease amongst the Kukis
who were living on the higher slopes. As the tribes resident at high altitudes periodically visit the local bazaars on the plains to sell their produce and to purchase salt I have had many opportunities of confirming the Missionary's observations.

Very few of these people show any lesions whatever and in the absence of yellow crusted yaws such lesions as they present are distinctly syphilitic in appearance. When however these same people with these apparent syphilitic lesions reside for a month or so on the warm steamy plains the true character of their disease soon manifests itself by the appearance of characteristic lesions.

The Civil Surgeon of the Naga Hills whose district varies from 4500 to 6000 feet wrote to me that the cases he had been diagnosing as syphilis had usually condylomata around the anus, in the groin and on the genitalia and crusted lesions at the angles of the mouth but that it was remarkable he had never seen the typical secondary eruptions of syphilis amongst Nagas.
The same phenomena are evident during the cold season on the plains amongst coolies and Manipuris and among the hill tribes who live on the lower ranges of hills.

During December and January it is a very rare occurrence to see a case presenting typical yellow capped yaws but chronic fungating ulcers, condylomatous-like lesions in the moist regions of the axilla and between the nates, yellow crusted lesions at the angles of the mouth, furfuraceous and nutmeg grater patches, chronic dermatitis of the hands, desquamating and worm-eaten like lesions of the soles of the feet, painful joints all liable to be mistaken for syphilitic lesions are comparatively common. As soon as the weather becomes warmer the characteristic yellow crusted yaws appear with on the advent of rain painful plantar lesions meanwhile the lesions of syphilis are as characteristic throughout the warm weather as they are during the cold season.

As far as I have been able to ascertain yaws was not recognised amongst the various Labour Corps
recruited from these infected tribes who served in France and elsewhere during the Great War.

The effects of climate rendering the disease quiescent or giving the lesions a syphilitic appearance was probably the principal reason for the true nature of the affection passing unrecognised as many of the cases seen locally state they had yaws before they went on service.

Heat and moisture but principally the former appear to be the factors responsible in producing the characteristic lesions of framboesia for the cooler the climate the more closely do yaws and syphilis resemble each other. Further the absence of "eye-flies" the Siphonella or Siphunculina funicola, in my opinion one of the chief factors in the transmission of yaws, in the cooler climate of high altitudes is to a large extent responsible for the diminished incidence of framboesia as it is chiefly during the warm eye-fly season on the Plains that primary lesions are usually contracted.
Transmission of Yaws.

Castellani summarizes the communicability of yaws by saying that the reservoir of the causal organism is man; that no animal is definitely known to act as a carrier through "flies" probably act as such; that the only known method of natural infection is by direct contact, in which case it is necessary for the recipient's skin to be broken, as the germ cannot pass through intact skin; and that inheritance of the germ by children from their parents is not known to occur.

The conditions for the study of the natural transmission of the disease in the tea gardens of this practice are highly suitable as framboesia is practically localised to infected foci, cases in the majority of the adjacent tea estates being uncommon and the source of infection in most cases as a rule easily traced.

Direct contact between infected and healthy is a frequent history given by coolies. Only recently the source of infection is eleven male adult coolies was traced to a garden barber (napit).

The barber on examination had yaws onychia of the right middle finger.
All the cases he infected had the primary lesion on the face chin or neck where the skin had been cut with his razor.

On another occasion a little coolie girl living on an uninfected garden developed a yaw on the lobule of her left ear. On investigation it transpired that her ears had been punctured for ear rings by a relative with a yaw on the anterior aspect of his right wrist. For other possible means of transmission I carried out a series of investigations in the most highly infected coolie village (Kalabheel) of this Practice. There are seventy residents in this village and forty seven of them have been under my care for framboesia.

About 500 yards to the west of this village are the main lines of a tea estate (Narainpore) housing about 1200 employees, on the south about 1000 yards away there is a small Naga village and within a radius of three miles to the south-west, north and east there are three tea estates Tarrapore, Bundoo & Labac with populations varying from 1000 to 2000 coolies.

The coolie inhabitants of the infected village
are all Mundas by caste an aboriginal tribe originally recruited from the Ranchi district of Bengal about fifty years ago.

They give a history of the disease being introduced into the Kalabheel village about thirty years ago by one of their members now deceased having contracted the disease locally but are unable to state from where or in what manner the infection was originally contracted. With a Naga village teeming with yaws close by it is not unlikely that the disease was introduced from this source.

In the main garden lines (Narainpore) 500 yards distant although I have made repeated careful examinations of the labour force I have only seen six cases of yaws during the past four years and in every instance these cases gave a history of having visited or been visited by residents of the Kalabheel village prior to having contracted their disease.

Some observers believe yaws to be transmitted by winged blood sucking insects, if such were the case the conditions between the Kalabheel village and Narainpore tea estate are extremely favourable yet the
disease has practically remained a localised infection.

I have failed after many attempts to transmit yaws by bugs, lice and fleas, these insects being caught on framboesial patients or in their beds and subsequently fed on healthy individuals.

On two occasions I failed to transmit yaws to healthy individuals by injecting in one case intravenously and in the other subcutaneously two c.c.s of (citrated) blood withdrawn from a framboesial patient, the interval between withdrawing the blood from the donor and injecting into the recipient being less than two minutes. This would seem to indicate that the spironema pertenuae is rarely present in sufficient numbers in the peripheral blood stream for this to be a usual means of transmission. The water supply of the Kalabheel village is an open surface well near which is a small tank, the latter being used by the inhabitants for their ablution arrangements. Both the well and the tank are within twelve yards from the public highway.

Coolies from the surrounding tea estates (Narainpore, Tarrapore & Labac) frequently drink the
water from this well and bathe in the tank but as I had never been able to trace a case of yaws contracted in this fashion, I decided to test the possibility of water transmission. For this purpose I filled a clean kerosene oil tin with three gallons of ordinary well water. A patient with a large yaw on the inner aspect of his ankle had the crust removed and bathed his lesion in the water. The water was at once divided into two equal portions and two coolie volunteers with simple abrasions on their legs immediately bathed their wounds with this water then sat with their legs immersed in it for half an hour. The abrasions were subsequently dressed with sterile unmedicated gauze plain cotton wool & a bandage but in neither case did yaws develop.

Had water been a means of transmission the disease would undoubtedly have been more widespread amongst the neighbouring gardens.

The question of infection by direct contact between a yaws lesion and an abraded surface is established but results recorded by "fly contact" are difficult to obtain and in fact the only authenticated
successful experiment I have seen recorded is that of
Castellani's where he successfully transmitted yaws
to a monkey by bringing an infected fly in contact
with an abrasion and keeping the infected fly in situ
by means of strips of gauze smeared with collodion to
keep it in position.

At certain seasons of the year in Cachar but
especially during the warm dry spells from the beginning
of March to the middle of November myriads of little
flies popularly known as "eye-flies" abound.

It is a very noticeable fact that local epi-
demics of conjunctivitis and Cachar sores (ulcus
tropicum) coincide with epidemics of these flies and
on investigating this point I find that it is only in
the eye-fly areas of the Province that these epidemics
occur.

The "eye-fly" I recognise from text-books on
entomology to be the Siphonella or Siphunculina
funicola.

The little flies are a dreadful pest making
ceaseless efforts to reach human eyes and haunt every
exposed abraded surface. They also swarm on decompos-
ing food and fruit and on one occasion while microscopically examining a faecal specimen teeming with Entamoeba histolytica I saw one of these dirty little flies insert its proboscis under the cover slip and freely imbibe the liquid faeces.

The literature on siphonella is apparently very scanty but Patton a leading Indian entomologist writes an interesting article on its life history and breeding habits in the Indian Journal of Medical Research (Vol. 8 No. 4 April 1921). He worked out the life history of the eye-fly in test-tubes and found that the larvae will feed on the dead bodies of adults eventually pupating and hatching out but after much patient research states that the natural breeding grounds of these flies still remain a mystery.

It is interesting to note that tea planters who have lived in the Dibrugarh District of Assam and have migrated to Cachar state that eye-flies are only found in the former district in bungalows and tea gardens where the sungrass used for thatching purposes has been imported from an eye-fly area.

My own experience has been that they seem to
be most prevalent in the vicinity of Jack Fruit trees especially when the fruit is ripe.

I conducted a series of experiments with these flies to determine their infectivity in Yaws.

Siphonella funicola feeding on the secretion which exudes after removing the yellow framboesial crusts were caught in a bottle as used in catching mosquitoes.

Four coolie volunteers were then procured, numbers (1 and 2) were scarified aseptically on the outer surface of their right upper arms and numbers (3 and 4) had their left forearms similarly treated.

In the case of number (1) the flies were allowed to come into contact with the scarified area immediately after capture.

In the case of number (2) an interval of ten minutes elapsed before the bottle with the flies was brought into contact, in number (3) twenty minutes elapsed and in number (4) the interval was extended to forty minutes.

The result of these experiments was that number (1) developed a yaw (Photo Number 3) and numbers
(2), (3) and (4) were negative.

In number (1) the scarified area completely healed within ten days but on the 27th day three small itching papules appeared at the "eye-fly site", the papules remained stationery in size and appearance for a week and then during the ensuing five days rapidly developed into a protuberant granulomatous yellow crusted excrescence from which I was able to demonstrate spironemata by Burri's & Fontana's methods.

At this stage the patient was given a course of novarsenobillon.

To eliminate the possibility in these experiments of transmitting infection through infected material adhering to the projecting test-tube which had come in contact with the framboesial secretion the test-tube and cork were immediately withdrawn before bringing the mouth of the bottle with the captured flies in contact with the experimental scarified site.

The flies were caught with the bottle held inverted but when bringing the mouth of the bottle into contact with the experimental site it was held vertically upwards as "eye-flies" captured in a bottle
invariably immediately fly upwards.

That yaws failed to develop in the other three cases was probably due to the fact that too long an interval intervened between the period of the fly feeding on the secretion and the period of contact as the spironema pertenue evidently rapidly dies when the secretion dries for dried scabs which have been removed from framboesial patients and applied to open wounds at intervals varying from an hour to three hours after removal have on the six occasions on which I attempted to transmit yaws by this means failed to convey infection.

In the local bazaars it is a common sight to see the framboesial lesions of the Hill tribes covered with eye-flies sucking the secretions with avidity. The infection of the coolie population from the infected Hill tribes has undoubtedly been chiefly through this source although contact when exchanging goods and money may account for a number of cases. That the percentage of coolies who become infected is small is undoubtedly due to the fact that tea garden discipline in this practice demands that exposed abrasions of coolie employees must be protected with surgical dressings.
Prophylaxis.

Prophylaxis resolves itself into protection of any breach in the continuity of the skin from contact with viable Spironema pertenue, isolation and treatment of the infected until complete cure.

Yaws is a disease which flourishes amongst jungle tribes and the peasant classes of rural districts and is rarely recorded amongst city dwellers or among the better educated and better clothed rural residents.

The reason is obvious for the latter in their vocation are less exposed to scratches, abrasions and leech bites etc. than the former.

Again the residents of towns have more facilities to have their wounds properly protected.

Yaws as I have seen it in the tea gardens of Cachar is practically confined to villages and out-gardens which are unprovided with hospitals and where the illiterate and apathetic coolie or villager rarely seeks medical attention until his wound causes him pain or renders him unable to work.

The infrequency of the disease on adjacent main lines is doubtless due to the garden discipline
which compels the coolies to have their abrasions dressed at the Garden Hospital.

As blood sucking insects do not transmit yaws by means of their suctorial apparatus and as the virus rapidly dies in separated scabs or dried discharges, there seems no reason why houses which have been inhabited or clothing which has been worn by a person suffering from yaws should be destroyed. I have seen yaws houses inhabited and clothing from framboidal patients worn by the uninfected who when seen after a period of two years had elapsed were still free from the disease.

The closing of water supplies either bathing or drinking as far as the transmission of yaws is concerned is in my opinion needless. Cleanliness personal and general is at all times indicated but destructive methods of disinfection and the closing of popular water supplies apart from being unpopular entails a needless waste of finance and energy when there is no apparent necessity.
Prognosis.

The prognosis in yaws is not serious as far as life is concerned. Amongst two hundred infected coolies I have never seen a death directly due to the spironema pertenue. Statistics amongst the residents outside the tea gardens are difficult to obtain being as a rule fiction and not facts.

The greatest danger is complications from secondary infections of the cutaneous framboesial lesions. Vincent's bacilli and Schaudinn's spirochaetae the causal organisms of Cachar sores (ulcus tropicum) are the usual cause of the large septic ulcers seen in the framboesial patients of this district. These large foul swelling ulcers may lead to sloughing of tendons, destruction of bones and joints, to deformities and contractures of limbs, sometimes to loss of life.

Fortunately since the introduction of eusol into this practice serious complications due to Vincent's fusiform bacilli & Schaudinn's spirochaetae are now events of the past.
Treatment.

The effect of Salvarsan and its derivatives on the lesions of framboesia is a triumph to modern therapeutics.

Lesions which have incapacitated a patient for months generally disappear within a few days after one or at most after two injections.

Salvarsan, Kharsivan, novarsenobillon and galyly are the derivatives of this arsenical group with which I have had experience. With the exception of galyly which is slower and less reliable in action, the therapeutic effect of the others on yaws appears to be much about the same but the one I usually employ is novarsenobillon chiefly on account of the ease with which it can be prepared for injection and administered.

The dose is given according to age, weight, general health of the patient, apparent intensity and duration of infection. The usual preliminary precautions of carefully examining the urine, heart and clearing the primae viae being always carried out.

In the absence of local facilities to carry out serological tests by Wasserman or Sachs Georgi
methods I advocate a minimum course of 2.25 grms. novarsenobillon for recent infection in adults.

This dosage is based on the fact that three patients have returned for treatment with recurrences not reinfections from uninfected gardens within eighteen months of having undergone a course extending to 1.8 grms.

Since making 2.25 grms the minimum course no cases during the past 2 years have required further treatment and the disease now appears to have been eradicated from the infected tea garden villages of this Practice.

Personal experience, after having administered over two thousand intravenous injections of novarsenobillon, indicates that small doses (0.3 - 0.45 grm) are less liable to be followed by arsenical dermatitis or serious complications such as high fever, delirium, jaundice or nephritis than after large doses (0.6 - 0.9 grm).

The usual dose I administer to adults is 0.45 grm repeated at weekly intervals until a total of 2.25 grm has been given.
In cases showing tertiary lesions of joints and bones, the administration of potassium iodide per oram as an adjuvant to intravenous treatment certainly appears to assist in bringing about a more speedy cure.

Tertiary cases which have had several recurrences respond much more rapidly to treatment than recent infections. It would appear that in these old standing cases the antitoxic content of the blood in a disease, where the tendency is spontaneous cure, is already high and the destruction of the remaining spironemata a therapeutic simplicity producing dramatic clinical results.

In recent infections the course of treatment has to be more intensive as any spironemata left viable are liable at a future date to furnish recurrences.

Intramuscular injections are stated by many to be more efficacious than intravenous as the drug is more slowly excreted from the system. This may be so but any advantages to be gained by slower elimination are more than counterbalanced by a decided liability to abscess formation and by being more painful which at once makes this route unpopular in an illiterate community. In this Practice I reserve intramuscular
injections only for children whose veins are unsuitable for intravenous therapy.

The effect of novarsenobillonised serum obtained by blistering a patient a fortnight after he had completed his course of treatment was tried on two of his infected relatives. To each a subcutaneous injection of 5 c. c.s of the serum was given on two separate occasions a week intervening between the injections but in neither case was there any noticeable change in the lesions.

Lt. Col. Palmer my neighbouring colleague tried the effect of sodium antimony tartrate, he writes, "I got in some cases as good results with antimony as with salvarsan in my search for a cheaper panacea. Then I found it seemed to be erratic and without influence on some cases and I felt I had been perhaps too optimistic, anyhow the intramuscular for children was painful. Lately I have given some stabilarsan but it did not seem as good as novarsenobillon and as with antimony there were a few cases unaffected by it and in others it would appear at least two or three doses might be required."
Castellani's yaws mixture I have also found very disappointing.

The mixture is composed as follows:-

R/ Tartar emetic 1 gr.
Pot. Iodide dr.1.
Sodii Salicyl. gr.X.
Sodii bicarb. gr.XV.
Sodii tartar. gr.X..
Glycerine dr.II.
Aq. ad. One Oz.

It is directed to be given three times daily well diluted in four times the quantity of water. The mixture occasionally causes vomiting and pains in the stomach and is unpopular with patients who usually politely ask either for a few days leave from Hospital and forget to return or to be given "the needle medicine" as the medicine per oram is doing them no good.

Recently in six cases I have tried the effect of sulpharsenol subcutaneously as recommended by Knowles. The results have been so encouraging that I
intend giving this preparation a further trial as one wants a sequence of many cases before coming to definite conclusions in a disease like yaws which is so subject to spontaneous cure.

For chronic fungating ulcers with superadded infection the best results are obtained with eusol. Ulcers on the arms or legs are best treated by immersing in a eusol bath while to ulcers on other parts frequently changed compresses should be applied. As soon as sepsis is eliminated eusol is replaced by saline dressings which completes the cure.
Summary.

The Kuki Lushai and Naga tribes of Assam are highly infected with framboesia tropica and not with syphilis as was formerly believed.

All evidence historically, racially and geographically indicates that the "saighree" "sakaura" "chako" or "suah bow" of Assam is an extension of the "buena" "kwe na" or "kwe na bow" of Burma and the "purru" of the Straits Settlements and that yaws was endemic in Assam long before tea garden coolies were ever imported into the Province.

Further the indications are that the framboesia tropica of the Far East has originally disseminated from a common centre of infection.

The tertiary lesions seen in patients infected with spironema pertenue in Assam are much milder than those depicted by some observers elsewhere.

Tertiary syphilis in Assam however is rarely the severe disease as is frequently seen in Great Britain.

One sees more severe cases of tertiary syphilis in an out-patient department of an average British
City Hospital in a week than one sees in Assam in four years.

The general mildness of tertiary syphilis and the absence of para-syphilitic diseases in this Province I believe to be due to a prophylaxis produced by plasmodia and not to specific strains of spironemata and this likewise probably explains the general mildness of tertiary framboesia and the absence of the so-called para-framboesial lesions in Assam. Climate however certainly modifies the course of yaws making framboesial lesions in the colder climate at high altitudes practically indistinguishable from the corresponding lesions of syphilis but in the warm steamy plains of Cachar excepting the possibility of a local prophylactic agent it is otherwise difficult to explain the general mildness of framboesia unless these so-called severe tertiary and quaternary lesions are diagnostic errors. The latter unkindly suggestion seems to me not altogether impossible for a careful study of much of the literature on yaws is not very convincing and gives one the impression that there is a tendency by many observers to attribute all lesions seen
in patients suffering from framboesia to be due to the spironema pertenue or to base their diagnoses on personal histories given by patients which as far as Eastern Communities are concerned are far from reliable. The subject of these so-called severe tertiary and quaternary lesions requires in my opinion further investigation in yaw infected countries. The severe lesions seen in framboesial patients in Assam have not been due to the Spironema pertenue but to superadded infection with Cocci, Vincent's bacilli and Schaudinn's spirochaetes for which eusol is the most appropriate treatment.

The "eye-fly" or Siphonella funicola is apparently the principal agent in disseminating yaws in this Province although direct contact between infected fingers or lesions and abrasions of healthy individuals and probably transmission by other varieties of flies such as species of musca may also account for a fair percentage of cases.

Prophylaxis resolves itself into protection of any abraded surface from contact with viable spironemata carried by either fingers or flies and treatment of the infected.
Novarsenobillon has to date been my sheet anchor in treatment but it is possible that sulpharse-nol may be as equally effacacious and as it can be given subcutaneously it has the decided merit of being a more suitable remedy for administration in the hands of an Indian Subordinate Medical Staff.

The results of treatment in framboesia are excellent and like successful cataract operations are highly appreciated by the illiterate sons of the soil and the jungle who will trek at least two hundred miles to obtain the benefits of Western Medicine.
Chunei: female Kuki age about 10, resident of the North Cachar Hills. (Foot-nills).

History: The primary yaw developed at the site of a leech bite on the left leg about two months ago.

Present Condition: A generalised yellow pointed papular eruption especially marked on the dorsum of both hands showing in places nutmeg grater patches. The patient was given an intravenous injection of novarsenobillon the day previous to taking this photograph.
Akhol: female adult Kuki age about 40 years, resident of Jowty Village, Manipur State (Makoi hills).

History: about 3 years ago a primary yaw developed over the left external malleolus.

Present Condition: Yaws on the anterior aspect of the right wrist, over the right antecubital fossa, over the right hypochondrium, left popliteal region, back of the right thigh and condyomata in the groin.
A primary yaw on the outer aspect of the right upper arm produced by immediate contact with infected "eye-flies".

This primary yaw was seen by Dr. C. Strickland, Professor of Entomology, School of Tropical Medicine, Calcutta during a visit to this Practice.
The Eye Fly
or
Siphonella funicola.
Magnified about thirty times.
The method of catching "eye-flies" by applying the bottle held vertically downwards on a yaw.

The cotton wool is withdrawn and the flies enter the bottle via the glass tube.
The method of applying the bottle with "eye-flies" to a scarified area.

The bottle is held vertically upwards as "eye-flies" invariably immediately fly upwards and come in contact with the scarified experimental area. The cork glass tube and cotton wool are withdrawn to obviate the possibility of transmission through adherent infected material.
Napchulo:- Naga girl age about 14 years resident of Naga Village near Kalabheel (coolie) Village.

History:- About a year ago the primary yaw developed at the site of a Cachar Sore on the left external malleolus.

Present Condition:- Yaws on the legs, knees, thighs, arms, axilla, and left nipple.
Klura:- Kuki boy age about 5 years, resident of the North Cachar Hills.

History:- The primary yaw developed at the site of an abrasion on the outer aspect of the right leg about 10 months ago.

Present Condition:- Yaws on the legs, hands and on the lower lip.

On the day previous to taking this photo the boy was given an intravenous injection of novarsenobillon.
Rolal:- male adult Kuki age about 55 years, resident of Jowty Village, Manipur State.

History:- Primary Yaw developed on the index finger right hand about 8 years ago.

Present Condition:- Circinate yaws on the abdomen, neck, back, left axilla and on the thighs and a yaw on the scrotum.
Shongkori: female caste Mundah age about 3 years, resident of Kalabheel Village.

History: Cachar Sore on the right leg. Primary yaw developed at the site of the Cachar Sore about 4 months ago.

Present Condition: Yaws on the legs, thighs, arms, chest, back and face.

The mother (seen in photo) of this child subsequently contracted a primary yaw on the little toe of her left foot. The father had previously been treated for framboesia.
Photo No. 11.

Thooma:— Male adult Lushai age about 42 years, resident of Sakordai Village, Lushai Hills.

History:— Lacerated wound on the dorsum of his right foot caused by a piece of bamboo jungle when about 10 years of age. The primary yaw developed at the site of the wound.

Present Condition:— Desquamation of the soles of both feet. Periosteal thickening at the lower ends of the right radius and ulna and left radius.
Tuaveh:— female Kuki age about 12 years resident in Manipur State.

History:— About eight months ago the primary yaw developed on a healing Cachar Sore on the back of the right leg.

Present Condition:— Yaws on the face, forehead, arms, shoulders, thighs, legs, chest, abdomen, back, and on the soles of feet.
Tepa:— Male adult Kuki age about 30 resident of the Lushai Hills.

History:— The primary yaw developed on an abrasion on the outer aspect of the lower third of the right leg about twelve years ago. Has since had annual recurrences of framboesial eruptions and crab yaws during the Monsoon Season.

Present Condition:— (November 1923). A solitary yaw on the antero-lateral aspect of the left elbow.
Midmettin: male adult Kuki age 40, resident of the Lushai Hills.

History: About thirty years ago the primary yaw developed on the outer aspect of the lower third of the left leg. Patient had recurrences of framboesial excrescences and plantar yaws during the Rainy Season for eighteen years.

Present Condition: Chronic dermatitis of the hands and desquamation of both feet.
Kaithuama:— male adult Kuki age about 22 years, resident of the North Cachar Hills.

History:— Abrasion on the dorsum of the right foot about three months ago.

Present Condition:— Yaws on the legs and knees, buttocks and back.
Kaithuama:- male adult Kuki age about 22 years, resident of the North Cachar Hills.

History: - Abrasion on the dorsum of the right foot about three months ago.

Present Condition: - Yaws on the legs and knees, buttocks and back.
Thilpuilal, male adult Kuki age about 36 years, resident of Manipur State (near Imphal).

History: About 4 years ago the primary yaw developed at the site of an abrasion on his right buttock.

Present Condition: Desquamation of the soles of the feet and a yaw on the outer border of the right foot.
Tuaveh:— female Kuki age about 12 years resident in Manipur State.

History:— About five months ago the primary yaw developed on a healing Cachar Sore on the back of the right leg.

Present Condition:— Yaws on the face, forehead, arms, shoulders, thighs, legs, chest, abdomen, back and on the soles of both feet.
Halljani:– female adult, Kuki, age about 50 years, Teepoimukh, Manipur State.

History:– Primary yaw developed on her right loin about twenty years ago.

Present Condition:– Yaws onychia right thumb, arthritis of the interphalangeal joint, right middle finger, and desquamation of the soles of both feet.
Thangkhim; female adult Lushai age about 30 years, resident of Dilmol Village, Lushai Hills.

History:- The primary yaw developed at the site of a Cachar Sore over the right external malleolous about 10 years ago.

Present Condition:- Swelling of the right elbow joint and desquamation of both feet.
Pajangshong; Naga boy age about 10 years, resident of the Naga Hills.

History:— The primary yaw developed on an abrasion on the dorsum of the left foot about 2 years ago.

Present Condition:— Yaws on left hip, in the anal cleft, in the groin, on the scrotum, on the thighs, legs, arms and back.
Changkhoom:- male Lushai age about 13 years resident of the Lushai Hills.

History:- The primary yaw developed at the site of an abrasion on the outer aspect of the left leg about 3 years ago. The patient developed characteristic secondary framboesial excrescences but the mother yaw subsequently became infected with Vincent's bacilli and Schaudinn's spirochaetes and developed the characters of tropical sloughing phagedaena with a spreading eczematous ulceration around the phagedaenic ulcer.

Present Condition:- Under treatment with novarsenobillon intravenously and eusol foot baths the ulceration is rapidly healing.
Bormkai:- male adult Lushai age about 20 years resident of Aijal Lushai Hills.

History:- About 10 years ago the primary yaw developed on the outer aspect of the right leg at the site of an abrasion.

Present Condition:- Desquamation of both feet and arthritis of the phalangeal joints of both hands.
Kairongdon: Naga boy age about 9 years, resident of the Naga Hills.

History: A Cachar Sore developed on the anterior aspect of left ankle following a leech bite. The primary yaw developed at the site of the Cachar Sore about six months ago.

Present Condition: Fungating mother yaw on the front of the left ankle with yaws on the legs, hands, chest and at the angles of the mouth.
Naphulo: Naga girl age about 14 years resident of the Naga Village near Kalabheel (coolly) village.

History: About a year ago the primary yaw developed at the site of a Cachar Sore on the left external malleolus.

Present Condition: Yaws on the legs, knees, thighs, arms, axilla, and left nipple.
Lama:- Kuki boy age about 12 years, resident of Pathpuimoon Village, Manipur State.

History:- Lacerated wound on the lower third right leg caused by a spear grass. The primary yaw developed at the site of the wound about 5 years ago.

Present Condition:- Yaw on the right eyebrow and yaws on the dorsum of the right hand.
Sumteh: male adult Kuki age about 38 resident of the Naga Hills.

History: The primary yaw developed on an abrasion over the middle third of the right tibia about 3 years ago.

Present Condition: furfuraceous desquamation over the back of both legs and thighs and a typical yaw on the inner surface of the right leg.
Anglam:– male adult Naga age about 36, resident of Nongompoh Village, a Naga Village on the eastern boundary of this Practice.

History:– about four years ago the primary yaw developed on a Naga Sore on the outer surface of the middle third right leg.

Present Condition:– Yaws in the right antecubital fossa, on the left side of the face, on both legs, thighs, right shoulder and back.
Avae:— female adult Kuki age about 45, resident of Jowtay Village Hakoi Hills Manipur State.

History:— About 18 years ago the primary yaw developed on her left nipple and states that her child at this period was suffering from "saighree".

Present Condition:— Periosteal thickening of the lower third of the left tibia.
Akhop: male adult Kuki age about 50, resident of Jowty Village Makoi Hills Manipur State.

History: When a little boy he states he contracted Saighree but is unable to point to the site of the primary lesion.

Present Condition: Juxtra-articular nodules over both external malleoli with patches of leucoderma over both legs and feet.