SOME OBSERVATIONS, MAINLY CLINICAL,
ON CERTAIN OF THE DISEASES MET WITH
IN A DISTRICT OF NORTH EAST INDIA,

being

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SOME OBSERVATIONS ON "JUNGLE FEVER"
AND MALARIA IN GENERAL IN CACHAR.

This is the commonest type of malarial attack here.

Synonyms: "Bilious Remittent Fever", "Jungle Fever", "Clearance Fever".

Prodromata.

The following symptoms constitute the prodromata: - A general slackness for some days, usually in forenoons, before attack comes on; tired feeling is complained of; yawning; desire to stretch limbs; burning in soles and palms ("malarial hand" occasionally seen in old residents); aching in front of legs ("woolly legs"); loss of appetite for morning meal; sometimes slight nausea; slight headache, usually frontal, sometimes unilateral; occasionally constipation; sleeplessness.

The Attack.

Within a day or two the attack comes on.

Cold Stage: The following signs and symptoms mark the cold stage: rigor, marked in some, usually in new infections in new comers, in others, chilliness only: teeth chatter; pulls up bedclothes; pains in back, loins, hips, knees, nape of neck and
shins; nausea, vomiting bile stained stomach contents; eyes suffused, hyperaemic, photophobia; constipation the rule; if diarrhoea, stools are dark; pulse small, tension increased usually about 90; respirations increased when patient is not shivering; face pale as a rule, pinched and anxious; dry short cough sometimes present; urine increased in amount, darkens in colour as hot stage is approached; tongue tremulous, slightly furred; giddiness if patient rises from bed; "cutis anserina" seen in new infections chiefly, usually skin dry; slight fever; 102° F. frequently seen in axilla when patient is "shivering with cold"; pains in muscles of legs, loins and nape of neck; relief sought by stretching limbs. The cold stage lasts an hour or two. It is shorter in old than in new infections.

Hot Stage: The following train of signs and symptoms now develop, constituting the second or hot stage: face flushed; vomiting distressing and constant of bile stained mucus; epigastric tenderness may become marked; headache much complained of, usually frontal, increased by vomiting; eyes become more suffused; eyelids may become swollen; skin hot and dry; tongue coated yellowish grey fur; mouth dry and sticky; restlessness; jactitation; pulse
quick, full and bounding, tension decreased, frequency 100 to 120 a minute; urine lessened in amount, specific gravity increases, may contain trace of albumin, very rarely glucose, darkens in colour; tenderness on pressure over liver edge occasionally noticed; temperature has risen to 103° F., 104°, 105°, 106° F. or over; conjunctivae yellowish tinge; thirst troublesome; constipation or diarrhoea, stools dark; fainting may ensue if patient rises up from bed, or vertigo; hips, knee joints, back, especially lumbar region, nape of neck become sore and stiff; respirations hurried; patient throws off bedclothes sometimes; dry cough increasing the tendency to vomit; hiccough very rare symptom but a distressing one and of serious import if continued; somnolence, in some cases between attacks of vomiting; in children, convulsions, delirium; in pregnant women miscarriage not infrequent if this stage be prolonged; friction over old pleuritic patches sometimes heard; jaundice may set in, but usually is definitely diagnosed when present towards end of attack; herpes labialis rarely seen; slight gastritis sometimes develops; the output of bile stained mucus is sometimes very great, varying in colour from yellowish to greenish; black vomit is practically unknown; nephritis, with presence of casts in the
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urine, I have never seen in this type of malarial at-
tack; insomnia present as a rule, due often to the
severe headache, which latter is increased if large
doses of quinine be given at night; nervous symptoms
increase as the termination of the hot stage is reach-
ed; squinting and trismus is sometimes seen in chil-
dren. Among conditions which are practically never
seen may be mentioned: bleeding from nose or stomach,
herpes zoster, parotitis, stomatitis, urticaria. The
hot stage may last from a few hours to several days.
The latter long duration may occur in double infec-
tions, e.g. double tertian when untreated. When
quinine is given intramuscularly early, even in se-
vere cases, this stage seldom lasts 16 hours.

Sweating Stage: The following signs and symp-
toms mark the third or sweating stage: sweating is
usually first noticed about the forehead and lips,
then on the neck, afterwards becoming general; some-
times sweating is very profuse; the sweat has some-
times a peculiarly objectionable mouldy smell; once
the sweating has fairly started the patient becomes
more comfortable; the headache, restlessness, pains
in the bones, joints and muscles abate; vomiting be-
comes less frequent and distressing; the pulse ten-
sion diminishes, and the pulse becomes soft, full and
sometimes, but rarely, dicrotic; respirations are now less frequent; the temperature has fallen several degrees; the more serious symptoms, e.g. hiccough, delirium, coma, unless there be underlying complications of cerebral or renal origin, now abate; the patient falls into a deep sleep, which may last for hours; signs of catarrhal jaundice may now set in, but these usually clear up in a few days. The sweating stage lasts from one to four hours as a rule.

Sequelae.

The following are the usual sequelae: patient feels more or less pulled down; sometimes complains of vertigo, weakness in the legs when he attempts to stand or walk; a feeling of distension in the stomach region and dyspepsia are frequently complained of, especially when there has been much vomiting; a slight enlargement of the liver can sometimes be made out, with tenderness on pressure over the organ; this enlargement gradually disappears after the fever has gone, but reappears with subsequent attacks; and, if these attacks be frequent, the enlargement may not subside for a considerable time. That cirrhosis of the liver with resulting ascites occurs, due to malaria, alone is doubtful. Herpes labialis, as already remarked, is rarely seen, although Keloch and
Kiener found it in 30% of their cases of bilious remittent fever. It is difficult to be dogmatic about enlargement of the spleen following one attack, although it can easily be made out in cases of double infections, where repeated attacks have occurred, and in old infections. In the latter the posterior as well as the anterior spleen border can be palpated in emaciated patients. Jaundice has already been referred to; it varies in intensity, but usually disappears within a few days should there be no recurrence of the attacks. The pulse may regain its normal character slowly, and in cases which have had repeated attacks the pulse tension may, weeks after these have passed, be found low. Cardiac dilatation may sometimes be made out in cases where attacks have been many; intracardiac thrombosis has been noticed by French writers, but is met with here in cases of associated anchylostome infection and is possibly due to the latter alone. Nephritis has never been observed by me; orchitis I have heard of, but was unable to exclude the doubt that the condition was of purely malarial origin; personally, I never saw, as a sequel of malaria, a case of it or of atrophy of the testicle; amenorrhoea, as a rule, does not follow a single attack, although common when there have been several recurrences. Hemiplegia
with aphasia I have only seen once. Paraplegia occurs very rarely in children. Neuritis, affecting the arm, is also very infrequently met with, as is also neuritis of the fifth; lumbar and intercostal neuralgia, sometimes lasting for two or three days, occasionally follows, and supra-orbital neuritis is common. Night blindness is sometimes complained of after repeated attacks; no pigmentation is seen on the retina, but the fundus appears anaemic. Tinnitus aurium is usually due to the quinine employed. I have never been able to trade ulcerative endocarditis or ulcerative enteritis to malaria; the latter condition is usually the result of typhoid fever, dysentery or Kala Azar.

**Malarial Cachexia.**

This condition is difficult to define, especially as regards natives, where it is erroneous to ascribe symptoms to malaria which are too often due to starvation or improper food, e.g. bad rice, jungle plants, etc. Anchylostomiasis, a very prevalent disease in the province of E. Bengal and Assam, must also be excluded; as must also be Kala Azar, Epidemic Dropsy, Round Worm infection, Beri Beri, Diabetes, Malignant Disease, especially carcinoma uteri, Phthisis, Chronic Dysentery, abuse for years of opium
organja, Pyorrhoea alveolaris, with resulting infection of bowel, Sprue.

The malarial cachectic usually suffers from recurring attacks of fever, often short. In Europeans the complexion is earthy, sallow. In natives, the conjunctivae are strikingly white, skin and lips are pale, as are also the nails of the fingers. Red blood corpuscles and haemoglobin are reduced. Sometimes it is difficult to find malarial parasites. The spleen can usually be readily palpated. It may enlarge to a moderate extent so as to be felt above the costal margin, or stretch across into the right iliac fossa. The spleen usually feels hard. Through the abdominal walls, which are often thin, the surface and edges can often be very well felt. The liver is slightly enlarged as a rule. Cardiac bruits can often be heard on auscultation. The feet and legs are often slightly oedematous. Anaemia is usually present, sometimes extreme. Capacity for work, mental and physical, is much reduced. Loss of body weight, even to emaciation, may be noticed. The presence of oedema, when general, as occurs in extreme cases, masks the real extent to which emaciation has progressed. Coolies so affected get a hopeless outlook on life, take little care of themselves as regards personal cleanliness, diet and their
houses. Europeans become slack, 'lose their nerve'.

By careful diet and regular and adequate treatment by quinine in solution, most of these cases recover. Neglected, they fall an easy prey to complicating conditions, of which dysentery, pneumonia and infection with intestinal parasites are the chief.

Complicating Diseases and Infections.

Anchylostome Infection.

The commonest is anchylostomiasis. It is very frequently met with in pregnant women who fear to take medicine lest they miscarry. Among these, a condition of extreme anaemia, general oedema, ascites, pleural and pericardial effusions, heart dilatation, splenic and hepatic enlargements occurs. They are miserable, water-logged, useless wrecks of humanity, rendered more wretched by relapses of malaria. Miscarriage sometimes ameliorates their condition. Not infrequently they die of intracardiac thrombosis or an attack of dysentery carries them off. In men, non-pregnant women and children, this condition is much less frequent. The temperature charts shew, besides the elevations due to malaria, other elevations of an irregular character. Eggs of the anchylostomum duodenale are found in the faeces and
malarial parasites in the blood in most instances. Eosinophilia is present.

In severe cases among pregnant women, sudden death is not infrequent.

Post Mortem: The liver is enlarged and contains much yellow pigment. The spleen is usually hard and enlarged; anchylostomata are found in the bowel. Serous effusions are common. The heart is plugged with blood clot, sometimes blocking the right auricle completely and extending into the right ventricle, matting the valves and the cordae tendineae together. The blood clot is yellowish in colour as a rule, exudes when pressed. It is less commonly found in the left auricle and ventricle. The heart muscle is fatty degenerated. This is often extremely marked in the wall of the right ventricle. Sometimes the blood clot cast of the heart is a very perfect one. (Similar intracardiac thrombosis also occurs in pneumonia cases)

Round Worm Infection.

Round worm (Ascaris Lumbricoides) infection is chiefly seen in children, although also met with in adults. A child during an attack of this, or another type of malaria, may suddenly lose consciousness - trismus, foaming at mouth, strabismus, general
clonic convulsions - or may pass into a delirious or comatose condition. These symptoms often clear up, with the expulsion of the worms and before the temperature has fallen. There is a general idea, even among natives, that these worms cause convulsions. Their presence seems certainly to enhance any nervous symptoms present, and the cause and treatment of nervous phenomena developing in children during a malarial seizure can often be ascertained by the examination of a small portion of faeces of the patient microscopically; round worm eggs can also often be found in scrapings from around the anus.

Dysentery.

This association is not infrequent. When the elevations of temperature are of daily occurrence, and when amoebae dysenteriae (histolyticae) are found in the stools, a careful examination is called for to exclude the possibility of the early stages of hepatic abscess being overlooked.

Pneumonia.

This combination is a very rare one, notwithstanding the fact that Lobar Pneumonia is very prevalent in N.E. India and probably, except in years when cholera epidemics are wide spread, the chief cause of mortality in most of the districts.
Typhoid, Cholera, Smallpox, Measles, Erysipelas.

Typhoid Fever, Cholera, Smallpox, Measles, Erysipelas are all met with in Cachar, but I have never seen any of these infections associated with any form of malarial infection of an acute character.

Labour.

Puerperal Fever is much more common than acute malarial manifestations after child birth.

Isolation.

This association I have never seen.

Kala Azar.

This is infrequently met with. A patient habituated to the long irregular fever of Kala Azar does not notice the superadded symptoms. The combination is a dangerous one.

Poverty.

"Physiological Poverty". - This is perhaps the worst of the complicating conditions by which the virulence of malaria is enhanced.
Diagnosis.

Microscopical.

The parasites of malaria which are found may be stated in order of frequency as follows: simple tertian; quartan; malignant tertian. Double simple tertian is the commonest form of infection found.

Failing to find parasites, Stephens* recommends that a search should be made for an increase of the large mononuclears beyond 15%, which he states is proof of an actual or recent malarial infection.

This is very difficult to carry out in practice in a large labour district; as is also the search for pigmented large mononuclears, as a routine test. The pigmented leucocytes, moreover, are not always found in such malarial infections.

Periodicity.

Periodicity cannot be relied on in most cases, although the natives call tertian "pari" and quartan "burrapari", for it is often masked, especially in double infections.

Mosquito Bites.

History of exposure to mosquito bites can always be furnished in the rainy season and is of no value in diagnosis. In old residents, mosquito bites as

* Stephens & Christopher's Practical Study of Malaria.
a rule produce only very slight irritation locally, sometimes none, whereas irritation is marked in new comers.

**Splenic Enlargement.**

Splenic enlargement is not of much value per se for it occurs in typhoid, kala azar and pneumonia. Splenic enlargement, however, when associated with periodicity and parasites is of great diagnostic value. (Splenic enlargement developing rapidly is strongly suggestive of the danger of onset of Black Water Fever).

**Intramuscular Injections of Quinine.**

Intramuscular injections of quinine bihydrochlorate are of considerable value for diagnostic purposes, as malarial attacks rapidly yield under their use.

**Differential Diagnosis.**

**From Anchylostomiasis.**

The difficulty might arise in advanced cases of chronic malaria. Anchylostomes set up irregular rises of temperature in their hosts. The presence of Eosinophilia in the blood, adult anchylostomata
or their eggs in the stools, with the absence of (1) malarial parasites, (2) pigmented mononuclears, (3) increase in large mononuclears beyond 15%, (4) enlarged spleen, would point of ancylostomiasis. In ancylostomiasis the loss of haemoglobin is not proportional to the loss of red blood corpuscles as in malaria. Gastro intestinal upsets may occur in both diseases as vomiting, diarrhoea, slight jaundice, anaemia and oedema.

From Enteric Fever.

But little stress can be laid on time of remission, especially in malignant tertian infections where there may be practically no morning rise and evening fall.

As regards temperature, the height attained in malignant infections may not be so pronounced as in the simple tertian and quartan infections. In the latter two, the initial temperatures are as a rule higher than the initial temperatures of typhoid.

As a rule the pulse is much slower in the early stages of typhoid than in those of malaria. In the latter the pulse more nearly keeps pace with the temperature.

Little assistance can be obtained by ascertaining site of headache; occipital headache may be present in both malaria and enteric.
Nervous symptoms occurring early are rather in favour of malaria, but may on the other hand be due to enteric associated with round worm infection, especially in children.

Jaundice is in favour of malaria, but its absence would not of course exclude typhoid.

Diarrhoea or constipation may be present in either malaria or typhoid.

Temperature Charts, when procurable, may be atypical and of little assistance in typhoid, and very vague in infections of the double tertian variety.

Blood may be found in the stools of both malarial and typhoid cases.

Haemorrhages from the nose are more common in typhoid than in malaria.

The spleen may be found enlarged in either disease.

The rash is sometimes well seen in Europeans and is of great value in diagnosis, but I have never been able to see it in a native.

The stools in this form of malaria often contain much bile, but some typhoid cases here, as elsewhere in the East, pass grass-green stools.

As a rule the liver enlargement is later, when present, in typhoid than in malaria.
In malignant infections in malaria, the severity of the symptoms is not always proportional to the height of the fever, which also is a characteristic of typhoid.

The presence of malarial parasites, or increase of large mononuclears to above 15%, or the presence of pigmented leucocytes would of course settle the diagnosis in favour of malaria, but malarial parasites cannot always be found and the same can be said as regards pigmented leucocytes. Malarial parasites will, however, usually be found about the end of the first week of fever.

Ehrlich's Diazo Reaction employed between the 6th and 14th day (Ker's Infectious Diseases*) when positive would lead to a diagnosis of typhoid or eruptive fevers, pneumonia, miliary tuberculosis.

There are no laboratories in the province of E. Bengal and Assam where Widal's Test can be carried through; blood samples must be sent to Kasauli or Calcutta. Ker states that it is usually found in the second week, in the third week, and after is rarely absent. Malarial attacks are not, however, of such long duration that the use of this test is in frequent demand.

* Infectious Diseases - A Practical Text Book, by Claude Buchanan Ker, M.D.
Intramuscular injections of quinine bichromate, 15 grains, on each of three successive days in an adult, if not followed by a fall of temperature to normal, indicate that the disease in question is not malarial.

From Hepatic Abscess.

This is not always easy, especially in N. E. India where malaria and amoebic dysentery are common, and sometimes coexist.

Rigors may precede a rise of temperature in malaria as in liver abscess. There may be a history of dysentery or diarrhoea in either disease. Jaundice may be a symptom common to both, and gastric symptoms may occur in both. In both the liver may be slightly enlarged, and tender.

There may be a history of previous malarial attacks in both; and in both the spleen may be enlarged. In both malarial parasites may be found in the blood or in both they may not.

The other microscopical evidences of malaria may be present or absent in both. Polymorphonuclear leucocytosis would point to a diagnosis of liver abscess, as would also the following clinical phenomena: a marked diminution of expansion of the right chest in inspiration; evidences of a rapid failure of
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health; pain in the region of the liver when the temperature is normal; shallow (right) unilateral breathing; temperatures shewing a decided evening rise or maximum impaired mobility of liver in respiration as seen by Rontgen Rays; right shoulder pains; right sided basal pleurisy; failure of quinine bi-hydrochlorate intramuscularly and by mouth in adequate doses to materially influence the evening rises of temperature; failure of fresh and good quality ipecacuanha, in adequate doses, given during the night only, on an empty stomach, and retained by the patient, to check the evening rises of temperature.

The cases where puncture of the liver is found necessary to clear up a diagnosis are not frequent now as formerly. The finding of chocolate coloured pus in the stools, with an abatement of symptoms, points to liver abscess. In a doubtful case which I saw after death, the patient coughed up chocolate coloured pus and died of suffocation almost immediately afterwards. This patient was under treatment for "malarial fever and dysentery", with jaundice.

From Kala Azar.

In both malaria and Kala Azar a history of daily attacks of fever may be given. In both the spleen and liver may be enlarged. In both gastrointestinal upsets may occur.
In cases of old infections, in both, emaciation, anaemia and oedema, the latter confined to the legs or general, may be present. Both may give a history of dysentery or diarrhoea.

In some cases of Kala Azar, malaria may complicate and malaria parasites be found. In old infections, ascites may be present in both. I have not found in every case of Kala Azar that a double rise of temperature occurs on the days when fever is present. There may or may not have been similar cases of either disease in the same house. Slight jaundice may be present in both. Darkening of the skin may be met with in both.

The main points of distinction lie in that the fever of Kala Azar is not materially influenced by quinine given by mouth or intramuscularly as is the case in malaria; also in the finding of Leishman Donovan bodies in the fluid aspirated from the liver in Kala Azar cases by a hypodermic syringe, or in the peripheral blood. In the latter, the parasites are found in the large mononuclears chiefly. The search for these parasites in the peripheral blood is as a rule a long one. Leishman Donovan bodies are characteristic of Kala Azar and are absent in Malaria.
From Black Water Fever.

This is not as a rule difficult in pronounced cases of Black Water Fever or in the later stages of cases of this disease of medium severity; but difficulty may arise in distinguishing Bilious Remittent Malarial Fever from a mild case of Black Water Fever in the early stages of the latter. A rigor may be present at the onset of both, though as a rule more pronounced in Black Water cases; vomiting may be present and frequent in both; the vomited matter may be at first bile tinged, becoming of a dark greenish colour later in both. Constipation, headache, furred tongue, fever, pains in limbs and back may occur in both. Jaundice may be present in both. Early jaundice setting in a few hours after the onset, and rapidly deepening the skin, early assuming a bright yellow colour, is strongly suggestive of Black Water Fever. The jaundice of Bilious Remittent Fever occurs later on in the course of the attack. Malarial parasites may be present in the blood of both. The urine in Black Water Fever when shaken up has a reddish froth; that in Bilious Remittent Fever is yellowish or greenish yellow. The urine in Black Water Fever is much darker than in that of Bilious Remittent Fever. The urine in Black Water Fever varies from a slightly reddish to a black porter colour, and when the bottle containing it is rolled on its long axis,
the urine is seen to leave a film on the glass; and to roll slowly from its syrupy consistence. It contains albumin sometimes in large amount, a few red blood corpuscles, and masses of haemoglobin, sometimes in the form of tube casts. In the urine of bilious remittent fever sometimes only a trace of albumin and bile are seen. In doubtful cases, especially in those who have come from a black water district, or who give a history of having suffered from black water fever, a sample of the urine should be obtained before administering quinine, as the latter drug must be used in such cases as shew black water urine with extreme caution. Marked tenderness and rapid enlargement of the spleen are strongly suggestive of black water fever.

From Dengue.

Dengue is a comparatively rare disease in Cachar, and wide spread epidemics in Cachar are not on record. In both malaria and dengue there may be quick ascent of temperature, frontal headache, vomiting of bile stained material, hyperaemic conjunctivae, photophobia. Pharyngitis is more common in dengue than in bilious remittent fever. The characteristic eruption of dengue which appears after 24 to 26 hours is a valuable aid in diagnosis. Its character is
subject to much variation and is usually accompanied by itching. Itching is very rarely complained of in malaria, and only when associated with marked jaundice. It is a much later symptom in malaria than in dengue as a rule. Desquamation follows the disappearance of the eruption in dengue. I have never seen desquamation occur in a case of malaria. In dengue the pains are more acute, and their onset is more sudden than is the case in malaria. The pains chiefly affect the joints in dengue, and the muscles in malaria. The movements of the patient are much more limited by the pains of dengue than by those of malaria. The finding of malarial parasites in the blood of the patient would establish a diagnosis of malaria. The itching and desquamation may persist for several days in the stage of convalescence after dengue.

From Pneumonia.

The frequency of lobar pneumonia being mistaken for bilious remittent fever in Cachar is the only excuse for mentioning this possibility of error in diagnosis. In both diseases there may be continued fever, headache, pains in body and limbs, sickness, slight cough at the onset. In both a rigor may usher in these symptoms. The sputum, even in the
early stages of pneumonia as seen in Cachar, is fibrinous, but very rarely "rusty". Physical signs as a rule suffice to establish a diagnosis. In doubtful cases the finding of malarial parasites in blood is proof of a diagnosis of malaria. When no parasites are found, when quinine fails to reduce the temperature, when the sputum is fibrinous and cough persists, the case is almost certainly one of lobar pneumonia. Many coolies try to fight an attack of malaria, and I have seen a man work full task up to the end of the sixth day of an attack of pneumonia - under this impression - the attack in question terminating favourably.

From Elephantoid Fever.

Rigor, fever for several days, and terminal diaphoresis may accompany both diseases. Tenderness, redness and swelling along the course of the lymphatics may or may not be present in cases of elephantoid fever. Blood examinations usually suffice to establish a diagnosis - the finding of malarial parasites on the one hand, and the discovery of filaria perstans plus eosinophilia on the other. Intramuscular injections of quinine will also prove of service in diagnosis.
From Plague.

Plague has appeared on three separate occasions in Cachar, but in every outbreak the disease was stamped out before many people had become affected. Rigor, fever, vomiting, constipation or diarrhoea, dry cough, enlargements of liver and spleen, mental aberration may occur in both. The symptoms of mental aberration are much more common in plague and occur earlier than in malaria; and in plague patient speaks thickly, not answering questions at once. The plague patient is apt to get up and wander about with a staggering gait like a drunken man. Malarial patients, on the other hand, travel as little as possible after the onset of the fever. In plague tenderness over one or other of the superficial lymph glands can be made out early. Examination of stained films made from contents of original vesicle, or from juice of an enlarged gland, or from sputum, and finding of plague bacilli therein, would establish a diagnosis of plague. Laboratory confirmation of diagnosis should be sought.

The following diseases which possess some points of resemblance to Bilious Remittent Malarial Fever have not, as far as I am aware, been reported from Cachar yet:
Malta Fever  Relapsing Fever  Typhus Fever  Weil's Disease.

Yellow Fever.

In the tropical regions of the western hemisphere the question of differential diagnosis from Yellow Fever might arise.

Treatment.

Retrospect.

Old Planters have told me that the rule in the seventies, eighties, and even in the early nineties, in Cachar, was never to give quinine in malarial fever until the temperature was falling. Prior to the administration of quinine, calomel, or a saline purgative, following by Tinct. Aconiti were given. In the nineties, antipyretics, chiefly phenacetin, were used instead of Tinct. Aconiti. Quinine was not given "until the fever had broken", i.e. when the sweating stage was reached. Much harm was done by delaying the administration of quinine. Some justification of this line of treatment may be found in that quinine, given by the mouth, during the hot stage, was often vomited, also that quinine when retained increased the headache, and again, that quinine
pills, of the imported variety - much in vogue then - did not influence the course of the attack. Quinine was not given for more than a few days after each attack, and so invaliding from malarial fever and deaths therefrom were commoner then among Europeans. It is, however, possible that some of the deaths attributed to malaria then were really due to enteric, as in 1895 I was told by the older residents that typhoid fever was unknown among Europeans and natives in this district. It was customary then for Europeans suffering from continued fever to "go away for a change", "get off for a blow on the river", but on these excursions some patients died.

Present Day Treatment.

Quinine. Once the diagnosis of malarial fever has been settled in the affirmative, no time should be lost in administering quinine. In most cases of bilious remittent malarial fever one can never rely on doses of quinine given in solution by the mouth being retained by the patient. In many cases the tendency to vomiting is increased thereby. Even if retained, absorption is often defective and the fever unnecessarily prolonged. Administration by the bowel is not popular with European adults, though sometimes quite effective in European children.
Natives, however, strongly object to this method and coolies regard it with dread.

In 1899 I introduced the practice of intramuscular injections of quinine in cases of bilious remittent malarial fever into Cachar, at first using the sulphate with tartaric acid dissolved in water. This produced a considerable amount of irritation locally, but nothing further, and the effect in reduction of temperature was prompt. The dose of sulphate of quinine given in this case was 5 grains injected into the muscles of the buttock. The use of this method was extended with encouraging results.

Later I employed the more soluble salts of quinine, the acid hydrochloride, and the acid hydrobromide, but for several years past have used the bihydrochlorate (Howard's) with complete satisfaction.

The Technique Employed. The technique employed is simple. Five to seven grains of bihydrochlorate of quinine is put into a dry test tube (6 x 5\(^3/8\)). Twenty minims of boiled water is taken up with an all glass hypodermic syringe and dropped into the test tube containing the quinine. On heating over a spirit lamp, the quinine soon dissolves. The solution is now boiled, the mouth of the test tube is passed three or four times through the spirit
flame, and the test tube is now laid on the slant, care being taken to avoid the orifice of the test tube being touched. Into a small platinum capsule, big enough to admit a push on platinum iridium hypodermic needle, enough boiled water is poured to cover the needle, and the capsule is held by forceps in a spirit flame until its contents have been thoroughly boiled. The capsule with its contents is now set aside and covered with a dry glass finger bowl. Into the barrel of the hypodermic syringe are drawn up, and then ejected in turn, carbolic acid, absolute alcohol, boiled water. The syringe is now laid alongside the solution in the test tube. The patient's skin is now disinfected over an area about the size of a five shilling piece, where, a hand's breadth from the crest of the ilium, and a hand's breadth from the middle line of the back, cross. Soap and water, turpentine, corrosive sublimate lotion (1 in 1000), and absolute alcohol are applied in order mentioned, a pad of cotton wool soaked in absolute alcohol being left on the cleansed area of skin. The needle is now caught in forceps which have been held in the spirit flame, and the water is now poured out of the platinum capsule. Only the outer surface of the platinum capsule must come in contact with the fingers. The mouth of the test
tube containing the quinine solution may now again be passed through the flame. The quinine solution is now poured into the platinum capsule, and drawn up into the barrel of the syringe. With the forceps the needle is now passed through the spirit flame and its point held there till it glows red. After about a minute the needle held in the forceps is firmly fitted on to the nozzle of the hypodermic syringe. Any air bubbles present in the syringe are now dislodged. The base of the needle is now touched with pure carbolic acid. The pad of cotton wool soaked in absolute alcohol is now removed from the patient's buttock, and a small spot in the middle of this area of skin which was covered by the pad is now touched with pure carbolic acid. After a minute the needle is pushed through the skin and on into the muscle. Care must be taken not to inject into fat, as a hard swelling, lasting for years, may result therefrom. Care must also be taken not to impinge on bone. The piston is now gently pushed home, and the needle withdrawn. The injection site is now touched with absolute alcohol, and a small thin layer of sterile cotton wool, about the size of a threepenny piece, is laid over the puncture. A little Tinct. Benzoin Co. is dropped on this and allowed to dry.
31.

The injection is attended with very little pain; sometimes a numbing sensation is felt down the thigh for a few minutes after injection. In one instance, in a thin European patient, a blood tumour formed but soon became absorbed. I have never seen any other complication in any cases which I have injected, but have seen abscess and sloughing ensue in a few cases injected by native practitioners. None of the latter were complicated by tetanus, all recovered. These abscesses are in some instances due to carelessness by fouling or by injecting "hypodermically", not "intramuscularly". Some advocate that a greater dilution of the drug should be employed on the ground that it is more rapidly absorbed. Slight tenderness on firm pressure remains for two or three days at injection site. The injection may require to be repeated next day in heavy infections. Should this be necessary, the opposite buttock is selected. After injection the syringe and needle must be washed through with water acidulated with sulphuric acid dilute, and afterwards with plain boiled water before drying. If this is not done, the piston of the syringe becomes fixed in the barrel.
32.

Treatment of Symptoms in detail.

Thirst.

Lemon or lime juice with water - tamarind water in small quantities. When there is vomiting, ice is good but is seldom procurable when wanted. Barley water, thin, can be given freely once vomiting has stopped, as can other cooling drinks. Plain water enemata are useful.

Headache.

Ice cap, when procurable, or Leiter's tubing. Sometimes repeated swallowing of hot water, results in relief of headache when the contents of the stomach are voided. I have never found phenacetin or aspirin of much use.

Fever.

Tepid or cold water sponging is useful. When temperatures run high, the patient may be laid on a tarpaulin covered by a sheet, and a wet sheet spread over him. A punkah is then pulled over the patient's bed. This can often bring down a patient's temperature two or three degrees. I have never found it necessary to employ the immersion bath. Deep well water is often the coldest water available. When the patient's temperature reaches 102°F, he should
be put to bed between blankets. The use of the pack may have to be repeated. Usually half-an-hour is sufficient at a time. An enema of Warburg's tincture $\frac{1}{2}$ an ounce with a little Tinct. Opii or Liquor Morphin Hyd. is useful in adults. In children Warburg's Tincture is tolerated without the addition of either Tr. Opii or Liq. Morphin Hyd. Diaphoretics are of little use even when retained. Where there is a history of black water fever, potassium salts are best avoided.

**Insomnia.**

It is best to give quinine when possible in the forenoon or afternoon. When quinine is given late at night it increases headache and consequently the tendency to insomnia. Where there is a history of black water fever, or where the spleen is markedly tender, Trional and Sulphonal, possible excitants of haemoglobinuria, also Potassium Bromide, on account of its irritating action on the kidney, are best avoided. It is safer to employ Paraldehyde or Chloral Hydrate. Sometimes a little whisky or brandy given in aerated water induces sleep.

**Vomiting.**

Gastric sedatives are generally useless. The best results are gained by giving the stomach as
little to do as possible. When much bile stained mucus is being ejected, the patient should be encouraged to swallow tepid water and vomit it. This if repeated often results in considerable relief. In cases where vomiting is persistent and distressing the stomach should be washed out by tube.

**Hiccough.**

Hiccough occurs in severe infections. I generally give a second intramuscular injection of quinine when this sets in.

**Delayed Sweating.**

If vomiting has stopped, a small opium pill may be given to adults, followed by a little weak hot tea or hot water; some recommend a little hot black coffee with scraped ginger. Alcohol is not so useful. Enemas of Warburg's Tincture of an ounce at a time for an adult, repeated every two hours, are useful. A hot water bottle may be put to the feet to encourage perspiration. Should the sweating stage be much delayed, a second intramuscular injection of quinine may be given.

**Nervous Symptoms.**

In children, the stools may be examined or scrapings from around the anus for round worm eggs.
If these be found, Santonin and Calomel should be given. In adults, as in children, the dose of quinine given intramuscularly may be repeated in severe infections. Sponging or the wet pack and punkah may be necessary. The ice cap or Leiter's tubing may be employed. If retention of urine, the catheter must be used.

Constipation.

Calomel followed by saline aperient, Magnes Sulph or Sodii Sulph, is useful when given in the early stages. Plain water enemata are useful when vomiting is troublesome.

Where Black Water Fever is prone to complicate.

In cases coming from a Black Water District; in those who give a history of having suffered from Black Water Fever; and in those whose spleens are markedly tender or rapidly enlarging:

Special care must be taken not to excite haemolysis. The amount of quinine given must be small, e.g. one grain of quinine bihydrochlorate to be given intramuscularly, followed, if found necessary, by a second similar dose later on in the day.

Should there be no return of "fever", dosage by the mouth should be started - two to three grains of
the hydrochlorate of quinine in 24 hours, gradually increased as the patient's susceptibility to the haemolytic action of the drug diminishes.

I once saw a marked case of Black Water Fever with porter coloured urine and haemorrhages into the retinae, injected after above symptoms had appeared, with seven grains of bihydrochlorate of quinine intramuscularly. Perfect recovery resulted. Quinine was given in solution and a fat forming diet prescribed later. There was no recurrence.

In Pregnant Females.

It is sometimes most difficult to persuade native women in this state to take quinine in solution by mouth. They have the idea that miscarriage may result. Most practitioners in Cachar are of opinion that malaria starts uterine action, and that quinine, though not exciting, seems to sustain uterine action once started. The majority of these women, chiefly of the coolie class, will submit to intramuscular injections, even when they refuse to take quinine by the mouth. The hydrobromide of quinine may be used instead of the bihydrochlorate intramuscularly, and in the case of Europeans, by the mouth after the temperature has become normal.
Diet.

When the stomach is unable to tolerate food, and the attack has been a long one, the bowel should be washed out with plain water, or salt water, enemata. When there is no quinine in the rectum, milk, egg and salt enemata, each with a few drops of Tinct. Opii, may be given. Should it be desired to give quinine by the bowel, it may be given in enemas containing Bovril and Tinct. Opii. In children, Tinct. Opii may be omitted. In native women, rectal administration of drugs or food is in most instances declined with terror.

As soon as the stomach can tolerate food, egg, albumen water, or expressed meat juice may be given. A favourite and useful form of liquid nourishment is made thus. A fowl is killed and cleaned, then cut up small, skin and bone being rejected. The meat is put into a perfectly clean jar. Eight ounces of water are added. The water must previously have been boiled and cooled. Five minims of pure hydrochloric acid are added. The jar is covered, set aside for three hours, and occasionally the contents are stirred. The meat is then strained off, and the fluid is given to the patient. Hindoos prefer rice water, with a little milk, barley water milk and sago moogdhal soup made without meat, pigeon
soup, khoi, made from rice. The latter is made by putting unhusked rice on very hot sand. In a few minutes the rice is removed, the husks now loose are picked off. The rice is now given to the patient in milk.

After Treatment.

Quinine.

Ross* lays down three to four months' treatment as necessary in order to kill every malarial parasite in the blood. The best form in which to administer it is the hydrochlorate dissolved in dilute hydrochloric acid and water. This solution is not, however, a popular method, either with Europeans or natives, of taking the drug. Compressed tablets are much more in favour, though much less reliable. Freshly made pills of bihydrochlorate of quinine, hydrochlorate of quinine, or bisulphate of quinine made up with extract gentian and glycerine are more reliable than compressed tablets, because they break up and dissolve much sooner. These pills can be made as required in mofussil districts. A coolie can make, and sugar coat if necessary, a hundred an hour. Large quantities of these pills are in demand

*Lectures, Liverpool School of Tropical Medicine, Second Course, 1908.
in the populous labour camps and coolie lines in Cachar. Coolies will not take quinine in solution once they have recovered from the acute stages of malaria, for a period of months, although they may do so for a number of days.

**Dosage: (Adult)**

<table>
<thead>
<tr>
<th>Month</th>
<th>Grains daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>20*</td>
</tr>
<tr>
<td>Second</td>
<td>15</td>
</tr>
<tr>
<td>Third</td>
<td>10</td>
</tr>
<tr>
<td>Fourth</td>
<td>5</td>
</tr>
</tbody>
</table>

*In pernicious infections, 30 grains may be given daily for 1st month, should there be no indications to the contrary.

The above are Europeans' doses. For natives, about three-quarters of above quantities would prove sufficient in most cases.

**Other Cinchona Preparations.**

Recent experience has shaken my trust in extract cinchon. liq., which was found not to be able to kill off simple tertian parasites in a European. This and Huxham's Tincture of Bark are, however, valuable adjuncts to quinine.

**Arsenic, Strychnine, Iron.**

Arsenic, strychnine and iron are sometimes of service when the parasites are few in the blood, but where the patient looks anaemic, sallow and weak. In these cases freshly made quinine pills upset the
patient's stomach less than quinine in solution. In cases where constipation is present, and splenic enlargement persists, magnesium sulphate may be added with advantage. Iron is not well tolerated soon after the acute stage has passed.

Diet.

Nourishing diet is essential, and it is due to the lack of this, and also to the negligence of the native population as regards the after treatment of malarial attacks by quinine, that invaliding and deaths from malaria are so common among them.

Prevention of Malaria.

Obstacles.

The three principal obstacles to antimalarial measures are:

(1) The heavy rainfall, and the extent of country under water during the rainy season.

(2) The disinclination of the native population to assist themselves.

(3) The expense of antimalarial measures.

The prevention of malaria falls under three heads:
i. To kill all parasites in the blood of the infected:

It is very difficult to persuade natives to take quinine for long periods after attacks of malarial fever. When this can be managed, daily dosage is probably the best method. This can be done by giving pills, which latter must be freshly made and so compounded that they will readily break up and dissolve in the patient's intestinal tract. Natives will not take quinine in solution for long periods, after attacks of malaria. By employing daily dosage, the patients become more accustomed to the action of the drug, and the cumulative action of the drug on the parasites is ensured.

Again, should any patient not feel very well on any particular day, he would not be able to say that his indisposition was caused by quinine and to attempt to discontinue the drug.

As far as possible all adults, and particularly all children, shewing enlarged spleens should be so treated. On tea estates the pills can be quickly served out to the coolies at the daily muster.

ii. To ascertain the varieties of malaria infected anophelines, find out their breeding places and destroy the latter:
Varieties.

Very little work has been done in Cachar as regards ascertaining the varieties so infected. Bentley*, in writing of malaria in the Dooars, mentions the following species as malaria carriers:

- **Myzomyia listoni** - A stream breeder: larvae found in running water at bank, round boulders, and among pebbles.

- **Nysorrhynchus theobaldi** - A stream breeder: larvae found in small drying up pools in stream beds.

- **Pseudomyzomia rossi** - Breeds in buffalo wallows, rice fields, small pools on roads and in surface pools in lines (coolie lines).

- **Nysorrhynchus barbirostris** - Breeds in grassy pools and drains.

- **Nysorrhynchus fuliginosus** - Found in some large pools of weed covered water.

Once the breeding places have been discovered, the problem arises as to how these should be treated. Drainage is the best method where practicable.

Breeding Places.

Streams: The jungle shading the banks should be cut down. Pooling should be prevented by bamboo

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* Report to Government on Malaria in the Dooars.
fencing across in line with the bank, and filling up the bays thus cut off with earth, gravel or stones. This is cheaper than cement work, the price of which is prohibitive in Cachar.

Pools in the bed of the stream, when the latter is drying up, should be filled up with stones and gravel.

Weeds and grass growing in the water should be hoed out. The bed of the stream may be deepened in places where it is so wide that a good flow is not maintained.

**Drains:** Catch drains or border drains round elevated ground should be led into feeder drains; the latter should open into the large main drain at an acute angle.

**Rubble drains,** made by filling a drain cutting from below up with (a) large stones, (b) medium stones, (c) small stones, are useful near cow sheds.

**Tanks:** Trees shading tanks should be cut down. Weeds and grass should be regularly removed by dragging a chain along the bottom, or hand weeding. Shallow places at the edges should be filled up with
stones, gravel and clayey soil. The tank may be stocked with small varieties of fish, like minnows, or the surface may be oiled weekly with a mixture of half crude and half refined Kerosene oil, sprayed on with a syringe. Where the minnows have proved unsuccessful in coping with the destruction of the larvae, duck weed may be thrown in. Native fish poisoning plants, which also destroy mosquito larvae, may also be tried. The plants of this kind found in the jungles here are creepers and are beaten with stones before being thrown into water. In moist, low lying places near the tank, papita trees may be planted to make these places drier.

Other collections of water: Holes in earth, rocks, or trees, should be filled up with earth or stones, or both. Trees containing collections of water should be cut down. Disused wells should be filled up with stones and soil. Split bamboos should be used for fencing. The cultivation of rice near coolie lines should not be encouraged.

iii. To protect people from being bitten by Mosquitoes.

Native Measures: Natives chiefly rely on small windows and smokey fires. The cows in their lean-to sheds may offer a counter attraction. Mosquito
nets are used by some natives, but not so much as they ought to be. Some wrap themselves up in blankets before going to sleep.

**European Measures** are chiefly the punkah and the mosquito net. Some burn rosin in their bedrooms. Some bungalows are being made mosquito proof by wire netting, sixteen to twenty meshes to the inch.

Too much stress cannot be laid on the fact that on all the tea estates in Cachar very few of the coolies have mosquito nets. Some coolies could afford to buy them; some gardens could afford to present mosquito nets to their coolies. Native made mosquito nets are cheap.

**Mortality due to Malaria on Tea Gardens, among Coolie Population.**

It would be better to say "Mortality possibly due to malaria", for in the great majority of the cases the diagnosis was made on clinical evidence only.

From the mortality returns of nine tea estates for many years, the following figures have been collected.

- Total deaths, 6887 coolies.
- Deaths possibly due to malaria, 765 coolies.
- Among coolies, 9.002% of the total deaths are possibly due to Malaria.
Since coming to this district in 1895, I have never had to record Malaria as a cause of death among Europeans. The Europeans have numbered from thirty to fifty during these years.

Through quinine prophylaxis and treatment over adequate periods of time; general and systematic use of mosquito proof shelters by the coolies when asleep at night; free and ample gifts, not advances, to coolies weakened by malaria, of money or food to restore their strength, are the main lines on which to work for the reduction of the malarial death rate. Antimosquito measures promise less in the immediate future in Cachar. Tea gardens are not, as a planter once told me, "Charitable Institutions", but there is no reason why the death rates from malaria on many of them should not be reduced.
THE PREVENTION OF ANCHYLOSTOMIASIS AMONG COOLIES ON TEA ESTATES IN CACHAR.

Anchyllostomiasis is a fertile source of ill health among coolies, limiting their wage earning capacities.

Under the present conditions of labour employment in Cachar, too stringent regulations as to hygiene cannot be enforced on coolies, else they will abscond to other places of employment. The methods which must be pursued must give the coolies the minimum amount of trouble. The privy system has been tried in Cachar and has failed. Coolies adhere to the primitive system of disposal of excreta. Segregation of anchylostome infected people is not practicable. Protection of the feet by tar and sand, tar and sawdust, are measures which coolies will not tolerate or adopt. Boots or goloshes are too expensive for coolies to buy, or most tea concerns to give to the labour forces, apparently. Native made shoes would stick in the mud in the rainy season.

Method.

(1) Selection of Site for Defecation purposes. The first essential is to set apart, away from the
cultivation area, a piece of ground where the coolies can "relieve themselves".

(2) Search for and Treatment of Infected People.
The infected people must then be sought out by examination (microscopic) of the stools of suspected cases for eggs of ancylostomata. The infected are then treated with Santonin gr. V., Betanaphthol gr. XV. at 8 a.m., and again at 10 a.m. Betanaphthol gr. XV. are given. At noon, half an ounce of Castor Oil is given. The foregoing are adult doses. The above doses are given on two days every week, with a three days' interval. Thymol is not so much in favour with coolies as Betanaphthol. I have never seen Retinitis result from the use of Betanaphthol. Thymol is strongly objected to by pregnant women, and not without reason. When the stools are found free of ancylostome eggs, the patients are discharged. An iron tonic may be given on the days when Betanaphthol is not administered. Santonin is given on account of the commonly associated round worm infection.

(3) Boiled Water Supply to the people at work on the Garden. Boiled water must be served to the coolies at work to induce them to desist from drinking impure collections of water in drains, etc.
(4) Protection of Feet against Water Itch.

For the protection of the feet, wooden sandals can be cheaply made at garden expense. These the coolies have the knack of wearing with comfort. They are bound to the feet by loops of cane.

I have found that an ointment made of Betanaphthol one part and Lanolin seven parts mixed, is an excellent protection, rubbed well in over the feet and lower parts of the legs against 'water itch' ("paneghow", "bunches", "coolies' sore feet"). The filariform larvae of the anchylostome entering the skin of the feet and legs produce this condition.

In gardens where the filth area is in the area of cultivation, coolies do not care to work, as they know from experience that many of them will develop 'water itch' soon afterwards.
SHORT CLINICAL NOTES ON CASES OF YAWS.

(1) Yaws contracted by sexual intercourse.

A woman, Radhia, shewing the dark discoloured patches which ensue on the healing of yaws, was admitted on "sick leave" to garden hospital to look after her daughter aged 10 years, suffering from yaws of the button and ringworm character, on 30. IX. 09. The woman was a widow. They left hospital on 26. XII. 09. The girl's yaws had then healed. Dark discoloured patches were then the only signs of the disease left on her skin.

Melluah, hospital sweeper, was admitted on 8. I. 1910, suffering from a mother yaw on the base of the penis. He stated that this appeared about two months after he had sexual intercourse with Radhia. A general eruption of yaws, of the button variety, followed, associated with marked joint pains. The yaws began to dry up about the middle of March, 1910. Potass Iodid. gr.XV. was given by mouth twice daily, and a saturated solution of Bicarbonate of soda in water was frequently applied locally.

(2) An Outbreak of Yaws in a Family.

Jogtoo, male adult, had "yaws" a year ago. (His wife was similarly affected two years ago.)
Their youngest child, a boy, suffered from this disease about two years ago. These people are of the Pasee caste.)

12. II. 1910, Jogtoo: Yaw scars can still be seen. Patient suffers from arthritis, which developed in the first right interphalangeal joint of the index finger, and in the left ankle when the yaws were in eruption. These joints are still slightly swollen and stiff.

12. II. 1910: Jogtoo's daughter, aged 5 years, has suffered from yaws for the past five months. The yaws are of the mixed type. The ringworm type is most marked on the arms, body and face, being very numerous on the arms. The button type is confined to the thighs.

(3) Crab Yaws: Scalp Yaws.

Koonjoo, male, aged 30 years, Bowri; first seen on 14. VII. 09. Prior to eruption of yaws, which started about five months ago, patient suffered from pains in his left knee and left shoulder for about a week. The first yaw appeared on his neck. Next several yaws formed on his scrotum. The face was next affected. These yaws healed. Then a more general eruption of yaws all over the body followed. When patient was seen, yaws were present on scalp,
face, neck, chest, abdomen, back, arms and legs. The yaws on scrotum had healed. Many yaws on the legs, arms, face, body and neck had healed. Crab yaws were present on the soles of the feet. There were no ringworm yaws, all were of the button type.

Treatment: Potass Iodide gr.XV., twice daily, by mouth, and saturated aqueous solution of Bicarbonate of soda locally.

On 18. IX. 1909 the yaws were smaller in size. Many yaws were drying up, covered with yellowish scabs, but the yaws on the front of the thighs were still large and raw. Dark patches marked the sites of healed yaws. The yaws on the soles of the feet had healed.

(4) Yaws mainly of Ringworm Variety.

Goluk, male adult, Bowri: first seen on 14. VII. 09. Shortly before, an eruption of yaws broke out all over his body, eight months ago, he had an ulcer on his right ankle. When seen, all the yaws except a few were in the form of segments of circles. These areas varied in diameter from one to three inches. The scalp was unaffected. Two small button yaws were seen on the face. There were no yaws on the chest or back. Yaws were very numerous on buttocks, and back of legs, bend of left forearm,
inner surface of right upper arm, front of thighs. There were no yaws on the shins. A few small button yaws were seen on scrotum and penis.

Patient was seen again on 18. IX. 09. The small button yaws on the scrotum and penis had assumed the ringworm shape. The yaws on the buttocks were still unhealed. A few small button yaws were seen on the axillary surface of the right arm.

(5) An Outbreak of Yaws in a Family.

The wife and child of Lareeah Bowri were recovering from yaws when he had a chronic ulcer on his left shin. On this ulcer the first yaw appeared. The next yaw formed on his left forearm, followed by another on his left upper arm. Other yaws appeared on his neck and face, and afterwards on his scalp. Another crop of yaws then broke out on his face, then one on his scrotum and one on his penis. One formed later on his right upper arm. Others formed on his palms and soles. The yaws were of the button variety, some were about the size of hazel nuts, and others as large as an inch in diameter. They were many and large on the face, scalp and neck. Some were seen on the ears. Many were healed. There was a large moist yaw on the penis and another on the scrotum. Two large yaws on the left shin were discharging freely.
(6) Crab Yaws.

Jaleema, male, adult, Chamar, was first seen by me on 23. VII. 1909, convalescent from yaws. Prior to the outbreak of the eruption, he had an ulcer on the left ankle. Yaws formed all over his body in May. Some formed on the palms and soles. Now all the yaws have dried up. The yaws on the soles of the feet healed last, but on the sites of these the skin readily breaks down, forming sores.
SHORT NOTE ON A CASE OF FILARIASIS.

An elderly woman, coolie, sought sick leave stating that she was "passing worms in her urine". She had come from Central India about two years previously. On examination of her urethra, nothing abnormal could be seen. The urine was, however, found to be chylous. Two days later I was informed that a worm was in process of being passed along with the urine. On examination I found that the urethra was partially plugged by a fibrinous cast which came away readily on gentle traction. A sample of the blood taken at night was found to be full of filariae.

The woman left the district some months later. Filariae were present in the blood at night on the occasion of the last examination.
NOTES ON CASE INCIDENCE AND MORTALITY OF LOBAR PNEUMONIA AMONG COOLIES FROM NINE TEA ESTATES IN CACHAR,
from 7th September, 1901, to 19th March, 1910.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cases</th>
<th>Deaths</th>
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<tbody>
<tr>
<td>1902</td>
<td>342</td>
<td>89</td>
</tr>
<tr>
<td>1903</td>
<td>136</td>
<td>28</td>
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<tr>
<td>1904</td>
<td>73</td>
<td>17</td>
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<tr>
<td>1905</td>
<td>27</td>
<td>7</td>
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<tr>
<td>1906</td>
<td>45</td>
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<td>56</td>
<td>9</td>
</tr>
<tr>
<td>1908</td>
<td>130</td>
<td>18</td>
</tr>
<tr>
<td>1909</td>
<td>294</td>
<td>43</td>
</tr>
<tr>
<td>1910</td>
<td>33</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1136</strong></td>
<td><strong>228</strong></td>
</tr>
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</table>

Case Mortality 20.07 per cent.

The coolie population on each of these estates varies from 800 to 2000 souls.

There are twenty-three main and out gardens in this practice. Figures collected from the gardens not included in above list are unreliable.
NOTES ON MORTALITY FROM CHOLERA
AND ON THE PREVENTION OF SPREAD OF THE DISEASE
AMONG TEA GARDEN COOLIES IN CACHAR.

Cholera Mortality Figures:

<table>
<thead>
<tr>
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<td>1903</td>
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<td>1906</td>
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<td>1908</td>
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<tr>
<td>1910</td>
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<td>0</td>
</tr>
<tr>
<td>to mid March</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>Total</td>
<td>303</td>
<td>135</td>
</tr>
</tbody>
</table>

Death percentage among attacked 44.55.

The above figures are taken from the sick and death returns of nine tea gardens.

Prevention of spread of Cholera among Tea Garden Coolies, in Cachar.

Segregation House: A house for the reception of cholera cases should be erected a quarter of a mile away from the lines, and the wells, tanks or streams which constitute the water supplying sources of the garden.
Stock of Building Materials: Building materials for the erection of extra cholera houses should be stocked near the proposed segregation site. These materials are usually jungle timber, or large bamboos, smaller sized bamboos, sungrass, cane, cow manure. It will not be necessary to stock these materials which the immediate neighbourhood provides, but as a rule sungrass, cane and cow manure must be stocked.

Stock of combustible materials: A stock of combustible materials, which must be cheap, easily procurable locally and capable of absorbing moisture, as rice huskings, sawdust, the waste from sugar cane presses, should be kept near the cholera segregation site. Failing being able to procure these, sand or earth, which is not mixed up with clay, should be collected near the cholera site. Empty kerosene oil tins can always be obtained on a tea estate at a cost of 2½d. to 3d. each.

Soiled Clothes to be boiled: After examining and prescribing for the patient, all his soiled clothes should be boiled in water in kerosene oil tins, and those of his attendants should be treated in like manner at the cholera house.

A Cholera Bed: The legs of the bed, which usually costs ten pence, on which the patient has been
brought along should be cut short so that a layer of combustible material can be interposed between the earth floor and the bed on which layer the rope network of the bed rests.

**Heating arrangement:** In cold weather a layer of heated sand under the bed will keep the bed warm for hours. Hot water bottles are useless, as patients are often very restless. Sand or dry earth may be employed where combustible and absorbent materials are not at hand.

**Prevention of Fly Carriage:** Should soakage of stools through this layer of combustible material, earth or sand occur, fresh dry layers must be thrown down immediately to eliminate the danger of flies conveying the disease.

**Disposal of dejecta, etc:** In the night the material fouled by discharges from patient must be burned or buried, and a fresh layer of same must be spread under the bed. This further eliminates the danger of fly carriage of the disease. Five percent formalin in open vessels may be put on floor to kill flies.

**Inspection of Patient's House:** The patient's house in the coolie lines must be visited. Should any vessels containing water be found, these must be put and kept on a strong fire till the water boils.
All food stuffs found should be destroyed by fire. The house should be cut down and set fire to if this can be done without endangering the destruction of other houses near by. If the house cannot be burned, it should be unroofed and a fire of jungle rubbish lit on the spots on the floor where evacuations from the patient have been passed. Quick lime may be spread over the floor of the house. Any trees shading the house should be cut down so as to expose the floor to the sun's rays.

Water Supply: 1. Well disinfection, &c: The well from which the patient drew his drinking water must be visited. If potassium permanganate be available, this may be thrown into the well, dissolved in a bucket of water. If not available, a bottle of kerosene oil thrown into the well will prevent other coolies from attempting to drink the water.

2. Tank disinfection: Should the patient have drawn his water supply from a tank, this, if small, may be permanganated or sprayed with oil; if large, drained and cleaned. In the event of the tank being the only source of water supply available, boiled water should be served out to the coolies in the morning, and when they return at midday and in the evening.

3. River: Should the patient have drawn his
drinking water from a river, and should the river be the only source of water supply, long platforms of bamboos, from the far end of which water can be collected, should be run into the stream. This water should be boiled and served out to the coolies.

**Milk Shop:** A list should be made of the coolies who buy milk from the milk seller who had the patient's custom.

**Staff:** The coolies employed in collecting, boiling and distributing water must be of good caste.

**Observation Cases:** Should the source of supply of patient's drinking water have been a well, a list of the people who drew water from this well should be made, and the condition of their health enquired into for five days after the date of onset of patient's symptoms. The patrons of the milk seller should be kept under similar surveillance for a like period.

**Rules for Attendants on Patient:** The attendants on the patient must be made to wash their hands in soap and water, then in plain water and in corrosive sublimate lotion 1 in 1000, and again in plain water before eating. These attendants must cook their food and keep their boiled drinking water some distance away from the cholera house, or their food may be cooked for them in the coolie lines. In the
latter event water must be boiled in the vessels used by the attendants before the vessels are returned to the lines.

Boiled Water Supply to labour force at work: Boiled water must be served out to the coolies at work on the garden during the day to stop them from drinking from impure collections of water in drains, puddles, etc.

Convalescence precautions: Should the patient survive, he should be segregated for a month in the cholera house along with his attendants.

Disposal of excreta: His excreta should be passed on combustible material and destroyed by fire or passed into kerosene oil tins containing a little earth and these tins put and kept on a fire till their contents have been thoroughly boiled. When stools are passed, earth, sand or combustible material must be thrown over the stools. Water may be poured over the stools, when the same must be boiled.

Disposal of dead: Should the patient die, the disposal of the body most agreeable to the Hindoos and most to the interests of the public health is destruction by fire.

Disinfection of Cholera house site: When the cholera house is no longer required, it may be set on fire and a new cholera house erected on the segregation area.
Extra accommodation: A new house can be got ready for patient before he returns to the lines, or his old house can be rethatched. All the patient's clothing and that of his attendants must be boiled before he returns to the lines.

Preventive Inoculation.

This was performed by Hoffkyne on some tea gardens in this district in 1894. At that time coolies were more tractable than at present, yet on one garden then where the coolies were offered opportunities for being inoculated, they disappeared into the jungle by day, visiting their homes only at night, until the inoculator had left the garden.

In attempting to estimate the advantages of inoculation, the facts that the number of admissions to hospital from cholera vary widely in different years, and also that the disease is subject to great variations as regards severity of type at different times, must not be lost sight of. On one garden in this district, in 1897, over 80 people died from cholera. Since that time no cholera epidemic on this garden has occurred. In 1909 (see mortality list) there were 23 cases, and among these, 4 deaths on nine gardens. On another garden, five years ago, out of 21 cases, 20 died.
Inoculation never won the approval of the coolies, and unless the protection conveyed thereby in the future be permanent, never will.

Cholera occurring in the cold weather months in Cachar is attended by a much higher mortality than when the disease occurs during the rains.

A reaction occurring in the urine of Cholera convalescents on the addition of Pure Sulphuric Acid thereto:

This I first observed some years ago. It was present in every case of cholera in the urine examined in the convalescence. It is also found, however, in some cases of chronic dysentery in the urine.

On adding the urine of a cholera convalescent to some pure sulphuric acid, a claret colour develops. It is deepest in the urine which is first passed after the attack, less marked in urine passed later, and finally no reaction is obtained within a few days. Possibly it depends on the excretion of some derivative of indol in the urine. Its constant presence in the urine of cholera cases is remarkable.