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A T H E S I S

Presented for

M. D. D E G R E E, Edin. 1 9 0 9

by

C. W. HUNTER, M. B. C. M. Edin. 1886.

District Surgeon Koffyfontein

Medical Officer Koffyfontein Mines Limited.

S U B J E C T..... S C U R V Y

Kindly typed by my friend

S. W. Kachelhoffer Esq

Attorney etc.

KOFFYFONTEIN

Scurvy which was formerly so common in Europe that every Medical Practitioner was intimately acquainted with it,has of recent years become so rare, that one only reads of it in text books on Practice of Physic, or occasionally sees an account of some isolated case in the Medical Journals, or the forms usually referred to as " Infantile " or " tea "scurvy.

In South Africa which is essentially a country of feast or famine, so much depending on the rainfall which is very irregular, especially in the higher plateaus, and where as long a period as two years have passed without a drop of rain falling, and as the South African native is always the first to feel the famine, from his not having been sufficiently educated to think of laying past for a rainy day.--Scurvy is by no means uncommon amongst them.

It was not however until after the late Boer War broke out that the disease appeared to any marked extent as if in epidemic form.

At that time owing to the difficulty experienced in obtaining proper food, a serious outbreak of scurvy occurred amongst the native employees of Koffyfontein Diamond Mines. During the three years war, and for some time after its termination, a great many cases of scurvy came under my care in the Mines Hospital. Some of the cases developed the disease while working in these Mines, while others arrived from nearly all

parts of South Africa, with evidence of Scurvy upon them.

The method of recruiting labour by means of Agents, necessitating that natives recruited by them must be taken in and treated if they are not found fit to work on their arrival, brought me in contact with a great many cases, and the disease proved so interesting that I have decided to make it the subject of my Thesis.,

Scurvy first appeared in Koffyfontein Mines during the late Boer War owing to the difficulty experienced in obtaining fresh vegetables, especially potatoes, in the early summer months. Market gardening and especially potato growing was not carried on, on a sufficiently large scale in the Orange Free State to cope with the demand, farmers on their return from the war contenting themselves with small patches sufficient only for their own use, and fresh vegetables imported from other Colonies, such as Cape Colony, were too expensive and perishable to be bought in sufficient quantities to feed large numbers of natives. And again Maize or Mealies, which are sun dried, the chief diet of the South African native had not been grown during the long continued war, and had to be imported from America, now it was that Scurvy first made its appearance to any extent amongst the natives. American mealies, which are Kiln

dried, that is dried by artificial heat in large ovens were observed to, or appeared to predispose to Scurvy, either owing to the removal of certain constituents in the process of drying or by the formation of some fungus on the mealies. From whatever reason, it was found that natives fed on these mealies rapidly developed Scurvy.

Another predisposing cause is the great change of temperature between day and night in the early summer, in the day time the temperature is often as high as 95 °F in the shade, while at night it may reach as low as freezing point ~~most intense~~, and this at an elevation of 4000 feet above the sea level where the climate is very dry and the cold at freezing point most intense, this sudden change of temperature is most keenly felt by the native, who is at all times insufficiently clad. During the day time he works with nothing on but a loin cloth or pair of trousers, and at night wraps himself in a cotton blanket and sleeps as near an open wood fire as he can get. It has also been noticed that natives who have been resting at their kraals or houses, as they often do for months at a time, and where they are fed almost entirely on mealie meal or stamped mealies, rapidly developed Scurvy on resuming hard labour, such as they have in a Diamond Mine, although on admission they had the appearance of being in the best of health.

Whereas the native whose muscles were in good training, although he looked thin and scraggy, did not develop the disease; so that sudden change from idleness to hard work is a predisposing cause.

Overcrowding in badly ventilated rooms, such as is often found in Compounds where natives are housed in large numbers, may also be added to the list of predisposing causes. The exciting causes are want of fresh vegetables and fresh meat and milk (of fresh vegetables, potatoes are of the greatest importance see treatment.)

DEFINITION :-- On looking through various Text Books one is struck with the very varied definitions given to this disease, thus :--

1. Bristowe, " The Theory & Practice of Medicine " 1882, defines it as a peculiar form of Anaemia arising from a deficiency of vegetable diet and attended with a tendency to recurrent haemorrhages, profound impairment of nutrition and great mental and bodily prostration.

2. Munro :-- As a constitutional condition, induced by prolonged deprivation of fresh food, and characterised by general debility, Anaemia, swelling of the gums, and haemorrhages.,

3. The Practitioners Guide:-- As an Apyretic and

non-contagious disorder, consisting of mental depression, extreme debility, a temdency to syncope, and special lesions of the mouth, skin, and muscular system, indicative of a morbid change in the composition and properties of the blood.,

4. Tilbury Fox in his Manual on Skin Diseases 1873 says:-- Scurvy has the same general symptoms as severe Purpura, but it however can be readily distinguished from Purpura by the following characteristics.

1st It is always caused by privation of fresh vegetable food.,

2nd The gums are always swollen, spongy, and bleeding.,

3rd There is always great lethargy and prostration, and the skin is of a dirty dusky looking pallor, these features are not observed in Purpura.,

5. Thomas Barlow writing in Keatings " Cyclopaedia of the Diseases of Children " says:-- Scurvy is a disease which in adults is characterised by great anaemia, sallow, muddy complexion, extreme debility, and proneness to syncope, sponginess of gums, and ecchymoses in various parts of the body, but especially in the lower limbs in which also brawny indurations occur. It has a definite relation to the deprivation of fresh vegetables, and is almost immediately ameliorated by their administration, but appears

to be controlled also by fresh raw meat, and by fresh milk.,

Of more recent writers

6. Flemming, Robert A. in his Manual " A Short Practice of Medicine " 1906 says :--

Scurvy is a morbid condition, characterised by increasing debility, anaemia, breathlessness on the slightest exertion, and sponginess of the gums, with a tendency to haemorrhages in various situations.,

7. In a " Handbook of Medicine & Therapeutics " 1908 by Alexander Wheeler and William R. Jack, the disease is defined as -- A constitutional affection, characterised by great debility, a spongy condition of the gums, a tendency to haemorrhages and cachexia.,

From these definitions it will be seen that some writers define the disease as a peculiar form of anaemia, others as a morbid constitutional state accompanied by anaemia, while others look upon it as a disease, consisting of certain well marked symptoms and lesions, indicative, of a morbid change in the composition and properties of the blood.,

That Anaemia is not a cause but a result of the disease is the conclusion come to by the writer, after examination of several hundreds of cases. There is no evidence of anaemia at the commencement of the disease, there is rather a fullness of blood, as is

seen in the congestion of the gums, although there is no doubt a change in its properties and composition as is seen in its reduced coagulability, and the difficulty in arresting haemorrhage.

The conjunctival mucous membrane also is not pale but on the contrary is of a bright red colour.

Again Scurvy is defined as an apyretic disease--Now nearly all the cases seen here continued to work until compelled to seek assistance on account of a feverish state, very often when first seen, the patient would have a temperature varying from 100 ° F to 105 ° F, or even higher, with this high temperature the tongue remains clean and moist, the intellect clear, and his only complaint is pain in his head and neck, and weakness, (malaise) in addition he may complain of pain in the calf of the leg, or in he the thigh, or elsewhere. Very often this temperature keeps up until haemorrhage takes place, most commonly from the nose or from the gums.,

The temperature is greatly influemced by changes in barometric pressure, thus before a thunderstorm in the summer months, when the temperature of the air is high, and the barometer is falling, Scurvy patients will be found to have very high temperatures, and as soon as the atmospheric disturbance has passed over there is a sudden fall in their temperatures.,

No. A

KOFFYFONTEIN MINES, LIMITED.

Patient's Name 961   Date of Admission 17th Feby 09

Name of Master K. W. L.   Date of Discharge 6th March.

DISEASE Scurvy   Cured.

18/2/09 Bleeding mix

23rd 2/09 " " + quinine + iron.

22nd

23rd

(Calcium Chloride gr. xl.)

March

No. A

KOFFYFONTEIN MINES, LIMITED.

Patient's Name 961

Date of Admission 17th Feby 09

Name of Master K. M.h.

Date of Discharge

DISEASE Scurvy

17/2/09 Tonic = (Quinine Gr ii. Tr Ferri Perchlor. M 15.)

18/2/09 Bleeding Mix

Bleeding from gums when admitted and continued doso until 2[illegible] Feby.

2 hourly Temp:

20th

21st XXX grs Calcium Chloride

22nd

This feverish state might be attributed to a disturbance in the heat regulating mechanism of the body, caused by the profoundly impaired state of nutrition, and the great mental and bodily prostration, and it is possible that as he continues his work notwithstanding this feeling of great prostration, under the intense heat of a South African sun, that with his heat regulating mechanism out of order, a heat apoplexy, may be the true cause of the fever. From whatever cause there is undoubtedly fever at the outset of the disease, and it usually continues for some days after his admission to Hospital.

If the temperature is taken at short intervals it is noticed that there is an almost continual change in it as is seen in chart (a) where the temperature has been taken every two hours.,

No. A. B

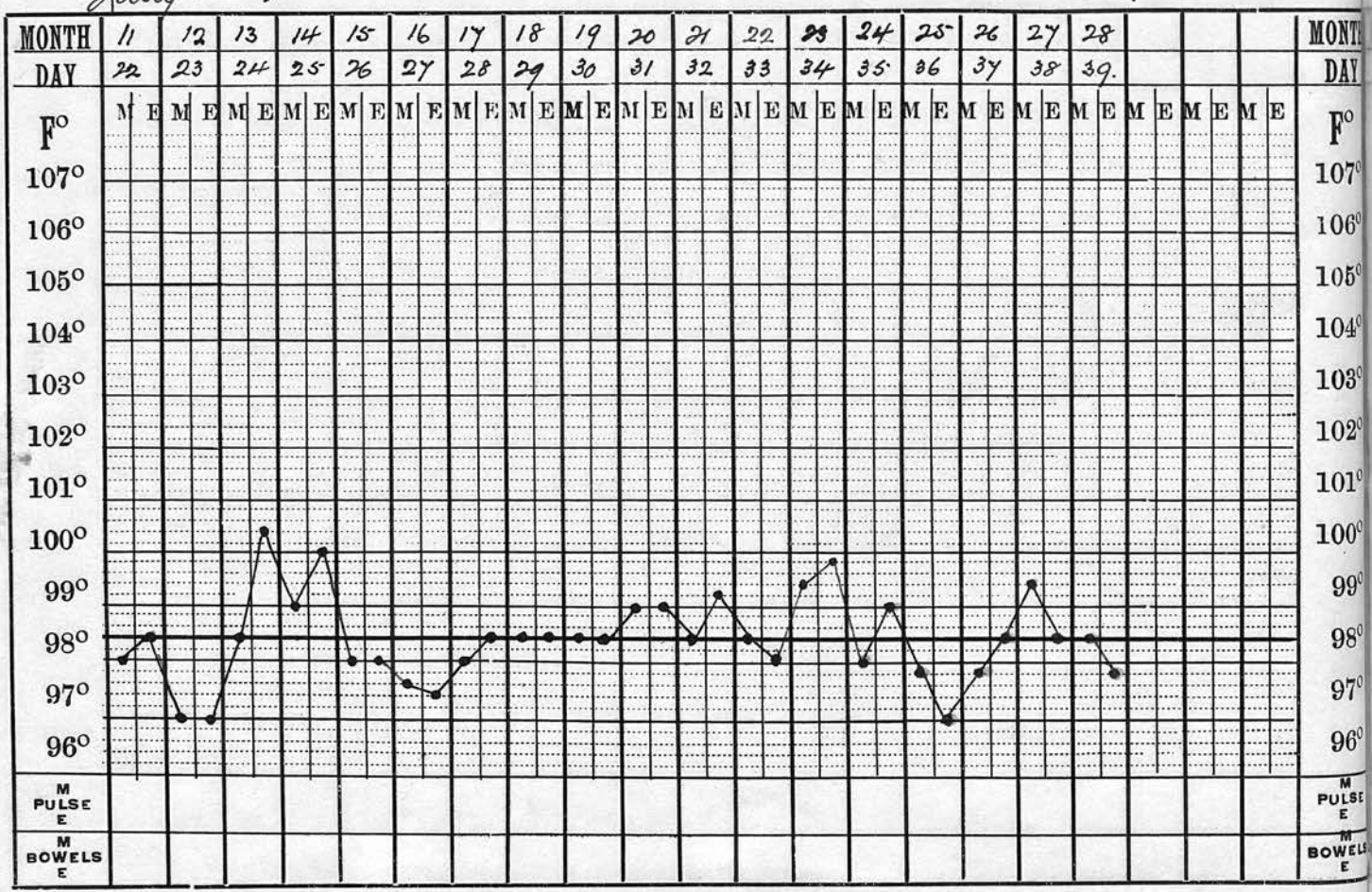
KOFFYFONTEIN MINES, LIMITED.

Patient's Name No 490 Date of Admission 21. 12 08.

Name of Master K.W.Lt Date of Discharge 28. 1. 09

DISEASE

Jany. Bronchitis Discharged.



No. A. B

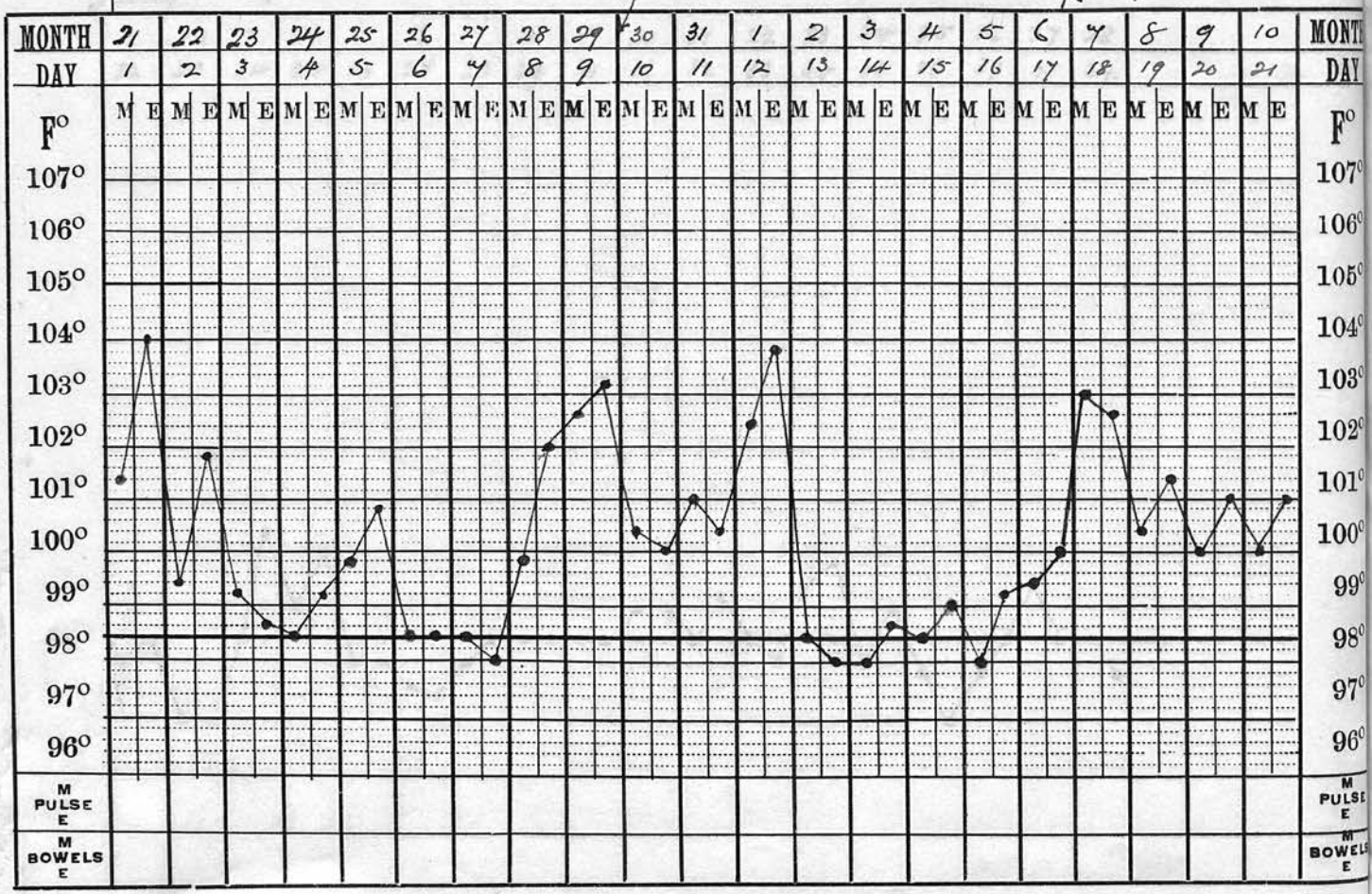
KOFFYFONTEIN MINES, LIMITED.

Patient's Name No 790 — Date of Admission 21. 12. 08.

Name of Master K. M. Ltd. — Date of Discharge 28. 1. 09

DISEASE Scurvy.

21/12/08 Admitted with Scurvy leg, bleeding gums, intense pain in head neck.



Dr Neil Macvicar Resident Medical Officer of the Victoria Hospital Lovedale C. C. published notes on scurvy in the South African Medical Record 25th April 1906, in which he mentions that a rise of temperature was observed in most of the cases (35 in all) This agrees with our own experience that fever is present in nearly all the cases treated here.

As we have natives working in these mines who come from nearly all parts of South Africa it is possible that some of them have a latent Malaria in their blood which would to some extent account for the fever although the type of fever is not generally that of Malaria, but this would not account for the fact that fever is an almost constant symptom in them all.,

CLINICAL FEATURES :-- The modes of onset as they have appeared here present very varied types.

TYPE 1. The patient on admission complains of intense pain in the head and neck, with swelling of the muscles of the neck, usually accompanied with more or less fever, and pains all over his body. See Chart B.

TYPE 2. Complains of pains of a rheumatic character in the back, chest, and legs, generally one leg only being affected.

TYPE 3. In this the patient is admitted into Hospital with a temperature of 104 to 105°F, which remains high until haemorrhage takes place, either

No. 6.

KOFFYFONTEIN MINES, LIMITED.

Patient's Name No. 462 Date of Admission 1st Feby 1909

Name of Master K. M. Ltd Date of Discharge 12th Feby 1909

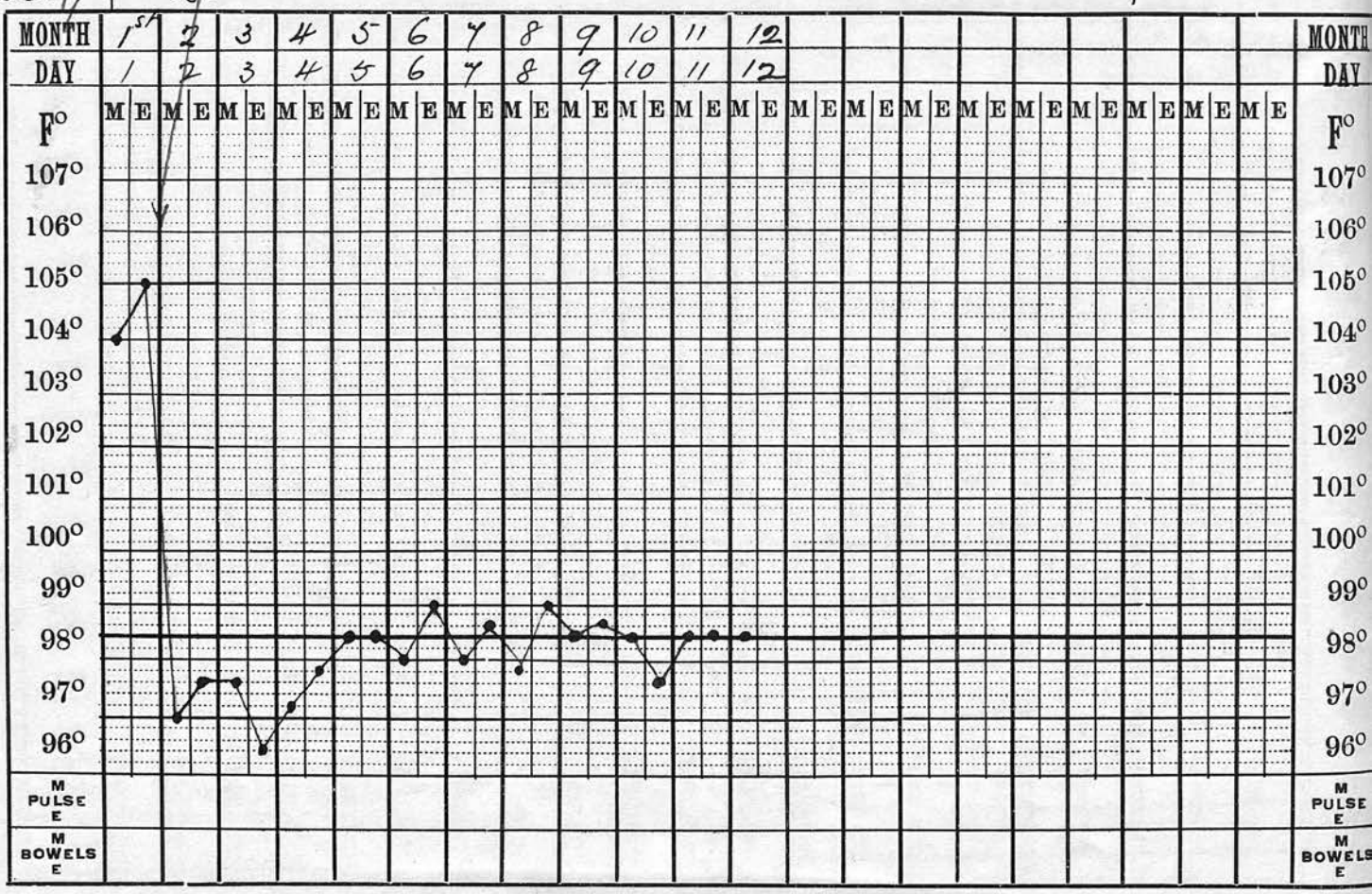
DISEASE Scurvy.

1st Cold Sponging.
2nd Bleeding Mixture (Calcium Chloride)
3rd Quinine & perchloride of iron.

Diet.
Routine.

Feby

Epistaxis



No. D.

KOFFYFONTEIN MINES, LIMITED.

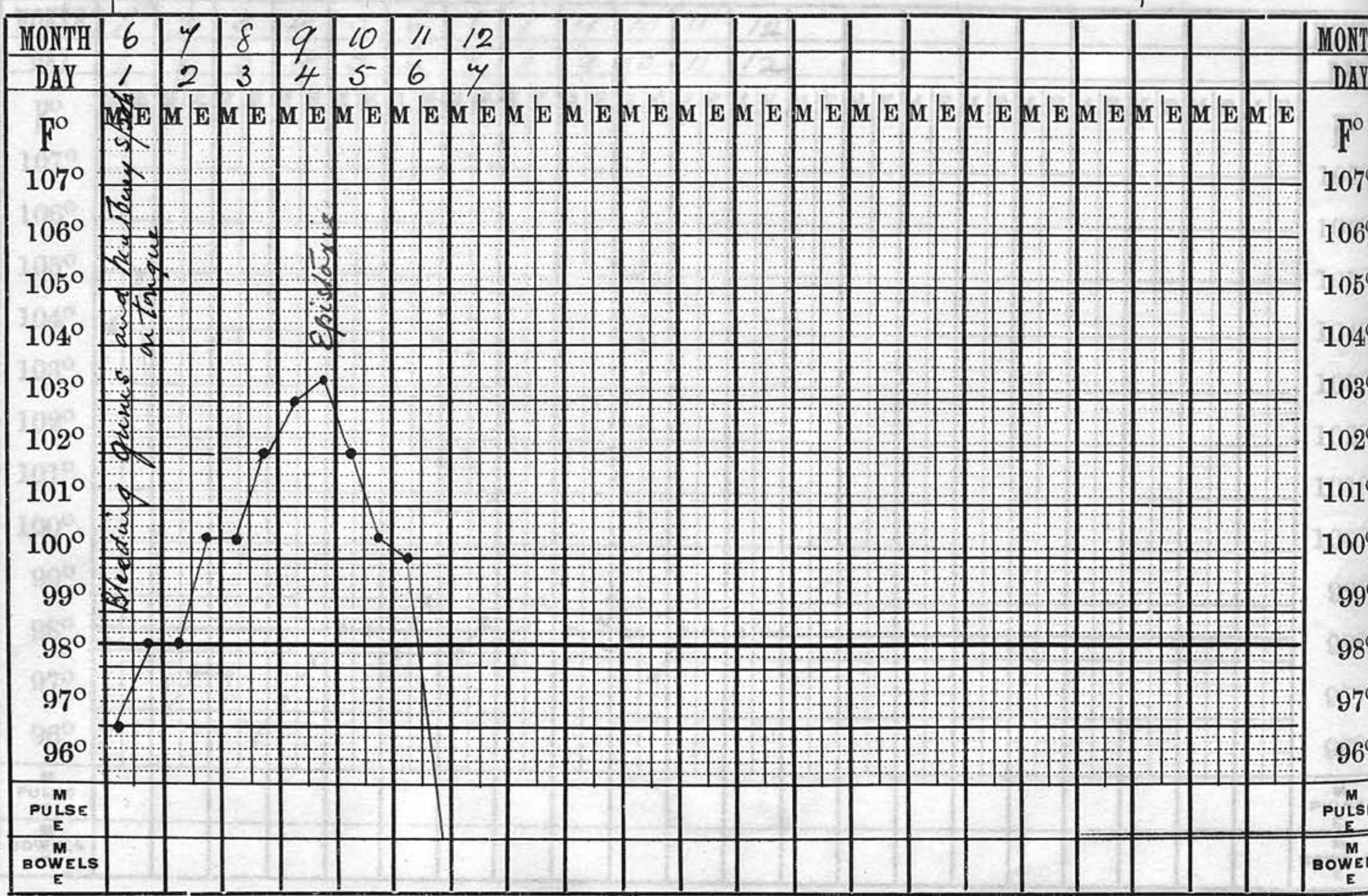
Patient's Name No 1392.

Date of Admission 6th Feby 1909.

Name of Master K.M.D.

Date of ~~Discharge~~ Death 11th Feby 1909.

DISEASE Scurvy.



Died of Syncope.

from the nose, or gums, often he has no pain and does not even complain of headache, although his temperature is so high. See Chart C

TYPE 4. In this the patient is admitted bleeding from the nose, or gums, or from both, with no temperature, but generally develops fever, after he has been in Hospital for a time. See Chart D.

COURSE. In a large proportion of cases, fever has been a very constant symptom when the patient first presented himself, and it has been observed that if the temperature be taken at short intervals, say every two hours, there is continually rising and falling, as is seen in chart A. In some cases, especially in those who are admitted with a very much swollen and inflamed leg, the temperature only comes down as the swelling of the leg subsides, in others, there is a sudden fall in temperature, when bleeding takes place from the nose, or gums, and after a severe haemorrhage, it may remain normal, or subnormal, throughout the remaining course of the disease.,

Haemorrhage from the nose, which is often one of the first symptoms to attract one's attention to a diagnosis of Scurvy, takes place as far as one can ascertain from the Ethmoidal veins, and is usually so severe, that unless the nose is plugged, or some strong haemostatic is injected into the nostrils may

continue until the patient is pulseless.,

Haemorrhages may also occur from other partsof the body, as has been already mentioned the swelling of the leg, thigh, and popliteal space, is caused by extravasation of blood, into, and between the muscles of these parts, or into the fasciae covering them, causing the enormous proportions which these swellings reach, and it is often possible to make out fluctuation on palpating them, although in some cases, the swelling is of the nature of a brawny induration, due to deep seated extravasations.,

Haemorrhages may also take place from the stomach bowel, kidney, and urinary tract, around the eye, and into the eyeball, into the spleen, sometimes causing rupture of that organ, into the liver, peritoneum, and pleura, where large quantities of sero-sanguineous effusions are found, into the brain, and on to the brain surface, these two last being a most common cause of death from scurvy.,
More rarely Haemorrhage takes place at the angle of the jaw, into the flexor surface of the elbow joint, and under the periosteum of the femur, or tibia.

Petechial patches appear on the surface of the tongue, most usually on its dorsum and are also found in the mucous membrane of the lips, cheeks, and soft palate, these vary in size from a split pea, to a

mulberry, and have exactly the appearance of a mulberry, being lobulated, and filled with dark coloured blood, they burst and bleed freely, after which they readily heal up.,

PETECHIAL and PURPURIC spots appear on various parts of the body, especially on the lower limbs, but are also ocasionally to be seen on the abdomen, back, chest, arms and face. Large discolourations which are more extensive superficial haemorrhages, occur especially on the shins, the skin over which becomes dry and glazed, and ulcerates after the slightest scratch.,

The gums present a characteristic appearance, at first, they present swollen and congested points, projecting between the teeth, then they become bulging, deeply congested masses, which overhang the teeth, bleeding is often observed to begin from these pointed projections, and to gradually spread along the whole congested edge, the bleeding may continue for days despite all treatment until the gums are quite blanched. Ulceration now takes place along the edges, forming semi-circular sloughing ridges around the teeth, these ulcers are of an indolent type, and as they heal, cause retraction of the gums from the teeth.

The Spongy or honeycombed appearance of the gums, does not usually become evident until after the bleeding and during the ulcerative stage and it is then

that they have the dirty greyish green colour, and the spongy appearance may be seen, long after the patient has recovered from all other symptoms of scurvy, and has resumed his work.,

Following the retraction of the gums, the teeth may become loose and sometimes fall out, there are however certain tribes, such as the Basutos, and Zulus, whose teeth are so strong and firmly set in their jaws, that they are at all times most difficult to extract in health, and it is noticed that amongst them the teeth rarely become loose.,

On examining the leg, a hardness of the muscles and tenderness, is all that can at first be felt in the calf, but soon the whole leg is seen to be swollen, tense, glazed, and acutely painful, the superficial veins become engorged, and so painful, that the patient cannot bear them to be touched, sometimes the swelling is confined to the innerside of the thigh, or to the popliteal space, and the leg or thigh may develop great proportions, measuring often three times the size of the normal leg.

On aspirating such a swelling large quantities of dark coloured altered blood, may be drawn off. The glands in the inguinal region become enlarged and tender, but they never suppurate. There is a feeling of great depression, and tendency to fainting. It is not uncommon to find a scurvy native, while waiting in the out patient room to be admitted into

hospital, suddenly fix his eyes, break out in a profuse perspiration, and were he not caught hold of and placed on his back, would faint.

The tongue is at first clean, and moist, and free from flabbiness, even although the patient may have a very high temperature, but later it becomes paler than normal, flabby, and indented by the teeth.

The bowels are usually constipated, and the appetite good.

The breath is most offensive from the ulceration of the gum.

The patient often complains of great tenderness over the spleen, which is sometimes large enough to be palpated, although, this is not so often made out as one would expect, considering the frequency with which this symptom is met with.

In one instance the spleen enlarged so as to reach within two fingers breadth of the umbilicus, the enlargement developed during two or three weeks, with a remittent temperature, ultimately the swelling appeared to be fluid, and it being suspected that an abscess had formed, an operation was performed, and a pint or more of altered blood let out, it appeared on examining the cavity, that the spleen was disintegrating although it was difficult to decide, which of the material was spleen, and which blood clot, the patient recovered from operation, but gradually became weaker during the following three weeks

and died.

It is after repeated haemorrhages that the patient becomes so markedly anaemic, and his gums get to be of a dirty grey colour, he now also becomes very breathless, and has a great tendency to syncope on the slightest exertion, when even raising his head from his pillow to be fed, may cause fatal syncope , there is now anasarca around the ankles, rapid and feeble pulse, haemic murmurs, the appetite has gone, diarrhoea has probably set in, mixed with blood, and having a very offensive odour. The tongue has become dry, red, and cracked on its dorsum, the skin of the legs becomes dry and scaly, and that of the soles of the feet, dries and separates like a piece of sole-leather. He also complains of nyctalopia, and hemeralopia, is occasionally delirious, his strength gradually fails, and he dies from asthenia, .

But death is far more frequently due to internal haemorrhages, the most common being cerebral haemorrhage, or to syncope, or to complication, of which meningitis, and pneumonia, are the most frequent, and following this last pulmonary phthisis may set in.

Of twenty two deaths from scurvy where post mortem examinations were held by me
10 were due to cerebral haemorrhage
7 " " " syncope
1 was " " Pneumonia

1 was due to Hepatic Haemorrhage

1 " " " Splenic Haemorrhage with rupture of the Spleen.

1 " " " Haemorrhage of the stomach

1 " " " meningitis.

Recovery is usually rapid under suitable treatment, three weeks being the average stay in Hospital, but this may be prolonged to as many months, under unfavourable circumstances. It has also been noted how rapidly scurvy convalescents put on fat.

COMPLICATIONS of SCURVY :-- besides meningitis and pneumonia already mentioned, pleurisy with or without effusion, bronchitis, gangrene of the lung, peritonitis, inflammation and enlargement of the spleen, Chronic and indolent ulcers of the legs, bedsores, and inflammation and suppuration of the middle ear, are the most frequent.

Fractures occurring in a scurvy patient do not unite and the union of ~~the~~ an old fracture may break down. Old cicatrices also readily break down and form ulcers, and amputations performed on scurvy subjects are very slow to heal.

MORBID ANATOMY:-- The first thing that strikes one on making a post mortem examination on a scurvy cadaver, is the ecchymoses, and purpuric spots seen on almost any part of the body. On section, these are

found to be extravasations of dark coloured liquid blood, varying greatly in size, and found not only under the skin, but into and between the muscles, under the periosteum, into mucous and serous membranes and serous cavities, into internal organs as brain, lungs, heart, liver, kidney, spleen, and into the alimentary and urinary tracts, and more rarely into joints.

Large haemorrhages have more especially been found on the brain surface, the brain itself being healthy, into the Spleen, causing great enlargement and disintegration of that organ. In one recent post mortem examination held on a scurvy patient who had a large and tender spleen, but was to all appearances progressing favourably, until in the middle of the preceeding night when he complained of acute pain in the abdomen, and expired a few minutes afterwards, his Spleen was found extending to within one inch of the umbilicus, and on slitting open the capsule, the whole spleen was found to be a disintegrating mass, mixed with dark liquid blood, and the contents of the capsule could be emptied out with ease.

On opening the pericardium, the sac is often found to be filled with a straw coloured serum, sometimes blood stained, while evidences of pericarditis are seen, on the walls of the heart, and pericardium. The heart is often in a state of fatty degeneration, sometimes it is pale, soft, and flabby, and in a large

proportion of cases examined, an organised blood clot is found, sometimes large enough to fill both auricle and ventricle, the largest being found in the right side of the heart, frequently the right side of the heart is filled with dark coloured liquid blood while the left side is empty.,

In most cases where death has been due to syncope, organised clots have been found, and it has been thought, that death has been caused by these clots, obstructing the passage of blood through the valves.

Decomposition is rapid after death from scurvy, no definite lesion has been found in the walls of the blood vessels, the blood has the appearance of a secondary anaemia.

Blood stained fluid is frequently found in the pleural and peritoneal cavities, and firmly coagulated blood clots are occasionally to be found in muscles.,

The Mucosa of the gums is thickened, spongy and ulcerated.

PROGNOSIS:-- The tendency to internal haemorrhages, and to sudden syncope, should always be borne in mind in making a prognosis in this disease, even where the case is seen early, and everything has been done in treatment, and where the patient is to all appearances doing well, sudden syncope or a serious inter-

nal haemorrhage, may terminate the disease in disappointment. An absolutely favourable prognosis, should therefore never be given, even in the mildest looking case, until all active evidencesof the disease have disappeared.

DIFFERENTIAL DIAGNOSIS

1. ANKYLOSTOMIASIS,-- In this disease according to Sir Patrick Manson in his book on tropical diseases 1903 the essential symptoms are those of a progressive anaemia generally associated with dyspeptic symptoms, appetite sometimes defective more often ravenous, colic, borborygmus, diarrhoea, melaena, but rarely with extensive haemorrhage, unless complicated by colitis, serous effusions into different organs, fatty degeneration of heart, and syncope, pain or uneasiness in the epigastrium, generally increased by pressure. Later profound anaemia, skin pallid, face puffy, feet and ankles swollen, and all the subjective symptoms of a definite anaemia, become more and more apparent. Slow and steady fall of the corpuscular richness of the blood.

Roger has pointed out that in this disease the loss of haemoglobin is in excess of the loss of red corpuscles.

In uncomplicated cases there is no wasting of the body, no excessive leucocytosis. The worm is common in many warm countries, and is usually associated

with damp.

The ova of the Dochmius Duodenalis in the stools render the diagnosis easy.

2. BERIBERI is described by Flemming in his book entitled " A Short Practice of Medicine" as an endemic and epidemic peripheral Neuritis occurring in tropical and subtropical countries, but differing from the other varieties of multiple neuritis, by the special involvement of the vagus, phrenic, and vasomotor nerves, by great liability to oedema, and a tendency to cardiac dilatation which may be fatal.

Sir Patrick Manson describes two varieties of cases, Paraplegic, and dropsical, in the former besides paraplegia of greater or lesser degree, there is anaesthesia or numbness of the skin, particularly of the front of the tibia, dorsa of the feet, sides of the thighs, finger tips, with areas on the arms and trunk, thinness of the calves and flabbiness of the gastrocnemii, with pain on deep pressure, over the calves and thigh muscles, and degeneration of the muscles, with absence of knee reflex and ankle clonus, and with as a rule all the deep reflexes lost, but with, except in extreme conditions of paresis, and muscular atrophy, the superficial reflexes more or less active. In the latter there is oedema which is somewhat firmer than that in acute nephritis, dark scanty urine, with a high specific gravity, but no

albumen.

The oedema does not often involve the scrotum, is occasionally localised and fugitive, with the same symptoms of peripheral neuritis, and of dilatation of the heart, as in the other case. There may also be mixed paraplegic and dropsical cases. This disease is due to an organism which however has not yet been discovered.

In neither of these cases are haemorrhages under the skin, into the muscles, internal organs, from the gums, or nose, present, nor is there any evidence of spongy or sloughing gums as in scurvy.

TREATMENT:-- As this disease has long been known to be caused by improper dieting, the most important consideration in its treatment, is the restoration of a suitable diet, which will bring back to the system those constituents, from which it has been deprived, and which are necessary to maintain the body in a state of health.

Burney Yeo in his book on " Food in Health and Disease " quoting Parkes's Hygiene 6th edition by De Chaumont says:-- Certain salts, such as the lactates, tartrates, citrates, and acetates, become converted into carbonates within the body, and confer upon the system that alkalinity, which appears to be necessary to the integrity of the molecular currents.

The state of malnutrition which in its highest

degree we call scurvy, appears to follow inevitably on their absence, and as they exist in fresh vegetables, it is a well known rule of dietetics, to supply these with great care, although their nutritive power otherwise is small.

Again the same Author states-- That the Potato is chiefly valuable, in supplying the anti-scorbutic element in its cheapest form, and to obtain this anti-scorbutic element the Potato must be properly cooked. Within and surrounding the cells of the Potato, is a juice or fluid, the albuminous constituents of which are coagulated during the process of cooking. The watery part of this juice is absorbed by the starch granules, which swell up, and distend the cells in which they are contained, so that they no longer adhere together, and the result is the loose flocculent mass, which is described as a "floury" or "mealy" potato.

In the treatment of this disease, we have introduced a large quantity of potatoes into the daily diet, and have found the following diet table most suitable as a routine

HOSPITAL VICTUALLING SCALE

Meat	Bread	Potatoes	Carrots & Onions	Milk	Sugar	Tea	Lime Juice
¾lb	11oz	½lb	5oz	½pt	1oz	⅛oz	1oz

The meat and vegetables are made into a stew, for those Patients who are in a fit state to eat meat,

Carrots and onions have been given owing to their also having great anti-scorbutic properties, and because they are nearly always procurable at a reasonable price, and because a scurvy native will eat them in preference to green vegetables.

Other vegetables and fruits which are known to have anti-scorbutic properties have not been tried, owing to the difficulty in procuring them except at certain seasons of the year, or because they were too expensive to feed natives on.

For those who are unable to eat meat and vegetables, either from the state of their gums, or from other causes, fresh cow's milk, with mutton broth, in which vegetables had been boiled down, beef tea, porridge, switched eggs etc. have been given.

Cape Brandy, and Pontac, (which is Cape port wine,) have been also given with benefit, and kaffir beer , which is made by soaking kaffir corn, (which is the same thing as Indian hemp) in water and fermenting with yeast has also been tried but with very doubtful benefit.

The Juice of raw meat which some writers advocate has also been tried, but we have not found any advantage from it, over stewed meat gravy, and the latter is more palatable.

GENERAL HYGIENE, next requires attention.

In a hot climate such as we have in South Africa

especially in the higher plateaus, where there is a great variation between the day and night temperature it is of the utmost importance, to have the patient placed in a large airy room, where the temperature can be regulated, and where a good supply of warm blankets can be got to cover him at night. Overcrowding has to be carefully avoided.

The MEDICINAL part of the treatment varies greatly in different cases. Where the patient is admitted with a high temperature, cold sponging has been found to be of great advantage, followed by small and repeated doses of Sodium Salicylate (Gr V to X) every four hours, and guarded by half drachm doses of Aromatic Spirit of Ammonia, until diaphoresis is produced.

When the temperature has been brought down, no drug seems to give more satisfactory results, than Quinine in 2 grain doses, dissolved in tincture of Perchloride of Iron (30 minims). Potassium Citrate has been found to be especially useful where there are pains of a rheumatic character.
Lime Juice has been given in one ounce doses daily throughout the treatment.

The various symptoms require special treatment

The swollen legs are best relieved by painting, or rubbing, Belladonna liniment into the painful parts and applying hot fomentations over them, and eleva-

ting the limb, and after the pain and hardness have subsided, rubbing with camphor and soap liniments.

Epistaxis, we have most readily controlled with a strong solution of Perchloride of Iron, with which we have soaked long plugs of cotton wool, and introduced into the nostrils, plugging the posterior nares is also sometimes necessary. Adrenalin we have tried but not with such satisfaction as the Perchloride of Iron.

Bleeding Gums. Have also been most easily stopped, by using Perchloride of Iron, as a mouth wash.
For the ulcerative sloughing stage, Permanganate of Potash, or tincture of Myrrh, or Chlorate of Potash, with Perchloride of Iron and Glycerine, and occasionally painting the ulcerations with a solution of Nitrate of silver (30 grains to the ounce)

For internal haemorrhages we have given Chloride of Calcium grs 15 every 3 or 4 hours, and have found it clear up a severe haemorrhage from the urinary tract in a very short time, Ergot in 1 drachm doses has also been given with benefit, in internal haemorrhages.

The rheumatic pains, pains in joints and the acute pain so often complained of over the Spleen, have been treated by fomentations, followed by applications of Iodine Liniment.

Sub-periosteal haemorrhages, and effusions into serous cavities, have been improved by giving Iodide of Potassium internally.

Diarrhoea and vomiting by doses of Bismuth and Soda with tincture of opium.

The tendency to syncope and general exhaustion by small doses of tincture of nux vomica and digitalis (5 minimus of each every 4 hours)

T H E O R I E S

Sir Alfred Garrod suggested in 1848 that Scurvy was due to a deficiency of Potassium in the diet,

Buzzard however in 1866 advanced conclusive evidence to show that the deficiency was not one of Potassium as such, but of the vegetable salts of Potash, although he did not attempt to explain how such a deficiency brought about the scorbutic process.

Dr Robert Hutchison in his " Lectures on diseases of Children 1905 " in discussing -- What is Scurvy due to? asks whether it is due to an error of omission or to an error of commission? and settles the question by leaving the diet as it was, and finds that by adding fresh fruit juice to it, the patient gets well, he therefore concludes that the disease is not due to the development of ptomaines in the food.
He further finds that boiled fruit juice cures the case just as fresh fruit juice does, and as ferments

are destroyed by boiling, decides that it is not due to a ferment.

He then asks What constituent of the fruit juice is it that brings about the benefit? " It must be a " dead " constituent because it is evidently unaffected by boiling, and it belongs either to the Crystalline or colloid group of ingredients. The next step therefore is to dialyse the fruit juice, and administer the dialysate, and he finds that the dialysate has a curative effect, but the colloid constituents have not, in other words what is absent from the diet that produces Scurvy is a crystalline substance which is present in fruit juice. One must therefore try the effect of the crystalline substances contained in the juice in a pure form."
Of these the citrate of potash and the citrate of lime suggest themselves for trial first. The reason that he takes the citrates first is that there is presumptive evidence in favour of the view that it may be absence of citrates which produces the disease. Cows' milk contains far more citric acid than you might suppose, a quart of it is said to contain as much citric acid as a large lemon.

Citrate of Lime when it is boiled passes into a less soluble form, and when milk is condensed, citrate of lime is apt to separate out in the form of gritty granular particles in the tin. There are grounds therefore for believing that it may be the

absence of citrate of Potash or of Citrate of Lime which produces scurvy.

He has not found however that the administration of Citrate of Potash or Citrate of Lime in pure form has a definately curative effect. He has tried Citrate of Lime in large doses without producing improvement.

On the other hand from a mixture containing malate, of potash, citrate of potash, and tartrate of potash, he found great improvement, which however is not brought about so quickly as by a complete change of diet, and he thinks this mysterious alteration in the blood is due to a deficiency of salts of potash, though how it is that this deficiency tends to cause haemorrhages he is not in a position to explain. He however says that the haemorrhages are not due to any defect in the coagulability of the blood for he has estimated the coagulation time in many cases of infantile scurvy and has never found it materially different from the normal.

In the British Medical Journal of October 31st 1908, Sir Almroth Wright in a paper read by him at the seventy sixth annual meeting of the British Medical Association, says, that in a disease like scurvy the first essential was to investigate the dietary, a much simpler matter in young children than in adults This done they ought to be in a better position to

define the disease according to its true etiology, instead of trying to classify it according to its symptoms. No one could have much doubt that the essential factor in etiology was to be found in connection with the diet; hence some classification of food stuffs was necessary. He then read the table in which food stuffs were classified as acid, neutral or alkaline, according to the reaction of their ash after incineration.

The acid foods which he called scorbutic were oats, barley, fresh meat, salt meat, ship biscuit,, wheat, eggs, rice, maize, peas, beans.

The Neutral or nonscorbutic were sugar, vegetable oils, animal fats, and the alkaline or antiscorbutic, carrots, turnips, potatoes, onions, milk, blood, or meat containing blood, lime juice, orange juice, wood, and green herbage.

Information as to the production of scurvy might be obtained by carefully examining the dietaries of travellers whose supplies had been limited to certain articles; or of people, who being in great poverty had tried to support life on tea and bread alone.

This would show that a diet of meat and cereals, or cereals alone, produced scurvy, and that those food stuffs produced scurvy which on incineration showed mineral acids and especially phosphoric acid in excess over mineral bases.

Such facts so far as they went would seem to suggest that scorbutic foods produced scurvy by introducing into the system an excess of mineral acid.

Another argument which supported the theory, that an excess of acids in the system was in some way concerned in the production of scurvy could be derived from infantile scurvy.

Specimens of bone from such cases shew that decalcification was going on, this fact seemed to confirm the view that there was an excess of acid present in scurvy, as well as some absorption, or at any rate solution, of lime salts in progress.
He had obtained evidence of acid intoxication on testing the alkalinity of the blood in scurvy patients and found that as the reaction of the blood became normal the patients recovered. Hence he thought that it might fairly be concluded that diminished alkalinity of the blood was in all cases of scurvy a characteristic feature. With regard to the cure of scurvy when once established, the giving of antiscorbutic articles of diet was rather a round about method of treatment for all these food stuffs were bulky, and carried a large proportion of unnecessary ballast.

A much more direct mode of treatment was to administer the desired alkali in combination with an organic acid-- for instance a compound such as sodium lactate. These substitutes were easily transformed in the blood into the corresponding carbonates.

Another principal of treatment should be to replace the calcium and magnesia salts, which in scurvy might have been extracted from the tissues.

Another haemic change in the disease was a great reduction in the coagulability of the blood, hence any treatment adopted should keep in view the possibility of restoring this, and for this reason the administration of lime juice and orange juice was to some extent contra-indicated.

Professor Axel Holst (Christiania) British Medical Journal 31st October 1908, in discussing Sir Almroth Wright's paper relates some experiments carried out by Dr Frölich and himself at the Hygiênic Institute of the University of Christiania, Norway, on guinea pigs, in which they found that if a guinea pig is fed on dry cereals, for instance, on oats and water, or on wheaten or rye bread and water, it will die in a few weeks; and if death does not occur before about three weeks certain changes will be found, these changes are the same as those found in "Infantile" scurvy, moreover exactly the same phenomena are common in scorbutic adults.

From these experiments they are of opinion so far as they can judge from animals, that scurvy is in no wise due to an acid intoxication, as argued by Sir Almroth Wright.

What they imagine is, that scurvy is due to a lack in the food taken of nèutrient constituents which so far have not been identified but are of an easily decomposable kind.

These constituents are present in antiscorbutic articles of food but are lacking in cereals such as flour and grains, because these foods are dry, and he adds-- there are some reasons for believing that these constituents are of the nature of an enzyme or ferment.

Dr Edmund Cautley (London) in taking part in the discussion of Sir Almroth Wright's paper says, Clinically, he inclined to the view that scurvy depended on changes produced in the proteids or ferments of the food by the various processes of preparation and the theory of acid intoxication seem to him to rest upon an insufficient basis of facts,.

From a study of the opinions of wellknown writers on this subject it is evident that no definite conclusion has yet been arrived at as to the real etiology of scurvy.

Some are of opinion it is due to a deficiency of the salts of potash while others are inclined to favour the ferment theory.

At the beginning of this Thesis I mentioned that I had found that natives fed on American kiln-dried mealies developed scurvy whereas those fed on South African sun dried mealies did not.

This has led me to the view that there may be some change produced in the preparation of these

mealies which makes them a suitable nidus for the growth of a ferment in them which is the cause of scurvy.

It may be that a deficiency of the salts of potash in the blood render it suitable for the growth of this ferment introduced into the system.

Professor Axel Holst found that if guinea pigs were fed on grain which had been allowed to sprout it did not produce scurvy whereas dried grain did, it is possible that the ferment might be present in the dried grain and be destroyed by the sprouting process.

Dr Hutchison found that by giving a mixture containing malate, citrate, and tartrate of potash great improvement was produced in the scurvy patient but this was not brought about so quickly as by a complete change of diet, this might go to prove that by administring these salts the blood was rendered less suitable for the growth of the ferment, whereas the complete change of diet, stopped the introduction of the ferment.,

Again Dr Hutchison found no defect in the coagulibility of the blood whereas Sir Almroth Wright found a great reduction in the coagulability.,

From observations made here I am satisfied that there is a great reduction in the coagulability.,