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Thesis on Beri Beri

Presented by

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B E R I B E R I

For the purpose of this thesis, the writer travelled to the far East and India. He was thereby able to observe the disease as it is in its native home in the various parts. From materials thus collected he presents this thesis.

GEOGRAPHICAL DISTRIBUTION.- The disease is found in the tropical and sub-tropical areas. In Europe now and then specimens are observed but they are imported cases. The disease is most widely prevalent in China, the Malay Peninsula, Siam and Ceylon. In India it is found chiefly on the Malabar Coast, The Circars, and the plantation districts. At one time the Indian Army was greatly attacked by Beri Beri but good hygienic rules have almost eradicated the disease from the army. In the Dutch Army too it was similarly treated. In Japan for reasons to be hereafter stated the scourge has practically died out. It is to be noted that quite a crop of cases occurred when the Panama Canal was excavated. This fact leads one to believe that microbe is indigenous and like Malaria supports itself on the soil. The disease also finds congenial home in the Congo States, Sandwith Islands, Africa, Hayate, Havana and New Caledonia

It occurs in places where there are mass congregations, such as lunatic Asylums, Jails, Schools, ships or armies or where there are gangs of coolies. When the writer visited China shortly after the Boxer movement he found the traces of an epidemic which had been caused by some of the prisoners returning to their native place and bringing the infection

from the jail in which they had been incarcerated. In Singapore the writer saw several marked atrophic cases of Beri Beri from amongst the Chinese coolies so extensively employed in the Penang districts of Malaya.

It is found amongst the fisherman of New Foundland Banks, not only amongst those who are strictly fishermen but also amongst those on shore or those making "shore trips" (Berge of Province town). It has also been found in Brazil Uruguay and Monte Video. As a rule Beri Beri is found in the low-lying districts, along the cost, and on the banks of rivers.

DEFINITION.- Beri Beri is a disease of the tropical areas. It may also occur in the temperate Zone brought from endemic areas, and due to damp and moist state of the locality together with the artificial conditions of overcrowding, imperfect ventilation and unsuitable food. It may be epidemic or endemic. It is characterised by motor and sensory peripheral neuritis, muscular changes, gastro-intestinal disturbances, tachycardia and oedema of the various serous sacs. Death as a rule being produced by cardiac paresis.

Beri Beri says Herklotts suggests the Hindu word "Bharee" (a sheep) from the fanciful resemblance of the gait of persons affected to that of sheep. Carter thinks it might come from Bhari, a sailor from the word Bahr, the sea or Bhayr shortness of breath. We have it on Mason Goods' authority that Bontius introduced the word Beri Beri and attributes an Eastern origin to it.

HISTORY.- Beri Beri is one of the oldest of known diseases. The Chinese doctors with whom the writer discussed the subject stated that it had been known to the Chinese physicians in the reign of Emperor

Yao. It is said that his celebrated court physician cured one of the dignataries who was suffering from this fell disease and thereby gained great credit. Whether this is true or whether it is not there is no gainsaying that Beri Beri is a disease which was well known to the Chinese for a long time past. In India the Sanskrit medical treaties by Churuka deal with a similar disease. Thus runs a Sanskrit passage " He who gets watery swelling of the upper and lower limbs and of the abdomen and loses his appetite and strength and dies of that complaint from which the Chinese generally suffer together with heart complaint, should be treated carefully", and goes on to describe the treatment to be mentioned later. With the advent of the British power in India the study of Beri Beri has been renewed and yielded to the touch-stone of Western Science with the result that the British Army in India is now practically free of Beri Beri. In connection with the systematic study of this science in India the following writers occupy a prominent position in the niche of Fame, Malcolmsen, Carter, Waring, Morehead. In Japan, when in the early days of her civilization she had to depend on Western teachers, Baelze and Grimms greatly distinguished themselves and by their example brought out the splendid genius of Minra and Takaki whose contributions to the literature of the subject are some of the finest. The Dutch exercised great political supremacy over the East and the Dutch physicians studied the matter with great care and attention. We also have the works of Anderson, Simmons, Schenbe whose zeal and assiduity have been monumental. They worked with much precision and utilised the latest scientific discoveries in the investigation of its pathology, aetiology and

symptology.

AETIOLOGY.- Beri Beri is no respecter of age or sex. It attacks both sexes and occurs at all ages with the doubtful exception of the two extremes of life. General weakness or temporary decline in health is not a necessary factor in bringing on the disease. The disease has been an unwelcome visitor across the threshold of the rich and the opulent no less than across that of the poor and the needy. Like Diabetes it seems to pick out those who lead a sedentary in-door or indolent life. Males between the ages of puberty and 30 are most liable to catch the disease. Pregnant females contract the disease readily especially if they be primiparae and such is the rooted belief in Cambodia that the first thing a woman does when she discovers that she is pregnant is to give a votive offering to the diety to preserve her from the evil spirit of this disease. One of the most important factors is overcrowding. Bondurant (New York Medical Journal describes a most heart-rending instance of Beri Beri breaking out in the State Insane Hospital at Tuscaloosa. The figures quoted are these. The total number of inmates was twelve hundred, of whom seventy one were seized with the attack and out of these no less than twenty five per centum died. It is however to be noted that of the two hundred employees of the hospital not one contracted the disease. As regards the question of race it was observed that the negroes got off comparatively scotfree but there was a heavy toll amongst the whites. Probably the negroes enjoyed a certain degree of hereditary immunity. It was observed that of all forms of Beri Beri, the atrophic form was the one most met with in this outbreak. There was a loss of the electric re-action, anasarca, tachycardia, rise of tem-

temperature, gastro-intestinal disturbance. Another well-known instance is the out-break at the Richmond Asylum Dublin in the years 1894, 1896 and 1897. It is said that the Europeans in the tropics are less susceptible to the disease due probably to the simple fact that they always live on the fat of the land and observe better hygienic laws than the permanent inhabitants of the place. Overcrowding in jails, mines, ships etc also produces the disease. In ships the sailors suffer most not only because of their exposure to the inclement weather but also because of the overcrowding. For instance in the case of the liners trading with the East the lascars and Chinese Sailors suffer most; and often contract the disease months after they have left the place of infection. It has been found that owing to the severe cold these men do their best to suffocate themselves by shutting off all sources of ventilation in their frantic endeavour to keep the cold out. The damp and sudden condition thus produced readily induces the disease.

TELLURIC INFLUENCE.- In countries where the hot and cold seasons are most marked the disease is apt to break out during the hot season or during the rains. At present there is no definite conclusion arrived at as to whether it is a germ disease or not; but it is supposed to resemble Malaria very closely and indeed some people go so far as to say that Beri Beri is but one of the many forms in which ubiquitous Malaria delights to disport itself. Like Malaria it is a disease of locality, like Malaria it is readily contracted by those who sleep on or near the ground but the microscopic evidence shows the essential difference in the two diseases. Newly settled or damp villages and freshly cleared jungle lands also show cases of Beri Beri

Manson states the well-known example of an epidemic of Beri Beri which broke out in the Singapore jail. The peculiarity was that it attacked the male side whereas not a single case occurred on the female side. Both sides were fed and clothed exactly alike and hence the cause must have been something else and it was found that the only difference was that the female side was situated on a dry soil whereas the male side was damp.

FOOD AND BERI BERI.- Discussion has raged fast and furious associating Beri Beri with the kind of food taken The incidence of this disease it is well known was very great in the Japanese navy. Takagi is of opinion that Beri Beri is dependent greatly on the kind of food given to the sailors. Rice the staple diet of the Eastern people, is said to be the cause of the disease. The writer in discussing this matter with the Health Officer of Shanghai was told that it was the belief in that part of China that rice was the medium of infection. The practice in most parts of China is to eat rice which has been brought straight from the fields. But it has been observed that certain districts have adopted as in Malaya (where the writer found the Brahmanic influence still very marked in the daily life and habits of the people) the Indian custom of eating Balam rice (i.e. grains which had been previously immersed in boiling water and then dried and husked) as distinguished from Atab rice (i.e. husked without the intermediate process of being immersed in boiling water) . It has, therefore, been found that those who ate the immersed or Balam rice practically escaped from the disease. In Java it has been observed by the Dutch physicians that those who ate rice completely shelled, had the disease in proportion of 1 : 39 but those who ate it with the pericarp on suffered only in proportion of 1 : 10,000.

The fish theory also holds the field and gives food for discussion. Probably it is not the fish per se which is the causa causans mali but the fact that it is eaten raw or badly cooked. Through the exertions of Takagi the Japanese Government have extablished an improved nitrogenous diet, including meat and diminishing fish and now as has been stated Beri Beri has been practically rooted out of the Japanese navy. The theory adduced by Takagi was that the nitrogenous element being at a minimum in the body the patient fell an easy prey to the sinister advances of the malady. Some have held that Beri Beri is in the nature of a scorbutus and that Anœmia plays an important role , but the microscopical investigation has shown that the anœmic condition of the blood instead of being the main feature of the disease is but an incidental manisfestation. Others again consider that the Ankylostomum Duodenale and the Tricocephalus Dispar produce the disease. None of these theories has yet been accepted by the generality of medical scientists.

THE GERM THEORY.- Against all these theories Patrick Manson advances the germ theory, but the germ itself does not act as the cause but rather the toxine which it generates. This infects the soil which in turn poisons the individual. In support of this view Manson quotes the paper of Hiroter in which he ralates how in 52 infants wet nursed by mothers who suffered from Beri Beri those who recovered did so immediately after the children were weaned, showing says Manson "that had a germ been the cause of the symptoms the germ and the disease it produced would not have died out so rapidly but we can readily understand the cessation of symptoms on the supposition that they were caused by a toxin which on the cessation

of suckling was no longer being imbibed".

Pekelharing and Winkler hold the direct germ theory. They are reputed to have discovered the germ which they state is a bacterium found in the circulatory system In proof of their assertions they claim to have reproduced the disease. But they were unable to cultivate the cocci and bacilli, but in some cases they produced a micrococcius which infected into the rabbits gave rise to the signs of Beri Beri. These investigators further strengthened their position by demonstrating that they were able to recover the same micrococcus from the tissues of the inoculated rabbits, which when subjected to a fresh cultivation produced a new colony which was again infected into other animals and produced the disease. Pekelharing's and Waring's investigations gave a fresh impetus to the bacteriological investigation of the disease, and has divided the question into two conflicting camps. Pekelharing & Winkler are supported by Van Ecke, Mosse and Morelli; whereas Eykman, Mendes, Fiebig and Schenbe have opposed the idea, maintaining that the cultures were impure and that the white micrococci of Pekelharing and Winkler were nothing but Staphylococci Pyogenes Alba. As regards the question of neuritis said to be produced by Pekelharing and Winklers's experiments, the latter school suggested that that occurred irrespective of the injection.

SYMPTOMS.- The disease may be studied under different groups of symptons, giving rise to distinct types.

BERI BERI AMBULANS.- In this type there may be nothing more than a slight disinclination to exertion which may last for only a part of the day or come on during regular days of the week, the legs and arms begin to ache there is a tendency to vomiting, puffiness of the face and limbs, the patient going about his usual avocation. The disease may stop in its /ownward march and gradually the symptoms

disappear leaving nothing behind. It may sometimes leave a dilated heart or a weakened and dibilated condition of the body or hyperæsthesia.

THE RELAPSING FORM.- Some cases go on a steadily improving course when suddenly a relapse comes on and then it presents all the characters of a fulminating or malignant type. It may run an uncertain course ending in death or convalescence

CARDIAC FORM.- In this type the brunt of the disease is borne by the circulatory system. The right heart is dilated, producing venous pulsation at the neck. There may be re-duplication of the second pulmonary sound; of ten also of the first sound at the apex. Systolic bruits are frequent, and second pulmonary sound in addition to its re-duplication may be accentuated. The pulse is very sensitive and responds to the slightest change in the posture of the patient, a rapid fall is always an ominous sign. The tension is low in proportion to the weakened action of the heart. But of all the circulatory symptoms the most distressing is palpitation, there may be epigastric pulsation, dyspnœa, or apnoea. The lungs may be gorged with serous exudation, the thorax or the pericardium may be fitted with exudation or even the diaphragm may strike work.

But these cardiac cases sometimes in the early stages are very deceptive. It is not at all an uncommon practice to meet with cases which but a few hours previously seemed to be but of a trivial nature or which seemed to be on the high road to recovery suddenly take on a serious form and the man who was indulging but a short time ago in the dearest of all human hopes suddenly becomes doubled up panting, fighting for his breath and perfectly livid with cyanosis he has a "horrible tearing boring crushing pain under his sternum and in the epigastrium; the vessels of

his neck are throbbing violently, his pulse is quick small intermittent and his extremities cold. In a short time the patient is dead."

BERI BERI HYDROPS.- This consists of cases in which oedema is the most marked feature. The oedema is sometimes gradual commencing with the disease or comes on rapidly with the disease at its onset or assumes a grave form at one or other of its later satges. The favourite sites of the oedema are the ankles, over the tibia, sternum etc. In the more severe cases it involves the other parts of the body giving a general anasarcatous appearance. Certain peculiarities of the oedema ought to be noted. It pits less readily than renal oedema, and some authors maintain that unlike Cardiac and renal oedema it does not affect the genitals. This is one of those points which meet the eye of only hair splitting authors. The writer has scarcely been able to verify this latter fact by his experience. Stage for stage oedema in cases of Beri Beri which has been serious enough to invade the other parts of the body have not shown much respect for the genitals. The oedema in Beri Beri hydrops varies to a remarkable degree daily especially if it is localised, as in the arms and hands. The urine is dark coloured and scanty and specific gravity high as might be expected with the diminution of the fluid excreted. The chlorides are proportionately less than the urea, phosphates are increased, and indican is found in abnormal quantities. Sugar and albumen may be present but more as an accident than as an integral part of the pathology of the disease. The circulatory phenomena are varied, the blood is anoemic, though the corpuscular richness is of the average. It has been found, that Beri Beri may cause Anoemia but it is not in itself the result of anoemia. Whether the alkalinity of the blood is defective or not is a question

which is still SUB-JUDICE. The other circulatory phenomena have already been mentioned under the Cardiac type. The glands in the groin sometimes are swollen.

Fever i s ~~not~~ with in cases of Beri Beri but does not seem to be essential to the disease as in the case of malaria But it is quite a common observation that the disease, especially the neuritis is greatly increased if the patient has an intercurrent attack of fever. In the later stages of Beri Beri Hydrops symptoms of paresis manifest themselves such as ankle drop, hyperoethesia of the calf muscles, absence of knee jerk, numbness of the anterior surface of the legs. When the effusions take place into the serous sacs of the viscera forming hydropericardium hydrothorax or ascites the case may be termed hopeless.

BERI BERI ATROPHIA.- In this class of cases the nervous phenomena are the predominating symptoms. Among those symptoms Parœsthesias are the first to be developed. There are sliding pains, formication even changes in the feeling of heat and cold. Anœsthesia may follow or come on independent of parœsthesia, and appears first over the skins, the fleshy parts at the side of the legs, wrists, dorsum of the hand. Later on it may extend to the thighs and the foot. The abdominal and the thoracic areas are very often free. It does not follow that worse the disease worse the anœsthesia. It is generally symmetrical though sometimes it is only unilateral and it does not by any means pick out a definite set of nerves, but it is found by the œsthesiometer that the tactile areas are enlarged. In certain forms of the disease hyperœsthesia may come on. The hyperœsthesia is deep seated and generally elicited by squeezing the muscles especially the gastrocnemii t h e muscles of the arm and of the thumb.

The muscles give a great deal of trouble especially at night when they go into cramps. In bad cases the cramps may even take the form of tetanic contraction. The muscles as a rule atrophy in the later stages of the disease, but outwardly put on a false appearance inasmuch as a certain amount of oedema of the connective tissue of these muscles gives them a look of rotundity. The affection of the diaphragm and of the intercostals produces laboured breathing and later on they may be paralysed altogether. Various groups of muscles affected may produce various "gaits" of Beri Beri. Thus the paralysis of the muscles of the lower extrimity may produce what may be fitly styled as the "broom stick" walk, that is the drop of the toes makes them sweep the ground and later on not only the flexor but extensor muscles also become paralysed and thus the feet as a whole shuffle along the ground. The writer saw many such patients at Amoy, slowly and painfully carrying themselves along the streets by means of a stick, using to a greater degree the muscles of the trunk and the thighs to make up for the deficiency of the paralysed muscles of the leg. Some writers and teachers think the disease resembles Locomotor Ataxy to such a degree as to require special diagnostic differentiation. As regards the upper extremity the symptoms of Beri Beri may be best summed up in the expression that the fingers of Beri Beri patients are all thumbs. The anæsthesia the incoordination, the paresis of the upper extremity under the delicate act of writing or threading a needle or picking up some small object a task if not of utter impossibility at all events of immense difficulty. Like foot drop there may be wrist drop also and together with a general weakness of the functions of the muscles. Even in cases of the most severe forms of paralysis the facial and occular

muscles, together with those of mastication and speech retain their functions. The picture of the unfortunate patient is complete when his abdominal and perineal muscles share in the disease. The sight is characteristic for a protruding abdomen and a bulging perineum tells the tale of the paralysed diaphragm. With completion of his paralytic stage the patient is a miserable picture, he can neither feed himself nor move, nor make the slighest sign, he lies a helpless log of wood. The death of the patient is ushered in by the pulsation of right side of the heart, with all the resulting phenomena of backward turgescence. The following table gives how the muscles are affected:- Muscles of the leg suffer most, less frequently of the trunk and face, rarely those of the eye, mastication and deglutition. As a rule the muscles supplied by the Peroneal and Anterior Tibial nerves are those first affected then those of the calf, the extensors of the knee, the glutie, the flexors of the knee, the adductors and flexors of the thigh usually coincidentally with the appearance of paresis in the thigh, the muscles of the forearm and arms are attacked including the extensors of the wrist and fingers, the Supinator Longus, the Triceps, the flexors, and the small muscles of the hands and fingers. The abdominal muscles, the pectorals, the intercostals, the laryngeal muscles, and the diaphragm, may all one after another be affected. The heart too as shown by subjective symptoms generally is more or less implicated.

MIXED BERI BERI.- Besides the Hydrops and Atrophic varieties of Beri Beri there is another variety which presents a mixed group of symptoms and which therefore might well be classed as Mixed Beri Beri. There is oedema in some cases of a general nature, in others there may be dropsy on one side and atrophy on the other, or the atrophy of the muscles may be marked by oedema of its connective

tissue.

DIAGNOSIS.- In considering the question of differential diagnosis there is considerable degree of latitude with regard to the number of other diseases with which Beri Beri may be confounded. In the first place Beri Beri and Malaria occur in almost identical districts and under identical climatic environments, though the foci may be different. They are both at first localised or endemic, they may become epidemic, they both occur in people who sleep near or on the ground they both produce the yellow or sallow skin and often dedema especially in cases of malarial cachexia. But in Malaria enlargement of the spleen is a prominent sign which is absent in Beri Beri, fever high and periodic in Malaria is absent or little in Beri Beri. Quinine has little or no influence on Beri Beri but of paramount efficacy in Malaria and above all the Microscopic examination reveals the fact that Laverans parasites are absent in Beri Beri. Peripheral neuritis dedema and atrophy though met with in some advanced cases of malaria are not the cardinal symptoms of the disease as they are in Beri Beri.

FORM SCORBUTUS.- Some consider as stated before that Scorbutus and Beri Beri are very much the same disease, others hold that they are but the different phases of the same disease inasmuch as both occur in ships. But it has not been conclusively proved that in Beri Beri as in Scorbutus, the want of fresh vegetables is the cause of the disease, for it occurs in ships which are liberally supplied with fresh vegetables and are seen even on ships which have been in port for many months. Had Beri Beri and Scorbutus been one and the same disease one would expect to find hemorrhages spongy gums, or intramuscular or subperiosteal effusions in Beri Beri.

ALCOHOLIC NEURITIS.- Alcoholic neuritis presents many distinct features which mark out its own individuality. In the first place there is the history of alcoholism, gastro-intestinal disturbance, such as faetid breath, bad taste, enlarged soft or cirrhotic liver, loss of appetite, above all alcoholic neuritis does not come on in epidemics, nor is oedema a necessary accompaniment.

TRICHINOSIS.- Beri Beri may be confounded with cases of Trichniosis; but in the latter we have anoesthesia either absent or very slight there is no true paresis, fever is a marked sign, there are usually pains in the upper extremity. It is true there is dedema but that is chiefly under the eyes and over the face not over the tibia as is usual in the early stage of Beri Beri. The microscope reveals the characteristic parasite.

PATHOLOGY.- With reference to its microorganism nothing more can be added to what has been already stated. The chief lesions occur in the nerves and the muscles. The degenerative changes in the nerves increase from the central portion to the periphery. As a rule the anterior roots escape and the posterior roots may be affected very slightly if at all. The most serious changes take place in the medullary sheath. It coagulates undergoes disintegration, forms itself into drops and disappears on being absorbed through the process of time. The granular fat which is the result of the disintegration of the medullary sheath is partly taken up by the nuclei of the nerve fibre, but some find their way out of the primitive sheath into the surrounding connective tissue and the walls of the capillaries. The axis cylinder also undergoes absorption and the once active nerve is now nothing but a non-conducting mass of fibroid tissue.

The muscles also show distinct changes microscopically they are pale and flabby. Microscopically the striae

are no longer distinct, the degeneration going on progressively to the sarcolematous condition. The connective tissue increase and in some cases may actually replace the muscle fibres.

TREATMENT.- The treatment of Beri Beri divides into Hygienic, medical and dietetic.

HYGIENIC.- As soon as a case occurs it must be isolated, the place thoroughly washed with antiseptic fluid, fumigated and whitewashed. As regards vessels, masters should be specially warned that there should be as much ventilation and dryness as possible, that the damp clothing of sailors should never remain in their sleeping quarters, overcrowding and overheating should be prevented and the men encouraged to pass as much of their time as possible in the fresh air on deck.

All damp places are fatal to this disease, the patient should therefore without delay be removed to some dry place or sent on a sea voyage where practicable. Those who are unable to leave these Beri Beri districts, should have their houses built on as high an elevation as possible, they should sleep on beds raised from the ground, the floors of the houses should be rendered damp-proof and therefore a generous layer of cement should be spread over a substantial brick flooring. The walls should be built of porcelain or some other equally damp-proof material. There should be plenty of ventilation, admitting a copious amount of fresh air and sunshine.

DIETETIC .- According to some authority rice should be tabooed, inasmuch as it forms a very bulky article of diet. But as has been already stated in the earlier part of this thesis, rice per se is not the offending matter, but rather the deleterious kind of rice taken. Milk and fruits are of immense value in this disease. The use of

alcohol is quite an open question in the treatment of the disease.

THERAPEUTIC.- The medicinal part of the treatment resolves itself into symptomatic treatment, as no specific for this disease is known. The oedema is to be treated by various cathartics, diuretics, and hydragogues, Sodium Sulphate, Pulv Jalap Co., Elaterium, Buchu, Scoparii,are indicated. Digitalis is useful in a double sense both as a Cardiac tonic and as an indirect diuretic. In Cardiac cases, Strychnine, Lig. Ferri Perchlor, Sparteine Sulph, Nitrite of Amyl, Erythrol Tetranitrate are useful. Venesection and even aspiration of the right ventricle have been recommended. Drawing off the fluid in Hydrothorax and Hydropericardium has also been advanced. The ancient Indian writers treated the disease by many drugs, amongst them they greatly valued the DASA MULA HARITAKI (Terminalia Chebula). They also placed great faith in their preparation of DUGDAVATI which even now is greatly used by the modern kavirages (Ayurvedic doctors) in serious cases of Avasarca with Diarrhoea. This medicine is made up as follows:- Take of opium and aconite twenty four grains prepared iron ten grains, prepared talc twelve grains. Beat them into a mass with milk and make into four grain pills. One pill is to be given every morning with milk. The diet is restricted to milk alone, water and salt being prohibited. Another of the ancient Hindu medicines for this disease is the PUNARNAVA MAUDURA which has been of the greatest use to the patient and is interesting also from the point of view of the unusual items employed in its preparation especially cow's urine. The ancient Hindus, unlike their modern brethren did not consider any excreta as "unclean" but recognised their chemical properties and utilised them when necessary. This is the formula:- Take of Boer

haavia diffusa (punarnava) Ipomae Turpethum (trivrit) ginger, long pepper, black pepper, baberang seed, dendaru wood, plumbago root, patchak root, the three myrobolams, turmeric, wood of Berberis Asiatica, wood of Baliospermum Montanam, piper Chaba, indrajava seeds, roots of Picrorhiza Kurroa, long pepper, root and the tubers of Cyperus rotundas equal parts, iron rust in weight equal to twice that of all other ingredients, mix them together and boil the mixed powder in eight times its weight of cows urine till the watery part is evaporated. Dose about twenty grains.

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