also it is absolutely necessary to take into account. These are the advanced-stage patients who remain in their dwellings and those who are already too far gone for the sanatorium treatment but not yet so far that they are unfit for work and must go to a hospital. Should these tuberculous patients, whose number, as already said, is very considerable, be left to their fate, a great gap would be made thereby in the line of battle. The merit of having filled this gap belongs to Calmette, to whom occurred the happy idea of providing for this class of patients by the *dispensaries* organised by him. Calmette's suggestion has met with approval everywhere, especially in Germany, where more than 50 such dispensaries already exist and where many cities are about to provide themselves with such. It was in Germany, too, that the dispensaries, which were originally intended only to give working people gratuitous advice, medicinal treatment, and at the same time material support, were widened and completed in an important manner under the guidance of Pütter and Kayserling. In their present form they are intended to serve not one particular class only but all helpless tuberculous patients in every way. The patient is visited in his dwelling and instruction and advice as to cleanliness and the treatment of the sputum are given to him and his family. If the domiciliary conditions are bad, money is granted in order to render the separation of the patient from the healthy members of his family possible and thus to convert a dangerous patient into a comparatively harmless one by hiring a suitable room or even another dwelling. In other respects also poor families are supported by gifts of suitable provisions, fuel, &c. The dispensary itself does not undertake the treatment of the patients, in order not to get into conflict with practitioners, but it takes care that they are placed under medical treatment and, if advisable, admitted to a hospital, a sanatorium, or a health-recruiting home. One specially important part of their work is that they supervise the family, and especially the children, and have them examined from time to time to see whether infection has taken place in order to be able to bring help as early as possible. In this way these dispensaries really take care of poor consumptives and they have therefore with perfect justice been named "care-stations." I regard them as one of the most powerful means of combating tuberculosis, if not the most powerful of all, and I believe that when, as we may hope, a dense net of care-stations overspreads the land they are destined to do a most blessed work.

The measures hitherto discussed—namely, notification, hospitals, sanatoriums, and care-stations, are the heavy artillery in the battle against tuberculosis. But there are lighter weapons, too, which cannot themselves exercise so incisive an effect, but the coöperative help of which we cannot dispense with. Among these I reckon in the first place all efforts to *instruct the people as to the danger of tuberculosis* and to keep the interest of the masses in the combating of tuberculosis awake by popular publications, lectures, exhibitions, and other such means. Later, when there are care-stations enough, the said instruction will emanate from them so copiously that we shall hardly need special arrangements for that any more, but for the present we cannot dispense with them. Very valuable help is also given by the numerous associations which take part in the combating of tuberculosis by collecting money in order to found sanatoriums and health recruiting homes, endow free beds, support the families of poor phthisical patients, &c. We must not shut our eyes to the fact that the combating of tuberculosis demands a great deal of money. It is at bottom only a money question. The more free beds are endowed for cases of pulmonary phthisis in well organised and conducted establishments for the cure and care of the sick, the more adequately the families of tuberculous patients are supported, so that the latter may not be deterred from going to such establishments by anxiety on behalf of those belonging to them, and the more care-stations are established, the more rapidly will tuberculosis as an epidemic disease decrease. As, however, it is hardly to be expected that the municipalities, many of which already make very large sacrifices for the tuberculous patients, will be able in the immediate future to do justice to all requirements in this respect, private help is greatly to be desired. Care must be taken, however, that the means collected by the associations or placed at disposal by individual benefactors be not applied to minor matters, but accrue to the benefit of the most effective measures, above all the establishments for the accommodation of the sick and the care-stations.

In the conflict against tuberculosis hardly anything remains for the State to do, and yet it, too, can take an effective part in it. It can by legislation introduce *obligatory notification*, which already exists for all other important epidemic diseases, for tuberculosis too. In several States this has already been done, and it is to be hoped that the other civilised States will soon follow this example. Many demand also a legal basis for the compulsory isolation of patients who are a special source of danger to those around them. My experience in the combating of pestilences, however, teaches that we can dispense with this hard measure. If only we as far as possible facilitate the admission of consumptives to suitable establishments for the sick in the manner already indicated, we shall attain all we need. In one respect, however, the State can render aid of extraordinary utility with a view, namely, to *bettering the unfavourable domiciliary conditions*. Against this evil private activity is almost powerless, whereas the State can easily provide a remedy by suitable laws. If we look back on what has been done in the last few years in the combating of tuberculosis as an epidemic disease we cannot but get the impression that a truly important beginning has been made. The fight against tuberculosis was not dictated from above and has not always developed in accordance with the rules of science. No; it emanated from the people itself who have rightly recognised its deadly enemy at last. It is pressing forward with elementary force, sometimes in a rather wild and disorderly manner but gradually striking more and more into the right paths. The fight is kindled all along the line and the enthusiasm for the lofty purpose is so general that flagging is not to be feared. If it goes on in this vigorous style victory is sure.

Three Lectures

ON

THE PRESERVATION OF HEALTH AMONGST THE PERSONNEL OF THE JAPANESE NAVY AND ARMY.

Delivered at St. Thomas's Hospital, London, on May 7th, 9th, and 11th, 1906,

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LATE DIRECTOR-GENERAL OF THE MEDICAL DEPARTMENT OF THE IMPERIAL JAPANESE NAVY.

LECTURE II.[1]

Delivered on May 9th.

MR. PRESIDENT AND GENTLEMEN,—On Nov. 29th, 1883, I had the honour of being presented to his Imperial Majesty at Akasaka Palace, and on this occasion explained my views as regards the cause of, and preventive measures for, beri-beri.

THE METHODS FOR INVESTIGATING THE CAUSE OF BERI-BERI.

1. As we could not discover the true origin of beri-beri in spite of examination of symptoms, pathology, &c., we must use some other means. 2. In order to examine the food necessary for nourishing the human body it is important to know the comparative scale of nutritive elements—that is, proteids, fat, carbohydrates and salts, and of carbon and nitrogen. 3. On examining the food taken by those suffering from beri-beri it is found that the proportion of these elements is not correct. 4. The causes of this disease are due to the loss of equilibrium in the proportion of nutritive elements and also to the deficiency of a certain element—that is, the composition of food is not correct. 5. The occurrence of beri-beri due to the deficiency of a certain element—that is, proteids—is shown in the examples of the long voyages of the *Asama*, *Tsukuba*, *Ryujo*, &c. The disease does not occur if the food is well supplied; for example, it does not occur among men having a sufficient

[1] Lecture I. was published in THE LANCET of May 19th, 1906, p. 1369

supply of food or among officers, and in voyages with long stoppages at ports and short sailings. From 1882 to 1883 when the *Ryujo* went for long voyages, the disease disappeared completely as soon as she arrived at Hawaii and was supplied with fresh articles of food. 6. High temperature, moisture, marshy air, over-crowding, hard labours, nervous exhaustion, coarse food, &c., cannot be considered the chief causes of beri-beri, because if they are the causes both Europeans and Americans ought to suffer, but on the contrary they do not. 7. On considering the question both from theoretical and practical points it seems quite reasonable therefore to suppose that the true cause of beri-beri lies in a wrong method of diet. In December, 1883, instead of the very simple rules of the previous year, I compiled a new book of instructions consisting of 77 articles and 22 blank forms, and had it used throughout the navy, with the approval of the Minister of the Navy. This book, since several times revised, is still in use. On Jan. 15th, 1884, Jungi Kawamura, the Minister of the Navy, issued the following notification to the navy:—"It is hereby ordered that the following regulations in regard to the supply of food to the petty officers and men in ships and barracks shall be observed from Feb. 1st, 1884."

REGULATIONS IN REGARD TO THE SUPPLY OF FOOD TO THE PETTY OFFICERS AND MEN IN SHIPS AND BARRACKS.

Article I.—The food of petty officers and men in ships and barracks shall be under the control of the principal officer under whom they are serving and the articles of food shall be bought with the money allotted for the purpose and supplied to them.

Article II.—The articles of food shall be as follows: Rice, bread, beef (fresh or preserved), salted beef, salted pork, fowls or eggs, fish, *miso*,[2] shoyu (sauce), vegetables (potatoes, carrots, radishes, cabbages, and onions), beans, wheat, flour, tea, fats and oils (suet or lard, butter, olive oil, oil of the sesamum orientale), sugar (and starch), milk, vinegar, spices, alcoholic liquors, salt, pickles.

Article III.—The articles of food shall be bought by the paymaster by order of the officer in command and they shall be given out after being examined by the surgeon.

Article IV.—A record of the articles of food shall be kept by the paymaster, which record shall frequently be examined by the officer in command.

Article V.—If the preserved articles of food are found to be in bad condition the matter shall be reported by the paymaster to the officer in command, who in turn shall order the surgeon or other officer to examine them and shall report the matter to the Minister of the Navy Department through the chief of different departments.

TABLE XI.—*Daily Allowance of Food for One Healthy Person (fixed on Feb. 2nd, 1884).*

	Momme.	Ounces.	
Rice	180	=22·5	Bread, 160 momme (20 oz.); biscuit, 130 momme (16·25 oz.)
Meat, fresh	80	=10·0	When eggs are substituted, each egg to be reckoned as equivalent to 10 momme (1·25 oz.)
Fish, fresh	40	= 5·0	Where there is no fish, 20 nomme (2·5 oz.) of meat may be substituted.
Miso	14	= 1·75	—
Shoyu... ...	16	= 2·0	—
Vegetables..	120	=15·0	—
Beans... ...	12	= 1·5	—
Wheat flour	20	= 2·5	—
Tea	2	= 0·25	—
Fat or oil ...	4	= 0·5	—
Sugar... ...	20	= 2·5	—
Milk	12	= 1·5	If condensed milk, 1½ momme (0·2 oz.) to be given.
Vinegar ...	2	= 0·25	—
Spices ...	0·3	= 0·05	—
Salt	2	= 0·25	—
Pickles ...	20	= 2·25	—
Fruit... ...	—		To be given with care.
Total ...	568·3	=71	

If the amount of 51 momme (6·37 oz.) of liquid food is subtracted there remain 517·3 (64·65 oz.) when rice is used, 497·3 (62 30 oz.) when bread is used, and 467·3 (58·40 oz.) when biscuit is used.

It is not necessary to give the exact allowance every day but if the food of two weeks is averaged the average daily allowance should be equivalent to the daily prescribed amount.

In 1883, after my proposal to reform the diet system on Nov. 26th, I made a great effort in order that the *Tsukuba* should go over the same route as the *Ryujo*. There was opposition to this from various points and the permission could not be obtained easily but in the end after much discussion all difficulties were overcome, except that of expense. So with the knowledge of the Minister of the Navy I consulted Hakubun Ito, Councillor of the Imperial Household, and Seigi Matsugata, the Minister of Finance, and finally obtained my object by the special allowance of 60,000 yen (about £6000) from the Treasury. Before the sailing of the *Tsukuba* a special committee for investigation was put on board and consisted of the following gentlemen: Captain S. Arichi, Lieutenant Y. Matsumara, Surgeon T. Aoki, and Paymaster N. Kataoka. The food-supply was ordered according to the new system. The vessel sailed on Feb. 2nd, 1884, and returned to Shinagawa on Nov. 16th. The result obtained was good and is shown in the next table, comparing it with that of the *Ryujo*.

When the good report ("no beri-beri") of the experimental voyage of the *Tsukuba* became known the principal men in the navy for the first time began to support me in my fixed purpose. They said that they had always opposed me in their hearts and only obeyed the new regulations because they were ordered by the Minister, but they would give in now after such powerful practical proofs. In January, 1885, on looking through the reports of 1884 I was greatly satisfied with the results as shown in Table I. The number of general diseases was nearly halved and that of beri-beri was considerably decreased without a death.

On Feb. 13th, 1885, I made a new proposal for using barley and rice in equal proportion instead of rice alone and of having this adopted from March 1st, as the season of beri-beri was approaching, under the following rules—that is, from March 1st to 15th, only once at breakfast; from March 16th to 31st, twice a day, morning and evening; after April 1st, at every meal. I did this for the following reason. Although the number of cases of beri-beri in the navy decreased considerably (almost half the number in the year before) and the deaths had become almost unprecedentedly few since the formation of our navy owing to the new food regulations of February, 1884, yet the disease had not yet disappeared completely and we were obliged to make further efforts to exterminate it. Then I thought of the plan of using barley instead of bread alone, as the men could eat the former better than the bread. From this I expected better results. The Minister of the Navy ordered the addition of the word "barley" amongst the articles of food and its practical application on Dec. 21st throughout the whole navy. As I saw uneasiness arising among the naval officers and men owing to this change and as I wanted to report the full results of the investigation on the voyage of the *Ryujo* and to tell the purpose of this new change I, with the approval of the Minister of the Navy, delivered the following address at the Naval Club on Feb. 25th:—

All of the gentlemen here present will remember the Orders G, No. 2743 (2), issued on the 29th November, 1883, and C, No. 7, issued in January, 1884, by which regulations regarding food were made for the first time. By last year's experience we have found that most of the men dislike meat as well as bread, and we do not know what we shall do next. But if we leave the matter to their own choice we shall certainly have a great many cases of beri-beri as has hitherto been the case, especially as more than 1000 new men have been enlisted this year. Now, there is nothing better than barley food for preventing beri-beri. As, however, barley is coarse in appearance we are afraid that some of the men who do not understand the object of the improvement in the scale of diet will feel dissatisfied. We consequently wish to speak about the preventive measures to be adopted against beri-beri and to take this opportunity of reporting the result of the examination into beri-beri on board the *Ryujo*. That beri-beri can be prevented by an improvement in the scale of diet has been deduced from scientific reasoning and has been proved by experience in our navy, and for a long time we were planning such preventive measures. Fortunately, G. No. 2743 (2) was issued on the 29th November, 1883, directing that nutritious food should be given as far as possible, to which followed the regulations in regard to the supply of food, which were issued with C. No. 7 in January, 1884. According to those regulations the medical bureau drew up tables showing the proper amount of food for healthy men and invalids and distributed these to vessels, barracks, and hospitals, thus trying to insure the health of the men. As we had expected, however, these suggestions often could not be carried out, especially in the case of newly enlisted men, who not only dislike bread but cannot take a proper amount of meat. If things are left in such a condition there is no doubt, from recent experience, that we shall again have a great many cases of beri-beri this year in spite of the favourable result shown in the decrease of cases of beri-beri which was obtained in the year which followed the improvement in the scale of diet. This is why we decided to give the barley food. We believe that the majority of the men in our navy have been used to take barley food from their childhood, so that in reality they can eat it, although they show their dissatisfaction at it after becoming accustomed to the rice given to them since they entered the navy. It is accordingly considered that the best preventive measure at present against beri-beri will be to give barley, which it was directed should be given to the navy in general from the month of March by the order of the 21st inst.

[2] A kind of sauce made of beans, barley, and salt.

If this order is carried out strictly we are sure to find no cases of beri-beri in our navy. We consequently ask you, gentlemen, that you will kindly help us in the work of prevention, for the good of our country, according to the order just given.

On March 19th, 1885, I obtained the honour of an interview with His Majesty the Emperor and presented the reports of the following items: 1. The results of beri-beri investigation on board the *Ryujo*. 2. The decrease of beri-beri from the gradual improvement of diet since Jan. 15th, 1884. 3. A great probability of exterminating the disease from the navy in a few years.

On March 28th, 1885, I for the second time spoke on the preventive measures of beri-beri before the meeting of the Hygienic Society of Japan, the chief items of which were: 1. The report of the investigation committee placed on board the training-ship *Ryujo* during its voyage in 1883. 2. The report of the experimental voyage of the *Tsukuba* in 1884. 3. The results obtained through the examination of food supplied in 1883—that is, the very small quantity of nitrogenous food as against the large amount of carbohydrates, the proportion being 1 of nitrogen to 28 of carbon. In addition, the occurrence of numerous beri-beri and general diseases during that year. 4. The good results obtained by improved diet since 1884 and the difference brought about in the proportion of nitrogen and carbon by various changes in the proportion of diet.

On August 24th, 1885, I made a proposal to change bread and biscuit for equally proportioned barley and rice which had been supplied since March of that year, because I recognised its necessity owing to the great difficulties in cooking during rough weather, even in time of peace. In November of that year my proposal was taken up and its application was at once ordered. Finally, besides arranging and investigating as described I had thought of experiments on dogs and in September, 1884, commenced my experiments. The results obtained were as follows:—

[Baron Takaki here gave a very detailed account of experiments made on the feeding of 12 dogs on various substances, his object being to show the unsuitability of rice as a staple article of diet and the superiority of barley to rice. The account included such minutiæ as the composition of the forenoon and afternoon rations, the date of birth of some of the dogs, and a full report of the post-mortem appearances presented by those which died. The principal points of interest were as follows. In the first experiment, which was commenced in the beginning of September, 1884, six dogs were used. The first of these dogs weighed 14 pounds (1800 momme) and had a daily allowance of 5 ounces of rice, 1¼ ounces of vegetable, ⅛ ounce of miso, and ⅛ ounce of soy. In a short time it gained 12 ounces in weight, but it afterwards gradually lost weight and became thin and weak; its hair fell out very much, but the animal did not show any symptom of disease. It died suddenly at the end of 307 days and was then found to have lost 3 pounds of its original weight; the necropsy showed the presence of general anæmia. The second dog weighed 15½ pounds (2000 momme) and had a daily allowance of 10 ounces of rice, 2½ ounces of vegetable, ¼ ounce of miso, and ⅛ ounce of soy. It increased in weight for a short time but soon afterwards began to waste gradually and after about eight months there was paralysis of the legs with complete inability to stand. It died at the end of 269 days; the necropsy showed the presence of general anæmia. The third dog weighed 28 pounds (3600 momme) and had a daily allowance of 10 ounces of rice, 2½ ounces of vegetable, ⅛ ounce of miso, and ⅛ ounce of soy. Its weight at first increased but afterwards gradually decreased, and after about 11 months there was paralysis of the legs with inability to walk. It died at the end of 337 days; the necropsy showed that the brain, spinal cord, kidneys, and right lung were full of blood, whereas there was a deficiency of blood in the rest of the body. The fourth dog weighed 12½ pounds (1600 momme) and had a daily allowance of 25 ounces of rice, 1¼ ounces of vegetables, 1⅛ ounces of fresh beef, ⅛ ounce of dry bonito, a small piece of tofu (legumen), and 1/16 ounce of soy. It lost weight at first but afterwards gradually regained it. As compared with the original weight there was a gain of 22½ ounces and after the lapse of 307 days the animal was still healthy and strong. The fifth dog weighed 17¼ pounds (2200 momme) and had a daily allowance of 5 ounces of rice, 3¾ ounces of fresh beef, 2½ ounces of vegetable, ¼ ounce of miso, ⅛ ounce of soy, and a small piece of tofu (legumen). It at first increased in weight and then gradually decreased, but as compared with the original weight there was a gain and after the lapse of 261 days the animal was healthy and strong. The sixth dog weighed 56¼ pounds (7200 momme) and had a daily allowance of 7½ ounces of rice, 5⅝ ounces of fresh beef, 2 ounces of vegetable, 3/16 ounce of soy, and a small piece of tofu (legumen). In the course of the experiment the dog's weight decreased in comparison with what it was at first, but after the lapse of 337 days the animal was still healthy and strong.

The weight of the first three dogs (which may be called the first A group) as compared with the original weight showed an increase of 23½ pounds (2995 momme), but all the dogs died. The total increase in weight of the other three dogs (which may be called the first B group) was only 11 pounds (1430 momme), as compared with their original weight, but all of them were alive and healthy at the conclusion of the experiment; it is therefore not always reasonable to take the increase of body weight as a positive proof of health.

The second experiment, in which six dogs were also used, was commenced on Sept. 1st, 1885, and completed on Nov. 30th, 1886. The principal articles of food given to the first three of these dogs were rice and sweet potatoes, while those given to the other three consisted of boiled barley, beans (soja hispidia), and sweet potatoes. The first of these dogs weighed 19½ pounds (2500 momme) and had a daily allowance of 7½ ounces of rice, 1⅞ ounces of sweet potatoes, ⅜ ounce of dried bonito, ⅜ ounce of soy, and ⅜ ounce of miso. It at first decreased in weight but afterwards increased; between the sixth and twelfth month of the experiment it suffered from spasms; it died at the end of 383 days; the principal post-mortem appearances were congestion and hæmorrhage in the peritoneum. The second dog weighed 14½ pounds (1860 momme) and had a daily allowance of 5 ounces of rice, 1⅞ ounces of sweet potatoes, ⅜ ounce of died bonito, ⅜ of soy, and ¾ ounce of miso. Its weight fluctuated a good deal but at the commencement of the ninth month of the experiment there was an increase of nearly one-eighth of the original weight. From the commencement of the eleventh month the animal became emaciated and extremely weak but there was no paralysis; it died at the end of 322 days; at the necropsy hæmorrhage in the mesentery and mucous membrane of the small intestine was found and there was fluid in both sides of the thorax. The third dog weighed 11¾ pounds (1500 momme) and had a daily allowance of 5 ounces of rice, 1⅞ ounces of sweet potatoes, ⅜ ounce of dried bonito, ⅜ ounce of soy, and ¾ ounce of miso. An increase of 2½ ounces (20 momme) in its weight was maintained up to the end of the experiment which lasted for 421 days; during the whole of this time it showed little change in any respect. The original weight of the fourth dog is not stated; it had a daily allowance of 5 ounces of barley, 2½ ounces of beans, 1⅞ ounces of sweet potatoes, ⅜ ounce of dried bonito, ⅜ ounce of soy, and ¾ ounce of miso. At the beginning of the fourth month of the experiment it had lost over a quarter of its original weight, but its movements were very active and there was afterwards an increase in weight; the experiment lasted for 456 days. The fifth dog weighed 11¾ pounds (1500 momme) and had a daily allowance of 2½ ounces of barley, 2½ ounces of beans, 1⅞ ounces of sweet potatoes, ⅜ ounce of dried bonito, ⅜ ounce of soy, and ¾ ounce of miso. The experiment was continued for 456 days, during the whole of which the animal showed no remarkable change in its weight and nothing unusual happened. The sixth dog weighed 31¾ pounds (4080 momme) and had a daily allowance of 7½ ounces of barley, 2½ ounces of beans, 2½ ounces of sweet potatoes, ⅜ ounce of dried bonito, ⅜ ounce of soy, and ¾ ounce of miso.

Of the first three dogs (which may be called the second A group) two died and the one which survived did not increase in weight more than 20 momme, whereas with the other three (which may be called the second B group) each increased in weight during the last month and at the end of the experiment the increase was from 120 to 150 momme. Baron Takaki then continued as follows:—]

The result of the two experiments mentioned above was that those six dogs to which rice was given as the principal food, in spite of an increase in weight all but one died before the expiration of the experiment. The increase of weight of six dogs to which barley, beef, and beans were given as their principal food was not so conspicuous as in that of A group, but every one of them was healthy and very active both mentally and bodily till the end of the

experiment. Therefore, although these experiments seem to be very crude yet the results certainly prove that the variety of food consumed and its combination have direct influence upon the health of animal life. It is not quite proper to conclude that the causes which affect the health and development of man will produce in some ways the same results as in dogs, but I have no doubt that the health of man is also greatly influenced by the variety and combination of food consumed.

By the beginning of 1890 the reformed diet was crowned with a complete success, and not only was the beri-beri wholly exterminated but also the general diseases became greatly decreased. In the same year the Imperial Ordinance for the reformed diet was issued and thus my original object was fulfilled.

All through these years of hardships I tried to explain my views to others by comparing the food to gunpowder. I said that the former is the primary force of the human body as is the powder in the case of the gun, so it is just as important to select the food suitable for sailors as the powder for guns and rifles.

In former time the food was supplied according to the monetary system without any regard for quality or quantity. Therefore, when the price of food articles was high the men could not get sufficient nutrition for the maintenance of health, although they were able to get more when it was low. As a consequence, the distribution of food was unequal at times and although the sailors could stand any hardship at one time yet they could not at other times owing to the want of food. Such a state of things is a serious danger for the country in time of need. The gunpowder is supplied in definite quantity and of the best quality without considering the amount of expense. This is what I wished to have with regard to the supply of food. By doing so we can preserve an equal supply of suitable food at all times and also keep the officers and men in good health so that they can bear hardships both in peace and war. In 1890, as the success of the reformed diet became positive, the particulars concerning the preventive measures taken for beri-beri were compiled into a book and presented to the Minister of the Navy.

As the result of the reformed diet and the improvement of the naval hygiene, during six years from 1884 to 1889 the amount of expense saved totalled 1,232,416½ yen (about £123,242). On Oct. 16th, 1890, I for the third time had the honour of an audience with His Majesty the Emperor and presented the following facts: 1. As I foretold on the occasion of the presentation to His Majesty in 1885 beri-beri had now been completely exterminated from the Imperial Navy. 2. The present condition of the health of the Imperial Navy and the economic influence of the improved diet. 3. The fear of the inability of the naval officers and men to endure hardships in time of need had now gone. 4. The general tendency of beri-beri to increase among students and others without any regard to occupation. 5. The appearance of beri-beri all over the country and its tendency to increase seemed to have its origin in the reformed land-tax of the sixth year of Meiji (1873). Since that time the habit of eating rice as the chief food settled upon the remote districts; and besides, owing to the general tendency throughout the country to raise mulberry leaves, the production of rice and other cereals markedly decreased. In consequence, the vegetable albuminates contained in food necessary for bodily nutrition decreased, while, on the contrary, the amount of carbohydrates comparatively increased, thus causing the increase of the disease.

On thinking over my past experiences I cannot hesitate to declare that the present improved condition of the Imperial Japanese naval hygiene was due to having had an able man at the head of the navy and also to the education of medical officers. Because if we had not such a man at the head my suggestions would not have been taken up or if the medical officers were not thoroughly educated they could not have succeeded in the task of the preventive measures. The success of the new diet system and the attaining of my long-cherished desire were accomplished owing to the late Count Jungi Kawamura who was the Minister of the Navy when I was made the Chief Director of the Medical Bureau. When I first took up official duty as the Director of the Medical Bureau I told the Count that if he would give me full power to execute whatever I deemed necessary in order to keep up the health of the naval officers and men so as to make them fit for any duty I would endeavour not to interfere with his plans in regard to education, training, duties of officers and men. These plans, it may be mentioned, seemed to be throwing too much work on the men and medical officers were inclined to object. He then answered, "All right." So that whenever I wanted to try any new plan he always supported me in carrying it out as long as circumstances allowed.

In order to maintain the health and efficiency of the men I firmly believe it to be of paramount importance to have the following facts in constant observation. A careful selection of men at the time of enlistment and the maintenance of their health are absolutely essential for the object of having an army and navy. To fulfil these objects there must be an organisation in which the medical officers and nurses must be properly educated so as to fit them for their duties and the officers and men of other branches must be taught elementary physiology and hygiene. Accordingly, in Japan elementary physiology and hygiene are taught to cadets and officers, in addition to the subjects special to themselves, both at the Naval College and the Academy.

TABLE XII.—*Casualties in Action with their Results in the Japanese and Russian War ending on Dec. 5th, 1905.*

Classification.	Total number of casualties.	Killed.	Died from wounds.	Wounded.	Returned to duty.	Invalided.	Still in hospital.	Out.
Officers	307	159	14	134	132	0	1	1
Gun-room officers	93	51	4	38	37	1	0	0
Petty officers ...	891	511	27	353	319	27	7	0
Men	2333	1139	68	1126	1010	74	42	0
Miscellaneous ...	65	31	4	29	28	0	1	0
Total	3689	1891	117	1680	1526	102	51	1

Percentage of killed and died from wounds, 54; killed, 51 per cent.; returned to duty, 90·8 per cent.; invalided, 6 per cent.; still in hospital, 3 per cent.

"*A.*" *Casualties in the Engagement outside of Port Arthur, Feb. 9th, 1904.*

Classification.	Total number of casualties	Killed.	Died from wounds.	Wounded.	Returned to duty.	Invalided.	Still in hospital.	Out.
Officers	16	2	1	13	13	0	0	—
Gun-room officers	2	0	1	1	1	0	0	—
Petty officers ...	11	1	1	9	9	0	0	—
Men	42	0	3	39	35	3	1	—
Miscellaneous ...	1	0	0	1	1	0	0	—
Total	72	3	6	63	59	3	1	—

"*B.*" *Casualties in the Engagement of the Yellow Sea on August 10th, 1904.*"

Classification.	Total number of casualties.	Killed.	Died from wounds.	Wounded.	Returned to duty.	Invalided.	Still in hospital.	Out.
Officers	28	12	1	15	15	0	—	—
Gun-room officers	6	3	0	3	3	0	—	—
Petty officers ...	64	29	3	32	28	4	—	—
Men	127	21	2	98	80	18	—	—
Miscellaneous ...	7	0	0	7	7	0	—	—
Total	232	65	6	155	133	22	—	—

"C." Casualties in the Engagement at the South-Eastern Coast of Korea.

Classification.	Total number of casualties.	Killed.	Died from wounds.	Wounded.	Returned to duty.	Invalided.	Still in hospital.	Out.
Officers	9	1	1	7	7	0	0	—
Gun-room officers	2	0	0	2	2	0	0	—
Petty officers ...	35	13	3	19	18	1	0	—
Men	83	22	6	55	49	4	2	—
Miscellaneous ...	4	0	0	4	4	0	0	—
Total	133	36	10	87	80	5	2	—

"D." Casualties among the Naval Men at the Siege of Port Arthur.

Classification.	Total number of casualties.	Killed.	Died from wounds.	Wounded.	Returned to duty.	Invalided.	Still in hospital.	Out.
Officers	6	1	2	3	3	0	0	—
Gun-room officers	8	3	1	4	4	0	0	—
Petty officers ...	61	6	4	51	44	7	0	—
Men	268	20	20	228	205	22	1	—
Miscellaneous ...	0	0	0	0	0	0	0	—
Total	343	30	27	286	256	29	1	—

"E." Casualties in the Battle of the Sea of Japan on May 27th, 1905.

Classification.	Total number of casualties.	Killed.	Died from wounds.	Wounded.	Returned to duty.	Invalided.	Still in hospital.	Out.
Officers	49	5	2	42	40	0	1	1
Gun-room officers	14	2	0	12	12	0	0	0
Petty officers ...	158	34	3	121	112	2	8	0
Men	459	45	22	402	358	8	36	0
Miscellaneous ...	10	2	2	6	5	0	1	0
Total	700	88	29	583	527	10	46	1

"F." Casualties during the Period between Feb 9th, 1904, and August 13th, 1905, excluding the Big Battles.

Classification.	Total number of casualties.	Killed.	Died from wounds.	Wounded.	Returned to duty.	Invalided.	Still in hospital.	Out.
Officers	199	138	7	54	54	0	0	—
Gun-room officers	61	43	2	16	15	1	0	—
Petty officers ...	562	428	13	121	108	13	0	—
Men	1350	1031	15	304	283	19	2	—
Miscellaneous ...	43	30	2	11	11	0	0	—
Total	2215	1670	39	506	471	33	2	—

Remarks.—The percentage of "killed" in the navy was, as is seen in the table above, 51 per cent, while that in the army was 28 per cent., thus showing that the "killed" rate is much larger in the navy. This is no doubt due to the more powerful weapons used in the navy which cause great damage from explosive shells. All the wounded cases have been aseptically treated under strict observation and, of course, when the necessity arose, cases were treated antiseptically according to the nature of each case. Surgical operations were generally avoided as much as possible because it was found that the conservative surgery gave the best result.

In our army and navy before the battle commences we are in the habit of wearing new clothes after cleaning the body thoroughly as a matter of self-respect and this is also useful as a preventive method against the introduction of any infection from the outside when a man is injured or wounded.

The Goulstonian Lectures

ON

AUTO-INTOXICATION: ITS RELATION TO CERTAIN DISTURBANCES OF BLOOD PRESSURE.

Delivered before the Royal College of Physicians of London on March 13th, 15th, and 20th, 1906,

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LECTURE III.[1]

Delivered on March 20th.

MR. PRESIDENT AND GENTLEMEN,—In the last lecture reference was made to the various disintegration products which are formed when proteids and nucleo-proteids break down. Attention was also called to the work done by Salkowski who has pointed out so admirably the importance of autolysis. Salkowski found that the autolysed liver contained not only substances which might be derived from the body proteid of the cell but also other substances which indicated dissociation of the nucleo-proteid of the nucleus. In his control experiments nucleo-proteid was found, but this was quite absent in the liver preparation exposed to autolysis in a thermostat. This was further confirmed by the observation that the phosphoric acid which had gone into solution was increased in amount, more so than could be explained by the decomposition of jecorin and lecithin which are known constituents of the liver. With such evidence before him Salkowski years ago insisted on the existence of intracellular enzymes. The doctrine that cellular activity is intimately associated with the maintenance of the natural appearance and condition of the cell has led to error in the past and it is now quite freely accepted that the enzymes present in cells are capable of being extracted and will exert their influence even when dislocated from the cell body. To study the influence of such bodies we must have knowledge of the substance on which they act as well as on the materials which they produce by such action. That these causes—namely, the intracellular ferments—are very labile and refuse to yield the knowledge of their ultimate composition is a great reason for the difficulties met with in the study of such agents and of their importance. The intracellular ferments in common with other ferments are destroyed by a temperature of 100° C. Precipitation of the solution containing them causes them to be carried down in the precipitate. They are of a colloidal nature and it is therefore not strictly true that they are soluble in water. Extraction with water or salt solutions of organs which have been ground up with sand is a common method of obtaining intracellular ferments. Buchner has, however, introduced hydraulic pressure as a substitute for extraction by this method and has obtained zymase from yeast which had hitherto failed to yield this ferment by other methods of extraction. The majority of intracellular

[1] Lectures I. and II. were published in THE LANCET of May 12th (p. 1295) and 19th (p. 1375), 1906, respectively.