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Special Article

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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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LECTURE I.

Delivered on May 7th.

MR. TREASURER AND GENTLEMEN,—I am here to-day owing to an invitation from the staff of St. Thomas's Hospital and Medical College. I feel that it is a great honour to me personally and also a great compliment paid to the medical profession of the Japanese empire, and I thank you all on their behalf for your cordial and friendly feeling towards us.

I think some of you are already aware that I was invited by Cartwright's Lecture Committee of the Alumni Association of the College of Physicians and Surgeons of Columbia University of New York to deliver the Cartwright lecture and I chose the Sanitation of the Japanese Navy and Army as the subject of my lecture. At that time I had no idea and never thought that I should be asked to speak before such a large and distinguished assembly as is present here to-day. But when I was in America I was requested by the staffs of this hospital and St. Thomas's Medical College to tell them some of my experiences and I could not resist accepting such an honour from this hospital, with which I may claim very close relation, in so much as I am one of the graduates of this ancient institution and have worked under this roof as house officer. The subject of my address here is the same as in the Cartwright lecture, the reason being that on this subject I may claim to having had some practical experience and knowledge on account of my long service in the navy.

Here I have Table I. showing various details from 1878-1888 and I am now going to explain all the details. From 1888 to the present day there have been no important changes. In looking over this table we find the average number of general diseases during 1878, 1879, and 1880 to be just over 4327 per 1000—that is, one sailor suffered 4·32 times every year. The death-rate averaged 16·34 per 1000 and the invaliding-rate 8·75. The number of beri-beri (kak'ke) patients was 349·33 per 1000. Those who died from it averaged 7·96 and those invalided 2·45. Therefore, the number of sailors lost through death and made invalids owing to general diseases was 24·09 per 1000 and those lost through death and invaliding from beri-beri 10·43 per 1000. If we now subtract 10·43 from 24·09 only 13·66 remain. Therefore it was clear that if beri-beri could be wholly exterminated the number of losses from illness would decrease to 13·66.

From 1881 to 1883 the number of cases of illness slightly decreased. In 1884 the general aspect of the health of the navy suddenly changed for the better and the number of general diseases as well as cases of beri-beri markedly decreased. The number of general diseases was 1865·02 per 1000—that is, one person became ill 1·8 times a year. Deaths per 1000 decreased to 7·98 and invalids to 7·80. The number of beri-beri cases averaged 127·35 per 1000. Deaths from it decreased to 1·42. Therefore, the average of deaths and invalids from general diseases decreased to 15·78 and that of beri-beri to 1·60 per 1000. Similarly in 1885 the number of general diseases decreased to 992·48 per 1000 and deaths to 7·08 per 1000. Beri-beri decreased to 5·93 per 1000 without death. So the number of deaths and invalids decreased to 12·14. In 1886 general diseases per 1000 averaged 577·46, deaths 7·43, and beri-beri 0·35, without death or invaliding. In 1887 general diseases per 1000 were 434·22, deaths 6·04, and invalids 6·15. In 1888 general diseases per 1000 averaged 400·59, deaths 7·08, and invalids 9·15. In short, the number of losses through deaths and invalids per 1000 in 1884 was 15·78, in 1885 12·14, in 1886 12·57, in 1887 12·19, and in 1888 16·33. If we now compare these five years with three years from 1878 to 1880 we find a marked decrease of general diseases and disappearance of beri-beri with corresponding decrease in the loss of sailors year by year. These good results must depend upon certain causes and in order to explain them I will first of all try to describe various important facts since the establishment of the Naval Medical Bureau in 1872.

THE ESTABLISHMENT OF THE NAVAL MEDICAL BUREAU.

The Naval Medical Bureau of the Japanese Empire was established for the first time in 1872. At that time there was no one who had a thorough idea of naval hygiene because up to that time there was no special sanitary work carried out by medical officers in our navy, and other officers thought that the necessity of medical men in the Navy was simply for treating diseases and wounded. Even the medical officers thought in the same way. They never had the slightest idea of doing anything in preventing disease or in general hygiene. Accordingly, the only medical record left from 1872 to 1877 was limited to the description of results of treatment, name of diseases, and names of patients taken into hospitals. Between 1878 and 1883 the record gradually began to include facts about hospital and non-hospital patients and some hygienic affairs. Finally, from 1884 the records became more and more complete, giving various tables illustrating hygienic conditions by the issue of instructions relating to the duties of the medical officers.

TABLE I.—SHOWING THE GENERAL HEALTH OF THE NAVY.

Year.	Strength.	All diseases and injuries.							Cases of kak'ke or beri-beri.					
		Cases of disease or injury.	Ratio of cases per 1000 of strength.	Average ratio of cases per person per annum.	Died.	Ratio of deaths per 1000 of strength.	Invalided.	Ratio of invalided per 1000 of strength.	Cases of kak'ke.	Ratio of cases of kak'ke per 1000 of strength.	Died.	Ratio of deaths per 1000 of strength.	Invalided.	Ratio of invalided per 1000 of strength.
1878	4528	17,788	3928·45	3·93	56	12·37	44	9·72	1485	327·96	32	7·07	19	4·20
1879	5031	22,426	4413·70	4·41	119	23·42	39	7·68	1978	389·29	57	11·20	8	1·57
1880	4956	22,819	4604·32	4·60	63	12·71	43	8·68	1725	348·06	27	5·45	9	1·82
1881	4641	15,766	3397·12	3·40	81	17·45	29	6·25	1163	250·59	30	6·46	16	3·45
1882	4769	12,074	2531·77	2·53	103	21·60	30	6·29	1929	404·49	51	10·69	17	3·56
1883	5346	16,380	3063·97	2·90	85	15·90	28	5·24	1236	251·20	49	9·17	4	0·75
1884	5638	10,515	1865·02	1·81	45	7·98	44	7·80	718	127·35	8	1·42	1	0·18
1885	6918	6,866	992·48	0·91	49	7·08	33	4·77	41	5·93	—	—	1	0·14
1886	8475	4,874	577·46	0·52	63	7·43	52	6·14	3	0·35	—	—	—	—
1887	9016	3,954	434·22	0·40	55	6·04	56	6·15	—	—	—	—	—	—
1888	9184	3,679	400·59	0·40	65	7·08	48	9·15	—	—	—	—	—	—

THE EDUCATION OF NAVAL MEDICAL OFFICERS.

At the time of the establishment of the Medical Bureau in 1872 Dr. Wheeler, attached to the British Legation, was invited by the Naval Hospital to give lectures, both theoretical and practical. In 1872 Mr. William Anderson was specially invited from England to teach junior medical officers and students. In 1877 16 men were qualified and passed out of the school. These were the first graduates. Chief among them were the present Surgeon-Generals Yamamoto, Totsuka, Suzuki, and Kimura. The first three were educated, like myself, in this hospital for the higher course of study. (Surgeon-General Yamamoto served during the late war with Russia as the chief surgeon of Yokosuka Naval Station, Surgeon-General Totsuka as the chief surgeon of Sasebo Naval Station, where the majority of the wounded from the naval fights were treated, and Surgeon-General Suzuki as the chief medical officer of Togo's fleets.) However, later, during my absence in England, the levying of medical students was stopped and Mr. Anderson's duties came to an end. It was then found that as the newly adopted medical officers could not understand a foreign language they could neither learn anything about naval and military hygiene in foreign lands nor could they follow the progress of medical science in general. Besides, they could not talk and associate with foreign medical officers, and on occasions when they went to foreign ports or lands they could not find out the sanitary conditions, especially those relative to the endemic and epidemic diseases of those ports.

Again this ignorance of foreign languages led to inconveniences in buying articles of food, drinking water, &c., and thus there was always fear of the invasion of infectious diseases through this channel. Moreover, the foreign language used by the Imperial University in teaching medicine was German, and I thought that the language most useful and important to our naval medical officers would be English. Finally, unless those who serve in the navy were able to keep up the general spirit characteristic of the sailors they could not work hand in hand with the fighting or deck officers and they would find many inconveniences in conducting sanitary affairs. Accordingly I insisted upon re-establishing the Naval Medical School and enlisted some students in 1881. Besides the full medical course the English language was taught as an extra subject and by 1894 80 students in all passed out as officers. But after that year (in 1893 I retired from active service, was placed in the reserve list, and became a member of the House of Peers) fresh students were not again enlisted and new medical officers were obtained from among those who studied in the Imperial University and specially licensed medical schools. Medical officers were also sent abroad to pursue further study in medical science. In 1872 Dr. S. Ono and Dr. K. Yoshida, in 1874 Dr. T. Ishigami, in 1875 Dr. K. Takaki, and in 1878 Dr. A. Saneyoshi were sent to England. Since then a number of medical officers was sent to Europe, chiefly to England and Germany. I entered the navy in 1872 and began to treat the sick and wounded. What at once attracted my notice was the large number of beri-beri patients and the numerous deaths resulting from it. And as this disease truly played havoc with the health of our navy and killed many, so as greatly to reduce our fighting strength, I turned my full effort towards finding its cause and treatment. By doing so, I meant to prevent the outbreak of this disease and to provide against unforeseen danger through ill-health in time of crisis in our Empire. In pursuing this purpose I met with many difficulties and passed through years of hard work.

The first time I heard of the fearful nature of beri-beri was 44 years ago. At that time guards were despatched by several Daimios to Kyoto to act as protectors of the Imperial Palace and my father being one of them stayed there for over a year. On his return he told me of the disease called beri-beri which killed many of these men. They attributed the cause to food and called a provision box the "beri-beri box." Later, in 1868, that is, in the year of the Meiji Revolution, I served for eight months in the army of Prince Shimadzu but did not see any beri-beri. As I said before, I entered the navy in 1872 and began to treat beri-beri patients for the first time. Up to May, 1875, I had seen several hundreds of beri-beri cases at the Naval Hospital. In the summer several acute cases appeared daily. Often five or six cases had to be treated at the same time and attending officers had to work very hard both day and night. At that time the beri-beri patients constituted three fourths of the whole number of patients. Various forms of treatment were adopted: purgatives and digitalis for œdema, palpitation, &c.; strychnine, iron, &c., for numbness and paralysis; tincture of aconite for hyper-sensibility of muscles; and purgatives and venesection for acute cases. These forms of treatment were general and there was no definite opinion as regards the food.

Conditions being such, it became my fixed desire to discover the cause and treatment of beri-beri. But I thought that with my insufficient knowledge of medical science I could not possibly discover them, and from then on the desire to go abroad in order to fit me for attaining my object never left my thoughts even for a moment. At last, in June, 1875, the desire was fulfilled and I started for England. I reached London in July and entered St. Thomas's Hospital Medical School in October. After staying there for over five years I returned to Japan in November, 1880, and was made the director of the Tokyo Naval Hospital in December. Thus, I got an opportunity to treat beri-beri patients again. The general conditions on my return were exactly the same as before I went to England and with subsequent increase of sailors more beri-beri cases appeared. At times, when the disease was in full force, we found the hospital too small and often had to use neighbouring temples. Moreover, acute cases were many and medical officers had a very busy and hard time. Such conditions used to strike my heart cold whenever I came to think of the future of our Empire, because, if such a state of health went on without discovering the cause and treatment of beri-beri our navy would be of no use in time of need.

As a first step towards the cause and cure of this disease I began to note the localities and seasons and to examine sailors in ships, barracks, &c., and I obtained the following facts:—1. Beri-beri occurred mostly from the end of spring to summer, but it was not limited to the warm season, sometimes occurring during the severe cold of winter. 2. The occurrence of the disease varied in different ships, barracks, &c. 3. Even in the same ship it appeared in some stations, not in others, and was never certain. 4. It occurred from time to time without regard to the state of quarters or clothing. 5. I found out that although clothing, food, living, &c, were not quite the same in all stations, yet they were almost similar.

With these facts I could not easily discover the cause and I went on with further investigations with the following results:—1. As regards the class of patients in general I found that sailors, soldiers, policemen, students, shop-boys, and so on, were those who suffered most. The upper class rarely became affected. 2. The people living in the same place suffered unequally—that is, some suffered and others did not. 3. Although it occurred mostly in large cities, like Tokyo, Osaka, and Kyoto, yet it sometimes appeared in smaller towns as well. Thus with such results and without discovering the cause of beri-beri the time quickly passed to the year 1882. In February of the year 1882 I was appointed the Vice-Director of the Naval Medical Bureau.

About that time it was found to be necessary to provide an extra medical officer besides the usual number on board the training ships going for long cruises on account of the abundance of beri-beri cases among the men during the voyage. In 1882 there was a critical state of affairs with Korea and three warships were sent to Ninsen (Chemulpo) and Saibutsu Bay. They stayed there only 40 days but owing to shortness of hands caused by the prevalence of beri-beri among sailors the officers felt quite unfit for battle and it was a very anxious time for those in positions of responsibility because those three ships would have been of no fighting value in the critical moment. For example, in one of the ships 195 out of 330 were down with beri-beri. As a consequence I handed to the chief of the Naval Medical Bureau on June 24th, 1882, a memorandum describing the facts. Following this, in August, 1882, H.I.M.S. *Iwate*, in spite of anchoring off Shinagawa Bay, had to send half of its crew ashore in turns for the treatment of beri beri. Continuing still further, I examined the reports of the Tokyo and Yokohama naval hospitals for 1881 and found out that three-fourths of the patients had suffered from beri-beri.

In 1883 I received permission from the Minister of the Navy to examine the hygienic conditions of ships, barracks, schools, &c., belonging to the navy. I found that although working hours, clothing, dwelling-houses, &c., were similar everywhere, yet in food there was a great deal of difference. So I now asked the head of each sectional department to send me in the reports describing the details of food taken

three times daily for a week. From this I discovered the following facts: 1. Nitrogenous substances contained in the food were not sufficient to make up for the amount of nitrogenous substances discharged from the body. 2. On the contrary, the food contained too much carbohydrates. If we now look into the table recognised by scientists showing the comparative amounts of nitrogen and carbon discharged daily by a fair-sized adult we shall see that carbon equals 310 grammes and nitrogen equals 20 grammes—i.e., nitrogen is to carbon as 1 is to 15·5. 3. The food taken by our sailor showed nitrogen 1 to carbon 17–32. 4. The greater the difference in these proportions the more beri-beri occurred, and the lesser the difference the less.

After obtaining these important facts I came to think that:—1. Beri-beri is caused by the disproportion of nitrogenous and non-nitrogenous elements (nitrogen and carbon) in food—that is, the amount of the nitrogenous was insufficient and that of the non-nitrogenous excessive. 2. The symptoms of beri-beri patients are really due to these causes and the good results obtained by purgatives are due to their powers in getting rid of the abundant carbohydrates. 3. The pathological changes occurring in nerves, muscles, &c., are the result of inability of the tissues to repair the waste owing to the insufficiency of nitrogenous substances in the food and the above changes are further aggravated by the presence of the large quantity of carbohydrates in the food.

In October, 1882, I submitted a proposal to the Minister of the Navy, the late Count Kawamura, the chief object of which was to change the old dietary system. When this proposal was put forward before a meeting there was a good deal of opposition. They said that the change was too radical and instanced the great disturbances caused by the change of diet in the Italian navy some years before. They also called attention to the new system of fixing the amount of food by quality and quantity instead of by monetary value as in the old. In spite of the difficulties caused by this opposition my opinion finally prevailed and the new system was adopted. But as we required a few months longer in order to examine and to fix the quality and quantity of food to be given, and as even some naval medical officers were holding the opposite view in heart, I took the opportunity of trying the new system on a certain number of beri-beri patients in the Tokyo Naval Hospital, comparing the result with that of the old system. The following is the table showing the increase in weight in the old and new diet on ten beri-beri patients, five on each diet during four weeks:—

Old Diet. *New Diet.*

1 momme = 58 grains Troy, or about 1 drachm.

Initials of Patients.

	F—— K——.*	U—— K——.*
	Momme.	Momme.
Before experiment	13,000 (101 lb.)	12,700 (98½ lb.)
1st week	13,020 (increase 20=2½ oz.)	12,800 (increase 100=¾ lb.)
2nd week	13,040 (,, 20=2½ oz.)	12,800
3rd week	13,380 (,, 340=2¼ lb.)	13,160 (increase 360=3 lb.)
4th week	13,440 (,, 60=7 oz.)	13,250 (,, 100=¾ lb.)
	Total increase 440=3¼ lb.	Total increase 560=4½ lb.

	B—— I—— *	T—— K——.*
	Momme.	Momme.
Before experiment	11,680	14,380
1st week	11,500 (decrease 180)	14,300 (decrease 80)
2nd week	11,980 (increase 480)	14,580 (increase 280)
3rd week	12,140 (,, 160)	14,660 (,, 80)
4th week	12,240 (,, 100)	14,660
	Total increase 560=4½ lb.	Total increase 280=2 lb.

	Y—— K——.*	Y—— C——.*
	Momme.	Momme.
Before experiment	11,100	13,320
1st week	11,100	13,220 (decrease 100)
2nd week	10,860 (decrease 240)	13,280 (increase 60)
3rd week	10,920 (increase 60)	13,360 (,, 80)
4th week	10,960 (,, 40)	13,640 (,, 280)
	Total decrease 140=1 lb.	Total increase 320=2¼ lb.

	Y—— K——.†	G—— M——.†
	Momme.	Momme.
Before experiment	14,960	14,360
1st week	15,280 (increase 320)	14,320 (decrease 40)
2nd week	15,200 (decrease 80)	14,220 (,, 100)
3rd week	15,300 (increase 100)	14,260 (increase 40)
4th week	15,300	14,300 (,, 40)
	Total increase 340=2½ lb.	Total decrease 60=¼ lb.

	T—— K——.†	T—— W——.†
	Momme.	Momme.
Before experiment	13,500	12,740
1st week	13,340 (decrease 160)	12,660 (decrease 80)
2nd week	13,230 (,, 110)	12,500 (,, 160)
3rd week	13,180 (,, 50)	12,500
4th week	13,150 (,, 30)	12,440 (,, 60)
	Total decrease 350=2½ lb.	Total decrease 300=2$\frac{1}{6}$ lb.

New Diet.

Increased weight of 5 experimental patients ... 1160 momme = 9 lb.
Decreased ,, 5 ,, ,, ... 360 ,, = 3 lb.
The difference between the two is the increase of 800 momme = 6 lb. —that is, each person increased 160 momme = 1·2 lb.

Old Diet.

Increased weight of 5 experimental patients ... 1340 momme = 10.38 lb.
Decreased ,, 5 ,, ,, ... 490 ,, = 3·8 lb.
The difference is the increase of 850 momme = 6½ lb.—that is, each patient increased 170 momme = 1 3 lb.

In this table those marked (*) show chronic kak'ke; those marked (†) show subacute kak'ke.

The new system diet for the first two weeks is shown in Table II.; that for the second two weeks in Table III. Table IV. shows the old diet. Of the five patients who received the new diet all were discharged with complete cure. Of the five patients who remained on the old diet four were cured and discharged from the hospital and one changed into pulmonary disease.

TABLE II.—*Showing the Daily Ration supplied to Sailors during Stay in Port.*

Breakfast.

—	Bread.	Biscuit.	Butter.	Cream.	Sugar.	Tea.
	Momme.	Momme.	Momme.	Momme	Momme.	Momme.
Sunday ...	60 (7½ oz.)	—	3 (⅜ oz.)	2 (¼ oz.)	4 (½ oz.)	1 (⅛ oz.)
Monday ...	—	50 (6¼ oz)	3	2	4	1
Tuesday ...	60	—	3	2	4	1
Wednesday	—	50	3	2	4	1
Thursday ...	60	—	3	2	4	1
Friday	—	50	3	2	4	1
Saturday ...	60	—	3	2	4	1
Sunday ...	—	50	3	2	4	1
Monday ...	60	—	3	2	4	1
Tuesday ...	—	50	3	2	4	1
Wednesday	60	—	3	2	4	1
Thursday ...	—	50	3	2	4	1
Friday	60	—	3	2	4	1
Saturday ...	—	50	3	2	4	1

1 momme = 58 grains Troy.

Luncheon.

—	Rice.	Fresh beef with bone.	Tinned beef.	Vegetables.
	Momme.	Momme.	Momme.	Momme.
Sunday	50 (6¼ oz.)	60 (7½ oz.)	—	25 (3⅛ oz.)
Monday	50	—	60 (7½ oz.)	25
Tuesday	50	60	—	25
Wednesday	50	—	60	25
Thursday	50	60	—	25
Friday	50	—	60	25
Saturday	50	60	—	25
Sunday	50	—	60	25
Monday	50	60	—	25
Tuesday	50	—	60	25
Wednesday	50	60	—	25
Thursday	50	—	60	25
Friday	50	60	—	25
Saturday	50	—	60	25

Dinner.

—	Rice.	Fresh beef with bone.	Fish.	Bean (Pisum)	Vegetable.	Japanese wine.
	Momme.	Momme.	Momme.	Momme.	Momme.	Go.
Sunday ...	50 (6¼ oz.)	40 (5 oz.)	—	—	25 (3⅛ oz)	2 (10 oz.)
Monday ...	50	—	40 (5 oz.)	10 (1¼ oz.)	25	2
Tuesday ...	50	40	—	—	25	2
Wednesday	50	—	40	10	25	2
Thursday ...	50	40	—	—	25	2
Friday ...	50	—	40	10	25	2
Saturday ...	50	40	—	—	25	2
Sunday ...	50	—	40	10	25	2
Monday ...	50	40	—	—	25	2
Tuesday ...	50	—	40	10	25	2
Wednesday	50	40	—	—	25	2
Thursday ...	50	—	40	10	25	2
Friday ...	50	40	—	—	25	2
Saturday ...	50	—	40	10	25	2

1 *go* = 10·931 cubic inches.

TABLE III.—*Showing the Daily Ration supplied to Sailors at Sea.*

Breakfast.

—	Bread.	Biscuit.	Butter.	Cream.	Sugar.	Tea.
	Momme.	Momme.	Momme.	Momme.	Momme.	Momme.
Sunday ...	60 (7½ oz.)	—	3 (⅜ oz.)	2 (¼ oz)	4 (½ oz.)	1 (⅛ oz.)
Monday ...	—	50 (6¼ oz.)	3	2	4	1
Tuesday ...	60	—	3	2	4	1
Wednesday	—	50	3	2	4	1
Thursday ...	60	—	3	2	4	1
Friday	—	50	3	2	4	1
Saturday ...	60	—	3	2	4	1
Sunday ...	—	50	3	2	4	1
Monday ...	60	—	3	2	4	1
Tuesday ...	—	50	3	2	4	1
Wednesday	60	—	3	2	4	1
Thursday ...	—	50	3	2	4	1
Friday	60	—	3	2	4	1
Saturday ...	—	50	3	2	4	1

Luncheon.

—	Rice (momme.)	Preserved Beef (momme).	Preserved pork (momme).	Corned beef (momme).	Vegetable (momme).	(Pisum) Bean (momme).	Indian corn (momme)
Sunday	50 (6¼ oz.)	40 (5 oz.)	—	—	10 (1¼ oz.)	—	—
Monday	50	—	40 (5 oz.)	—	—	25 (3⅛ oz.)	—
Tuesday	50	—	—	40	—	—	30 (3¾ oz.)
Wednesday	50	—	40	—	—	25	—
Thursday	50	40	—	—	10	—	—
Friday	50	—	40	—	—	25	—
Saturday	50	—	—	40	—	—	30
Sunday	50	—	40	—	—	25	—
Monday	50	40	—	—	—	—	—
Tuesday	50	—	40	—	—	25	—
Wednesday	50	—	—	40	—	—	30
Thursday	50	—	40	—	—	25	—
Friday	50	40	—	—	—	—	—
Saturday	50	—	40	—	—	25	—

Dinner.

—	Rice (momme).	Powdered flour (momme).	Potato (momme).	Vegetable (momme).	Canned beef (momme).	Canned beef (momme).	Canned pork (momme).	Canned fish (momme).	Biscuit (momme).	Japanese wine (sake).
Sunday	—	50	—	10†	40§	—	—	—	—	2 go¶
Monday	50*	—	—	10	—	—	40	—	—	2 ,,
Tuesday	30†	—	30	—	—	20‖	—	20	20	—
Wednesday	50	—	—	10	—	—	40	—	—	2 ,,
Thursday	—	50	—	10	40	—	—	—	—	2 ,,
Friday	50	—	—	10	—	—	40	—	—	2 ,,
Saturday	30	—	30	—	—	20	—	20	20	—
Sunday	50	—	—	10	—	—	40	—	—	2 ,,
Monday	—	50	—	10	40	—	—	—	—	2 ,,
Tuesday	50	—	—	10	—	—	40	—	—	2 ,,
Wednesday	30	—	30	—	—	20	—	20	20	—
Thursday	50	—	—	10	—	—	40	—	—	2 ,,
Friday	—	50	—	10	40	—	—	—	—	2 ,,
Saturday	50	—	—	10	—	—	40	—	—	2 ,,

* = 6¼ oz. † = 3¾ oz. ‡ = 1¼ oz. § = 5 oz. ‖ = 2½ oz. ¶ = 10 oz.

TABLE IV.—*Showing the Old System of Diet for Hospital Patient.*

	Breakfast.	*Luncheon.*	*Dinner.*
First class	Chief dish. Vegetables, two kinds, eggs, or peas, or beans, or sea-weeds, or eer (fish). Pickle. Plums (2). Boiled rice (rice gruel sometimes substituted).	Dish. Boiled fish or fried fish: 25 momme (3⅛ oz.). Small dish (cooked white bean). Boiled rice.	Dish. Chicken or beef: 25 momme (3⅛ oz.). Vegetables. Small dish (cooked white bean). Boiled rice.
Second class	Bread (¼ pound). Half-boiled eggs (2). Sugar: 4 momme (¼ oz.). Salt.	Bread (vermicelli, &c.).	Dish. Chicken or beef: 15 momme (1⅛ oz.). Vegetables. Small dish. Plums (2). Rice gruel (100 mommes (12½ oz.).
Third class	Soup. Vegetables (2 kinds). Small dish. Pickled plums (2). Boiled rice.	Dish. Vegetable (1 to 3 kinds). Small dish (potatoes, Indian corn). Boiled rice.	Dish. Beef or fish or fried eggs. Vegetables. Small dish. Boiled white bean. Boiled rice.

As the result of these experiments it was found necessary to spend 36 sen 1 rin (about 8¾*d.*) daily instead of 18 sen (about 4¼*d.*) under the old system—that is, more than double. In December of the same year an order was issued to make monthly statistics of the body-weight of each person in the navy in order to ascertain the necessary amount of food for officers and men. By this means we got the following comparative scale of body-weight for five years from 1884 to 1888.

In looking over Table V. you will find that the body weight is highest during the months of February, March, and April, and lowest in August and September. Therefore after 1889 the weights were taken only in March and September every year.

During ten years from 1884 to 1893 there was more or less difference yearly, but, taken as a whole, the weight had increased, that is, nearly eight pounds per person. From 1894 to 1903, for ten years, there was not much change in weight, and I think that shows the sufficiency of food supplied. During the former ten years the number of general diseases decreased in accordance with the yearly increase of weight. The last ten years showed not much change in weight and number of diseases. On Sept. 26th, 1883, I for the first time spoke on the cause of beri-beri before the meeting of the Japan Society of Hygiene and expressed my view as to the cause of the disease. On Oct. 5th, 1883, I was promoted to be Director of the Medical Bureau. Soon afterwards I asked the Minister of the Navy to have a special committee of investigation on the cause of the occurrence of the almost unprecedented number of cases of beri-beri on board the training ship *Riujo*, which left Shinagawa

on Dec. 19th, 1882, and returned to Shinagawa on Oct. 15th, 1883, after a voyage of 271 days to New Zealand, South America, and Hawaii. My proposal was adopted and a special committee consisting of the following members was formed: Rear Admiral Maki (Chairman), Surgeon-General Takaki, Captain Isobe, Commander Kunitomo, Fleet-Surgeon Kagami, Fleet-Surgeon Toyozumi, Paymaster Ijichi, Paymaster Kurihara, Secretary Iwamura, Lieutenant Serada, and Clerks Matsumura, Sakamoto, and Mishina.

The first meeting of the committee was held on Nov. 12th, 1883. The chairman, Admiral Maki, explained the object of this committee and I was appointed the chief of the investigation board. After this the meeting was held five times a week till April 11th, 1884, and altogether the committee met 79 times. During that time 76 records were made, comprising 10,862 questions and 10,400 answers. As a result I, with the assistance of Staff Surgeon Toyozumi, compiled ten reports concerning (1) patients, (2) clothing, (3) bedding,

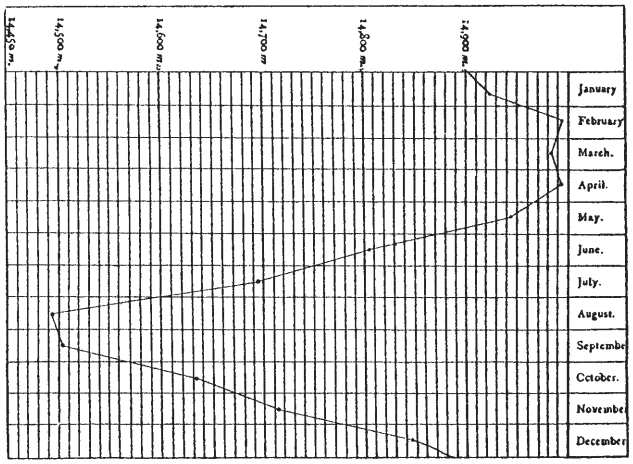
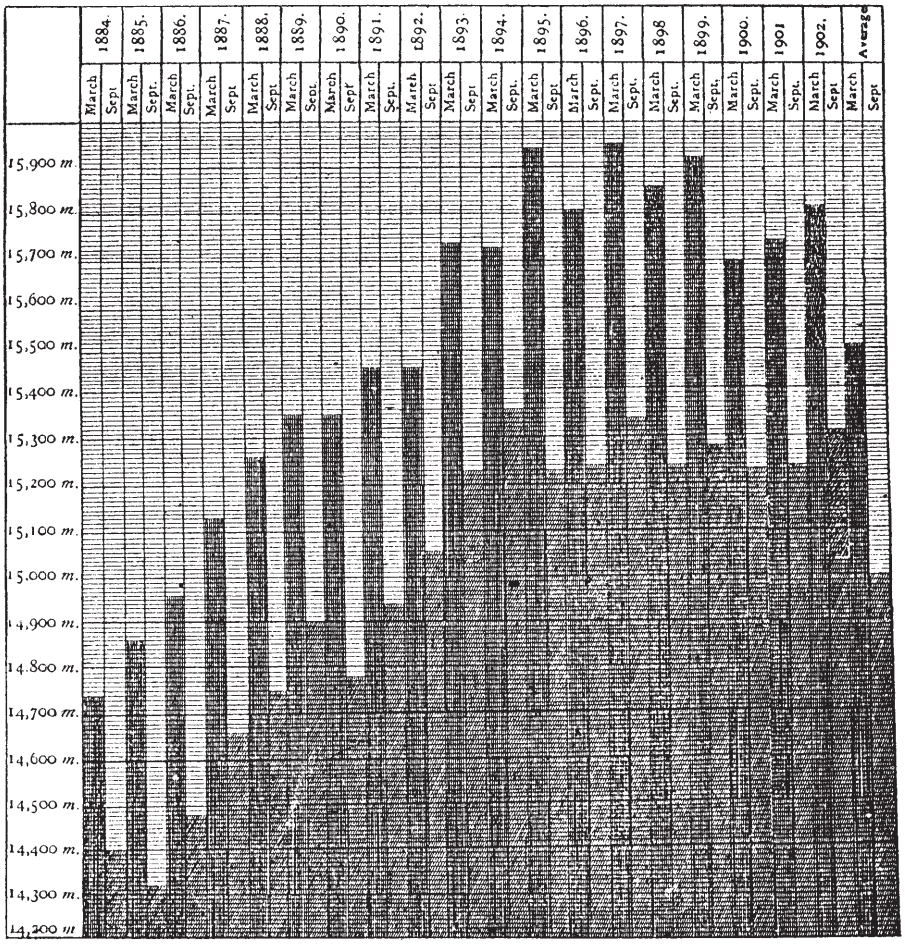


TABLE V.—*Average Monthly Body-weight of each Person from 1884 to 1888.*

TABLE VI.—COMPARATIVE SCALE OF BODY-WEIGHT IN MARCH AND SEPTEMBER DURING 19 YEARS.



(4) food, (5) drink, (6) housing, (7) labour, (8) rest, (9) voyage, (10) anchorage, (11) weather and climate, and (12) conclusion. Besides, we made up six tables on diseases, 32 tables on food, one each on drink, climate, weather, and temperature, and also tables on food supplied daily to petty officers, sailors, students, gun-room officers, and officers. Finally, the committee met to discuss the results of investigations on Feb. 12th, 1885.

In November, 1883, I was informed of the sailing of the training-ship *Tsukuba* in a short time and at once arranged to utilise this opportunity of testing the new system of diet by making her go the same route as that of the *Hiyei*. So before the sailing of the *Tsukuba* on Nov. 24th, 1883, I demanded the immediate practical application of the new diet and in consequence the Minister of the Navy issued the order to change the diet throughout the navy on Nov. 29th. Also on Nov. 26th, 1883, I proposed the necessity of the Medical Bureau having the reports on food supplied in ships, barracks, schools, &c., every month, and in the following December the Minister ordered this to be done. These reports have continued up to the present day.

TABLE VII.—*Showing the Average Daily Amount of Food for Each Person during 19 Years from 1884 to 1902.*

Year.	Amount of food for each person per day.	Year.	Amount of food for each person per day.
	Momme. Ounces.		Momme. Ounces.
1884	606·63 = 75·83	1894	416·08 = 52·01
1885	625·57 = 78·19	1895	406·70 = 50·83
1886	644·62 = 80·51	1896	384·90 = 48·11
1887	563·58 = 70·44	1897	391·29 = 48·91
1888	551·13 = 68·89	1898	406·75 = 50·84
1889	596·06 = 74·50	1899	408·01 = 51·00
1890	443·01 = 55·37	1900	415·45 = 51·93
1891	407·02 = 50·87	1901	460·60 = 57·57
1892	399·56 = 49·94	1902	438·55 = 54·82
1893	386·41 = 48·30		

The decrease of the amount of food since the year 1890 is due to the alteration of the Food Regulations in April of that year and also to the fact that, according to the revised regulations, when members of a table company exceed five in number they are allowed to receive per every five members (this number was altered to ten in 1898 and resulted in a little increase in the amount of food since that year) one man's allotment in money, with which they can buy whatever food they like, and such food is excluded from the Table. Some increase of the amount of food from 1900 is also due to the alteration of the Food Regulations from May of the same year.

TABLE VIII.—*Showing the Amount of each Nutritive Element in the Average Daily Amount of Food*

Month.	Proteids.		Fats.		Carbohydrates.		Total.		Ratio of carbon to 1 of nitrogen.
	Momme.	Ounces.	Momme.	Ounces.	Momme.	Ounces.	Momme.	Ounces.	
January ...	38·93	= 4·86	8·45	= 1·05	160·40	= 20·05	207·78	= 25·97	16
February	38·21	= 4·77	8·52	= 1·06	160·19	= 20·02	206·92	= 25·85	16
March ...	38·00	= 4·75	8·34	= 1·04	159·88	= 19·98	206·22	= 25·77	16
April ...	39·08	= 4·88	8·89	= 1·11	161·72	= 20·21	209·69	= 26·20	16
May	37·91	= 4·74	8·38	= 1·04	170·89	= 21·23	217·18	= 27·01	17
June... ...	39·19	= 4·89	8·56	= 1·07	163·95	= 20·49	211·70	= 26·35	16
July... ...	38·79	= 4·85	8·67	= 1·08	160·74	= 20·09	208·20	= 25·92	16
August ...	37·85	= 4·73	8·58	= 1·07	157·72	= 19·91	204·15	= 25·51	16
September	39·39	= 4·92	9·11	= 1·14	165·87	= 20·48	212·37	= 26·54	16
October ...	38·41	= 4·30	8·68	= 1·08	160·83	= 20·10	207·92	= 25·98	16
November	38·65	= 4·83	8·39	= 1·05	162·74	= 20·34	209·78	= 26·22	16
December	38·85	= 4·85	8·54	1·07	162·96	= 20·37	210·35	= 26·29	16
Average ...	38·61	= 4·82	8·59	1·07	162·16	20·27	209·36	= 26·16	16

TABLE IX.—*Amount of Each Nutritive Element in the Average Daily Amount of Food for the Period of 19 Years, from 1884 to 1902.*

Year.	Proteids.		Fats.		Carbohydrates.		Total.	Ratio of carbon to 1 of nitrogen.
	Momme.	Ounces.	Momme.	Ounces.	Momme.	Ounces.	Momme.	
1884	52·17	= 6·52	11·67	= 1·43	206·16	= 25·77	270·00	16
1885	52·43	= 6·80	12·13	= 1·50	211·95	= 26·49	276·51	17
1886	56·73	= 7·09	12·86	= 1·60	204·66	= 25·58	274·25	15
1887	49·70	= 6·21	12·79	= 1·60	185·19	= 23·15	247·68	16
1888	48·57	= 6·07	11·78	= 1·47	177·38	= 22·17	237·73	15
1889	51·46	= 6·43	11·99	= 1·49	191·48	= 23·9	254·93	16
1890	42·44	= 5·30	7·75	= 0·94	147·44	= 18·43	197·63	15
1891	37·42	= 4·67	6·66	= 0·83	141·33	= 17·6	185·41	16
1892	38·74	= 4·8	7·33	= 0·91	144·79	= 18·10	190·86	15
1893	39·37	= 4·92	7·43	= 0·93	146·52	= 18·31	193·32	15
1894	42·23	= 5·28	8·04	= 1·06	160·79	= 20·10	211·06	15
1895	41·78	= 5·22	8·08	= 1·01	154·07	= 19·26	203·93	14
1896	39·53	= 4·94	7·64	= 0·95	145·52	= 18·19	192·69	14
1897	38·93	= 4·86	7·39	= 0·92	144·18	= 18·02	190·50	14
1898	45·37	= 5·67	8·05	= 1·00	143·40	= 17·92	196·82	17
1899	47·49	= 5·93	9·33	= 1·16	159·94	= 19·99	216·75	15
1900	48·75	= 6·09	9·79	= 1·21	158·24	= 19·78	216·78	15
1901	52·66	= 6·58	9·03	= 1·13	156·90	= 19·61	218·58	14
1902	38·61	= 4·82	8·59	= 1·07	162·16	= 20·26	209·36	16

The reason of decrease in the amount of nutritive elements since the year 1890 and that of some increase in it since the year 1898 is due to that stated in the note appended to Table VII. The present scale of diet supplied to the sailors is as follows:—

TABLE X.—*Average Daily Amount of Food for Each Person.*

Article.	Amount.	Article.	Amount.
	Momme. Ounces		Momme. Ounces.
Biscuit	8·99 = 1·12	Vegetables ...	112·12 = 14·01
Bread	52·97 = 6·62	Tea...	0·41 = 0·05
Preserved meat	6·45 = 0·80	Baked barley	0·76 = 0·09
		Sugar	9·91 = 1·24
Preserved fish	6·50 = 0·81	Shoyu (a kind of soy) ...	19·89 = 2·48
Meat (fresh)...	53·98 = 6·74		
Fish (fresh) ...	19·60 = 2·42	Vinegar ...	1·52 = 0·19
Rice	100·49 = 12·56	Oil	0·54 = 0·07
Cracked wheat... ...	34·26 = 4·28	Salt	1·83 = 0·23
		Fat...	1·30 = 0·16
Beans	3·44 = 0·43		
Wheat flour...	2·63 = 0·33	Total ...	438·55 = 54·82
Dry vegetables... ...	0·96 = 0·12		

CHELSEA CLINICAL SOCIETY.—The ninth annual dinner of the Chelsea Clinical Society was held on May 3rd, under the chairmanship of the President of the society, Dr. J. B. Ball, at the Criterion Restaurant, Piccadilly, London. The feature of the evening was the brevity of the speeches and this unusual occurrence accounted for the great success of this dinner. The loyal toasts having been duly honoured the chairman proposed the "Chelsea Clinical Society," and after this had been acknowledged by Mr. A. F. Penny Dr. T. Vincent Dickinson promptly rose and submitted the toast of "The Visitors and Kindred Societies." This was responded to by Mr. C. R. B. Keetley and also by the Mayor of Chelsea. Dr. R. J. Collie in a few words then gave the toast of "The President and Officers of the Society," and the chairman in responding expressed in generous terms the thanks of the society for the services rendered by the honorary treasurer, Dr. A. E. Cooper, and the honorary secretary, Mr. A. A. Cooper. The evening was enlivened by some excellent music and dramatic recitals.

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,

BY BARON TAKAKI, F.R.C.S. ENG., D.C.L.,

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 momme (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 $\frac{5}{128}$ 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, 5⅜ ounces of fresh beef, 2 ounces of vegetable, $\frac{5}{128}$ 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, 99·8 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	469	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,

BY H. BATTY SHAW, M.D. LOND., F.R.C.P. LOND.,

LECTURER IN THERAPEUTICS, UNIVERSITY COLLEGE, LONDON; ASSISTANT PHYSICIAN TO UNIVERSITY COLLEGE HOSPITAL AND TO THE HOSPITAL FOR CONSUMPTION AND DISEASES OF THE CHEST, BROMPTON.

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.

namely, lymphocytes and plasma cells—which form the only characteristic microscopic evidence of a specific form of insanity—general paresis. In the true insanities where there is no dementia—for example, delusional insanity, hallucinatory insanity, and even in dementia præcox—the brain in its convolutional pattern and in the depth of the cortex generally shows nothing which would enable one to say that it was the brain of an insane person. Nor can we find microscopic evidence of any specific and characteristic change, although many may have been described by enthusiasts. Indeed, Dr. A. Campbell used six out of eight brains of patients dying from unsound mind in his very admirable studies on the histological localisation of the cerebral cortex. If such a systematic examination of every part of the cerebral cortex as he made revealed no departure from the normal it is obvious that other measures must be adopted to solve the mystery of insanity, but it is not until we have some trustworthy knowledge of the physiological processes of mind, the bio-chemical or bio-physical changes incidental to mental activity, that we can have any hope of dealing with the pathology of the question. It is easy enough to say that toxins and auto-toxins circulating in the blood produce this or that form of insanity, and we have definite evidence that certain poisons produce specific forms of delirium and hallucinations and even delusions, but this does not serve to explain insanity.

300 chemical substances have been prepared from the brain and separated by the chemist, but we do not believe that 300 chemical substances exist in the brain as collected in the test tube but probably a few only, with a large and complex molecule, of variable stability and with individual differences of synthetic combination. The impenetrable veil of the chemistry of nervous activity has only been lifted at one corner. It is probable that the complex phosphoretted molecule of the lecithins which lead to the formation of choline, glycero phosphoric acid, and the higher fatty acids, especially oleic acid, is a great exaggeration of a normal process of katabolism. But in healthy tissues there is always a proportional anabolic process. The disturbance of this normal equilibration of metabolism by toxins, deficient vascular supply, and other causes, including an innate or acquired loss of specific energy of the neurons themselves, leads to disordered metabolism and subsequently degeneration. Mental stability will depend upon chemical potential which can be transformed into nervous energy and this again must depend upon stability of metabolism. If we knew more about metabolism of the brain we might know more about the pathological causes of insanity. We know that a high oxygen tension is essential for the activity of the neural elements but we do not know that all this oxygen is used up and converted into carbon dioxide. We know that in starvation every tissue in the body may waste except the brain. How and why is it protected? Is it that there is a chemical associative memory of all the tissues of the body by which those of lowlier function have come to recognise in the long procession of the ages their dependence upon the controlling functions of the brain, so that they sacrifice themselves in order to preserve the mind (the directing influence of their activities) from destruction? It may, however, be argued that the brain does not waste because the metabolic processes occurring in it, although of a very complex and special nature, are yet infinitely small as compared with other tissues. Neurasthenic states may be due to the instability or lack of some chemical substance lying between the synapses of all the neurons and epilepsy and all paroxysmal psychoses may be due to a tendency of this substance to fulminate under the influence of excitation. This substance the psychologist McDougall has postulated to explain the process of attention and he has unfortunately termed it *neurin*. There is some histological evidence that there is such a substance lying between all the points of contact of the neurons; it is conceivable that it stores up oxygen and constitutes neural potential. It is possible upon this theory that when a stimulus passes along the fibrils of one neuron it excites the next by exploding the substance lying at the synapsis of the next neuron and so on along the chain of neural elements constituting the path of a physiological function, or, in other words, that chemical energy is transformed into molecular motion. This is mere speculation, but we want ideas and men competent to carry out researches to test such ideas. Unfortunately, physiologists can know but little of the organic chemistry of the brain unless they have devoted years to its study, and chemists seldom know much of physiology. Dr. Paton, of the Johns Hopkins University, in his admirable work on psychiatry calls attention to the necessity of the establishment of a fully equipped and well-organised psychiatrical clinic under the control of a university. We want such an institution in London, with a mental hospital attached and a central bureau for the investigation of the relation of heredity to insanity and of the social, industrial, and educational conditions which may be related to the production of insanity. Attached thereto a pathological laboratory for the study of the chemistry and histology of the brain in health and disease and its normal and morbid states by psycho-physical and other methods of research. Such exists in Munich, where Kräpelin has attracted a large number of men from all parts of the world and instituted new ideas and new methods, and, above all, aroused enthusiasm for the study of this most complex, difficult, and yet vital problem of the race.

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,

BY BARON TAKAKI, F.R.C.S. ENG., D.C.L.,
LATE DIRECTOR-GENERAL OF THE MEDICAL DEPARTMENT OF THE IMPERIAL JAPANESE NAVY.

LECTURE III.[1]

Delivered on May 11th.

MILITARY SANITATION.

MR. TREASURER AND GENTLEMEN,—On the subject of army sanitation I am afraid I cannot quite claim the same knowledge and speak with the same authority as in the case of the navy owing to the fact that my duty was chiefly concerned with the navy. As to practical experience, I can claim only very little which I acquired during my short stay in Manchuria. But your army had a most capable man at the front as your military attaché and Lieutenant-Colonel W. G. Macpherson, R.A.M.C., the late British medical attaché to the Japanese army, has already described and published articles concerning our medical organisation for the preservation of the health of the army under the title of "The Medical Organisation of the Japanese Army" in the *Journal of the Royal Army Medical Corps* for March, 1906. If any of you are interested in the subject of our medical organisation I strongly recommend you to read his clear and excellent article in that journal. The facts are very clearly and correctly described and I think that you may rely on them without fear. The time at my disposal being short I

TABLE XIII.—*Showing the Number of Cases of Beri-beri per 1000 Men.*

Name of division, &c.	Year. 1883.	1884.	1885.	1903.
Imperial Guards	489·53	486·56	269 82	
Gendarmes	408·17	354·54	254 96	
Academy, &c.	607·70	725·00	412·12	
School of Sergeants, &c.	217·82	412 89	349 81	
Tokio Division	349·38	467·99	311·16	
Sendai	120·16	216·02	138·36	14 63
Nagoya	119·55	100·24	94·58	
Osaka...	308·31	232·90	7 07	
Hiroshima	144·82	2·85	3·08	
Kumamoto	102·95	154·75	39·17	

[1] Lectures I. and II. were published in THE LANCET of May 19th (p. 1369) and 26th (p. 1451), 1906, respectively.

will omit the subject of our medical organisation and will proceed to explain various figures which I obtained from our military authority in Tokio showing the results of our efforts in the preservation of the health of the army. The struggle against beri-beri which has been going on in the navy has also been taking place in the army and the percentage of beri-beri cases was a good indication of the general health of the army because whenever beri-beri cases diminished the health of the army also improved generally—that is to say, cases of other diseases decreased proportionally.

MILITARY HYGIENE.

The health of our army has been gradually improving in late years but beri-beri is not yet eradicated as it is in the navy and I regret to state that although the cases are few in time of peace at home the disease is apt to break out in time of war just at the time when stronger men are needed. In former years beri-beri prevailed largely in the army as it did in the navy, but now it occurs less frequently than before. Table XIII. explains the facts.

This table shows that the disease was violent in its attacks. The different sections of the army suffered differently as to numbers, so that the hospitals provided for certain divisions were inadequate to take all the cases of beri-beri; therefore, in order to meet such emergencies other accommodations were provided in the special localities to which patients could be sent, such change of air being considered beneficial and curative. In the Nagoya division

TABLE XIV.—GIVING THE NUMBER OF CASUALTIES IN THE WAR BETWEEN JAPAN AND RUSSIA, 1904-05.

Killed.		Wounded.		Missing.		Total casualties.		Total.
Officers.	Non-commissioned officers and men.	Officers.	Non-commissioned officers and men.	Officers.	Non-commissioned officers and men.	Officers.	Non-commissioned officers and men.	
1657	41,562	5307	148,366	53	5028	7017	194,956	201,973

TABLE XV.—GIVING THE NUMBER OF PATIENTS ADMITTED INTO THE FIELD HOSPITALS FROM THE BEGINNING OF THE WAR TILL AUGUST 31ST, 1905.

Wounded.			Accidents.			Infectious or contagious diseases.			General diseases.			Total.		
New cases.	Recovered.	Died.	New cases.	Recovered.	Died.	New cases.	Recovered.	Died.	New cases.	Recovered.	Died.	New cases.	Recovered.	Died.
146,813	15,018	8304	16,456	4147	237	17,866	2044	5961	203,270	23,063	6850	384,405	44,272	21,352

This table may have to be corrected later.

TABLE XVI.—SHOWING THE FINAL DISPOSAL OF THE PATIENTS EVACUATED TO JAPAN.

Classification.	Officers.			Warrant officers.			Non-commissioned officers and men.			Non-combatants.			Total.
	Wounded.	Infectious or contagious diseases.	Miscellaneous.	Wounded.	Infectious or contagious diseases.	Miscellaneous.	Wounded.	Infectious or contagious diseases.	Miscellaneous.	Wounded	Infectious or contagious diseases.	Miscellaneous.	
Recovered	1097	—	930	287	1	227	50,690	460	73,327	64	50	10,477	—
Invalided ...	3	—	10	2	—	1	11,355	—	4,113	—	—	—	—
Died	26	1	18	3	—	3	935	311	2,125	1	40	138	—
Miscellaneous ...	1089	9	801	346	3	167	36,941	1095	57,207	51	133	1,072	—
Remaining	137	1	178	27	—	51	9,604	42	14,790	3	10	1,095	—
Total ...	2352	11	1937	665	4	449	109,525	1908	151,562	119	233	12,782	281,547

TABLE XVII.—SHOWING THE NUMBER OF INFECTIOUS CASES AND OF BERI BERI PATIENTS FROM THE BEGINNING OF THE WAR IN 1904 TO THE LAST DAY OF AUGUST, 1905.

Small-pox.		Scarlet fever.		Typhus fever.		Diphtheria.		Typhoid fever		Dysentery.		Beri-beri.	
New cases.	Deaths.	New cases.	Deaths.	New cases.	Deaths.	New cases.	Deaths.	New cases.	Deaths.	New cases.	Deaths.	New cases.	Deaths.
347	33	10	2	51	11	9	1	9722	4073	7642	1804	97,572	3956

This table may have to be corrected later.

TABLE XVIII.—COMPARATIVE TABLE OF INFECTIOUS DISEASES PER 1000 MEN.

—	Cholera.		Typhoid fever.		Dysentery.		Malaria.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Chino-Japanese war	82·77	50·86	37·14	10 98	108·96	15 72	102·58	5·29
North China troub'e	—	—	36·42	12 14	108 71	33·65	95·61	2·20
Russo-Japanese war	—	—	9·26	5 16	10·52	2·68	1·96	0·07

the number of beri-beri cases greatly diminished in 1885. This result is considered to have been due to a supply of rice with barley, in the proportion of 7 to 3. The Hiroshima division has suffered very little in general. The price of food is less there than at other places, so that better and more nutritious food could be supplied at the same expense, and therefore the division was supplied with some bread in place of rice. The results of the experimental use of barley in the Osaka division, and navy, induced the army authorities of other divisions to adopt a supply of barley in the proportion of 3 of barley to 7 of rice, and the result in 1903, as shown by this table, was a decrease of beri-beri.

Unfortunately, during the Chino-Japanese and the beginning of the Russo-Japanese wars owing to circumstances only rice was given to the men as principal food and as a consequence cases of beri-beri increased greatly—in fact, there was a very much larger number of cases than usual. But in the later period of the Russo-Japanese war when we began to give the men barley with rice and increased the quantity of meat the cases of beri-beri decreased rapidly with this change in diet. Another illustration of the influence of diet upon the health of the men is shown by the fact that there was not one case of beri-beri among the sailors of the naval brigade during the siege of Port Arthur, although there was a large number of beri-beri cases in the army. These men lived among the soldiers and under exactly the same conditions, but they differed from the soldiers in one respect, that they were supplied with one pound of meat, ten ounces of barley, and 20 ounces of rice per day, while the soldiers were supplied with five ounces of meat and 30 ounces of rice per day. The above examples confirm my view that beri-beri largely occurs among men who are fed with an insufficient quantity of nitrogenous food and an excess of carbohydrates.

The accompanying tables show the state of our army's health during the recent war.

Warrant officers are included under "officers." Table XIV. was made from the reports received to June 30th, 1905, concerning troops in Manchuria, and to the end of August, 1905, concerning troops in Korea and Saghalin. The proportion of officers killed to officers wounded is 1 to 3·25 and that of non-commissioned officers and men as 1 to 3·56. The table shows that the officers killed were in a larger proportion than the non-commissioned officers and men. The proportion of deaths from wounds, including both killed and subsequent deaths, is 1 to 3·94.

In Table XV. the proportion of deaths from infectious and general diseases (the total number 12,811) to that of deaths from wounds is 1 to 4.

Table XVI. is compiled from the reports received from the beginning of the war to the end of August, 1905. The "miscellaneous" include those cases sent to their own homes and discharged from hospital for other causes. The figures may have to be corrected later. The total number of patients evacuated is 281,547. The proportion of the wounded to cases of infectious and general diseases and accidents is 100 to 150.

Table XVII. is compiled from the reports received from the beginning of the war to the last day of August, 1905, and may have to be corrected later. Table XVIII. is of great interest in showing the progress that has been made in our army in the preservation of health since the Chino-Japanese war. Comparing the result of the Chino-Japanese war with that of the recent war against Russia we find the following facts. 1. That cholera has practically disappeared. 2. That typhoid fever cases decreased from 37·14 per 1000 men to 9·26 per 1000. The death-rate therefrom is almost halved. 3. That dysentery cases decreased from 108·96 per 1000 of men to 10·52 per 1000. The death-rate was brought down from 15·72 per 1000 of men to 2·68 per 1000. 4. That malaria cases decreased from 102·58 per 1000 of men to 1·96 per 1000. The death-rate is practically *nil*. These remarkably good results were chiefly the results of the progress made in the medical organisation as regards food, drink, clothing, camping-ground, &c., and we took particularly great pains to exterminate flies and to prevent them from coming in contact with our bodies, the articles of daily use, and into the dwelling-houses. Muslin nets were used at the windows and doors of the houses in order to prevent flies from coming in, and also to protect the exposed part of the body, such as the face, when flies are in abundance. This extensive use of muslin nets against flies, and at the same time against mosquitoes, may possibly be responsible, besides the improved sanitary organisation, for the remarkable decrease in the number of cases of typhoid fever, dysentery, and malaria. I may mention that another prophylactic, which we did not employ previously, was the use of creosote pills. Each man in health was supposed to take one of these daily throughout the campaign, and this, too, may have had some influence in causing these improved health conditions.

TABLE XIX.—*Giving the Number of the Medical Officers of the Japanese Army on Nov. 10th, 1905.*

Rank.	Active.	Reserve.	Retired.	Total.
Surgeon-Lieutenant-General..	1	3	—	4
Surgeon-Major-General	7	2	2	11
Surgeon-Colonel	37	5	3	45
Surgeon-Lieutenant-Colonel..	43	6	5	54
Surgeon-Major	176	29	19	224
Surgeon-Captain	443	78	74	595
Surgeon-Lieutenant	232	866	110	1208
Surgeon-Second-Lieutenant...	134	2076	6	2316
Probational Surgeons	38	—	—	38
Totals	1211	3065	219	4495
Pharmacists—				
First-class inspector	1	—	—	1
Second-class ,, ...	2	—	—	2
Third class ,, ...	8	4	1	13
First-class pharmacist... ...	53	7	5	65
Second-class ,, ...	30	72	9	111
Third-class ,, ...	15	428	2	446
Totals	109	511	17	637
Grand totals	1320	3576	236	5132

TABLE XX.—*Giving the Number of Killed and Wounded among the Medical Officers during the War.*

Rank.	Killed.	Wounded.
Surgeon-Colonel	1	69
Surgeon-Captain	2	
Surgeon-Lieutenant	6	
Surgeon-Second Lieutenant	9	
Total	18	69

GENERAL REMARKS.

During the recent war we had to take the most strict precautions to keep our men free from any epidemic disease by the carrying out of various plans arranged at the beginning of the war. For instance, as to the supply of water, we had to provide a water-cart drawn by four horses and a water-boiler cart drawn by one horse, and boiled-water stations were established and a small mess tin was carried by each soldier so that he could have boiled water by boiling it in his own mess tin when the necessity of doing so arose. At the boiling-water station during the march the soldiers had to fill their own water-bottle with boiled water. During the march when they had exhausted their own water-bottle they had to get water from the water-boiler cart which always accompanied the troops when possible and necessary and the water carts were almost always with them. When they had to get water from a stream or river they were ordered to get the drinking water from the centre of the stream so as to avoid the impurities coming from the bank of the rivers; even then the water had to be boiled before they took it. As a result of experience they found some difficulty in knowing whether water which they got during the night was pure or dirty. They could, of course, see the water but the light was not sufficient to enable them to say whether it was pure or not. We had therefore to take great care during night marches.

FOOD.

Almost all foods were sent from Japan to the front under strict superintendence of officials who ranked as officers, but, of course, whenever they could they obtained fresh food locally but took strict precautions not to get any injurious materials from the natives because there was some danger of poisonous matter being mixed with them. We therefore tried our best to give fresh food as much as possible. During the severe winter the soldiers had to keep their mess tin wrapped in a piece of flannel and carry it under the overcoat so as to prevent its freezing. They also were ordered to cook their rice each time they had to eat it, according to the circumstances, and also at times they were given biscuit in place of rice and barley. During the hottest part of the summer they added a small quantity of acetic acid to the cooked rice and barley in order to prevent decomposition. Besides a regular supply of food materials the soldiers were allowed to buy some eatables locally, according to special regulations laid down prohibiting them from buying food directly from the natives. Saké, two ounces on an average, was allowed to each as an extra under the strict superintendence of the medical officers. Sweets were allowed to those who had no inclination to drink saké.

CAMPING.

Whenever they had to go into camp, first of all a so-called camping party, consisting of the line and medical officers, was sent out so as to select a place where they could be safe both from a strategical and from a sanitary point of view, and medical officers had to inspect the source of water-supply, the condition of the houses found there, and the people living therein. When medical officers found any water which was unfit to drink they put up a notice cautioning the troops not to take it, and in cases where there was great liability for the soldiers to take it, according to circumstances, they had to place a guard over it. As to the Chinese inhabitants, they had to inspect them in order to ascertain whether they were suffering from any infectious disease or not. On finding them suffering from such they provided a special quarter to which they were sent and where they were treated by the medical officers. As to the houses which were used as quarters by the soldiers and which had been occupied by Chinese, in the first place they cleaned the house from corner to corner and disinfected the parts which they considered dangerous and also they thoroughly cleaned and disinfected as much as possible the surface of the soil round the houses as well as that outside of the camping ground. Afterwards they removed daily and destroyed all the combustible refuse by burning or else buried it. Fæcal matter was treated in the same way as is done in other countries. As to flies, we had considerable trouble with them. At the beginning we tried to kill them in various ways but they were so numerous that we were practically overwhelmed by them. Soon, however, it was discovered that they lay their eggs in manure as well as in refuse and since then we tried to burn all the manure and refuse as quickly as possible. We were thus able to diminish the number of flies.

CLOTHES.

Besides washing the clothing as often as opportunity occurred we had disinfecting apparatus with which the clothing, &c., belonging to each soldier were disinfected or sterilised whenever we thought it necessary to do so. Each apparatus had a capacity of disinfecting for 20 men at a time, and I believe we had to use more than 100 apparatuses, and I still further believe they were very useful means of preventing any epidemic disease from spreading.

SENDING THE TROOPS TO THE FRONT.

Before the troops were sent out to the field they were made to undergo strict inspection by medical officers to see whether there was suspicion of any form of epidemic disease amongst them. When such was found all were disinfected before being sent out. As to transportation of troops from the front back to Japan, all the troops had to be disinfected at quarantine stations and were then allowed to land. We are now employing three quarantine stations, the principal of which is that of Ninoshima, where they can disinfect 6000 men in the course of 24 hours. As to disinfection, the means employed there are both steam sterilisation and formalin fumigation, of which I do not think there is any necessity of description because they are the same as you have in your own quarantine stations. All the transport ships were made to undergo thorough cleaning and disinfection each time they come back to the ports and the space between decks was cleansed and disinfected with steam, &c.

As to the treatment of wounds, our army surgeons were in favour of the conservative surgery and all were treated aseptically as much as possible. In a great many cases, with the first dressings applied, they healed by the end of a week or ten days without the dressings having been changed. Major operations were avoided as much as possible in the front, but of course, after evacuation to Japan such has been done according to the nature of the wounds. Various means of treating the wounded in the front were employed according to the nature of the wounds, but, on the whole, aseptic surgery was the principal object. As to the results and terminations of all the cases treated, we are not yet in a position to inform you because such a large number of troops and medical officers were employed and consequently the reports which were made at the front had not yet arrived at the time when I obtained the notes which I have given you here. As one part of the results and terminations of treatment I give you a short account of the hospital established in Hiroshima.

The hospital of Hiroshima was established in April, 1904, and the report covers the period till Nov. 30th, 1905, during which time the hospital admitted 203,782 cases of which 162,885 were transferred to other hospitals. The average number of patients in the hospital was about 5000 and the largest number the hospital had was 10,000 cases at a time. Almost all the serious cases were kept in the hospital because they were unfit to be transferred, yet the result was so good that the ratio of deaths and invaliding is a little above 1 per cent. Almost all the wounds of the soft tissues healed within about ten days, while those with injuries to the bones have progressed favourably except those who were wounded at the siege of Port Arthur. Many men who were wounded in the head and chest have recovered from the wounds received. There were many cases of traumatic aneurysm and wounds of nerves requiring operation. The number of operations performed at the hospital amounted to more than 3500.

ABSTRACT OF

An Oration

ENTITLED

SOME CONTRIBUTIONS TO THE PATHOLOGY OF THE THYROID GLAND.[1]

BY PROFESSOR H. KOCHER,
OF BERNE.

[*Specially reported for* THE LANCET.]

PROFESSOR KOCHER, who was introduced to a full meeting of the society by Sir LAUDER BRUNTON, the President, delivered an oration on the Pathology of the Thyroid Gland which was listened to with much interest.

He said that there existed a divergence of opinion on the nature of exophthalmic goitre, many neurologists adhering firmly to the idea that it was a neurosis and was to be treated as such, because they frequently saw the first symptoms appear after severe mental shock. There was no doubt about the diagnosis of exophthalmic goitre in a severe case but there were other symptoms as important and constant as exophthalmos and goitre. He had never seen a severe case of the disease without an alteration of the thyroid gland. There was always a certain amount of swelling of the gland and as a very early symptom dilatation of the vessels was noticed, that being the case especially in regard to the arteries, together with a characteristic bruit often combined with a thrill. In the later periods of the disease and especially after treatment the vascular symptoms disappeared, leaving the swelling (much larger at this period) characterised by a uniformly diffuse increase of all parts of the gland. At that period the gland was harder than normal, whereas in the beginning the vascular dilatation made the organ feel softer. He would not accept the diagnosis of exophthalmic goitre without being able to make out the characteristic

[1] Delivered before the Medical Society of London on May 21st, 1906.