caused the trouble there was a mesentery of the diverticulum. All the diverticula were between two and one-half and four feet from the illeocecal junction. The manner of causing strangulation in Case 1 was unique.

I believe from this short series of cases, as well as the reports of some of our most careful observers, that diverticulum troubles are more common than are generally supposed and should be borne in mind as one of the not uncommon causes of intestinal obstruction.

A PORTABLE RATION FOR SOLDIERS IN BATTLE AND ON THE MARCH.*

LOUIS L. SEAMAN, M.D., LL.B.

Surgeon and Major U. S. V.
NEW YORK CITY.

So many and so complex are the considerations involved in this question that it can be readily seen no uniform standard can be made applicable to all armies or to all countries. Climate, season, custom, fixed tastes of different nationalities inherited through generations, distance from base of supplies, cost of preparation, are all factors that materially influence the selection of a portable ration and also indicate the impossibility of uniformity. It is, therefore, not my purpose to advocate any single standard ration, but rather to point out the advantages of certain articles of food that may be added to or replace others in already existing standards, as gathered by an experience with different armies in various lands.

An efficient dietary requires that its constituents shall furnish the proximate principles in amounts necessary for the economy, that they shall be easily digested as well as palatable, and that they shall fulfill their requirements with the minimum waste.

Briefly, the nutritive substances in food are the proteids, the carbohydrates and the hydrocarbons or fats. To these are added the mineral salts, water and accessories. The function of the proteids consists principally in the repair of waste, and they also supplement the carbohydrates and hydrocarbons in the generation of heat and energy.

The inorganic salts and water, although not foods, since they neither repair waste nor produce energy, are absolutely necessary to the chemical and metabolic changes which take place in living organisms.

Muscular energy requires for its generation a far more complicated process than mechanical force, just as the human machine is much more complex than the mechanical. In the steam engine the transformation of force from fuel to heat, and heat to power, is rapid and can be measured with mathematical exactness. In the animal machine this is not the case. A complicated process of digestion and assimilation are necessary, and these are often influenced by surrounding conditions which affect the nervous state of the individual and impair the production of energy and the repair of tissue. Nature provides for this by conserving the animal forces and storing them, so they may be available when needed. No more striking example of this conservation of energy in muscle can be found than in the hunting dog, who works from morning till night on his stored muscular power, often covering a hundred miles without a morsel of food until his day's work is done, when he is given a full meal before his rest. During the night his food becomes thoroughly digested, absorbed and stored, so

that he is ready next morning to repeat his labor. Feeding during the day impairs his keenness of scent and produces heaviness and desire to rest.

All animals naturally rest after eating. It is by following these dictates of Nature that the most beneficial results are obtained.

A portable military ration for soldiers on the march or in battle requires special elements which are not demanded in the dietary of those in other walks of life. Such a ration must be small in bulk, compact so as to be easily carried by the soldier in sufficient amounts for several days' use; it must be previously prepared or capable of being prepared with facility by the individual soldier, often under the most adverse conditions, and it must be non-irritating and of such character that it will keep under varying conditions of climate and weather.

That these requirements are not easily fulfilled is apparent by the varied rations in use in different armies, and the frequent changes made in them.

For many years the data deduced by Voit as to the amounts of the proximate principles of food necessary to maintain health and to produce heat and energy have been accepted as a standard. He estimated that a man of 154 to 156 pounds, working at moderately hard labor for nine or ten hours per day, required 118 grams proteids, 105 of which shall be absorbable, 56 grams fat and 500 grams carbohydrates, the food values of these principles being equivalent to 3,054 calories.

Chittenden, in an elaborate series of careful investigations, carried on for many months with students, soldiers and athletes, has demonstrated that Voit's estimates were excessive, that less than half the amount of proteids is ample under ordinary conditions and that with this diminution in proteids no increase in carbohydrates is necessary. He also proved that 3,000 calories is in excess of the real needs of the economy; in other words, that the average individual consumes double the amount necessary for the maintenance of health, and that the excess of food frequently acts detrimentally in producing imperfect digestion, fermentation, the creation of toxins and thereby necessitating additional work of elimination, for excess will as surely produce disease as insufficient or improper food.

While these conclusions hold good in the case of the subjects of Chittenden's experiments, a soldier in campaign or in battle undergoes an entirely different process of nervous tension and physical fatigue, wear and tear. Admitting his results, however, the proportions of one part proteids, two-thirds of a part of fat and three and one-sixth parts of carbohydrates, with one-fourth of a part of mineral matter, hitherto taken as a standard, may be changed to advantage. In the hitherto accepted scale of proportions the relation of nitrogen to carbon is as 1 to 15.

The results achieved by the Japanese in the prevention of disease in their army in the recent war with Russia, wherein the death rate from disease was far below that of any other army in history during active warfare, was due to several factors, of which the ration only concerns us at present.

This ration up to February, 1905, was as follows:

Rice	6	go	=	1,020	grams.
Or hard bread	270	momme	=	480	grams.
Fresh meat without bone.....	40	momme	=	68	grams.
Or fresh meat with bone.....	50	momme	=	85	grams.
Or dried salt meat	30	momme	=	51	grams.
Pickled plums.....	15	momme	=	25.5	grams.
Powdered misc.	20	momme	=	34	grams.
Salt	3	momme	=	5.1	grams.
Sugar	3	momme	=	5.1	grams.
Tea	1	momme	=	1.7	grams.
10 go — 100 momme = 170 grams; 1 momme = 1.70 grams.					

* Presented before the Military Section of the International Medical Congress, Lisbon, April 23, 1906.

The nutritive value of this ration is approximately as follows:

Articles.	Pro- tein. gms.	Fats. gms.	Car- bohy- drates. gms.	Nitro- gen. gms.	Car- bon. gms.	Fuel Value. Calo- ries.
Rice, 36 oz., 1,020 gms.	81.60	6.12	805.80	13.05	302.97	3604
Fresh meat, 2.4 oz., without bone 68 gms.	12.02	5.71	.....	2.06	2.11	102
Misc. estimated 1.70 oz., as per meal 34 gms.	8.36	.34	21.08	1.33	8.06	120
Sugar, 1.8 oz. 5.1 gms.	.....	...	4.84	...	1.79	19
Totals	102.88	12.17	931.72	16.44	314.93	3845
Nitrogen to carbon, 1 to 19.						

According to Voit's tables it is markedly deficient in fats, though the fuel value is high. The proteids are likewise below his standard. The carbon in the ration is almost entirely derived from the carbohydrate elements, which can not entirely replace the fat element without detriment to the nutritive process. Yet with this ration the Japanese troops endured all the hardships of a most vigorous campaign. The Russian troops likewise, according to Colonel Havard, U. S. Army, maintained a state of health superior to that of troops at home in the Russian garrisons on a ration which American or English soldiers would reject with scorn. The same observer gives the Russian field ration as follows: Fourteen ounces (396 grams) of fresh meat; two pounds (907 grams) of black rye bread; three or four ounces (85-113 grams) cereals or fruits, and vegetables, tea and sugar when procurable. In emergencies these quantities, especially the meats, were often reduced. This ration has a nutritive value of about 150 grams of proteids and 450 grams of carbohydrates, while its value in calories is 4,180.

Among the Japanese troops there was a noticeable absence of gastrointestinal diseases, and I am firmly convinced that their easily digested, non-irritating and readily assimilated ration was an important factor in eliminating disease of this class. On the other hand they suffered greatly from the scourge of Oriental races, beriberi. Almost one-half of the sickness in the army during the war with Russia was from that disease. The estimate of the number of cases—24.3 per cent. of the entire sick and wounded—shows the enormous total of 84,545. The disease had been practically eliminated from their navy in 1885, and no case occurred among the naval forces during the Russo-Japanese war. This result was accomplished by Baron Takaki, medical director of the navy, through a change in the naval ration, principally by the addition of barley, whereby its nutritive value was increased from 109 grams of proteids, 15.8 grams of fat and 622 grams of carbohydrates to 196 grams of proteids, 43 grams of fat and 775 grams of carbohydrates.

Bread and meat are the essential constituents of all dietaries, and military men generally recognize the importance of making provision for their supply whenever possible. Portable field ovens for baking bread and the furnishing of fresh beef by herds accompanying the army or the preservation of meat by refrigeration and its transportation in the frozen state are now commonly employed in the military service for this end. Vegetables will always be supplied when practicable, as their use is of the greatest importance in the maintenance of the health of troops.

I wish, then, to be distinctly understood that in proposing a portable ration for soldiers on the march or in battle I advocate it only as a field ration, when fresh meat and bread and vegetables can not be supplied; that in no manner is it proposed to replace the ration issued under ordinary military conditions; neither do I wish

to be understood as advocating it as a substitute for the numerous varieties of the emergency ration, which is only to be taken under occasions of great stress.

As the proteid constituent of such a ration I desire to call attention to smoked beef. In the process of its preparation the meat is exposed to the slow action of wood smoke. After a preliminary salting and drying the meat is suspended in a closed chamber and saturated with the smoke on alternating days for at least a month. Green hickory and beechwood are the best varieties for this purpose, as they generate more creosote than other woods. As a result of the action of the smoke, the meat becomes impregnated with pyroligneous and acetic acids and creosote. Meat preserved in this manner will keep indefinitely, is easily digested and palatable, and it may be eaten raw or cooked. It does not soon become distasteful, like canned roast beef or corn beef; it is small in bulk, hence there is no transportation of unnutritious material; it is not irritating and is not likely to cause gastrointestinal disturbances. Its nutritive value is high as it contains 26.4 per cent. protein and 6.9 per cent. fat; and owing to the creosote with which it is impregnated it possesses antiseptic qualities, which I consider of great value in a military diet.

For the carbohydrate constituent of the ration I would suggest a mixture of 7 parts rice to 3 parts barley meal. Rice, while deficient in proteids and fat, possesses the quality of being easily digested, its starch granules ranking first among the carbohydrates in this respect. It is procurable everywhere, cheap and economical, in that there is no loss of any of its constituents in the cooking. Barley meal is slightly richer in proteids and nearly four times as rich in fats, and approaches wheat in its nutritive power.

The mixture of these two grains is a very good substitute for bread, and lends itself particularly to the making of a palatable soup or stew. It should be cooked, dried and ground; so prepared it keeps well, is easily transported, and can be quickly prepared by the individual soldier. It is especially proposed as a substitute for the hard bread which now forms such an important constituent of most military field rations. Hard bread is irritating to the alimentary canal and unless well masticated or soaked in fluids its sharp angular particles will cause diarrhea. While theoretically it appears to be a good substitute for leavened bread, it is well known that it soon becomes distasteful and men do not thrive on it. It also has the objection of readily becoming moldy if exposed to the damp weather. (Prepared breads like French *pain de guerre* and Austrian acrated hard bread, are either too expensive or unsatisfactory in other respects.)

In the proportions suggested, the water-free combination of rice and barley, weight for weight, has a larger percentage of fats and carbohydrate than hard bread, and though its proteid value is somewhat less, there is less loss from non-absorption, because of its greater digestibility.

In this form it was issued to the Japanese troops after February, 1905, with the result of rapidly diminishing beri-beri in their armies.

Napoleon, commenting on the terrible trials of the Moscow campaign, mentions that of all his army the Italian troops withstood the hardships best. They were subsisted on a ration made up almost exclusively of vegetables and cereals. Leonidas and his little Spartan band defended the pass of Thermopylæ on a diet of lentils. The winner of the late Marathon race at the Olympian games trained on the same food, the lentil.

Barley meal and rice with smoked beef are then to constitute the bread and meat components of the ration. In addition to these nutritive elements I would strongly advocate the issue of sugar in greater amounts than is now used in any army. While it is recognized as a necessary adjunct to the military ration, I do not believe its advantages are appreciated to the extent that its qualities merit. When energy is to be liberated rapidly, with the least tax on the digestive system, sugar, an almost pure soluble carbohydrate, would seem to be the ideal food for the purpose. It is essentially a producer of muscular energy; it increases the ability to perform work and lessens or delays fatigue. Harley showed that when 200 grams were added to a small meal the total amount of work done was increased from 6 to 30 per cent., and when added to an ample meal, this total was increased still more. Comparative experiments made by Prantur and Stowasser in 1899, showed that men to whom sugar was administered were able to perform more work with less fatigue than those from whom it had to be withheld. The pulse rate and respiration were less affected when it was given than when it was withheld.

Sugar is readily soluble, easy of digestion, appeases hunger, and lessens thirst. Possessed of such qualities, its value as a part of a military ration is unquestioned. Its combination with chocolate has been frequently recommended, especially as an ingredient of the emergency ration. When so combined it makes an excellent food or drink and is a valuable adjunct to the field ration. Chocolate is easily digested and absorbed. It has slight stimulating properties, due to its active principle, theobromine, though in this respect it has less of the active principle than coffee, but like these it appeases the cravings of hunger. It contains 12.9 per cent. protein, 48.7 per cent. fat and 30.3 per cent. carbohydrates. Its nutritive value is therefore very high. It is palatable and can be eaten uncooked or readily made into a beverage with hot water. It is easily compressed into tablets, making it easily portable, and possesses excellent keeping qualities. It thus meets with all the requirements of a military food. The only objection against it for general use is its cost.

All military men agree as to the necessity of tea or coffee as an article in the soldiers' ration. Both, when properly made, are agreeable, refreshing and stimulating beverages; both diminish bodily fatigue, and allay hunger, and as they are prepared with boiling water, they are certain to be sterile. Both enable men to endure cold and hardships, but the experience of Arctic travelers give tea the preference. When drunk hot they maintain the bodily temperature and permit the use of food for purposes of energy which would otherwise be applied to the maintenance of bodily heat. Tea is in my opinion far preferable to coffee as a component of the military ration under consideration. Coffee when roasted and ground, and in that form only is it feasible in the ration under discussion, rapidly loses its fragrance and aroma. Tea retains these qualities much longer. The equivalent of a ration of tea as compared with a ration of coffee is but one-sixth in weight, while its bulk is correspondingly smaller. Compression into tablets increases its economical value through the breaking up of the vegetable cells by pressure. The readiness with which the infusion can be made by the individual soldier is another great advantage it has over coffee. To this purpose the water bottle or canteen of the Japanese soldier lends itself readily. This is made of aluminum with a flat bottom, with a screw top which serves as a cup; water can be quickly heated in a bottle so shaped, and in a very

short time the soldier's tea is prepared. Another advantage of the aluminum water bottle is that tea does not attack the metal and produce a tannate of iron as is the case when an iron vessel is used.

To the above articles should be added salt and pepper. The necessity for them is self-evident and needs no argument. The quantities in which these ingredients of the proposed daily ration should be issued, and their nutrient force values are as follows:

Articles.	Protein. gms.	Fats. gms.	Carbohydrates. gms.	Nitrogen. gms.	Calor. gms.	Fuel Value. Calories.
Smoked beef, 170 gms.	44.88	11.73	.....	7.18	9.26	283
Rice, 315 gms.	25.20	1.89	248.85	4.00	93.56	1113
Barley meal, 135 gms.	14.18	2.97	125.78	2.36	46.54	586
Sugar, 79 gms. ....	.....	.....	66.56	.....	24.60	266
Chocolate, 70 gms.	9.03	34.09	21.26	1.42	7.84	424
Tea, 10 gms. ....	.....	.....	.....	.....	.....	.....
Salt, 10 gms. ....	.....	.....	.....	.....	.....	.....
Pepper, 1 gm. ....	.....	.....	.....	.....	.....	.....
Total	93.29	50.68	462.33	14.96	181.80	2672

Nitrogen to carbon as 1 to 17.8.

This ration is easy of digestion, is palatable, satisfying, and with water it has considerable bulk; it is non-irritating, and to a degree antiseptic, and in my opinion meets with the requirements demanded.

The main objection to be apprehended from the use of a concentrated ration is its lack of bulk. Quantity is as essential as quality in rendering a food digestible. The stomach and intestinal canal require a decided amount of distension to stimulate their normal secretions, while at the same time the bulk serves to increase peristalsis, to flush the kidneys, and carry off waste products, which, if retained, would generate toxins. For this purpose I believe nothing equals hot water in value. It mixes admirably with every constituent of the ration enumerated; it furnishes that most grateful quality—heat to the digestion tract, especially at night when the soldier is exhausted and chilled after a hard day's march or the nervous tension of field service—it relieves fatigue, reinvigorates the system, and rapidly restores it to the best possible condition to resist disease.

An essential adjunct for the successful use of this ration is the portable water and soup kettle, which should form a part of every company's outfit. It should be made of aluminum, with attached fire box, mounted on wheels, and light and easy of transportation. These kettles, or similar ones, were in almost universal use by both armies in the recent oriental conflict, and they proved a most important factor, through the sterilizing of food and water, in reducing mortality from preventable diseases to the minimum point known in the history of war.

247 Fifth Avenue.

Treatment of Typhoid.—At the beginning, says Van Zant in the *Denver Medical Times*, I am accustomed to clear out the bowels with calomel and a saline, but later I rarely give purgatives for this purpose, relying entirely on colon enemata. In accordance with this plan, I have never felt it wise to resort to the Woodbridge treatment, for it is essentially laxative and irritant, increasing peristalsis and, I fear, the tendency to hemorrhage. A moderate experience with the new intestinal antiseptics has not impressed me in their favor. Salol has seemed useful in limiting tympanites, due to fermentation of food, and also as a urinary antiseptic; likewise the sulphocarbolates and creosotal. Turpentine by the mouth and in high colon flushings has a well-merited place in treatment. If the movements are not especially loose or frequent, it is not best to check them by medication, but to limit the degree of tympany as above suggested. Hemorrhage is best met by ice-bags to the abdomen, morphia hypodermically, and hypodermoclysis of normal salt solution; perforation by immediate laparotomy. Of direct specific treatment I believe there is none.