June	21	38	November	18	27
July	22	47	December	10	29
August	39	71			
September	29	42			
October	31	50	Total	235	413

FEEDING IN TYPHOID FEVER.*

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Coleman (1) believes "that the solution of the essential problems of the typhoid fever diet will be found in the correct answers to two questions: 1. Should the typhoid fever patient be given enough food to meet his energy requirements? 2. How much food may be considered necessary to fulfil these requirements?"

It is generally agreed now that the average demand of the normal organism is approximately thirty-three calories or heat units per kilo, or, since we are in the habit of calculating doses upon the basis of 150 pounds weight, a normal patient of this weight would need or oxidize 2,300 calories. Krehl (2) estimates an increase of 25 per cent to meet the energy requirements of the typhoid patient, and this estimate is in common acceptance. Therefore, we observe that the 150-pound typhoid patient demands 2,800 calories per twenty-four hours. This is his minimum requirement. Assuming that 2,800 calories is the minimum energy requirement of this patient, it is obvious that he must get it out of his diet or out of his warehoused energies.

Just here the question arises as to the ability of this patient to assimilate his energy requirement from any amount of intake, no matter how arranged as to concentration or digestive tax. This proposition is purely a matter of experience or test. Since the pathology of this disease has recently been rewritten, to the extent that it is now understood to be a bacille-mia, with an incidental infiltration of certain

portions of the small intestines, it is agreed that some of our conceptions of the intestinal possibilities of a full diet were largely imaginary. At the same time the proposition is absolute that this patient is in the midst of enormously devitalizing processes, no matter if this devitalization is construed to be a demand for more energy producing intake, and his ability to digest and appropriate nourishment may be definitely impaired.

The empiricists have been studying this feature of the situation with increasing vigor and boldness. Seventy years ago Graves showed temerity in asserting that these patients should be fed, and proceeded to give them a regime of broths and jellies which figured 300 calories. Thirty years later Flint announced that these patients were insufficiently nourished, and mapped out for them a milk campaign of two quarts a day, or approximately 1,400 calories. Twenty years later still a great many men began giving serious and more or less competent attention to diet in this disease, and now today Coleman says, "in one case we reached 100 calories per kilo or 6,000 calories a day." This paper of Coleman's is based upon an elaborate study of forty-six patients, only one of whom died, and which he thinks, for reasons given, "might, with fairness, be excluded." So there, on this high caloric regime, you have as low mortality as any one might dare to ask for.

As for the best arrangements for making up this caloric intake, that is largely a question of

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judgment, based upon individual considerations. It is more or less customary among the advocates of this regime to administer nourishment every two hours during the day, and every four hours during the night. Others prefer a three-hour daytime interval, and once or twice at night. I think the smaller quantities necessary at each feeding on the two and four-hour interval plan would be less likely to produce stomachic discomfort and restlessness.

As to the caloric value of the various food items, this is largely charted ground. By consulting any of the recent texts, and using a little ingenuity, it is an easy matter to construct a satisfactory dietetic outline for any given patient. However, as a working basis and for example I will list a few articles and their caloric values as selected from a recent article by Crohn (3):

Food Substance	Amount	Calories
Broth	Ounce 1	7
Bread	Ounce 1	75
Bread (without crust) ...	Gm. 20	50
Butter	Gm. 5	37
Bread and butter as used.	Slice 1	87
Buttermilk	Ounce 1	10.93
Cereal	Portion 1	160
Cream	Ounce 1	70
Cocoa	Ounce 1	22.50
Custard	Portion 1	60
Egg	1	60
Ice Cream	Plate 1	90
Lactose	Ounce 1	125
Milk	Ounce 1	20
Malted Milk	Ounce 1	15
Egg albumen	Eggs 1	40

Still quoting from Crohn, I will give you the outline of an average typhoid fever diet:

Breakfast, 6 a.m.: Farina 1 portion with lactose 1 ounce and cream 1 ounce. Coffee 6 ounces with cream 1 ounce and lactose $\frac{1}{2}$ ounce.

8 a.m.: Hot milk 6 ounces with cream 1 ounce and lactose $\frac{1}{2}$ ounce.

10 a.m.: Cocoa 8 ounces with cream 1 ounce and lactose $\frac{1}{2}$ ounce. Bread and butter 1 slice.

Dinner, 12 m.: Broth 8 ounces, bread and butter (in form of milk toast) 1 slice of bread with milk 4 ounces and cream 1 ounce and lactose $\frac{1}{2}$ ounce. Egg 1 (poached). Rice 1 por-

tion with lactose 1 ounce and cream 1 ounce.

2 p.m.: Ice cream 1 portion, bread and butter 1 slice, milk 6 ounces with cream 1 ounce and lactose $\frac{1}{2}$ ounce.

4 p.m.: Orangeade 8 ounces, with egg 1 and lactose $\frac{1}{2}$ ounce.

Supper 6 p.m.: One of the wheat breakfast foods 1 portion, with cream 1 ounce and lactose 1 ounce, bread and butter 1 slice, egg 2—Feeding in Typhoid Fever

1, malted milk 2 ounces with milk 6 ounces, cream 1 ounce and lactose $\frac{1}{2}$ ounce.

8 p.m.: Orangeade 6 ounces, with egg albumen 1 and lactose $\frac{1}{2}$ ounce.

12 p.m.: Hot milk 6 ounces, with cream 1 ounce and lactose $\frac{1}{2}$ ounce.

4 a.m.: Lemonade 6 ounces, with egg albumen 1 and lactose $\frac{1}{2}$ ounce.

This gives you a twenty-four outline possessing a total value of 3,704 calories. The constituent makeup of most of these articles is as follows: (4)

	Protein %	Carbohydrate %	Fat %
Milk (by volume)	3.3	5	5
Cream (by volume)	2	3	30
Butter (by weight)	..	..	85
Toast	11	60	..
Eggs (selected to weigh 60 gm. gross)	12	9	..
Lactose	..	100	..

The energy value of these constituents is as follows: (5)

	Calories
1 gm. protein	4.1
1 gm. carbohydrate	4.1
1 gm. fat	9.3

In calculating the energy demand of the typhoid fever patient his oxidation processes should be considered. His condition on this point is found to be one of intensified protein catabolism. In fact, this is true of the febrile reaction of all acute infections. So, in taking care of the nutritive status of the typhoid patients, it becomes a question of conserving protein loss and supplying protein energy.

This loss of body protein hitherto observed is charged to pyrexia, toxemia and starvation. Pyrexia can be materially modified with water,

without any upsetment other than the increased energy demands of increased exercise and manipulation, and its demand is imperative. Starvation can be met by an enriched dietary. As stated, this toxic destruction or febrile catabolism is very largely a protein loss. Indeed, Krehl and others think it almost exclusively so, and the exigency is almost wholly one of protein conservation. At the same time it is unwise to make the protein content of the intake any higher than absolutely necessary, as all articles of diet rich in protein are the things most likely to provoke digestive disturbances. Then, too, protein alone must be given in prohibitive amounts before nitrogen equilibrium is approached. The organism can successfully handle only about 100 gms. of protein a day, and it may better discharge its functions on 70 gms. a day. Fats alone hardly retard the protein loss at all. And they should always be administered cautiously, being kept down to the minimum upon the slightest evidences of digestive disturbances. So we are forced to place our chief reliance upon carbohydrates, and it happens, as Folin has shown, that their absorption in this disease is practically normal. Furthermore, experiment has proven that the checking of protein waste is best conserved by the liberal administration of carbohydrates. Carbohydrates alone may reduce the nitrogen output as much as 50 to 70 per cent.

A careful distinction should be kept between improperly nourishing and improperly feeding a patient. So far as at all consistent with the needs of the situation, the patient's appetite should be studied and his peculiarities noted, as digestion has its psychology, and will not tolerate a diet too distasteful. Yet there should be no mental tax upon the patient in the selection of his diet, and it should be changed as little as possible. His energy requirements having been agreed upon, an effort should be made in every instance to meet them, by carefully testing him out up to his full caloric demand, or until his digestion tolerance line is

unmistakably reached. Where it is impractical to have an elaborate food chart, it is quite an easy matter to make up the demands of the patient from a combination of lactose, milk, cream and eggs.

"The dietary at St. Luke's Hospital contains on an average 63 ounces of milk to which 1 ounce of milk sugar is added to every 7 ounces, and 3 whole eggs a day. This diet contains 2,585 calories, about 1,000 less than Shaffer & Coleman's and about 85 gms. of protein." (6)

"The basis of the high caloric diet as used in the wards of the Bellevue Hospital is milk, cream, eggs, milk sugar, bread and butter. With such materials various combinations may be made; one and one-half quarts of milk will give 1,000 calories, a pint of cream 1,000, one-half pound of sugar about 1,000 more, four eggs 250 more, thus making 3,250 calories. If one wants a few calories more, 250 to 500 more can be gotten in two to five ounces of sugar added to lemonade." (7)

"A glass of milk that contains seven ounces of milk, one ounce of cream, and one ounce of milk sugar, offers about 325 calories. Eight such glasses in twenty-four hours will give 2,600 calories, as high as many care to go. The protein, as well as the calories, in this food must be remembered. The milk contains 35 gms. to the quart, and the cream a trifle less, 25 gms.; the eggs, 8 or 9 gms.; the bread about 9 per cent, or 45 gms. to the pound loaf. In the more liberal dietary just suggested, about 100 gms. are afforded; in the smaller, 70. Two eggs added to this would increase the protein to 85 gms." (8)

1. J. A. M. A., Vol. LIII, No. 15.
2. Principles of Clinical Pathology, Philadelphia, 1905.
3. J. A. M. A., Vol. LVIII, No. 4.
4. Shaffer-Coleman, Archives Internal Medicine, Vol. IV, No. 6.
5. Ibidem.
6. Meara, American Journal Medical Sciences, January, 1911.
7. Ibidem.
8. Ibidem.