

THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

535 NORTH DEARBORN STREET . . . CHICAGO, ILL.

Cable Address "Medic, Chicago"

Subscription price Five dollars per annum in advance

Contributors, subscribers and readers will find important information on the second advertising page following the reading matter

SATURDAY, SEPTEMBER 22, 1917

THE OBJECTIONS TO RAW EGGS IN THE DIET

In the classic experiments on digestion in the human stomach which Dr. William Beaumont conducted nearly a century ago on Alexis St. Martin, the patient with a gastric fistula, it was noted that native egg white leaves the stomach very rapidly in comparison with other foods, including cooked egg white itself. This observation has repeatedly been confirmed in experiments on animals, and is doubtless correct. It is furthermore the presumable basis for the widespread impression that raw eggs are very easily digested, "inasmuch as they are 'chymified' in one and a half to two hours as against three for soft-boiled eggs."

Experiments conducted in vitro with raw egg white have demonstrated that this mixture of proteins is notably resistant to the digestive action of the gastric enzyme, pepsin, and likewise exhibits conspicuous antitryptic power. These are properties indicating sufficient obstacles to digestion in the case of the native product to place it almost in a class by itself among albuminous substances. Several years ago, Mendel and Lewis¹ of Yale University called attention in a casual way to the poor utilization of raw egg white in animals as exemplified by the diarrheas to which it can give rise. In the same laboratory, Bateman² has made an extensive study of this phenomenon. Native egg white was found to be a decidedly indigestible substance in dogs. When fed in any considerable quantity it invariably caused diarrhea and sometimes induced vomiting. The severity of the symptoms depended largely on the amount of material ingested, but also, to a less extent, on the individual susceptibility of the subject. After the ingestion of even small amounts of native egg white, the latter could be recovered unchanged in small quantities from the stools of the experimental animals; and when the amount ingested was large, the proportion of coagulable protein in the feces was correspondingly increased. Even

when the feces appeared normal, undigested egg white could usually be recovered, in contrast with the fact that as a rule albumin is not found in normal feces. Strangely enough, a tolerance to the raw egg white seems to be developed in the course of a few days, although prior to this an albuminuria may sometimes be detected. Even after an apparent tolerance manifests itself, the utilization of the egg white protein has not been found to exceed 85 per cent.

According to the report of Bateman,³ this deportment of egg white noted in several species is by no means unknown in man. He cites numerous instances to show that raw eggs may cause diarrhea and vomiting, and that the utilization of the native whites in the human alimentary tract is often found to be as low as 50 per cent. All of this information may seem somewhat startling in view of the reputed prescription of raw eggs in dietotherapy and its recommendation by prominent writers in this field. Without quoting the seemingly fabulous advice of Ely⁴ that physicians should throw away their tonics and "lead the stomachs of their patients up to the egg-an-hour practice," we may remind our readers that the use of from six to twenty-four whites daily is still advocated in widely read texts on the therapy of tuberculosis, the advice being to employ the raw product.

It should be clearly understood that although it is not difficult to find indications of the poor utilization of native egg white, so that one wonders whether such indigestible protein may not frequently reach the large intestine and become pabulum for putrefactive bacteria, the same criticism does not apply to the cooked product. Heating to 70 C. (158 F.) removes the partial indigestibility and puts egg white into the category of readily assimilable nutrient. Acids and bases likewise can effect a change in the same direction. The resistant properties of the egg white appear to be associated with the albumin fraction. The effect is not peculiar to the egg of the common fowl, since it has likewise been observed after feeding uncooked egg white from the egg of the duck. In contrast to egg white, egg yolk appears to be well digested and utilized.

Various considerations now make the popular advocacy of raw eggs seem inadvisable. Bateman³ has summarized the problem as follows: "A substance which fails to stimulate a flow of gastric juice and is antipeptic, which hurries from the stomach, calls forth no flow of bile, and strongly resists the action of trypsin, which is poorly utilized and may cause diarrhea, has evidently little to recommend it as a foodstuff of preference for the sound person, let alone for the invalid. And when the native protein needs only to be coagulated at 70 C. in order to obviate almost all the effects mentioned, there appears to be still less

1. Mendel, L. B., and Lewis, R. C.: Rate of Elimination of Nitrogen as Influenced by Diet Factors, *Jour. Biol. Chem.*, 1913, **16**, 55.

2. Bateman, W. G.: The Digestibility and Utilization of Egg Proteins, *Jour. Biol. Chem.*, 1916, **26**, 263.

3. Bateman, W. G.: The Use of Raw Eggs in Practical Dietetics, *Am. Jour. Med. Sc.*, 1917, **153**, 841.

4. Ely: The Fable of the Egg, *New York Med. Jour.*, 1903, **78**, 928.

reason for using it uncooked." This does not mean, of course, that raw egg is toxic in the correct sense of the word. The reputed relation of excess of egg white to renal damage and the frequent occurrence of hypersensitiveness to its proteins offer additional reasons for debating the wisdom of a liberal use of raw eggs.

EVERY DAY IS FISH DAY

In the search for new or little appreciated sources of palatable foods to meet the shortage that the war has brought to the entire civilized world, some consideration has already been given to fish. From a physiologic or nutritional standpoint, this type of animal food commends itself on account of its comparative richness in precisely those nutrients—proteins and fats—which at present command the highest prices. The fact that no special feeding or nurture is required to produce the common fish of our markets puts them into striking contrast, from an economic standpoint, to the various types of meat that are obtained as the result of the prolonged feeding of animals originally valued at a liberal price, through a period of growth and the process of finishing for the market. The cod, the mackerel and the shad, for example, require no management comparable to the methods of animal production in farm practice. The essential features of expense lie in the capture and marketing of the food.

Beef contains from 2 to 3 ounces (from 60 to 90 gm.) of protein per pound; fresh fish, such as cod, haddock, halibut, mackerel, perch, salmon and shad, furnish from 1½ to 2½ ounces, while the commoner dried fish contain as much as 3 ounces. From the standpoint of cost, on the other hand, 25 cents will purchase about as many calories of energy, and far more protein, when expended for salted cod at 15 cents a pound, and decidedly more nutrients when expended for smoked herring at 16 cents a pound, than can be obtained in the form of medium fat beef at 35 cents a pound. Admittedly it is not always justifiable to compare foods on the basis of price and calories alone, for there is a quality as well as a quantity factor involved. But with fish and other forms of flesh, the chemical features of the tissues are far more nearly alike than would be the case in a comparison of, let us say, corn meal and beef. For, after all, muscular tissue is chemically much the same in the vertebrate animals, the chief variations being in the unlike content of water or of fat.

Professor Ward¹ of the University of Illinois has pointed out that an entirely unjustified prejudice, or rather a series of prejudices, has stood in the way of the more widespread use of fish as food. In commending the new slogan, "Every day is fish day," Ward indicates the serious objection to the custom of

purchasing fish only on Friday. The work of the fisherman, he rightly says, covers more than a single day in the week, and to be efficient from the economic standpoint and satisfactory for the public, the fish business should be encouraged by the distribution of the demand over a larger part of the time.

The food purchasers of this country are losing valuable opportunities to extend the variety of edible products in this period of stress through an ignorance of the advantages or possibilities offered by some of the little used fishes. The prejudices engendered through ignorance or tradition in turn limit the satisfactory development of the fish-producing and fish-distributing industries. Even inland the opportunities are not so limited as is commonly supposed, so that a more liberal use of fish is not necessarily restricted to the regions bordering on the coast line of this country.² As instances of such neglected nutrient products Ward mentions the burbot, a fresh-water fish belonging to the cod family, which is sufficiently palatable to be regarded as a delicacy in continental Europe. The bowfin is a Mississippi basin fish that yields a smoked and salted product of satisfactory flavor. The carp, which is caught far inland, likewise has acquired an undeserved prejudice. Among ocean fish the tilefish and the sable-fish are destined to come into popular favor; while the rapidly increased demand for the grayfish, a new candidate for recognition in this country, though long used along the Mediterranean, suggests something in the nature of psychologic popularity promoted by the familiarity with whitefish and bluefish.

If butter substitutes can become popular despite the prejudice that was long created and maintained against them, if other cereals can win their way as competitors of wheat for popular favor in human nutrition, surely widespread reminders of the value of fish can and ought to create a demand for these wholesome products even in cases of little recognized merit. Strange names have not militated against many other novelties that have become household words. As Ward says, most families plan for fish once a week or less frequently; if they do not find just what they want available, they are apt to pass by, and meat is substituted. Thus for one cause or another the average fish consumption in the interior portion of the country falls far below that which obtains in the Old World, or that which should exist here when our extensive and splendid supply of fish food is taken into account. Fish are worthy of a more prominent place in the dietary despite the fact that they are not the unique "brain food" that an antiquated fancy would have them be, and despite the unsupported belief that they are concerned in the transmission of cancer. Like other perishable products they are liable to

1. Ward, H. B.: The Housewife and the Fish Problem, *Jour. Home Economics*, 1917, 9, 369.

2. The Bureau of Fisheries has recently published a series of economic circulars for the purpose of educating the public on the value of various fish and the best methods for preparing each kind.