CHAPTER VII

PROTEIN-RICH FOODS USED IN PLACE OF MEAT

I. Fish, eggs, cheese, milk, beans, peas, and nuts are the chief foods used as meat substitutes. Milk is taken up in chapter XII and peas and beans in chapter XIII. As regards the use of these foods it is interesting to note that the Allied Committee on Alimentation, in deciding not to fix a minimum meat ration, states that no absolute physiological need exists for meat, since the meat can be replaced by proteins of animal origin such as those contained in milk, cheese, and eggs as well as by proteins of vegetable origin.

II. The use of meat substitutes is important:
   A. To save meat for the Army and the Allies, since it is more easily shipped than most of the substitutes.
   B. To introduce an important economy in the individual’s expenditure for food. Some, though not all, of the substitutes are cheaper than meat.
   C. To cut down on the use of grain for animal food.

III. Fish.
   A. Consumption.

   The United States eats far less fish than most other nations. Our average per capita consumption is only 18 pounds per year. (Compare this
III. Fish (continued).

with our meat consumption of 178 pounds.) The British and Canadians, whose food habits on the whole are similar to ours, consume much more, 56 and 29 pounds per year respectively.

B. Availability.

Our low consumption is not due to lack of fish, because quantities of it are available. The potential supply is practically unlimited. There are 19,000 varieties, some of which, however, are inedible.

1. Many inland waters are plentifully supplied with little known fish that make excellent food. Only a few varieties, such as whitefish and trout, have been widely used, while fully three dozen more varieties from rivers and lakes are wholesome food and available in our markets. The use of many of these has been studied by the Bureau of Fisheries and the State Colleges.

2. Edible varieties of salt-water fish also abound in great numbers and should be utilized. Varieties that have hitherto been more or less despised and wasted have been attractively prepared and now make a valuable addition to the dietary. Whale is on sale on the Pacific Coast and is also being canned, and so is shark and seal meat.

3. The students should become familiar with all the varieties of fish in their locality, especially the little-known kinds. In some of
III. Fish (continued).

the smaller inland towns in which fresh fish has not been available, an assured demand will frequently make a steady supply possible, or salt, smoked, and canned fish can be used.

C. Nutritive value and digestibility compared with meat:

1. The protein is about the same in quantity and quality.

2. The fat content is much lower. Few fish have more than 10% fat. Butterfish, shad, catfish, herring, and salmon are among those containing the most fat. Cod and shellfish have little fat.

3. The water content is higher than in meat, varying in most fish from 70 to 80%, and in oysters up to 90%.

D. Fish supply.

1. The potential world supply is practically unlimited. A large proportion of the catch never gets into trade. The average value of the world catch before the war is roughly estimated at $500,000,000, of which the United States took one-eighth.

2. The great fishing regions are in the feeding banks.
   a. American: off the northeast coast.
      (1) Most important are the Grand Banks of Newfoundland, and the smaller banks off Labrador, New England, and New Jersey.
      (2) The Grand Banks of Newfoundland were known to fishermen of Brittany shortly after the voyages of Columbus. The right of fishing on these banks was an important issue in the French and English colonial wars from 1688 to 1763. Amer-
III. Fish (continued).

ican negotiators vainly tried to secure from England concessions satisfactory to New England fishermen at the close of the American Revolution. The subject was brought up in most of the Anglo-American commercial negotiations. A satisfactory war agreement has at last been reached in 1918, giving American and British fishermen equal rights in the waters or harbors of either country.

(3) Newfoundland and Labrador are supported almost entirely by fishing. Dried cod constitutes two-thirds of the exports of Labrador to Great Britain.

(4) The total catch of the United States is somewhat smaller than that of Canada. Massachusetts and Maine are the chief fishing regions of the United States. The normal value of the Massachusetts catch is estimated at about $7,000,000 annually.

b. European fisheries: Off the northwest coast.

(1) The North Sea was the greatest fishing ground in the world before the war. The catch in 1914 is estimated at 2,500,000,000 pounds, of which Great Britain took almost half, or 22 pounds per capita. Holland, Denmark, Belgium, France, and Germany also were provided for from the North Sea.

(2) The banks off the Faroe Islands, Iceland, and the other northern islands are rich in fish. Norway is very dependent upon these, as fish and fish products form one-third of the Norwegian exports.

c. Northeastern Asiatic fisheries: the Japanese dominate the richest Asiatic fisheries, for Japan, having few meat animals, depends largely upon fish.

3. Less important fishing regions are numerous, especially
III. Fish (continued).

in the Pacific. The great salmon fisheries are not confined to any one region, but extend from the rivers and coast of California and Oregon northward to Alaska.

a. The salmon are caught either in the sea or far inland in the rivers as the fish go far up the rivers to spawn.

b. The drain on the salmon supply had threatened these fish with extermination. National and State Governments have established hatcheries to increase the supply. In the State of Washington alone, there are twenty-two salmon hatcheries where more than 100,000,000 salmon are turned out annually.

c. Salmon is the chief fish export of the United States. Before the war we exported over 40,000,000 pounds.


Fishing in the open sea is both hazardous and expensive, but the catch is very valuable. European fleets, especially those of Brittany, penetrate American waters and fleets from Maine and Massachusetts go annually to waters off Iceland for herring and mackerel, which last is the most important open-sea fish. Sardines are found off the west coast of Europe and the eastern coast of the United States. Herring and sprat are used largely as "commercial sardines."

5. Shellfish and crustaceans.

a. The United States furnishes about five-sixths of the world's oyster supply. The numerous bays between Cape Cod and Galveston having shallow water and a suitable temperature are the best in the world for oysters.

b. Clams, crabs, and lobsters bring large cash returns, and are important along the middle Atlantic coast. The American lobster is threatened with extermination. Most of the present supply comes from Canada, Newfoundland, and Japan. These foods
III. Fish (continued).

are often too expensive to be frequently substituted for meat, but they should be used where they can be afforded. The mussels of our east and west coasts can be easily and cheaply obtained, and should be more extensively used.

E. Effect of war on the fish supply.

1. The European supply of fish is greatly depleted. The supply in Great Britain is only 46% of the normal amount.

   a. Mines abound in the North Sea and are a constant source of danger. They and the German submarines are a peril not only to the Allied fishing vessels, but also to those of the neutrals.

   b. Both ships and men are lacking. In Great Britain, for example, 80% of the steam fishing ships have been made into auxiliaries of the Navy, and fishermen of military age are in the service.

   c. Fuel and equipment are scarce. Most of the large fishing fleets of Denmark and Holland are laid up in harbors because of lack of fuel (particularly petroleum) and the high cost of fishing equipment.

   d. The Norwegian herring catch, however, is still good, and a survey of Norwegian fish stocks, fresh and preserved, taken in December, 1917, showed a large supply on hand, sufficient to last even twenty years.

2. In the United States the annual catch was smaller in 1917 than in 1916, because of the utilization of some of the fishing boats by the Navy and because of the high cost of equipment.

   a. All salt-water fishermen as well as wholesale and large retail dealers are controlled by license.

   b. The National Government is urging the States to remove certain less important restrictions which limit fishing. No alteration is being made in regulations necessary to conserve the supply.
III. Fish (continued).

F. Preservation of fish.

1. Frozen fish. The development of this process was of great importance for the transportation of fish. Small fish are frozen together in large numbers. Large fish (as halibut) are frozen singly. They can be used with perfect safety if they are not thawed until shortly before using, as they deteriorate after thawing more rapidly than fresh fish.

2. Canning.

a. The process was first used in the United States in 1819. A few lobsters, salmon, and oysters were canned. The industry has grown tremendously until in 1914 the value of the pack was over $33,000,000.

b. The industry is scattered all over the country — salmon is packed in Oregon, Washington, and Alaska; tuna, in California; sardines and clams, in Maine; crabs, in Virginia; oysters, along the Atlantic coast from Maryland to Georgia and on the Gulf of Mexico; shrimp, on the Gulf coast and as far north as Georgia on the Atlantic. Roe, herring, and other marine products are also canned.

c. Other new fish-canning industries are being developed — an excellent method of getting little known fish on the market in an attractive form.

3. Salt fish. This is an important industry
III. Fish (continued).

centering in this country at Gloucester, Massachusetts, and dating back to the time of the settlement of New England. Mainly cod, but some cusk and haddock are salted and dried or preserved in brine. Their keeping qualities make them useful for export to Latin-American countries.

4. Smoked fish. Smoking is often thought to improve the flavor and render coarser fish more desirable. Herring, haddock, whitefish, salmon, and various other fish are smoked, especially those with a moderate amount of fat.

IV. Eggs.

A. Nutritive value.

1. Eggs are one of our most important and valuable foods as would be expected from the fact that they serve as the sole food of the embryo chick.

2. They are rich not only in protein, but in ash constituents, especially iron and phosphorus, and in both vitamins. Recall that an average egg gives about seventy calories, half as many as a glass of milk.

3. They are completely and easily digested.

a. Raw eggs are less completely digested than cooked. The value of raw egg therapy is probably exaggerated.¹

IV. Eggs (continued).

b. There is no difference in the completeness of digestion between hard- and soft-cooked eggs, but the soft-cooked are more quickly digested—a difference that may be of importance to the person of weak digestion.

B. The egg and poultry industry.

It is of world-wide extent, undoubtedly the most generally distributed of the animal industries, but only of recent years has it been anything but a local industry.

1. In Europe before the war there was even greater production than in America. Great Britain imported more eggs than the rest of the world combined, getting about half of her supply from Russia.

2. In the United States.

a. The total production of eggs is very roughly estimated at almost thirty billion per year. Only 1% of this number are exported.

b. Our consumption, therefore, is slightly under one egg per capita per day. This average, of course, is very unevenly distributed, probably much more unevenly than that of meat. Only one-third of the eggs ever reach the large cities; one-third are consumed on the farms and one-third in small towns.¹

c. Many States produce no more eggs than they consume. The region with an excess to ship out to the great cities, to other states, and abroad is a large area in the central part of the country, chiefly in the corn belt and in the Southern States.

d. Grading of eggs is done by outward appearance (size, cleanliness, and freshness), and by candling.

e. Because of special difficulties in marketing, many efforts have been made to obtain greater efficiency.

FOODS USED IN PLACE OF MEAT

IV. Eggs (continued).

It is estimated that nearly 8% of the eggs marketed are lost — a cost of $50,000,000. (For various methods of marketing see the Farmers' Bulletins given at the end of the chapter.)

C. The war and the egg and poultry industry.

Even this widely distributed and comparatively little organized industry has been greatly affected by the war.

1. In the United States the industry was seriously threatened in the spring of 1918.

a. The supply of poultry had decreased greatly — it was estimated that the farm flocks had been reduced about 50%. This was due to the steady advance in feed prices and a rise in the price of poultry, making it more profitable to the farmer to kill his poultry than to feed it.

b. The supply of eggs was seriously threatened for poultry slaughtering had been so severe that the supply of old hens and cockerels was practically exhausted and the hens and pullets were being killed.

c. To avoid this disaster, the Department of Agriculture, having received a special appropriation in the fall of 1917 to aid in increasing the poultry supply, used its agents to actively assist the poultrymen of the country. The Food Administration issued an order preventing the killing of hens and pullets between February 11 and April 30. This stopped the enormous slaughter of hens, increased the production of eggs and allowed them to go into storage so as to have a reasonable supply next winter.

2. Abroad the industry has been almost destroyed. The use of eggs and poultry is confined almost wholly to hospitals and invalids. In some of the German cities one and two eggs a month are allowed — if they are on the market and if one can afford them. In Leipsig in August, 1917, eggs were $1.14 a dozen, as compared with 20 cents a dozen in August, 1914.
IV. Eggs (*continued*).

D. Methods of preservation.

1. Numerous methods have been recommended for the preservation of eggs at home. Covering the eggs with a solution of water glass is probably the best. Only fresh, uncracked eggs should be used.

2. Cold storage.

   a. The commercial preservation of eggs helps to maintain a supply through the winter and a more nearly even price throughout the year.

   b. The number stored is variously estimated at from 6% to 15% of the total production.

   c. The changes in cold storage are very slight if the eggs were fresh when put in. There is a slow loss of water by evaporation through the shell, and a transfer of water from the white to the yellow. This results in a weakening of the membrane about the yoke, so that it may break when the shell is broken. The change in flavor is also slight, except under bad conditions of storage, excessively long storage, or storage of previously contaminated eggs.

3. Frozen and dried eggs.

   A growing industry for the preservation of eggs out of the shell. The products are used largely by the baking and confectionery trade.
IV. Eggs (continued).

E. Egg substitutes.

1. Numerous ones are on the market, most of them wholly devoid of egg and different from egg in composition. They are practically valueless.

2. Some are composed chiefly of some kind of starch with coloring matter and baking powder, and some of skim-milk powder or other protein material with baking powder.

3. Their production with much advertising, fraudulent and otherwise, has developed considerably abroad since the war.

4. Dried and frozen eggs are plentiful and far better than the so-called egg substitutes.

V. Cheese.

A. General statement of methods of making cheese and its composition.¹

1. It is made by coagulating the casein of milk by the enzyme rennet, usually obtained from the stomach of the cow. The whey is drained or pressed out. The flavor of different kinds of cheese is due chiefly to the kind of bacteria and molds which act during the ripening process.

2. Cheese contains the casein, fat (if made from whole milk), and most of the calcium and iron of the milk. Most of the lactose, lactalbumin, and the soluble part of the ash is left in the whey. (See chapter XII.)

B. Antiquity of cheese-making.

Cheese is probably the oldest of the milk products. For centuries it has been an important article of diet in the older countries. Job uses cheese-making similes to illustrate his sufferings (Job 10:10) and the young shepherd David brought gifts of cheeses to the army defending Judah from the Philistines (I Sam.17:19).

C. Use in Europe.

¹ See Sherman's Food Products, chap. 4, for details.
V. Cheese (continued).

The food value is more generally appreciated in Europe and Asia than in the United States. The enormous European supply has had to be supplemented even in times of peace by imports from North America and New Zealand.

1. Great Britain.
   a. Consumption.
      (1) Cheese is classed as more of a necessity than butter, which is now regarded as a luxury. It is a regular article of diet in the workingman's lunch. The average annual consumption before the war was 336,000,000 pounds, less than one-fifth of which was produced at home.
      (2) Consumption has increased during the war. It is included in the military ration. To stabilize the market and encourage production, wholesale prices were fixed by the Food Controller in 1917.
   b. Imports. The average importation before the war was 264 million pounds, over half of which came from Canada. Imports from North America have increased since the war, but the supply from the Continental European "dairy belt" (Northern France and the lowland countries across Europe to Russia) has become insignificant.

2. Continental Europe.
   a. The cheese supply at present is insufficient for the demand, which has been increased because of the shortage of other foods.
   b. Cheese rations have been fixed in urban centers in Germany at from 1/2 to 4 1/3 ounces per week. The supply is running very low.
   c. Cheese prices have been fixed in many countries, the question of price being especially important in Italy, where cheese is so very generally used.
V. Cheese (continued).

d. Switzerland and Denmark have both threatened to stop cheese export because of the fodder situation and consequent scarcity of milk. Holland laid an embargo on dairy exports in December, 1917, but made an exception of cheese, which could be exported to Germany in exchange for coal.

D. Production and use of cheese in the United States.

1. The centers of cheese production are New York and Wisconsin. Before the war there were some 2,000,000 dairy cows in Wisconsin and 2000 cheese factories. Both New York and Wisconsin produce American modifications of foreign styles, but the greater part of the product is American (cheddar) cheese. Cottage cheese is now being made in increasing amounts from skim milk.

2. The per capita consumption is only 3 1/2 to 4 pounds per year, much less than in Europe. About 95% of this is of domestic production.

E. Nutritive value.

1. Cheese is a concentrated and valuable food which could well be used in much larger quantity than has been our custom. Many varieties are roughly one-third water, one-third fat, and one-quarter protein. They are therefore higher in protein and fat and lower in water than most meats.

2. It is practically completely digested when eaten as an essential part of a meal.
V. Cheese (continued).

3. Cheese is often cheaper than most animal foods. "It is a fair general estimate that a given amount of money spent for American cheese at ordinary prices will buy about twice as much food value as it would if spent for meat." ¹

VI. Nuts.

The possible importance of nuts in our diet is little appreciated. Their use could well be greatly extended.

A. The supply.

1. Nuts are grown commercially over large areas, especially in the South and Southwest, and the crops are increasing in importance. Peanuts (which strictly speaking are legumes, not nuts) are grown in the cotton area especially in Texas and Georgia. In 1909, the peanut crop had four times the value of all the other nuts together, and now the annual value exceeds any single vegetable except the potato. The profit from the enlarged peanut crop partially offset losses from the cotton boll weevil in Texas in 1916–17.

2. The imports, formerly of considerable importance, are now curtailed.

B. The place in the diet.

1. Composition.

a. They are highly concentrated foods, con-

VI. Nuts (continued).

sisting chiefly of fat and protein. Chestnuts alone are high in carbohydrate and low in fat. Recall that the 100-calorie portion of most nuts is very small; e.g., 12 to 15 almonds make a portion. They are, therefore, to be regarded as staple articles of food and by no means simply as relishes or accessories.

b. Recent experiments show that peanuts and probably other nuts are a satisfactory source of protein.

2. They are considered as a very important part of the diet by groups of "fruitarians" in California.

3. Digestibility.

a. Nuts are almost completely digested under the proper conditions. In experiments with diets of nuts and fruit 90% of the protein, 85% of the fat, and 95% of the carbohydrate was digested.

b. They are much less completely digested if they are not properly masticated, as shown by one of the subjects in the above experiments; hence the great advantage of the finely ground preparations like peanut butter.

c. Occasional discomfort from their use is probably due to insufficient chewing, or eating them after an already sufficient
VI. Nuts (continued).

meal. There is no reason to believe that salt adds to the digestibility.

4. Pecuniary economy.

Many nuts and nut products are a cheaper source of protein and energy than some cuts of meat. For example:

Twenty cents spent for sirloin steak (at 40 cents a pound) gives about 475 calories and 37 grams of protein.

Twenty cents spent for peanut butter (at 30 cents a pound) gives about 1825 calories and 88 grams of protein.

Conclusions.

There is an abundance of excellent protein-rich food in the country not needed for export. Its use not only saves meat, but gives variety to the dietary and can lessen the amount spent for food.

REFERENCES

(The United States Department of Agriculture and various States have published many bulletins on eggs and poultry; the Bureau of Fisheries and some States, bulletins on fish; the nut-producing States, bulletins on nuts. Only a few are listed here.)


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