Cooking of Foods.

Cooking is a polite art. So is music, so are painting, architecture and drawing. The French excel in the art of cooking, and Paris is the Mecca of the *bon vivant*. A refined little dinner for six, served as the Parisian knows how to serve it, is a revelation, and is sure to bring out the better points of those who participate. Probably you will be served with several raw oysters, and following them a glass of white Burgundy. This gives a little zest for the soup. A few tablespoonfuls of this are followed by a glass of sound sherry. Now will come the fish, with a sauce such as only a well-educated chef knows how to concoct. A glass of white wine will help the flavor of the fish. Now will come the meat. As a gustatory morsel nothing will complete the triumph more thoroughly than a truffled fowl. Champagne of a proper vintage may accompany it, and both wit and wisdom will come forth with moderate indulgence. One or two well-selected tender vegetables will add enjoyment to the course. Now a dainty salad with a modicum of ripe cheese will be a nice addition. A sweet and a demi-tasse will complete the satisfying and artistic sitting.

This is only a pleasant diversion. Now let us return to cooking as an art. Soups are the result of boiling different meats, fish, milk, and vegetables. The good housewife keeps her stock-kettle always active, and here has a basis for many of the best-flavored and nutritious soups. Meats are roasted, baked, fried, broiled, boiled, and stewed. Roasting, as a rule, should be done with a quick, sharp heat, so the outside surface will quickly harden and retain the nutritious juices. Baking and frying should also be done under like conditions, and so should broiling. In boiling meats they should not be plunged at once into hot water. The result will be to toughen the fibres. Put the meat into cold water, over a sharp fire, and then boil it rapidly. Stewing of meats should be done slowly, to bring out and retain the flavors of the meats and vegetables of the combination. Fish, Sir Henry Thompson says, as a rule, should be baked. This will depend a great deal on the variety of the fish. Many fish in baking will become tough and hard. A perch or a smelt or a fresh-water bass should be fried. A rock, more properly called a striped bass, or a salmon, or a cod, should be boiled to bring out the flavor, assisted, when served, by a proper sauce. To my own taste the best boiled fish is the shad. Retain the roe or the milt. The milt shad is to be preferred. We get here its highest flavor and a dish for the gods. Broiling the shad is the most popular way of cooking it, but for a *pièce de résistance,* outside of boiling, give us a planked shad, fresh from the water. Fry it never. The most indigestible of foods are probably fried foods. They are loaded, as a rule, with too much fat, both from themselves and from the vehicle used in frying. Vegetables are boiled, baked, fried, stewed, etc. Many of those containing much water are better baked,—as the potato, for example.

The foregoing statements are merely given as examples and a further discussion of methods will be out of place in a work of this character. As Dr. Atwater suggests, the cooking of food has much to do with its nutritive value. Many raw things must be cooked in some way to bring out their nutritive value. Bad cooking is an abomination and the cause of much suffering.

There are three chief purposes in cooking,—

First, to change the mechanical condition so the digestive juices can act more freely on the mass.

Second, to make it more acceptable to the palate and stimulate the flow of the digestive fluids.

Third, to kill by heat pathogenic germs and parasites often present in uncooked food-stuffs. The typhoid bacillus, the trichina, and the tapeworm are examples.

In cooking starchy vegetables the heat ruptures the cell walls and makes the food more palatable.

The caramel produced also adds to the flavor. In baking bread, cakes, etc., the aim accomplished is to make them lighter and more palatable. This is also aided by yeast and baking-powders. In cake-baking the same effect is produced by adding white of eggs, beaten light, to the mass. Raw vegetables are more dangerous to eat than well-cooked vegetables. The same is true of oysters and clams, more especially of oysters. Salt oysters, as a rule, are not dangerous. We get few salt oysters in our markets. The trick of the trade is to bloat them in fresh water to make them measure up and look plump. Here is the danger,—the fresh water used may be contaminated. This bloating of oysters should be stopped by law in the interest of the public health.

Food too far gone, or kept too long, is liable to ferment, and the deadly ptomaines develop, and the heat of cooking does not even destroy their activity. Thus we get cheese poisoning, ice-cream poisoning, fish poisoning, meat poisoning, etc. Often interesting and startling individual peculiarities are developed. I have known more than one person who never could eat even the freshest fish without suffering from a species of ptomaine poisoning. Again, on some, mutton, eggs, and other unlooked-for food-stuffs have a poisoning effect. Daintiness in serving and cleanliness in preparing foods are absolutely essential to comfortable and safe living.

The chemistry of cooking is most interesting and important, but rather foreign to my purpose, and would take up too much space in this work. The reader is referred to books which take up this subject. One by W. Matthieu Williams, "The Chemistry of Cooking," is among the best.

Digestion.

In a little book of this character I think it important that those persons who may read it should have some idea of the processes of digestion in human beings, and for this reason I propose to give a short space for a *résumé* of the subject.

The process of digestion is both physical and chemical. The food passes into the alimentary canal, where it is liquefied and its nutritive principles are changed by the digestive fluids into new substances, which are in proper form to be absorbed by the blood. The digestive system includes the alimentary canal and appendages,—viz., the teeth, the salivary glands, the gastric glands, the intestinal glands, the liver, and the pancreas. There are seven stages of digestion,—prehension, mastication, insalivation, deglutition, gastric digestion, intestinal digestion, and defecation. The hands, lips, and teeth together are involved in prehension. Mastication triturates the food, and this act is brought about by the teeth—in the upper and lower jaws, the lower jaw moving and the upper jaw stationary—and the muscles. Mastication should be thorough and is a most important part of digestion. In the adult there are thirty-two teeth, sixteen in each jaw,—viz., four incisors, two canines, four bicuspids, and six molars, or grinders. The lower jaw makes a downward, an upward, a lateral, and an anteroposterior movement.

Insalivation comes next. The saliva is secreted by the submaxillary, parotid, and sublingual glands. The parotid saliva is thin and watery. The submaxillary and sublingual saliva is viscid. The saliva moistens and agglutinates the food and helps the swallowing of it. The ptyalin of the saliva converts starch into sugar and dextrin is formed. This completes the first stage of digestion.

Deglutition comes next and carries the food from the mouth to the stomach. The bolus of food passes from the mouth into the pharynx, from the pharynx into the œsophagus, and from the œsophagus into the stomach.

The Stomach.—The œsophagus terminates in the stomach, which has two orifices, the cardiac, or upper, and the pyloric, or lower. The stomach has three coats,—the serous, the muscular, and the mucous. While the food is in the stomach the gastric juice acts on it. The stomach now churns it up and gradually liquefies it, and thus fits it for passing on to the small intestines and for absorption into the blood.

Composition of Gastric Juice.

Water	994.404
Hydrochloric acid	0.200
Organic matter	3.195
Inorganic salts	2.201
	1000.000

The water holds the other ingredients in solution. The hydrochloric acid acidulates the food and prevents fermentation. Its absence or lessening or excess causes troubles of one kind or another. Pepsin is part of the organic matter of the juice. It is called a hydrolytic ferment or enzyme. The pepsin transforms the acidulated proteids, such as exist in meats, eggs, and similar foods, into new forms that can be absorbed into the blood.

Rennin is another organic matter in the juice. It has the power of coagulating the casein of milk. Stomach digestion is a complex process, involving many glands, cells, etc. The chief action of the gastric juice is to transform the proteids into peptones. They are the final product of the digestion of proteids,—that is, meats and such. It takes the stomach from three to five hours to digest an average meal. Much depends on the composition of the food taken. As the food is digested in the stomach it passes into the intestines through the pylorus.

Whipped eggs, raw, should digest in one hour and twenty minutes; soft-boiled in three hours; hard-boiled in three hours and a half; barley soup in one hour and a half; bean soup in three hours; chicken soup in three hours; mutton soup in three hours and a half; raw oysters in three hours; stewed oysters take a half hour longer; broiled lamb chops in two hours and a half; veal chops in four hours; roast pork, over five hours; broiled beefsteak in three hours; roast turkey in two hours and twenty-five minutes; chicken, boiled, in four hours, and stewed in two hours and three-quarters; roast duck in four hours; beef liver in two hours; fried sausage in three hours and a quarter.

There is much difference in the time of digesting the various vegetables. It takes boiled cabbage four hours and a half; boiled turnips three hours and a half; boiled parsnips two hours and a half; boiled beets three hours and three-quarters; boiled beans two hours and a half; boiled green corn three hours and three-quarters; roasted potatoes (white) two hours and a half; boiled white potatoes three hours and a half. This shows baking to be the proper method of cooking white potatoes.

Digestion in the Intestines.

Here again is a complex process. It is accomplished by the action of the pancreatic juice, the bile, and the intestinal juice. At the end of stomach digestion we have the chyme as a result. Chyme consists of water, inorganic salts, peptones, undigested albumins and starches, maltose, a kind of sugar produced by the action of diastase on starch (diastase is a nitrogenous principle developed in grain during germination), cane sugar, liquefied fats, cellulose, and the undigestible portions of meats, fruits, cereals, etc. The chyme is now acid. When it passes through the pylorus into the intestines it meets the alkaline intestinal juices and becomes alkaline. This arrests gastric digestion, and intestinal digestion begins. The intestines are about twenty-two feet long and, like the stomach, have three coats, the serous, the muscular, and the mucous. We do not know thoroughly the function of the intestinal juices. They convert starch into dextrose, but probably are unable to digest either albumin or fats. They invert, as it were, cane sugar, maltose, and lactose into dextrose, which prepares them for their absorption. This intestinal ferment is called *invertin.*

The pancreas secretes the pancreatic juice. Its duct opens into the duodenum. Pancreatic juice is colorless, alkaline, and viscid. It is one of the most important of the digestive fluids. It contains, water, 900.76; albuminoid substances, 90.44; inorganic salts, 8.80. Acting on starch, it changes it to maltose. Amylopsin is the ferment causing this change. The proteid bodies which escape stomach digestion are converted by the pancreatic juice into peptones. The proteids are changed into alkali albumin. Now another ferment, trypsin, changes the alkali albumin into peptone, of which, as in gastric peptones, there are two forms, hemipeptone and antipeptone. After this we get leucin, tyrosin, etc. The action of the pancreatic juice on fats is most important,—it emulsifies fats. The neutral fats are decomposed into their corresponding fatty acids and glycerin. The acids thus set free unite with the alkaline bases in the intestines and form soap. Soap is a fat acid united with any alkaline base. Steapsin is the ferment causing the decomposition of the neutral fats.

Bile is a most important digestive fluid. It is familiar to all as to its greenish-brown color, its bitter taste, and its viscidity. It contains, water, 859.2; sodium glycocholate and sodium taurocholate, 91.4; fat, 9.2; cholesterin, 2.6; mucus and coloring matter, 29.8; salts, 7.8. The cholesterin is a waste product. When retained in the blood it causes various disorders,—gall-stones, nervous troubles, etc. It passes off in the fæces as stercorin. The coloring matters of the bile are biliverdin and bilirubin. The amount of bile secreted in twenty-four hours by a healthy adult is about two and one-half pounds. It is both a secretion and an excretion. It is forming constantly and passes from the liver into the gall-bladder by the hepatic ducts, where it is stored until needed in digestion. When the food enters the intestines its presence causes the walls of the gall-bladder to contract and expel the stored bile. The bile helps to emulsify the fats, prevents putrefaction of the food, and excites peristalsis of the bowels by stimulating the intestinal glands to secretion. While the digesting food is passing through the intestinal canal the nutritive products, the peptones, the dextrose, the levulose, the fatty emulsions, the fatty acids, and their soaps, are absorbed into the blood, whilst the undigested matters are carried on into the large intestines through the ileocæcal valve by peristaltic movements.

If we eat too much or take improper diet, the food decomposes, and various gases and chemic compounds are developed and much discomfort results. Indol is formed by chemical action, and from it indican appears in the urine.

The large intestine is about five feet long and has three coats, like the stomach and small intestines. The ascending portion has the power of absorption, and therefore rectal alimentation is possible by enemata. Here the products of digestion lose their water and become more solid. These are fecal matters, consisting of undigested food, products of decomposition, mucus, and inorganic salts. *Defecation* is the getting rid of these effete matters by muscular action.

Absorption.—By absorption we transfer material into the blood from the tissues, the serous cavities, and the mucous surfaces. The mechanism employed is, first, the lymph spaces, the lymph capillaries, and the blood capillaries; second, the lymphatic vessels and larger blood-vessels. The lymphatic vessels take their origin in the lymph capillaries. These lymph capillaries are interwoven with the blood-vessels. They are valveless. They anastomose freely with one another and communicate with the lymph spaces and the lymphatic vessels. They collect the lymph which may have escaped from the blood-vessels and transmit it to the regular lymphatic vessels. The blood capillaries are also active in absorption and also allow the escape through their delicate walls of liquid nutritive portions of the blood. They are probably more active than the lymph capillaries in absorbing the products of digestion. The lymphatic vessels pass through the lymphatic glands. In the small intestines they are called lacteals. They are guarded by semilunar valves opening towards the larger vessels. The lymphatic glands complete the lymphatic system. In them are lymph channels. Through these channels the lymph is poured by the lymphatic vessels and is transmitted onward. Chyle is the product of intestinal digestion, found in the lacteals and thoracic duct as a milky-looking fluid containing corpuscles, fat globules, fibrin etc.

The agents most active in absorption are the blood-vessels of the digestive canal, particularly those going to form the great portal vein. Again the lymphatics coming from the small intestines converge to empty into the thoracic duct. The products of digestion get into the general circulation by two routes. First, the water, peptones, glucose, and salts, after passing into the lymph spaces of the villi, pass through the walls of the capillary blood-vessels, then into the blood, and are carried to the liver by the vessels forming the portal vein. Coming out of the liver, they pass to the vena cava by the hepatic vein. The fat emulsion enters the lymph capillary, and it contracts and forces the contents into the lacteals, and then into the thoracic duct, and finally into the circulation at the junction of the internal jugular and subclavian veins on the left side. Lymph is absorbed into the system for its many uses. When in excess, it is reabsorbed and reused.

Lymph is the fluid of the lymphatics. It is alkaline and much like blood in its chemical composition. It contains leucocytes and fatty matter. It contains, water, 95.536; proteids, 1.320; extractives, 1.559; fatty matters, a trace; salts, 0.585.

Chyle, as before shown, is the product of intestinal digestion. It is found in the lacteals and thoracic duct as a milky-looking fluid containing corpuscles, fat globules, fibrin, proteids, and salts. It contains, water, 902.37; albumin, 35.16; fibrin, 3.70; extractives, 15.65; fatty matters, 36.01; salts, 7.11.

Blood consists of two portions, the liquor sanguinis, or plasma, and the corpuscles, white and red. Hæmoglobin is the coloring matter, and is composed of C, O, H, N, S, and iron. The function of the red corpuscles is to absorb oxygen and carry it to the tissues. The red corpuscles far outnumber the white corpuscles. The white corpuscles are termed amœboid, because they have the power of movement and of changing their shape. They can move from place to place and adhere to the surface of the vessels, whilst the red corpuscles rush through the centre of the stream. The white corpuscles are identical with leucocytes and are found in milk, lymph, chyle, and other fluids. The white corpuscles are of the greatest importance in the economy. They are the body scavengers, as they prey upon and destroy pathogenic and other germs and tend greatly to make life possible. In giving this *résumé* of digestion I acknowledge the help I have obtained from Prof. Brubaker's "Compend of Physiology."

Why don't the Stomach Digest Itself?

For a long time the supposed best answer to this question was that the vital resistance of the stomach prevented it digesting itself. This theory has been disproved by the fact that the extremities of various reptiles and animals have been introduced into the stomachs of living animals and there acted on by the digestive fluids. Why does the tapeworm, for example, live and thrive in man? An answer may be that this is its natural environment. Prof. Weinland has shown that this resistance in the tapeworm is caused by certain of what he calls antibodies, analogous to antilysins and antitoxins. He isolated from the tapeworm an antitrypsin or antiferment, which when added to a mixture of fibrin and pancreatic juice prevented the digestion of the tapeworm. He also showed the presence of an antipepsin in the secreting cells of the stomach and of an antitrypsin in the cells of the intestines.

These antiferments neutralize the action of the digestive ferments and prevent their destructive action on the tissues of the stomach and intestines. This action, Weinland claims, solves the problem, and is the reason why the stomach does not digest itself.

General Remarks on Diet.

At the present day physicians, and laymen, too, are coming more and more to appreciate the importance of what we eat and drink, whether sick or well. When I entered the profession, more than forty-two years ago, little was said about it and less was taught concerning it in the medical schools. All, or nearly all, at that time, empirically believed in the antiphlogistic system of treatment, and almost every sick man, or wounded man, or crazy man, for that matter, was put upon a diet of as near bread and water as possible, and because women were fortunate enough to have babies, they were generally starved for about six weeks, much to their own injury and the inconvenience of the luckless offspring. Why were they starved? Oh, to prevent inflammation. What was inflammation? Too much blood. Thanks to Prof. W. Gilman Thompson, von Liebig, Sir Henry Thompson, Dr. Atwater, H. C. Wood, and others, the matter of diet has advanced from mere empiricism, from the mere didactic, thoughtless, even ignorant, assertions of the school men, to something approaching an exact science, and, like general therapeutics, is no longer a mere assertion or pill-giving calling, but a well-studied, scientific profession. In saying this I do not mean to say that it yet receives the attention it deserves in the curriculum of our medical schools,—far from it; but great progress is being made, and sooner or later, in the near future, it is bound to receive the attention so important a branch of medical teaching deserves.

When we order a course of diet for a person, sick or well, we should think in carbon and hydrogen, oxygen and nitrogen. Given a person with contracted kidneys, and hypertrophy of the left ventricle of the heart, and with other ills perchance following in the wake of these, of what use is medicine, of what use are pills and powders and potions, if we allow such a person to stuff himself with an excess of nitrogenous food? These are cases of commencing or confirmed hardening of the arteries from which arise aneurysms, apoplectic seizures, and so on. How useless are medicines in these cases if the eating and drinking of the person be not supervised and rigidly controlled! In such cases, if I must abandon one course of treatment and keep only to the other, give me diet.

"Throw physic to the dogs."

Another practical point is, study the individual.