ON

FLUID MEAT.

A NEW PREPARATION OF MEAT,

ESPECIALLY ADAPTED TO

WEAK STOMACHS,

AND

FOR INVALIDS GENERALLY,

WITH

REMARKS ON FOOD.

BY

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&c.

Any addition to the knowledge of human food, or any new variation imparted to it, must be interesting to all persons, but more especially to medical men at the present time when the regulation of diet has become an essential point of practice.

I therefore trust it needs no apology or further preface in offering this small pamphlet to their notice and consideration.

The separation of natural productions used as food into their proximate constituents has been very satisfactorily effected by chemistry, and the part performed by each in the function of nutrition, or in sustaining the temperature of the body, is to a great extent ascertained by the physiologist. There are, however, many points scarcely recognized by the lay public, and perhaps not sufficiently enforced by the profession, otherwise it would be difficult to account for the very

extensive use of substances containing little or no nourishment, under the mistaken idea that they are very nutritive and restorative. Thus almost pure starches bearing various names are recommended as food for children and delicate persons, or as restoratives for convalescents; and yet the profession are well aware of the necessity for the nitrogenous constituents of food, whether animal or vegetable, for the sustenance of health or the restoration of strength and vigour when impaired by disease. Indeed it would not be easy to find any natural fact more generally admitted than the superiority of animal flesh over every other form of food for repairing the waste arising daily and hourly from the exercise of every bodily and mental function.

Animal flesh, however, is a very complex substance. Denuded of the fats attached to it, and the large proportion of water making up its bulk,* it is composed of fibrine, albumen, gelatine,

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* 1,000 parts lean beef contain—

Matters soluble in cold water	60 parts	Albumen coagulable by boiling	29·5
		Left in solution or boiling ..	30·5
Insoluble in cold water	170 ,,	Gelatine	6·0
		Fibrine, Membrane, &c.....	164·0
Fat	20 ,,		
Water	750 ,,		
	1,000		

a group of matters termed in the aggregate extractive matters, and several saline substances. It is as a compound of all these that the lean of meat—the muscular fibre, vessels, membranes, juices, and salts—is more than anything else, able to sustain health and strength to build up the body in its growth, and to repair and replace the continuous waste, the loss of substance arising from wear and tear and all the actions of the living system.

When the several constituents of animal flesh are separated, no one of them is by itself capable of restoring the body or repairing the daily waste.

It has been ascertained by experiment quite conclusively, that neither fibrine, albumen, gelatine, nor extractive or saline matters severally and separately can afford efficient nourishment. Chemically considered, fibrine is quite insoluble; albumen is soluble in cold water, but is coagulated into an insoluble state in water at about 150° Fahrenheit; gelatine is soluble in hot water, but solidifies on cooling in combination with water. The saline constituents of flesh exist in it in conditions not perhaps accurately known. The

presence of some of them are probably essential to the constitution of fibrine and gelatine, but they undergo changes on separation, so that when we destroy their combination with the nitrogenized material, by burning or otherwise, the resulting ash or group of inorganic matter presents them to us in quite a different form.*

With respect to the extractive, it is itself highly compound. Treated chemically, (not by mere solution in water and evaporation,) several bodies are found in it—Creatine, Creatinine, Sarcosine, Inosite, &c.

It is very important to consider that these bodies are crystalline, and while they possess crystalline forms and properties they seem to have an intimate relation to the organic fibrine and albumen on the one hand, and to the ultimate form these take in the transformation which renders them effete and suited to be eliminated from the system, on the

* The following is the result of the analysis of Meat Ashes:—

Phosphoric Acid	36·60
Potash	40·20
Iron and Earth	5·69
Sulphuric Acid	2·95
Chloride of Potassium	14·86
	100·00

In the blood and tissues, Phosphorus, Sulphur, and Iron are probably in organic connection—not merely diffused through them as inorganic matter. They are oxidized in the process of separation by combustion.

other, namely, Urea. In other words, they are the first results of the molecular changes constantly going on,—the first steps towards the ultimate decomposition of the organized flesh.* This being so, we are less surprised that extractive should fail to sustain a healthy state of the blood and tissues and therefore life.

In confirmation of this view we have only to consider the universally acknowledged fact, that the quantity of extractive yielded by the flesh of wild animals and those destroyed in hunting far exceeds the amount we obtain from the flesh of stall-fed beasts. The life of ease and tranquillity, led by the latter, not producing by wear and tear the waste sustained by the former.

It is not the larger proportion of extractive in the flesh of game which renders it acceptable as food, but the flavor,—probably derived from the diet they procure; at the same time, it is admitted, that game, as generally eaten, is more suited to healthy than weak stomachs.

Be this as it may, we know that in perfectly

* Speaking of Extractum Carnis, Dr. Pavy says, "The preparation contains the salines with the various extractive principles, a considerable proportion of which, there are grounds for believing, consist of products of partial decay, materials in course of retrograde metamorphosis, that are of no use as nutritive agents."

healthy states of the stomach and system, the whole of the constituents of animal flesh as combined in nature, are in the stomach brought into a more or less perfect state of solution before they are suited to undergo the second part of the digestive process in the duodenum, and become fitted for being conveyed into and mixing with the circulating blood.

In a state of perfect health, without any hereditary or acquired weakness, with due and wholesome exercise and regimen, including well-regulated appetites, animal food in its natural state is the most nutritious, and best adapted to the maintenance of health and strength. But in by far the larger majority of mankind, some defect or debility, from within or from without, sooner or later affects the stomach and the digestive process. Indeed, the very common initiatory symptoms of disordered health are those arising from indigestion, the stomach being of all the organs that which is brought most directly into contact with the greatest variety of substances, beneficial or hurtful, in every degree.

We need not spend a word in describing dyspepsia, or in detailing its multiform symptoms;

happy is the man who does not know them well by his own experience; but every professional man becomes familiar with them from his first entrance on medical studies, and, however long his career, they must daily be under his notice and observation to its close.

Nor is it necessary to discuss the pathological theories respecting the states of the stomach, in which dyspepsia is the prominent basis of the symptoms of its disorders. It is however quite pertinent to our object to remark, that a long continuance of indigestion produces debility of the whole system and every individual organ not only predisposing to disease but actually originating diseases, change of structure, loss of, or imperfectly performed functions, and is really at the bottom of half the diseases included in our nosologies. Debility, or a low condition of the general vigour, is admitted by all to be a predisposing cause of most diseases, and especially as they are now witnessed. We readily understand that if a due supply of the proper constituents are not provided by the stomach, the blood becomes thin, weak, and watery, and every part depending for its energy on a supply of healthy blood is weakened.

Many writers attribute the origin of consumption to dyspepsia—while this is held to be disputable, every one admits that during its course the stomach loses its tone, and its power of transferring food is seriously diminished. This happens also in all febrile and inflammatory diseases, so that whilst idiopathic dyspepsia originates so many disorders of health, it comes on as symptomatic, or the result of almost every form of disease.

Hence from the earliest times means have been sought to relieve the stomach from the burthen of digesting the food necessary for the continuance of nutrition and sustenance.

The superiority of animal flesh has however only been recognized in more recent times—both for easy digestion and for containing most nutritive matter in proportion to its bulk; and concurrently it has been found that when the appetite for solid meats diminishes or fails altogether, it is because the stomach cannot digest it.

To present it to the stomach in a more acceptable form a variety of methods have been in use. Beef tea, broths, soups, especially the first, is the most common form of such modified animal food.

Beef tea is made by various processes, each giving a considerably different result.

From ordinary beef tea, prepared by boiling, we exclude albumen and fibrine, and obtain extractive matter, gelatine, and more or less proteine substances, according to the duration of the process of boiling. By long-continued boiling under the ordinary atmospheric pressure, lean meat will generally yield about one-twentieth part, or 5 per cent. of its weight, to the water. Thus a pint of such beef tea prepared from a pound of lean meat will, on evaporation, yield four-fifths of an ounce of solid residue.* Now the same meat will yield, when treated with cold water, one-thirtieth of its weight, or 3 per cent. of uncoagulable extractive; thus proving that one-third of the solid contents of such beef tea consists of gelatine, with some proteine substances.

Gelatine, even when combined with a considerable proportion of water, is incapable of permeating animal membranes, and is not to be regarded as a

* This was the mean amount I obtained from several experiments. Dr. Christison, says he found only a quarter of an ounce of solid residue in a pint of carefully prepared beef tea. He concludes that beef tea affords no nourishment, but acts beneficially in another manner. Miss Nightingale quotes this opinion in her popular work on Nursing.

staminal element of nutrition. Besides it readily undergoes putrefaction, being, according to the evidence of some experimentalists, the first constituent of animal structures to become putrid under a free access of air at ordinary temperatures.

We may therefore readily understand why beef tea, especially such as is prepared by long boiling, should so frequently give rise to flatulence and other disturbances of the stomach in weak states of this organ, and why its use has frequently to be discontinued in low conditions of the system, as in fevers and in general debility. It is often a source of vexation in practice to find patients refuse to continue taking beef tea when a fluid nourishment appears to be urgently needed.*

To obviate these objections to ordinary beef tea, Professor Liebig many years ago proposed to substitute for it a cold infusion of lean meat. He

* "Beef tea cannot do much towards the maintenance of the body, as it contains no albumen, which is the material blood requires for the formation of flesh. We may surmise that beef tea can indirectly and for a short time make flesh by supplying certain materials to the blood, which enables the albumen in store within it to be taken up by the tissues, so that they may temporarily for a short time be formed anew, according as they are wasting away. Supposing no food but beef tea to be taken during an attack of fever, it may be assumed the body will be nourished for a time, but when the albumen in the blood is exhausted, some of the material must be restored to it in the form of albuminous food, or an actual state of starvation must ensue."—Dr. W. Marcet.

directed lean meat to be macerated in cold water for some time, the fluid strained off by strong expression, a few drops of hydrochloric acid added, and this to be either administered without further treatment, or, warmed only to a blood heat or boiled and again strained, separating completely the coagulated albumen.

These cold infusions of meat, being destitute of gelatine, are often found very useful in practice, particularly in fever, to allay thirst and supply some small amount of nourishment. But they pass so rapidly into decomposition, and sometimes when kept in the sick room become so offensive, even in an hour or two (though possibly in such cases proper care has not been taken to follow the published instructions for making them), that their use is very limited.*

More recently Baron Liebig—whose researches into the composition of flesh, and discoveries of the constituents of the juices as distinct from the blood

* A theory has been advanced by some physiologists to the effect that the flesh of animals has simply to undergo solution, either altogether in a raw state, or as nearly as possible approaching the raw state, in order to pass into the blood and to replace the daily waste of the tissues, and that every kind of cooking, or preparing it with the aid of heat, serves to separate or to modify certain of its constituents, and to render it so far unsuitable for supplying nourishment. If this were true, there would be as little need of any artificial processes for cooking or preparing meat as for the stomach or other digestive organs. *Fluid Meat*, to be described presently, is, as the reader will perceive, a very different thing to raw meat dissolved.

contained in the blood vessels, must be familiar to our readers—proposed a new method for the ready preparation of beef tea. This consists in treating lean meat with cold water, boiling the solution which coagulates the albumen, straining the latter out and evaporating the clear solution to the consistence of a medicinal extract.

To this preparation he has given the name "Extractum Carnis," and although it contains only the extractive matters (described above) and the salts of the meat—being destitute of fibrine, albumen, and gelatine—this preparation has become of considerable mercantile importance.

In addition to what has been already said, it may be observed that the lean of beef, deprived of water and perfectly dry, has been subjected to analysis by Von Bibra; he finds it to consist of—

Fibrine, Albumen, and Gelatine—86 per cent;
Extractive and Saline Matters—14 per cent;

consequently, in the preparation of "Extractum Carnis," there is lost 86 per cent. of the total amount of solid materials of meat, and this composed of the most nutritive and valuable part of the meat employed. The wide acceptance of even this very imperfect representation of flesh nourishment furnishes abundant evidence of the

importance, nay, the necessity, for the further pursuit of the subject by scientific methods in this direction to obtain less objectionable articles of diet for both invalids and the healthy.

Baron Liebig himself is far too candid to attempt concealment of these truths. In a communication to the *Lancet* in 1865, respecting his Extractum Carnis, which was then beginning to excite attention, he says, "Were it possible to furnish the "market at a reasonable price with a preparation "of meat combining in itself the albuminous, "together with the extractive principles, such a "preparation would have to be preferred to the "Extractum Carnis, for it would contain the "nutrient constituents of Meat."

And, again, speaking of his own preparation, he says, "I have already stated that in preparing "the Extract of Meat the albuminous principles "remain in the residues, they are lost for nutrition, "and this certainly is a great disadvantage."

At the suggestion of Dr. Pavy, of Guy's Hospital, I undertook some experimental investigations to determine whether or no such a preparation were practicable, and after the expenditure of much labor and thought, and the experience of many

failures, I at length succeeded in making a complete FLUID MEAT in a condition rendering it an acceptable and very agreeable article of diet.

My *Fluid Meat* contains all the constituents of fresh meat which minister to nutrition. It is prepared in the form of a moist extract perfectly soluble in water. It possesses a full meaty flavor like that of roasted meat, and therefore is very agreeable to the taste. It may be eaten spread upon bread and butter, or biscuits, or dissolved in water as a substitute for fresh beef tea, but is far more nourishing.

Before bringing it prominently to the notice of the profession or the public, I have had it tried and tested by use, pretty extensively, in cases of dyspepsia, and invariably with great benefit for convalescents and persons of weakened stomachs; those debilitated by mental or bodily overwork or sedentary habits; and I can now confidently recommend it to the profession as a great desideratum for weakly persons, and in all cases where nourishing food is called for and where the digestive powers are impaired.

In order to enable the profession clearly to understand and justly appreciate the value of

Fluid Meat, I shall give below the process by which it is prepared, premising that it has not escaped the attention of practical physicians, who have perceived the want existing for such a means of affording nourishment to their patients when the stomach is too weak to take or digest animal food.

"I have often thought," says Dr. W. Marcet,* "that if there were a means of preparing meat so "as to enable its easy digestion by weak stomachs, "a great boon might be conferred on a very large "class of sufferers."

Accordingly Dr. Marcet proceeds to describe a process, the object of which he explains is to extend the preliminary digestion of meat one step further than is done by cooking before it is taken into the stomach, thereby relieving this organ from the task of carrying out, unassisted, the digestion of cooked meat.

Dr. Marcet's process involves the use of pepsin, carbonate of soda and hydrochloric acid, and a simple enough apparatus, and is intended to be carried out by persons not accustomed to chemical operations; consequently, I think I am warranted

* See a Pamphlet "On a New Process for Preparing Meat for Weak Stomachs."—By W. Marcet, M.D., F.R.S., &c. Churchill & Sons, 1867.

in saying, it would fail in such hands nine times out of ten; and when successful, the author candidly says—"This food contains all the constituents of beef tea and albuminous substances besides; although it only supplies a *portion* of the nourishment possessed by the meat which has been used for preparing it."

What then Dr. Marcet aimed at, I believe I may confidently say I have in my *Fluid Meat* actually accomplished, and I am sure the profession will see the propriety of having it prepared for them, as these processes can be so much better and more economically effected on a large scale and under the superintendence of skilled chemical operators than in the domestic kitchen.

My Fluid Meat, as I have already explained, contains all the constituents of lean meat, including fibrine, gelatine, and coagulable albumen; but by the process pursued these are all brought into a condition in which they are soluble in water and are not any longer coagulable on heating—in which state they have been designated *Peptones*. This change is effected, as in ordinary digestion, by means of pepsin and hydrochloric acid.

The Pepsin employed is very carefully prepared

—without addition of starch or any extraneous substance. Lean meat, finely sliced, is digested with the pepsin in water previously acidulated with hydrochloric acid at a temperature of from 96° to 100° Fah. until the whole of the fibrine of the meat has disappeared.

The liquor is then filtered, separating small portions of fat, cartilage, or other insoluble matters, and neutralized by means of carbonate of soda, and finally, carefully evaporated to the consistence required, namely, that of a soft extract.

The resulting extract represents in all its constituents the lean meat employed, but with the fibrine, albumen, and gelatine changed into their respective peptones or soluble forms. This change is effected solely by the pepsin and hydrochloric acid, or artificial gastric juice, without the evolution or absorption of any gas or the formation of any secondary products.

The peptones thus formed, although agreeing exactly in chemical composition and even in many physical properties with the substances from which they are derived, differ from them by a ready solubility in water and even in diluted alcohol. The changes thus effected coincide precisely with

those which physiologists tell us occur in the stomach in normal digestion when the food has been acted on, brought into a soluble state, and fitted to be passed through the pylorus, to be mixed with the bile and pancreatic juice in the duodenum.

It is important to observe that in this preparation the relations between the several proximate elements of the meat are not disturbed, far less is there any change in the state of the saline, or, as they are called, inorganic constituents, such as occurs when they are separated in the form of ashes by burning or otherwise totally decomposing the flesh.

But this process, whatever care may be taken, leaves the Fluid Meat with a strong bitter taste. This bitterness attaches always to meat digested with pepsin; and this, in the opinion of medical men, would wholly preclude its acceptance and adoption as an article of food. At the same time, it curiously illustrates the identity of the process in the laboratory and digestion in the living stomach.

In order to remove this bitter taste, and to obviate the objection to Fluid Meats on that

ground, I have made very many experimental researches, and at length have discovered that the purpose is completely and satisfactorily effected by the addition, in a certain part of the process, of a small proportion of fresh pancreas.

The Fluid Meat so prepared is entirely free from any bitter flavour.*

Physiologists, I apprehend, would demur to any pretensions that food, however treated out of the stomach, could be so completely digested as to require no action of the stomach or the gastric juice, but we may confidently affirm that the heavier work of the stomach is superseded by the Fluid Meat, and that food so prepared must relieve the enfeebled stomach of its main burthen, and enable it to complete the process of digestion without overtaxing its energies. It has been said that it would not be desirable to save the stomach the whole of its habitual work however much weakened, that the secretion of gastric juice is necessary to the health of the organ itself. Doubtless it is so; and it is not to be supposed the adoption of Fluid Meat wholly supersedes the

* I have deemed it proper to protect my preparation of *Fluid Meat* by making this discovery the subject of a Patent.

functions of the stomach. Besides it will almost always happen that some form of vegetable or farinaceous food will be given with it, bread, vermicelli, or the like, sufficient to satisfy and employ the stomach.

A very frequent case is where the mastication of meat is partial, or altogether impossible from loss of, or defect in the teeth, or diseases of the mouth. In such cases the Fluid Meat will be a great resource.

The following are methods of using Fluid Meat:—

One ounce by weight, or a large table-spoonful, equals the quantity of extract, obtained by boiling, from twenty ounces of meat.

It possesses a full meaty flavour.

Spread between bread and butter, and sprinkled with salt, it makes an agreeable sandwich.

Dissolved in water with a little salt and pepper it forms a liquid similar in taste to beef tea.

A small dessert-spoonful of the Fluid Meat in half a pint of water, or a tea-spoonful to a large tea-cupful is a good proportion, and this may be increased as desirable.

Flavoured with suitable condiments, Fluid Meat may be taken as soup, and, compared with the amount of solid matter obtained from meat by stewing, it becomes an economical article of diet.

FOR GRAVY SOUP.—Take a little carrot, turnip, onion, and celery, with a clove, small piece of mace and pepper; boil gently, strain, and for each half-pint of liquor add a table-spoonful of Fluid Meat, with a little salt.

FOR VERMICELLI SOUP.—Place in a covered jar in the oven a little sliced celery, onion, bruised spices and pepper, with water; when the celery and onion are thoroughly softened, strain, add (in the proportion of a table-spoonful to half a pint) Fluid Meat, with salt, a small knob of loaf sugar, and vermicelli, previously boiled.

ANOTHER SOUP.—Take two onions, a large carrot and turnip, cut into small slices, and fry them well with a little butter in a clean pan; when well browned, pour on three pints of boiling water; let stand till cold, scum, strain out the vegetables, add half a pound of girasole root, previously boiled in water till soft, and two ounces of the Fluid Meat; boil for a minute or two; macaroni or vermicelli, softened by boiling, may be added at pleasure.

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