ADDRESS IN THERAPEUTICS.

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ON FEEDING THE SICK.

MR. PRESIDENT AND GENTLEMEN,—My first duty is to express my acknowledgments to the Council of the Association, and to the South Wales and Monmouthshire Branch, for the honour they have done me in inviting me to deliver the Address in Therapeutics. This is, I believe, the first occasion in the history of the Association on which, from the wide domain of medicine, that portion which deals with the treatment of the sick has been specially selected as the theme of an address at the annual meeting. The subject of therapeutics is so large and complex, that to deal with it comprehensively within the compass of an hour's address would be beyond my powers. Such an attempt, even in much abler hands than mine, could scarcely issue otherwise than in the enunciation of a series of barren generalities which would edify no one. I therefore felt, as soon as I came to consider the matter, that the most prudent course for me, and the one most likely to prove interesting to you, was to confine myself to a very limited area in the field of therapeutics, and to endeavour, within that area, to say something which might prove of use in the daily practice of your profession.

Perhaps, of all the many duties which fall to the province of the medical practitioner, there is none so common as the duty of regulating the diet of his patients. Whatever the disease may be from which the patient is suffering, and whatever special means may be indicated for his relief, the regulation of the diet is sure, sooner or later, to crop up as an integral part of the management of the case. Dietetics, therefore, cover more ground than any other branch of the healing art—they are also, perhaps, the most ancient branch. Hippocrates traces back the very origin of medicine to dietetics. "For," he says, "the art of medicine would not have been invented at first, nor would it have been made a subject of investigation, if, when men are indisposed, the same food, and other articles of regimen which they eat and drink when in good health, were proper for them, and if no others were preferable to these." Notwithstanding this universal applicability, and this high antiquity, it must, I think, be allowed that dietetics, except in a few special cases, are somewhat neglected in these days. The often contradictory advice which is tendered to invalids in regard to their diet by the several medical men whom they may consult, betrays the want of a guiding principle, and of a general consensus of opinion in the medical profession on the subject of feeding the sick. This is, perhaps, not to be wondered at when it is considered how little systematic study is devoted to dietetics, and how fragmentary is the instruction on this subject which is given to the student of medicine. So far as I know, there is no systematic teaching of dietetics, even on the most limited scale, afforded to the student at any of our medical schools. He is left to pick up his knowledge of this subject, as best he may, during the earlier years of his practice; and he often ends by taking his own digestive organs as his type, and prescribes for his patients according to the likings and dislikings of his own stomach. This is, I need hardly say, a very unsatisfactory proceeding; for there is, perhaps, no subject in which individual experience is so fallacious a guide as dietetics, and none in regard to which it is more important to draw our inductions from a wide basis of facts.

The first pre-requisite for the acquisition of a sound knowledge of the dietetics of the sick, is to have clear ideas on the origin and meaning of the dietetic customs of the healthy; for it is obvious that the proper diet for the sick must be some purposive modification of the diet of the healthy. We have, perhaps, been too much inclined to seek, or to seek too exclusively, in the physiology of digestion and nutrition for our guiding principles and our point of departure in the study of dietetics. I doubt whether this is always, or even generally, the best starting-point. There are problems in human dietetics which appear to be beyond the reach of physiological research. What conceivable physiological inquiry, for example, could throw light on such problems as the following? What are the remote effects of the use or disuse of meat, or of alcoholic beverages, or of tea and coffee, on the

bodily health and mental attributes of the individual, and on those of his descendants in succeeding generations? And such questions are certainly, as I believe, involved in a comprehensive study of dietetics. On the side of natural history, it seems possible to approach such questions with some hope of success. For if we had the information, and could compare the mental and physical condition of the classes and nations which use these articles systematically with that of the classes and nations which abstain from them, the elements of a solution would seem to offer themselves.

I venture, therefore, to say that the science of dietetics must be mainly based and built up on an observation and a study of the practices and customs of mankind in regard to their eating and drinking, rather than on any *a priori* data supplied by physiology. In the case of the lower animals, we assume that each creature selects, from the nutrient materials within its reach, those articles which are most suited to its well-being, and are best fitted to promote its success in the struggle for existence, and that it is guided in this selection by an almost overpowering instinct. This, like other instincts, is now explained by biologists as consisting essentially in an inherited experience, which has been gradually accumulated through a long line of ancestors, and is transmitted by heredity to the descendants. Accordingly, when we see an animal feeding on a particular kind of food, we conclude, without hesitation, that that food is, of all the nutrient materials accessible to it, the best adapted for the special wants of its economy. But we know that man, in regard to his bodily functions, is subject to the same laws as govern the life of the lower animals; and we cannot doubt that, in the formation of his dietetic habits, man is guided by the same kind of instincts as those which guide the rest of the animal creation in the choice of their food.

The generalised food-customs of mankind are therefore not to be viewed as random practices adopted to please the palate, or to gratify an idle or vicious appetite. These customs must be regarded as the outcome of profound instincts, which correspond to important wants of the human economy. They are the fruit of a colossal experience accumulated by countless millions of men in successive generations. They have the same weight and significance as other kindred facts of natural history, and are fitted to yield to observation and study lessons of the highest scientific and practical value.

In taking dietetic customs as objects of study, it is obvious that widely disseminated customs, followed by many races and by vast masses of population, have a deeper and broader significance than customs limited to a few races or to small communities. It is also obvious that the practices of the more successful races, and of the easier classes of a nation, are more likely to yield good dietetic models than the practices of backward races or of the poorer classes; because the former, owing to their ampler means, have greater freedom of choice, and because also their greater success in the struggle for predominance is *prima facie* evidence of the beneficial tendency of their food-habits. I need hardly say that dietetic customs which are not the outcome of the free choice of the population, but are the consequence of legislative enactments or of religious injunctions, are of no utility as guides in the study of dietetics—except, indeed, as warnings of the mischief that may accrue from ignorant meddling.

The British races and the other races of Western Europe, together with their kindred and descendants in different parts of the globe, are, on the grounds just stated, fitted to supply us with a body of dietetic customs which may be regarded as a beneficial model. These races and nations are every way, but especially in intellectual power, and in their productiveness of men of originality and eminence, far in advance of all others. Their food-customs have grown up spontaneously, without material interference from legislator or religious reformer. Their world-wide commerce has brought cheaply to their doors the products of every land and every clime, and has enabled them to exercise a greater freedom of selection than has been possible to any other races.

The salient characteristics of the diet of the Western nations may be expressed in a few words. It consists partly of cereal and leguminous and other farinaceous articles, and of green vegetables and fruit, and partly of the various forms of animal flesh. The systematic use of alcoholic beverages is universal among them; and they consume, in large quantities, tea, coffee, or cocoa, or all three.

It is important to remark that the main dietetic customs of a country grow up, and are established, for the benefit of the robust and healthy, of the sober and temperate, and those of mean or average constitution; in other words, for those who are bearing the burden of the day, and fighting the battle of life. These form the great mass and bulk of the adult population, upon whose bodily and mental efficiency national progress and ascendancy depend. A good many in-

dividuals, and even entire families, may not find these customs, in certain particulars, beneficial to their exceptional tendencies or weaknesses; they may even find in them a source of destruction to their health and life; but here, as elsewhere, and indeed universally in Nature's operations, the individual is sacrificed to the welfare of the community:

So careful of the type she seems,
So careless of the single life.

Alongside the main dietetic habits formed for the operative mass of the community, there are secondary habits formed for the use of infants and children, and for persons advanced in years.

With regard to infants and children, we observe that they are not allowed to partake of the accessory articles of food which form so conspicuous a part of the dietary of their elders. They are allowed neither the use of alcoholic beverages, nor of tea and coffee—except gradually as they draw towards adult age—but are fed on simple nutrients, milk, cooked cereals, and more or less meat.

With advancing years, the diet undergoes a certain modification; the consumption of meat is, I think, somewhat lessened, and the consumption of soups, milk, and cooked cereals proportionally increased. With regard to alcohol, this modification of diet seems to vary with the preceding practice of the individual. Persons who have been in the habit during their prime of taking a full allowance of stimulants, gradually diminish the proportion as age creeps on, and their nutritive processes decline in elasticity and power. Sometimes the indications of this natural tendency are neglected or resisted by the unwary; they imagine that the quantity of stimulants they tolerated with impunity during the vigour of manhood, cannot hurt them in later life. This is a serious mistake, the commission of which tends to accelerate senile decay, and to provoke fatally tending organic changes in the large organs of the body and in the arterial system. On the other hand, persons who, during their youth and prime, have only used alcohol occasionally, or have abstained entirely from it, find advantage in their declining years in a more systematic use of alcoholic beverages.

There is a clear difference, also, to be discerned in the dietetic habits of the two sexes. There are no available statistical data to go upon, but, from common observation, we cannot fail to note that men eat much more meat than women. Probably we should not err in estimating that two-thirds of the meat brought to market is eaten by men, and only one-third by women. In regard to alcohol, the contrast is still more marked. My impression is that, in this country, three-fourths, if not four-fifths, of the alcohol consumed is consumed by men, and only one-fourth or one-fifth by women. This difference is consonant with our experience as medical men that women are more sensitive to the effects of alcohol than men, and are more easily injured by the excessive use of it. On the other hand, the consumption of tea and coffee, but especially of tea, is markedly more abundant among women than men. The comparison is completed when we add that women consume, in proportion to the totality of their food, more milk and more bread than men do.

It would not appear to be a wise proceeding to depart capriciously, and without clear reason, from the general dietetic customs of the country. We may be quite sure that the use of meat, and of alcoholic beverages, and of tea and coffee, subserve some useful purposes to the human economy, though we, in our ignorance, may not be able to specify them with precision. These customs are the spontaneous outcrop of natural instincts, and the fruit of an immense experience, and the sanction they derive therefrom constitutes an incomparably higher authority than the opinion of the wisest amongst us.

Nevertheless, differences of constitution and personal idiosyncrasies have to be reckoned with; and there are frequently solid, indeed paramount, reasons why individuals should, in some particular or other, depart from the general dietetic plan. I have known a few natural-born vegetarians who have had a lifelong distaste for meat. Some persons are intolerant of tea, others are intolerant of coffee. It is, however, with respect to alcohol that the most important deviations from the mean type of constitution occur. Some persons are made uncomfortable by the most sparing use of alcoholic beverages, either through their life or at some epoch of it. A good many, also, are wanting in that self-control which is necessary to the salutary use of this stimulant. These peculiarities or idiosyncrasies must be attended to. It may be regarded as certain, as a very general rule at least, that any food or food-accessory, the use of which is followed by a sense of discomfort, is not beneficial to that individual. Persons who are unable to take alcohol in moderation should, on pain of loss of health and life, refrain from its use—for to them it is easier to abstain than to be abstemious.

These general considerations, as furnishing the natural ground-

work of dietetics, should be kept steadily in mind in dealing with the practical questions which arise in feeding the sick. We may distinguish in a rough sort of way the patients who seek our aid in the matter of diet into two classes—namely, first, those who are able to take and to digest solid food, and to conform in the main with the general dietetic habits of healthy people; and, secondly, those more seriously sick, who can take little or no solid food, and must be fed on a plan deviating widely from the common custom.

FEEDING THE SICK WITH SOLID FOOD.

The great majority of our patients belong to the former class, and are able to use the ordinary diet. They consist of invalids who are suffering from various ailments of the slighter sort, or from some more serious disease which does not interfere radically with the digestive functions. In regard to all these, I take it that (except in special cases, which I do not purpose to consider) it is a sound canon of practice to adhere to the main features of the current dietetic habits, and to avoid teasing our patients with irksome and needless restrictions for which we cannot give a clear reason. Diversity and variability are marked characteristics of the dietary of the leading races of mankind, especially among the easier and more successful classes. The multifariousness of our eating and drinking is something very remarkable, and contrasts strongly with the monotonous fare of the less advanced races, and of the lower animals. Scarcely any two of our meals are exactly alike. Not only do the several daily meals—breakfast, dinner, etc.—differ from each other, but the breakfast or dinner of one day usually differs more or less from the corresponding meal of another day. This variability or diversity, we cannot doubt, fulfils some useful purpose beyond the mere gratification of the palate. It may therefore be inferred, that to prescribe a monotonous regimen is to contravene a beneficial rule, and to depart from a salutary principle in human dietetics. We know that a healthy man soon rebels against a daily repetition of the same dishes, however wholesome and savoury; much more an invalid, with weak appetite and feeble enjoyment of his meals, who craves for more change and variety than the robust.

Another part of our duty is to study the peculiarities and idiosyncrasies of the invalid's stomach. Our stomachs are nearly as individual as our faces, and are very peremptory in regard to their likings and dislikings. In adapting diet to these idiosyncrasies, it is, however, a good rule, as far as practicable to lessen the quantity of the offending articles rather than to forbid them altogether; or, if they must be forbidden, to provide in their place substitutes of kindred nature. The practice of forbidding fresh vegetables and fruit is especially open to objection. These articles, in addition to their use in promoting the peristaltic action of the intestine, have important antiscorbutic virtues; and although in these days, and among our own people, we almost never meet with fully developed scurvy, we are probably, without knowing it, often in the presence of incipient or larval scurvy. As there is a pre-arthritic stage of gout—a dietetic disease at the opposite pole of the feeding scale—so likewise, we may presume, there is a pre-hæmorrhagic stage of scurvy. I have sometimes observed the existence of a low standard of health, without any very definite symptoms, which I could only attribute to a too protracted abstinence from fresh vegetables and fruit. I think it is possible to go too far in humouring a capricious stomach; and that, in persons of a hysterical or neurotic constitution, a too indulgent consideration for the ease of this organ may entail disadvantages in regard to the general nutrition of the body, and produce effects which, in the long run, tend to lower the level of health, and even to aggravate that gastric sensitiveness which we are seeking to abate.

I need hardly say that due mastication and cooking of the food are essential to easy digestion. Perfect cooking is especially important in regard to farinaceous articles and fresh vegetables. These are often imperfectly cooked, and thereby rendered difficult of digestion by invalids. The bad reputation of potatoes and pastry in regard to digestibility is chiefly due to the fact that they are often imperfectly cooked.

A matter of considerable interest and importance is the regulation of the accessories which we use with our food. The chief of these are the various kinds of alcoholic beverages, and tea, coffee, and cocoa. These articles are usually taken with meals, and they mingle in the mouth and stomach with the food, and thereby directly complicate the task of the digestive organs. In the course of last year, I subjected the effects of these accessories on salivary and peptic digestion to a somewhat extended experimental inquiry. The time at my disposal will not permit me to lay before you the details of these experiments; but, as they will be shortly published, I may ask you to take them for the present on trust, and to allow me to indicate some of the conclusions and lessons which appear to be derivable from the inquiry.

In studying the influence of our food-accessories on digestion, it is necessary to distinguish sharply between their action on the chemical processes, and their action on glandular and muscular activity. These two actions are quite distinct, and generally opposed to each other; for, while all the food-accessories were found to exercise a more or less retarding influence on the speed of the chemical process, some, if not all of them, exercise a stimulating influence on the glands which secrete the digestive juices, and on the muscular contractions of the stomach. It is, also, necessary to distinguish between the effects of the food-accessories on salivary digestion, and their effects on peptic digestion, inasmuch as wide divergencies were found to exist in this respect.

The distilled spirits—brandy, whisky, and gin—were found to have but a trifling retarding effect on the digestive processes, whether salivary or peptic, in the proportions in which they are commonly used dietetically. Their obstructive effects only became apparent when used in quantities which approached intemperance. Taking this in conjunction with the stimulating action which they exercise on the glands which secrete the digestive juices, and on the muscular activity of the stomach, their effect in these moderate dietetic proportions must be regarded as distinctly promotive of digestion.

Wines and malt liquors exhibited an action differing considerably from that of ardent spirits. Wines were found to be highly inimical to salivary digestion. Even very small quantities of sherry, claret, hock, or champagne, inhibited the action of saliva on starch to a very high degree. This is due to the considerable acidity which all wines possess. When this acidity was neutralised by the addition of an alkali, the inhibitory effect of wines on starch-digestion was entirely removed. It is a common practice, as you know, to mix wines—especially sherry, claret, and hock—with soda, seltzer, or some other effervescent table-water. These waters all contain a charge of alkaline carbonate, and it was found that, when wines were thus mixed, they ceased to embarrass salivary action. This practice may, therefore, be looked on as highly commendable in the case of persons of weak digestion.

On peptic digestion, wines exhibited a retarding effect altogether out of proportion to the alcohol contained in them. Both the stronger and the lighter wines, except in very moderate proportions, checked the speed of peptic digestion. In the customary dietetic use of wines with meals there is, probably, a double action; on the one hand, a stimulating action on the secretion of gastric juice, and on the muscular contractions of the stomach; and, on the other hand, a retarding effect on the speed of the chemical process. In the case of persons of weak digestion, wines should be taken sparingly, and the quantity so adjusted as to bring out their stimulating action without provoking the retarding effects which follow their more liberal use. Champagne was found to have a distinctly less retarding power than an equal volume of claret or hock. This I judged to be solely due to the mechanical effects of the effervescence and liberation of gas, whereby a more efficient stirring up of the digesting mass would be effectuated. Effervescent wines, therefore—other things being equal, favour the speed of peptic digestion more than still wines.

The effects of tea, coffee, and cocoa exhibited some interesting diversity. It was found that tea had an intense inhibitory effect on salivary digestion; even in very minute proportion, it completely paralysed the action of saliva. On the other hand, coffee and cocoa had only a slight effect on salivary digestion. The inhibitory action of tea on saliva was found to be due to the large quantity of tannin contained in the tea-leaf. Some persons have supposed that by infusing tea for a very brief period—two or three minutes—the passage of tannin into the beverage could be avoided. This, however, is a delusion. Tannin is one of the most soluble substances known; it melts like sugar in hot water. One gentleman of my acquaintance, in his horror of tannin, was in the habit of preparing his tea by placing the dry leaves on a paper-filter, and simply pouring on the boiling water. In this way, he thought to evade the presence of tannin in his tea. But if you try the experiment, and allow the product, as it runs through the filter, to fall into a solution of perchloride of iron, you will find that an intense inky-black coloration is produced, showing that tannin has come through in abundance. You can no more have tea without tannin than you can have wine without alcohol; and I found, experimentally, that tea infused for two minutes had almost exactly the same inhibitory effect on digestion as tea infused for twenty or thirty minutes. If you wish to mitigate the effects of tea on salivary digestion, you should direct the patient not to sip the beverage with the meal, but to eat first and drink afterwards. In this way, time is given for the saliva to perform its functions unhindered. Another device is to introduce a pinch of carbonate of soda into the tea-pot; this removes the deterrent effect of tea on salivary digestion; it is a practice occasionally

followed in some households; under the idea that soda helps to extract the virtues of the tea-leaves. It was found that the addition of so small a proportion as one per cent. of the weight of the dry tea greatly mitigated its injurious effect on starch-digestion, and that twice this quantity (two per cent.) almost entirely removed it. This latter proportion corresponds roughly to ten grains of bicarbonate of soda to an ounce of tea-leaf.

The effects of tea, coffee, and cocoa on peptic digestion were found to be as nearly as possible alike for infusions of equal strength. All three exercised a retarding effect, when their proportion in the digesting mixture rose above 20 per cent. These beverages should, therefore, be taken very moderately by persons of weak digestion. The good reputation of cocoa in regard to digestion seems to be wholly due to the fact that it is used in weaker infusions than tea and coffee. The directions for the preparation of this beverage, printed on the packets of cocoa sold in the shops, indicate a strength of about two per cent.; whereas a medium tea is usually made of a strength of four to five per cent., and a medium coffee of a strength of five to seven per cent. The strong coffee which it is customary to hand round after dinner must have a powerful retarding effect on gastric digestion; and, although this practice may be salutary to robust eaters, it is not to be recommended to those of feeble peptic power.

FEEDING THE SICK WITH LIQUID FOOD.

In a considerable number of conditions, our patients are unable to take solid food, and are reduced to the necessity of using food which can be administered in the liquid form. This is usually the case in the febrile state and in serious organic disease, especially of the abdominal organs, and in the terminal stages of almost all diseases. There are other conditions in which, although the patient may have the ability to take solid food, it is not desirable that such food should be administered to him. In narrowing of the pylorus or other part of the digestive tract, in ulceration of the intestinal mucous membrane, it is obviously undesirable to administer articles of food which are capable of forming lumps or masses which may block up the narrowed parts of the intestinal tube, or irritate the ulcerated surfaces. There is thus a large field for the employment of liquid food; and one of the most embarrassing tasks in clinical dietetics is to devise food in this form in sufficient change and variety, and having at the same time an adequate nutritive value. Our resources in this state of things consist of milk, beef-tea and other meat-decoctions, cold-made meat-infusions, raw eggs, and the various gruels. I propose to make some remarks on each of these articles.

Milk.—By far the most serviceable liquid food we possess is milk. Milk contains, in almost equal proportions, proteid, saccharine, and fatty matter, and is capable alone, as we know, of sustaining life. All plans of feeding the sick on liquid food centre round milk. It can be given alone, or mixed with tea, coffee, or cocoa, or with lime-water, soda-water, ardent spirits, or with farinaceous gruels of various sorts, or as buttermilk, koumiss, or whey. Were it not for the necessity of change and variety, we should, in a large number of cases, want nothing but milk. It should, however, be remembered that milk is by no means a perfect kind of liquid food. In the course of its digestion, both in the stomach and in the intestine, milk, or rather the casein contained in it, is coagulated into solid masses, and these masses have to be redissolved before they can be absorbed. Not unfrequently, if milk be given too freely, these curdy masses fail of being dissolved; and they pass down the intestine more or less unchanged, and are ultimately discharged with the stools. In this way milk may become an objectionable form of liquid food; these curds may block up a narrowed part of the intestine, or they may undergo putrefactive changes, and thereby irritate the tender or ulcerated mucous membrane. This drawback to the use of milk may be obviated by predigesting or peptonising it, which is easily accomplished at a warm temperature by means of pancreatic extracts. The bitter flavour of peptonised milk is, however, nauseous to many invalids, and you cannot fully peptonise milk without developing this unpleasant flavour. One of the best means of covering the taste of peptonised milk is to add coffee to it. Another device, which may sometimes be adopted with advantage, is to add the pancreatic extract to cold or iced milk. In the cold, the action of the ferment is comparatively slow, and it takes some hours to produce an appreciable change of flavour. But as soon as milk, thus charged with the ferment, is swallowed and passes into the warm atmosphere of the stomach, it is rapidly digested. I have seen, in cases of typhoid fever, when undigested curds of milk were observed to be coming away with the stools, this plan followed by the immediate disappearance of these masses from the motions. But the palates of invalids are sometimes abnormally sensitive, and they detect, and resent, the mere presence of the ordinary pancreatic preparations in articles of food,

quite apart from the digestive changes produced by them. Recently Mr. Benger has placed at my disposal a pancreatic preparation which is absolutely free from taste and smell. This preparation, of which I have here a specimen, consists of the pancreatic enzymes in a highly purified state, under the form of a light, nearly white powder. It is not hygroscopic, and may be kept unchanged for an indefinite period fully exposed to the air.¹ This beautiful preparation is excessively active, and no palate can detect its presence in milk or other article of food until its effects are revealed in the process of digestion. I am inclined to think that it will prove a valuable addition to our resources when it is considered desirable to subject food to a process of pre-digestion, and still more when it is desired to add the ferment to the food in the cold state, with a view to promoting its rapid digestion after being swallowed.

Beef-tea and other Meat-Decoctions.—Next to milk, in frequency of use and in high esteem, come beef-tea and other meat-decoctions. Long experience has satisfied us in this country of the usefulness of these preparations in feeding the sick. Beef-tea and its congeners, however, take rank as restoratives and stimulants, rather than as nutrients. They contain no albuminous matter in solution, and the small quantity of gelatin contained in them cannot be of much account. There is a wide-spread misapprehension among the public in regard to the nutritive value of beef-tea. The notion prevails that the nourishing qualities of the meat pass into the decoction, and that the dry hard remnant of meat-fibre which remains undissolved is exhausted of its nutritive properties; and this latter is often given to the cat or dog, or even, as I have known, thrown away as useless rubbish into the midden. A deplorable amount of waste arises from the prevalence of this erroneous notion in the households of many who can ill afford it. The proteid matter of meat is, as you know, quite insoluble in boiling water, or in water heated above 160° Fahr. The ingredients that pass into solution are the sapid extractives and salines of the meat, and nothing more, except some trifling amount of gelatin. The meat-remnant, on the other hand, contains the real nutriment of the meat; and, if this be beaten to a paste with a spoon, or pounded in a mortar, and duly flavoured with salt and other condiments, it constitutes not only a highly nourishing and agreeable, but also an exceedingly digestible, form of food.²

Cold-made Meat-Infusions.—The defect in nutritive value of beef-tea led Liebig to suggest the use of cold-made meat-infusions. He recommended that minced beef should be infused in cold water, acidulated with a few drops of hydrochloric acid. An infusion so prepared differs essentially from beef-tea in the fact that it contains, in solution, a large amount of albuminoid matter. The addition of the acid is, according to my observations, a needless complication of the process. Infusions quite as rich in albumen were obtained when simple water was used, as when the water was acidulated with hydrochloric acid. Infusions made from minced meat with half its weight of water, and allowed to stand for two hours, and then pressed through cloth, were found, on analysis, to contain over four per cent. of dry albumen. This amount of proteid is equivalent to that contained in cow's milk. The nutritive value of such infusions is, therefore, very high. When heated to the boiling point, they coagulate into a solid jelly. Made from beef or mutton, the product has an unpleasant bloody appearance; but, when made from veal, the coloration is much paler. The best preparation, however, is made from the meat off the breast of a chicken. This meat is nearly white, and it yields an infusion which is almost colourless, and which sets, on heating, into a solid white jelly, of very agreeable appearance. Cold-made meat-infusions cannot be heated above 114° Fahr. without becoming turbid from commencing coagulation of albumen. It is, therefore, impossible to cook them without destroying their liquid character. The objection to these infusions is their raw flavour, which to many is highly disagreeable—though some invalids take them without the slightest objection. The best way of covering the raw taste is to add some ordinary beef-tea or a little of Liebig's extract of meat. Some prefer a flavour communicated by a slice of lemon, or by the addition of a little claret.³

Beaten-up Eggs.—Another highly nutritive form of liquid food is supplied by raw eggs. The yolk, or white, or both together, are beaten up in various ways and combinations which are well known. Eggs are more easily digested by the stomach in the cooked than in the uncooked state; but, when the stomach is weak and unable to digest solid food, beaten-up eggs pass through it into the duodenum

without being meddled with, and are slowly digested in their passage down the intestine. They are incapable of forming lumps or masses, and are, therefore, well adapted for cases of narrowing or ulceration of any part of the digestive tract.

Fortified Gruels.—A very important kind of liquid food is furnished by gruels made with the several kinds of cereal or leguminous seeds. Gruels are not by themselves an agreeable kind of food; they lack flavour; but, mixed with milk or beef-tea, they constitute a valuable addition to our resources in feeding the seriously sick. When prepared from the cereal flours in the usual way, they can only be made of feeble nutritive power, if their liquid character is to be preserved. These flours are very rich in starch, and gruels made from them become thick and pasty if the proportion of flour used in their preparation rise to four or five per cent., and a gruel of this 'strength' does not contain more than one-half per cent. of proteid matter. But if the meal be mixed beforehand with one-eighth of its weight of ground malt, you can prepare from these flours gruels of much higher nutritive value, and still preserve their liquid character. The diastase of the malt acts upon the thickening starch as the heat rises, and converts it into soluble starch and dextrine. These fortified gruels can be made with as much as 20 per cent. of meal, and still maintain the fluid state. Such gruels contain about two per cent. of proteid matter, and about 14 per cent. of carbo-hydrates, and are admirably adapted, combined with milk or beef-tea, to supply a varied kind of liquid food of highly nutritious character. Mixtures of this class seem especially suited for the nourishment of cases of typhoid fever.

A matter of interest, in designing food for the sick-room and nursery, is the consideration of the special properties of the several kinds of cereal and leguminous substances used as food. In point of chemical composition, the several kinds of cereal grains are closely allied; still, there are differences between them, and these differences may be of importance. The proteid of wheat is not quite identical with that of oats or barley. On the other hand, leguminous seeds differ importantly in composition from the cereal grains. Taking the lentil as a type of the leguminous group, it is to be observed that lentil-flour contains twice as much proteid matter as wheat or oat flour, and almost twice as much lime. Moreover, the proteid of the leguminous seeds differs materially from that of wheat or oats. These differences are probably of not a little importance in feeding the sick and the young; and, if we had more knowledge and experience in their use, we could, perhaps, utilise with advantage these several cereal and leguminous products, and combine them in varied ways to meet the indications and necessities of different cases.

You must all have observed how there has grown up in these latter years an enormous trade in prepared "foods" for infants and invalids. The very success of this trade is some evidence of the usefulness of these articles. Their composition is generally made more or less of a secret, but whatever secret there be must be hidden within a very narrow compass. The several possible flours out of which these "foods" are mingled can be easily counted—wheat, barley, oat, maize, pea, lentil, and one or two others. These are the ingredients—with malt-flour in some cases—out of which they are all compounded. Now, I cannot help thinking that it would be an advantage both to ourselves and to our patients, if we knew more precisely what we were about in this matter, and if we were in a position to prescribe for infants and invalids the several kinds of farinaceous aliments in proportions known to us, instead of blindly using some mixture of which we know not the exact composition. It is impossible for us to make progress in dietetics on such a path. I can quite believe that these flours have their special excellencies, and that they are severally adapted for different cases and conditions. In the first place, they have distinctive flavours, and thereby may be made to contribute to the important end of providing change and variety for the invalid. Moreover, the faculty of "agreeing" of the different flours, in reference to the individual idiosyncrasy, is a point of not a little significance. Lastly, the difference of chemical composition between the cereal and leguminous flours must have an important bearing on the dietetic uses of these two groups of aliments. It is, I repeat, a serious disadvantage that the control of the preparation of food for the sick-room and nursery should pass from the hands of the medical attendant to those of the purveyor. In the matter of drug-giving, all enlightened practitioners are chary of prescribing secret remedies. Such a practice, it is felt, must be fatal to the intelligent use of drugs. So it is with providing food for the sick. What we want is to have at our disposal a supply of the several articles of food in their simple state, and suitable appliances in connection with the sick-room, or nursery for cooking and combining them in various ways according to the exigencies of our patients.

If I were asked to enumerate the ingredients and apparatus, which

¹ It slowly acquires a slight peculiar odour when kept in a tightly corked bottle, but this passes off when it is exposed to the air.

² These remarks on beef-tea apply equally to Liebig's Extract of Meat, Brand's Essence of Beef, and Valentine's Meat-Juice, all of which are devoid of albuminous constituents.

³ Cold-made meat-infusions keep badly. They should be preserved in a cold cellar, or, still better, on ice.

are necessary for the cuisine of the sick-room and nursery, I think I could do so very briefly. In addition to the resources of the domestic kitchen and larder, the sick-room kitchen should contain a supply of the following flours: oat, maize, malt, and lentil flours in a finely pulverised condition, and freed from bran. It should be provided with a solution of soda-bicarbonate of known strength. This would be of use to add to milk when necessary, and to assist in the preparation of peptonised articles of food. Next to these would come a reliable pancreatic extract, and a preparation of pepsin or rennet for the production of whey. The associated apparatus should include a thermometer, wherewith the nurse could, when desirable, heat up cold-made meat-infusions to a proper temperature, and regulate the warmth required in the predigestion of food. A double-cased saucepan would form an indispensable item; this makes an admirable hot-water bath for the preparation of beef-tea and fortified gruels. A pair of scales, glass-measures, and a mincing-machine would complete the list. Finally, there should be, for the service of the nurse, a card or sheet containing plain directions for the preparation of the various kinds of liquid food.⁴

Given these simple appliances, I see no difficulty, in these days of skilled nursing, in the medical attendant being able to prescribe almost any kind of liquid food for his patients in any combination, and having it served up for the invalid in the most suitable possible manner. I have ascertained that there is no difficulty on the part of the miller in producing meals from malt, oats, or lentils, freed from bran and coarser particles, and in nearly as fine a state of preparation as wheaten flour. In this state, these meals are susceptible of much more rapid and perfect cooking than when roughly ground. I have little sympathy with much that has been said of the advantages of whole meal and decorticated flour. It has been alleged that the too complete separation of the outer parts of the grain deprives the flour of its mineral matter. If we lived on bread alone, there would be some force in this objection; but as that is not so, and that we find in milk, meat, fish, eggs, soups, and fresh vegetables, a superabundant provision of mineral matter, and have, moreover, always at our elbows a supply of salt, there can never be any lack of saline materials in our food. The branny matter of the flour is both indigestible and irritating to the primæ viæ; and although it may not injure, or may even be useful, to the strong and healthy, it is quite an unfit element in food designed for the weak and tender membranes of the invalid and infant.

Gentlemen, in bringing my remarks to a close, I should like again to press for a more systematic and a more comprehensive study of dietetics. The effects of diet are profound and far-reaching, and exceedingly subtle. Some inkling of this is got from the history of gout. You all know how slowly and how insidiously the gouty diathesis is developed under the influence of diet, and how it may affect the descendants unto the third and fourth generations. The immediate effects of diet are often not the most important. Behind these are remote sequences of vital concern to the family and the nation. And it is not solely in regard to feeding the sick that a scientific knowledge of dietetics is useful. There are public questions of great moment, affecting the food-habits of the people, the consideration of which ought not to be dominated exclusively by popular opinion. In legislating on such questions, it is of the last importance to proceed on correct lines; for it is certain that any policy which ignores the instincts of mankind and the laws of nature is foredoomed to failure. I believe that a comprehensive study of these questions from the side of history, and of natural history, would throw unexpected light on the issues involved, and furnish data of great value for the guidance of the legislator and of the social reformer.

⁴ Messrs. Paine and Benger (Mottershead and Co., chemists, Manchester) have put together the ingredients and apparatus above enumerated in a portable box, of which a sample was exhibited at the annual museum.

MESSAGE OF THE PROSTATE FOR RETENTION.—A Dutch surgeon, Dr. Le Rütter, has found means to subject the prostate to a kind of massage, and in this way has completely cured two patients of the ages of "over 50" and 70 respectively. The method employed is to pass the forefinger up the rectum, and then to move the prostate to the right, left, and in a vertical direction three times each way, rubbing it firmly afterwards. This proceeding is, as may be supposed, rather disagreeable to the patient (to say nothing of the operator's sensations), and it cannot be borne for long at a time. In one of the cases, 20 massages, and, in the other, 15, were required to effect complete restoration of the power to pass urine freely. In both, a small amount of bleeding took place from the urethra, caused by the manipulation of the prostate, for which liquor ferri sesquichloridi was given, with a satisfactory result.

ADDRESS IN PUBLIC MEDICINE.

BY

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THE SANITARY HISTORY OF MERTHYR-TYDFIL.

In this address, I propose, very briefly, to state the more prominent facts in the health-history of Merthyr-Tydfil, believing, with Dr. Norman Chevers, that, to pourtray in truthful words the unfavourable influences which have been detrimental to the health of the people who have resided in this upland valley, and to relate the beneficial results which have followed upon the removal of those influences, by the introduction of means promotive of good health, will be of as much value as the charming story told by one of the most eminent of sanitarians, of an ideal city of health.

The parish of Merthyr-Tydfil is situated at the upper part of the valley of the Taff, near the confluence of the greater and lesser Taff rivers, at a distance of 17 to 26 miles north of Cardiff. The area of the parish is nearly 18,000 acres; it is about nine miles in length, wedge-shaped, being four miles wide at the northern part, lessening to a point at its southern end. Along the whole length, the Taff River runs in a deep valley, the ridges of mountains on each side rising to heights from 1,000 to 1,600 feet above the sea. The two rivers have their sources near the summits of the Breconshire Beacons, nearly 3,000 feet above the sea. Necessarily, the climate is cold and wet, the rainfall averaging 57 inches annually.

The old town of Merthyr is placed in the centre of the valley at its widest part, 500 feet above the sea. Along the valley, and following the courses of the streams flowing into the Taff, many villages and towns—especially the town of Dowlais on the north-east, and the district of Cyfartha on the north-west—have from time to time been formed, as the works for the manufacture of iron and for the getting of coal have sprung up.

Sir Henry de la Beche says: "The rocks on which the town stands form that stratification of coal-beds, shales, and sandstones known as the coal-measures, with which, in this district and for a long line of country, are intermixed beds of clay ironstone." To these ironstones formerly, but now to the beds of steam-coal, and to the limestone quarried in immediate proximity on the north of the parish, Merthyr-Tydfil owes its importance, as one of the principal seats of the iron and steel manufacture, and of the districts whence annually are exported the far-famed smokeless steam-coal.

In his report to the General Board of Health in 1850, the Inspector, Mr. Rammell, says: "The rise of Merthyr-Tydfil as a seat of industry and wealth may be attributed to the period when the use of pit-coal, instead of charcoal, was found applicable to the working of iron. About 1748, the Dowlais district was leased by an ancestor of the Lewises, of Llanishen, in conjunction with an ancestor of the Guests of Dowlais. In 1755, Mr. Bacon obtained a lease for 99 years of a mineral tract, full of coal and iron ore; the whole of the leasehold interest in this property passed, at the close of the last century, into the hands of the Crawshays, of Cyfartha. Other mineral districts, as Peny-darran and Plymouth, were taken at almost nominal rents."

The population of Merthyr Parish, in 1801, was 7,705; in 1881, 41,857; and, in 1885, it was estimated at 52,500, occupying 10,438 houses. The houses of the working classes (that is, of 45,000 out of the 52,000 inhabitants) are three- or four-roomed cottages; two rooms on the ground-floor, and one or two on the first story. They are built of a sandstone which is frequently of a very porous nature, and the ground-floors are mostly paved with stone. Those houses which were first built, when the iron-works were being established (1750 to 1780) were chiefly built against a wall of earth, and hence these have always been damp and unventilated.

Sir Henry de la Beche, reporting in 1843-4, says: "There was no water-supply; there were some privies at the few decent houses, but none to cottages. Slops and refuse were thrown on to unmetalled and unchannelled highways and streets, and on mounds of coal-ashes at every turn. There was a great number of poor, as indicated by the fact that between 6,000 and 7,000 persons, out of a population of 37,000 (one out of six), were relieved from the poor-rates annually."

In 1849, Mr. Rammell states: "The town of Merthyr-Tydfil was entirely destitute of drainage; no provision was made for excrement-removal; there was an utter want of a proper provision for supplying