THE USES AND ABUSES OF PROPRIETARY FOODS IN INFANT FEEDING.*

BY

HECTOR CHARLES CAMERON, M.D., M.R.C.P.,
ASSISTANT PHYSICIAN AND PHYSICIAN IN CHARGE OF THE CHILDREN'S
DEPARTMENT, GUY'S HOSPITAL.

For the past year or more one subject has been interesting us particularly in the children's department at Guy's Hospital, where we come in contact with a very large number of infants suffering from all the disorders which are the common result of artificial feeding. We have examined all cases of infantile dyspepsia, among the artificially fed with the object of estimating the part played in the production of the disturbance by the proportion of sugar in the diet, and we have come to the conclusion that excess of sugar is by far the most common cause of dyspepsia, at any rate among the children from such a poor neighbourhood as Bermondsey and the river side. I believe that in the past far too little attention has been paid to this particular aspect of infant dietetics. Sugar, which is commonly added with so free a hand by the mothers, is looked upon by them merely as a flavouring agent, and not as the constituent of the food most vital for the growth of the child and for the development of animal heat. It is quite common to find that a heaped teaspoonful of cane sugar is added to each of ten feeds for an infant whose weight totals but 8 or 10 lb. This amount is equivalent, weight for weight, to the consumption by an adult weighing 10 st. of about 2 lb. of pure cane sugar in the course of the day. That all infants on receipt of such an amount do not immediately respond by developing diarrhoea is evidence of the enormous tolerance for sugar and the great demand for sugar which the growing child shows.

In contrast with this apparent neglect of the importance of carbohydrate excess as a factor in the production of dyspepsia, there is no doubt that in the past the difficulties of protein digestion have been much exaggerated. Cow's milk, as every one knows, contains a very high percentage of casein, and it is to this single peculiarity that in the history of infant feeding a vast deal of attention has been directed. A difficulty in digesting the casein of cow's milk has been regarded as the crux of the whole matter. When an infant fed on cow's milk is sick the vomit is apt to consist of a dense curd of casein, and it seemed natural to attribute this to a special difficulty in the digestion of a substance which is present in amounts so strikingly in excess of the proportions found in human milk. In order to prevent the formation of this clot a whole series of devices has been recommended from time to time—for example, the use of barley water, of lime water, of sodium bicarbonate, and more recently, of sodium citrate.

At one time confirmation of the belief in the indigestibility of casein was found in the appearance in the stools of milk-fed infants of certain white curd-like masses which were presumed to be formed of undigested casein. Such stools, indeed, are commonly described by nurses and mothers as "undigested." It is long since these white curds have been proved to consist not of casein at all but of soaps. I believe, too, that the vomiting of casein curds is not to be looked upon as implying an inherent difficulty in the digestion of casein, but is an accident due to the nature of the food. If an infant fed upon cow's milk happens to develop dyspepsia it has no option but to vomit a dense curd, because such curds are formed normally in the process of digestion. Any good which results from the use of lime water, sodium bicarbonate, or sodium citrate, is, I think, due not to the prevention of the clotting process, but to the effect upon the acid fermentative dyspepsia which is the actual cause and occasion of the vomiting.

Dyspepsia in infancy is nearly always of a nature to be benefited by the addition of alkalis. The fats, and especially the sugars, tend to undergo fermentative changes, with the result that a great excess of volatile fatty acids is formed. As a result the contents of the stomach become intensely acid, and even the breath may have a sour, rancid odour. When these acid gastric con-

tents reach the intestine, they act as a powerful stimulus to peristalsis. In spite of the free flow of alkaline succus entericus which their presence provokes the reaction of the intestine is always acid. The stools are green, watery, and so sour that the anus and any part of the skin which comes in contact with them is apt to be irritated and excoriated. The stimulus to peristalsis may be so great that the tense coils of intestine may be visible through the abdominal wall, while the pain is such that the whole body of the child is thrown into restless movement.

On the other hand, an infant fed upon a diet so poor in sugar as unaltered cow's milk is not likely to suffer from these symptoms of diarrhoea and vomiting. Upon a pure milk diet the stools are formed, clay-coloured and alkaline, because the volatile fatty acids, as a result of the low content of sugar in the food, are all held bound as soaps by the alkaline salts of the succus entericus. A diet of whole cow's milk, therefore, often results in constipation because the natural stimulus to peristalsis is absent. The very great success which whole-milk feeding has achieved proves, I think, two things. It shows that infants are able to digest the large amounts of casein without disturbance, and that the great majority of infants, among the sugar-fed children of the poor at any rate, are for a time likely to benefit by a change to a diet in which the percentage of sugar is relatively low.

Although an infant fed on whole milk without addition of any sort is likely to be free from any very stormy attacks of diarrhoea and vomiting, it is not to be supposed that the results will invariably be entirely satisfactory. In such infants the want of sugar often leads to constipation, to want of growth, and to backward development generally. We can therefore draw a sharp contrast between the baby fed only on cow's milk—pale, undersized, backward in development, with subnormal temperature and cold blue feet and hands, with alkaline, formed, clay-coloured stools and a tendency to constipation—and the infant fed upon a diet rich in sugar, whether milk dilutions to which sugar has been freely added or one of the numerous proprietary foods, in nearly all of which the sugar is present in great excess, an infant perhaps larger and better grown but with a troublesome tendency at the least provocation to suffer from explosive attacks of diarrhoea and vomiting. With each attack the tolerance for sugar tends to be lowered, sometimes only temporarily, sometimes permanently, so that a second attack supervenes more readily than in the first instance. In bad cases the tolerance for sugar may fall so low that dyspepsia is produced upon an amount less than that necessary for the maintenance of the body weight. In such a case a condition of true marasmus is produced in which the usual paradoxical reaction to food is seen. By the paradoxical reaction is meant that the child loses weight slowly when almost starved and loses weight with terrible rapidity when an attempt is made to increase the amount of food, because of the dyspepsia which results.

I do not mean that all infants fed on cow's milk will develop the one set of symptoms or that all infants fed on mixtures rich in sugar the other set of symptoms as an invariable rule; but if unsatisfactory results do follow they will in most cases be of the type described. We have, indeed, always to remember how great is the tolerance of infants living under good hygienic surroundings for even the most unsuitable forms of diet, provided only that no sudden changes are introduced. If infants invariably responded to an excess of any one constituent by developing the appropriate and expected symptom we should have a much clearer idea of the results of excess than we have at present. Because one sturdy infant has successfully accustomed itself to thrive upon a diet consisting largely of starch and sugar we must not conclude that to adopt a similar diet will therefore bring salvation to a weakling already in difficulties with its digestion. Yet this is the procedure again and again adopted by mothers and nurses, and it is the argument constantly reiterated by proprietors of special foods.

Proprietary foods have a distinct field of utility among a community which is not skilled in the difficult art of cookery for young children. We find in them an easily available and perfectly successful means of combating the ill effects which I have tried to describe as resulting from an exclusive milk diet. If we remember that most of them are composed preponderantly of carbohydrate of one or other

* An address delivered before the Camberwell Division of the British Medical Association.

sort and that therefore they have the drawback that they are liable, in those infants whose carbohydrate tolerance is small, to produce fermentative dyspepsia, diarrhoea, vomiting, colic, and excoriation of the buttocks, we shall be in a position to make use of them to attain good results without endangering the stability of digestion.

We may divide the foods into seven groups:

1. Condensed Milk with a High Percentage of added Cane Sugar.

Sweetened condensed milk is enormously popular among the poorer classes; it is cheap, it keeps for a long time, and it is easy to prepare. If one heaped teaspoonful is mixed with 3 oz. of water, a mixture containing approximately 1 per cent. fat, 1 per cent. protein, and 5 per cent. sugar results. During the first two months of life infants often show a marked intolerance for cow's milk, occasioned by their inability to digest the comparatively high percentage of fat, with the result that vomiting of curd is extremely common. On the other hand, upon a mixture with a low percentage of fat and a high percentage of sugar, such as sweetened condensed milk, they often thrive well. The danger lies in the increasing tendency which the child shows to develop fermentative dyspepsia as its growth calls for an increased concentration and larger amounts of food. I find, too, that mothers frequently add to the risk by adding still farther amounts of cane sugar. In children over 6 months the extremely low fat content is very liable to produce rickets.

2. Condensed Milk without added Sugar.

This consists of milk condensed in a vacuum to a third of its bulk. By the addition of water a mixture of approximately the same composition as milk can be obtained. For some reason or other, probably because it does not keep so long as the sweetened variety, it has never been popular, and it is sometimes difficult to get shopkeepers to stock it. There may, however, be a further explanation for this unpopularity in that unsweetened condensed milk does not differ sufficiently in its composition from fresh milk to make its substitution haphazard a procedure likely to bring about improvement. The not infrequent good results achieved by the sweetened variety are, as I have said, due to the accident that in many young infants there is an idiosyncrasy against fat, while the power of digesting sugar remains good. Such infants are, therefore, well suited by the change from cow's milk to a sugar-rich diet such as sweetened condensed milk. Unsweetened condensed milk, on the other hand, is nearly as rich in fat as fresh milk, and contains no more sugar. It is very useful when a supply of pure milk cannot be obtained, as in times of great heat or when travelling.

3. Dried Milks.

These are prepared by spreading a very thin sheet of milk over a heated metal plate, so hot that the milk is rapidly dried and converted into a powder. The composition of these milks does not differ materially from fresh milk, and in consequence their prescription does not as a rule show very marked therapeutic effects. I do not believe that dried milk is possessed of advantages over fresh milk, except, of course, in its relatively low bacterial content. If good fresh milk can be obtained its use is always to be preferred. In proprietary foods we are not seeking for a permanent substitute for cow's milk, but are prescribing for the time being a change in the diet with a definite therapeutic object. From this point of view foods under the headings 2 and 3 are of little service.

4. Dried Milks with added Malted Sugar.

Such preparations are undoubtedly very valuable because of the high percentage of malted sugar which they contain. All sugars are not equally liable to undergo fermentative changes, and to give rise in consequence to diarrhoea and vomiting. Undoubtedly the least liable is maltose, just as cane sugar is at the other extreme and is the worst offender in this respect. While comparatively poor in fat, these foods have a high carbohydrate percentage, while at the same time they are free from added cane sugar. They are therefore often very useful in the dyspepsias produced in very young infants fed upon cow's milk with its relatively high percentage of

fats. In older children they are too poor in fats unless used in a concentration which raises the percentage of sugar to a dangerous height. They have the further drawbacks of being relatively expensive and of permitting the development of scurvy.

5. Pure Malted Sugar.

If a child is convalescent from an attack of fermentative dyspepsia, or if it is known that its tolerance for sugar is permanently low, we should choose a malted sugar in preference to lactose or cane sugar.

6. Foods consisting almost entirely of Unaltered Starch.

Such preparations are specially useful for children over 7 months of age. In the later months of infancy it is often wise to make use of the growing power of the child to digest starch rather than to run the risk of producing diarrhoea by giving large amounts of saccharine matter. After 9 months of age a second form of carbohydrate in the form of starch should always be given. For young infants these foods are quite unsuitable.

7. Foods consisting of Mixtures of Unaltered Starch and Malted Sugar.

Many of these foods contain a ferment which is capable of converting starch into sugar, and the amount of this conversion to some extent depends on the length of time during which the milk mixture is allowed to simmer by the fireside. By diminishing this gradually, we can attempt to train the infant's powers of starch digestion.

These are the classes of food at our disposal, and by an intelligent use of them much can be accomplished. Unfortunately mothers and nurses, relying on the extravagant claims of proprietors, are apt to prescribe them absolutely at random without the least appreciation of their composition or properties. Often each is tried in turn, in the hope, too often fallacious, that one will eventually be found to suit. Before this happy result is reached, if it ever be reached, very often an enormous amount of harm and suffering is caused. To give a young infant suffering from the effects of sugar excess a proprietary food in which this particular fault is accentuated, is often to cause a serious danger to life itself.

TREATMENT AND DIET.

The infant with green watery stools, vomiting, colic, ulceration of the buttocks, and a slightly raised irregular temperature benefits almost always by a change to a whole-milk diet. Such infants are commonly fed on proprietary foods containing a gross excess of sugar or starch, or upon a milk mixture to which large amounts of cane sugar have been added. One attack predisposes to another because the tolerance for sugar is lowered long after convalescence is established. In hot weather, because his food and drink are bound up in the same fluid, the child, rendered thirsty by diarrhoea, vomiting, and perspiration, is apt to take excessive amounts of his sugary diet.

Treatment should be instituted by a purge and by twenty-four hours' starvation. During this time boiled water sweetened by saccharine alone is allowed. In severe cases the stomach and bowel may be washed out with a weak solution of sodium bicarbonate. A few drops of hydrochloric acid—*acidi hydrochlor. dil. mxxx-xl, mucilag. ʒss, syrup. simplicis ʒss, aquam ad ʒiv*, two teaspoonfuls every four hours—are extremely useful in controlling the fermentative process in the stomach. In all these cases the absence of free hydrochloric acid from the stomach plays an important part in the production of the excessive fermentation. When the symptoms improve, feeding may be begun again by giving small amounts of boiled milk undiluted except in the case of the very youngest infants. One ounce of this may be given at first every four hours. If the infant, used to the taste of the much sweetened food, will not take the plain milk, it may be sweetened with saccharine. About $\frac{1}{6}$ grain of saccharine is equivalent in sweetening power to a teaspoonful of cane sugar. During these days of underfeeding the needs of the child for fluid must be met by the provision of a plentiful supply of

water, and care should be taken to see that he is kept very warm. Gradually the amount of milk taken may be increased, but any diminution in the interval between the feeds should be avoided for some time, because the treatment aims at allowing the stomach to empty itself completely between meals. Only in this way can the fermentation be controlled. In very severe cases the cream should be removed from the milk. Sometimes further amounts of proteid may be given by the addition of somatose or plasmon. The principle underlying all these prescriptions is that no acid fermentation is possible on a purely protein diet. After recovery from the attack of diarrhoea, the child may sometimes be kept for a long time upon this diet of whole milk and continue to thrive. In other cases the addition of some carbohydrate feeding becomes necessary.

The troubles which manifest themselves on a diet of pure cow's milk are of two sorts. In the first place, very many young infants manifest a complete inability to digest the fat of cow's milk, even in great dilution. Such babies suffer from profuse vomiting, often of curdled milk, and are either constipated or pass bulky white, greasy, foul-smelling stools. Upon a change to a fat-poor, sugar-rich diet the symptoms usually cease at once. A similar fat indigestion, with vomiting, colic, and constipation, is usual with very young infants nursed every two hours at a freely flowing breast, with abundance of rich milk. Less frequent nursing and the provision of a little sugar will usually cure the vomiting and constipation.

In the second place, many babies fed on cow's milk, although they are free from diarrhoea and vomiting, remain small and ill developed. I have seen infants who for months showed no gain in weight, although they were daily taking enormous amounts of milk of good quality. These children are pale, flabby, and constipated because the volatile acids present in such excess in the sugar-fed child, and which form the natural stimulus to peristalsis, are reduced to a minimum. The stools are large, bulky, and pale when the percentage of fat is high, or hard and pellet-like when the milk is poor in fat, and are always alkaline to litmus. In such cases the addition of carbohydrate produces immediate improvement. In young infants the use of a malted sugar or of a dried milk with added malt is indicated. At 6 months one or more feeds made with the addition of some starch-containing food may be advisable, and substituted for a similar number of pure milk feeds. After 6 months it is found over and over again that infants who immediately react to increase in the amount of sugar with diarrhoea will tolerate starchy forms of carbohydrate perfectly well. Finally, it may be said that extract of malt agrees well with the milk-fed baby, but aggravates the disturbances of sugar-fed children, while cod-liver oil has properties just the reverse.

The disorders of sugar over-feeding are much more common among the poor than among the well-to-do. There are few infants in the hospital class who do not at some time or other suffer in this way, and we have here, I think, the explanation of the undoubted success of whole-milk feeding among them. Among the upper classes fat over-feeding from the use of a milk rich in cream is more common, and there is a distinct tendency at present to adopt the principle of giving undiluted milk without diminishing the bulk of the feeds and increasing the intervals between meals proportionately. Among these children the substitution of a suitable form of carbohydrate for the large amounts of fat consumed is sure to produce benefit in more rapid growth and in the disappearance of constipation. In infants habitual constipation, like habitual diarrhoea, is seldom to be treated by drugs, but is often to be looked upon as a symptom indicating a faulty composition of the food calling for the prescription of a change in the diet upon the lines indicated. The use of large doses of castor oil and of opium in young infants is generally to be avoided because such drugs mask the very symptoms which should guide our prescriptions, and introduce factors disturbing to our observations.

THE first meeting of the Swiss Surgical Society, founded last year, was held at Berne on March 8th. Professor Kocher, of Berne, was elected president; Professor Girard, of Geneva, vice-president; Dr. Steinmann, of Berne, secretary.

PREVENTION VERSUS CURE IN MODERN PRACTICE.

By CHARLES J. WHITBY, M.D. CANTAB.,

BATH.

THE President of the British Medical Association, in the address which he delivered at Liverpool on the occasion of the annual meeting, foretold the coming of a new era, in which the practice of medicine will be devoted largely, and increasingly to the prevention rather than the cure of disease. I mention this in order to emphasize the fact that it is not necessary to be an admirer of the National Insurance Act—of which, indeed, Sir James Barr has been one of the most outspoken opponents—in order to realize the proximity and inevitableness of this new era. Still, it remains true, and is not without significance, that the Act does provide for the payment of medical men for attendance on a large section of the community upon what is intended to be a preventive basis. I confess to grave misgivings as to whether the intention will be fully realized, because it does not seem to me that the conditions of genuinely preventive practice are met by the provisions of the Act. But the intention is there, and may be taken for what it is worth as a sign of the times and, we will hope, of better things to come. It seems to me, therefore, a timely proceeding to consider what are, as a matter of fact, the main conditions of success in the translation of medical practice from the mainly curative to the mainly preventive sphere, and to what extent these conditions already are or are in a fair way to be met.

To begin with such conditions as affect the profession as a whole, not as mere individuals, it seems indispensable that it should be functionally organized throughout in such a way that its ultimate resources of science and art shall be available at need for each and every case that may arise. This, I need scarcely say, is at present very far from being so: and in so far as it is so, the credit belongs in the main not to the State or the community but to the profession itself. We have done our best to arrange that the wisdom and skill of our wisest and most skilful shall be at the free disposal of those who cannot afford to pay for them. But there is a limit to the possibilities of charity, and, since those whose need is the sorest must be conceded the first claim, it inevitably happens that the resources of general and special hospitals are exhausted in the task of patching up more or less hopelessly damaged organisms rather than in the detection and stamping out of the insidious beginnings of disease. So far as charity is concerned, all the time and knowledge and skill that we can afford to give away are fully occupied at present in the curative sphere; of the attempt at prevention it is as yet futile even to dream. Yet it is, at all events, a hopeful sign that during the past three years the organization of the profession has advanced by leaps and bounds. It is as yet merely an economic and defensive organization, analogous to that of the trade unions; but I do not believe that it will stop there. Functional organization is bound to follow, and, if we are wise, will proceed upon lines governed by the preventive ideal. By functional organization I mean an arrangement by which every malady shall be recognized in its incipient stage by the regular attendant, and, if it be of a nature whose treatment falls without his province, referred to the proper quarter, where State-aided or other provision shall be made for its needs. The germ of such an arrangement may be recognized in recent suggestions that the out-patient department of hospitals, as at present constituted, be abolished, and that only consultative work and special forms of treatment be undertaken in its place. But the subject is too large for detailed discussion in a short paper—it is a matter for collective investigation, and one which the Association itself will probably have to take seriously in hand before very long.

To come now a little more to close quarters with our subject, it is obvious that the transition from the mainly curative to the mainly preventive aim in medical practice involves not merely a shifting of the general and individual points of view, but also a new standard of values as regards the theoretic basis of our work. Physiology