THE USE OF BANANA PULP IN THE FEEDING OF MARASMIC INFANTS.

BY

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The experience of all childrens' physicians in the feeding of marasmic infants is, I suppose, identical. It is not difficult to devise a method of feeding which shall be sufficient in quantity, and scientific in quality, and further is tolerable to the infant: but it is extremely difficult to secure that such a food shall be absorbed and built up into the tissues of the body. I am, of course, using the term marasmus in a strict sense to indicate that condition in which wasting disease is progressive or stationary without sufficient discoverable cause. In such cases it is, I believe, a common experience for the physician to find that in spite of his efforts to contrive a food which will benefit his patient, the condition remains unaltered for many weeks, with no gain in weight or strength, and yet with no appreciable lack of capacity in the digestion of the various foodstuffs of which trial is made. Further it is, I think not uncommon to find that such infants begin to put on weight, if their food contains an excess of carbohydrate material; and it is probable that this factor is mainly responsible for the reputation of some of the proprietary foods which contain starch or starch-products in large quantity. Yet even with the use of such foods there is a proportion of marasmic infants, who steadily refuse to improve and are the despair of the physician and the nurse. It is with cases of this type that I have lately experimented with the use of ripe banana pulp to supply the excess of carbohydrate which seems to be required, and the sudden and to me the unexpected improvement appears to be worth recording.

The cases to which I shall refer are six in number; four of the true marasmic type, and two "ruminators."

The first patient was admitted to the Hospital at the age of three months weighing about ten pounds. He had had a convulsion at the age of six weeks and since then had suffered from intermittent vomiting and failure to progress. In the ward the vomiting soon ceased but at the end of ten weeks in the Hospital he had made no gain in weight and actually weighed rather less than on admission. He was at this time on a diet which consisted of cows' milk, whey and Benger's Food. This had a calorie value of 580 C. per diem and was readily taken and retained and apparently well digested. Of the 580 C. roughly 300 were carbohydrate, 200 fat, and the remainder protein. At this point he was given the pulp of one ripe banana per diem and a few days later the Benger's food was omitted and on May 1st his diet was merely cows' milk and the pulp of two bananas with a calorie value of about 590 C. A reference

to the chart will show that the weight had already taken an upward turn. The pulp of a second banana was added and shortly it was possible to increase the amount of milk, an increase which had always previously been attended by indigestion and loss of weight. He was discharged from the Hospital three weeks after he had begun the banana diet on a diet of about 700 C. of which 100 C. were banana-carbohydrate calories.

CHART I.

G.H. 3/12. Admitted 20.XI.25. From date of admission to 10.IV.26, no gain in weight.

I have gone somewhat into detail in this case so that I shall not need to repeat the minuter details in other instances. The point which I wish to emphasise is that the addition of the banana pulp to the diet did not increase, but in fact slightly diminished, his total carbohydrate intake, though it maintained it at a point considerably above the normal proportion found in cows' milk: that is, that the good effects must not be attributed to added carbohydrate, but rather to the special form in which this was given, *i.e.*, the banana pulp.

The second, third and fourth charts exhibit the same phenomenon, though in an even more marked degree. The addition of banana pulp to the diet, replacing some of the carbohydrate previously given in another form, had the effect of increasing the weight and general well-being almost at once. I must here add that the change in the general condition must be seen to be appreciated at its proper value: from puling unsatisfactory infants they quickly became smiling and contented children. When once improvement has begun the amount of food which can be taken and utilised is rapidly increased. In the first case the increase in weight took place without any marked addition to the actual amount consumed, but in some of the other cases after the increase had begun with an unchanged amount of milk, this could be augmented rapidly without any fear of indigestion, whereas the previous attempts to increase the intake had invariably failed for this reason. This feature was especially noticeable in the patient whose progress is recorded

CHART II.

C.C. Aged 9/12. Admitted 17.ii.25.

From admission to April 14, no gain in weight.

CHART III.

M.B. 4/12. Admitted 23.ix.24.

Weight stationary till Nov. 22nd.

in Chart IV. Repeated attempts had been made to increase the amount of intake and each attempt had been followed by a set-back due to indigestion. When once the improvement had been initiated by the use of the banana pulp

CHART IV.

T.W. 7/12. Admitted 9.vii.26.

No gain in weight.

it was possible to add milk in considerable quantity to her diet, and eventually rusks, green vegetable and gravy. The same thing was observed in the case of the older of the two "ruminators." In the younger the increase in weight took place without any addition to the total calorie value of the diet. These two "ruminating" cases belong to a slightly different category than that of the other infants. They are marasmic infants, but there is an appreciable cause for their steady refusal to put on weight, in the "rumination" and rejection of some portion of the food which they have actually swallowed. Yet in both cases the addition of the banana pulp was the first step in solving the problem of the feeding.

To sum up the facts here recorded: six infants in whom the prolonged efforts of the physician, his house-physicians, and the Sister, had entirely failed to produce any improvement in power of absorption and utilisation of food, with the addition of comparatively small quantities of banana pulp at once began to make headway.

Naturally the question arises as to the property in the pulp which is apt to produce such welcome results. The actual facts regarding the composition of the banana are as follows: Of 100 grammes of ripe banana pulp approx-

CHART V.

D.S. 1/12. Admitted 21.x.24. Ruminator.
Weight stationary from August
to December.

CHART VI.

F.G. 8/12. Admitted 2.iv.25.
Ruminator.

imately 70 are water; about 1.5 grm. are fibre, which is mainly discarded in the method of preparation which has been employed; and from 21 to 27 grm. represent starch or sugar. There is practically no fat, less than 0.1 grm. per cent. and protein is about half of one per cent. Ripe banana pulp prepared as will presently be described, may be considered to have a food-calorie value of 85-100 C. per 100 grammes. The average weight of one stripped banana varies from 50-70 grammes. In addition, bananas have a certain, not a high, anti-scorbutic content, and contain water-soluble B. Their content of fat-soluble A is negligible.

I think it may safely be concluded that the results are not due to any of these vitamins. In all the cases recorded fresh orange-juice had been given

in ample quantity during the whole of the 'pre-banana' period. It certainly cannot be contended that it is due to the mere addition of carbohydrate because sometimes, as in the first case, the total carbohydrate intake was actually diminished when the banana pulp was added.

Nor can the nature of the carbohydrate account for the effects produced. In a ripe banana the starch has been converted into various sugars, chiefly, it would appear, maltose and glucose, with a small proportion of saccharose : that is, broadly speaking, sugars identical with those present in the malted foods such as Benger's.

The method which we have used in preparing the banana pulps is as follows : A ripe banana with as few bruises as possible is selected, stripped and any bruised portion cut away. The obvious fibres are removed and the remainder is pulped with a fork and then strained through coarse-meshed muslin so that the fibrous portions remain behind. The resulting pulp is mixed with the milk in the proportions ordered in one or several feeds ; the pulp of one average banana being considered to have a calorie value of roughly 50 C. The teat used for the bottle has an aperture rather larger than usual.

A further point which should be noted is that the stools of infants on the pulp present a characteristic appearance ; small black particles which represent the fibre which has passed through the sieving process are so abundant as to give the stool a stippled appearance.

SUMMARY.

An account is given of a method of feeding 'difficult' infants with banana pulp.

It is claimed that by this method in many cases progress is secured which is superior to that obtained by other methods.

It is suggested that the benefit is due not to any known peculiarity of the banana as a food, but possibly to some unidentified element in the banana. I may add that Dr. Harrison investigated this point for me without discovering any new element.