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INFANTILE SCURVY: THE BLOOD, THE BLOOD-VESSELS AND THE DIET

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During the past three years we have had a considerable number of cases of scurvy develop in infants being fed on pasteurized milk. In 1912, when the first cases were noted, we were pasteurizing the milk in our own diet kitchen, heating it to a temperature of 165 F. for twenty minutes. At this time several cases of scurvy developed, owing to the fact that through an oversight orange-juice was not given. During the past year we have been supplied by one of the large dealers with a pasteurized milk that has been heated only to 145 F. for thirty minutes. Nevertheless, we had several cases of scurvy develop on this diet. In most of the cases the infant was receiving two-thirds milk and one-third barley-water, with the addition of sugar. In two instances, whole milk was being given without the addition of barley water. There were other patients in the same ward on the identical diet who did not develop scurvy. In other words, the pasteurized milk was not the sole factor in the production of the disease. That the pasteurization did play an important role, however, was shown by substituting raw, unheated milk for the pasteurized milk, the formula and the amount of food remaining unchanged. In this case the scorbutic symptoms began to disappear within a week of giving raw milk and had altogether vanished in two weeks. Whatever the predisposing factor of scurvy (this infant had exudative diathesis), a case with this clinical course can be interpreted only as being, in a large measure, the result of pasteurized milk.

Raw cow's milk must not, on the other hand, be considered as having potent antiscorbutic properties. Its effect cannot be compared to the miraculous change which is brought about by giving orange-juice. This is especially striking when we take into consideration the small amount of orange-juice necessary to bring about a cure and compare it with the large amount of raw milk which is given. Raw milk, however, contains sufficient of the essential substances to prevent the development of scurvy.

Dietetic Therapy

We have come to a consideration of dietetic treatment, which at once suggests the efficacy of orange-juice. Last year we gave, as routine, orange-juice that had been boiled for five or ten minutes and found that we were able to obtain satisfactory results. One ounce was given daily and, as far as we could judge, boiling did not lessen its therapeutic value. This year, for orange-juice we substituted the juice of orange-peel, which was prepared as follows:

The orange-peel was finely grated and 1 ounce of it was added to 2 ounces of water, a small amount of sugar being added to overcome the slightly bitter flavor. The juice of orange-peel seems to serve the same purpose as the juice of the orange itself, It is being used at the asylum at the present time, and after a trial of several months, we have come to the conclusion that it has marked antiscorbutic power. At first we made use of the peel to test its value, but have continued its use because it allows us to serve the oranges to the older children in the institution, and in this way is somewhat economical.

According to our experience, the efficacy of vegetables cannot be compared to that of orange-juice. Two cases of scurvy developed among the infants over one year whose diet included vegetables, mainly carrots. It is impossible to state how much vegetable the nurses gave these two children; there is no reason to believe, however, that they received less than the twenty-eight other children in the ward. It is probable that they had a peculiar susceptibility to scurvy; one had exudative diathesis. When we reflect that sporadic cases of beriberi have been reported in which vegetables had been given that had been cooked for a long time, we must consider whether it is not possible that vegetables may also lose their antiscorbutic properties if cooked to a high degree. The experiments of Holst and Froelich would also seem to caution us in this regard; they found that the juice of white cabbage lost its antiscorbutic value when heated even to 60 C. for ten minutes.

The potency of potato was tried in some cases. It will be remembered that, in the scurvy of adults, the value of potato has been greatly lauded, and that epidemics of this disease have been reported to have followed a failure of the potato crop. First we made some trials with potato flour which is sold in the market; this was prepared with water and added to the milk in the same proportion as barley-water. It was soon evident, however, that potato flour cannot cure scurvy. We next employed mashed potato; a tablespoonful of boiled potato was added to a pint of water, using for this purpose the water in which the potato was boiled. In other words, instead of using a tablespoonful of barley to a pint of water, mashed potato was substituted. This was found very efficacious. The scorbutic symptoms quickly disappeared, although it did not seem to bring about the sudden change that is sometimes seen when orange-juice is given. It is probable that baked potato is just as valuable as an antiscorbutic.

In view of what has been outlined, at what age should we begin to give infants an antiscorbutic? There is no doubt that if an infant is fed solely on heated cow's milk the tissues begin to lose antiscorbutic substances — there is a negative balance of this material — from the very first days of life. Such being the case, it would seem that these essential substances should be supplied to the infant as soon as it is possible. As far as is known, there is no physiologic reason why orange-juice or potato should not be given in small quantities to an infant a few weeks of age. Two years ago, it was clearly shown by means of an examination of the duodenal contents, that starch-splitting ferments are present in the intestine of infants at birth, and are secreted in large measure after the first few weeks of life. It would also seem worthy of trial to substitute potato water for barley-water in the mixtures of pasteurized milk which are

being distributed with such great benefit by the various diet kitchens in the larger cities. This will obviate the necessity of constantly admonishing the mothers not to omit orange-juice from the daily diet of their infants.

This disease, furthermore, sharply emphasizes the fact that although an estimation of the caloric value of food is important, it may omit the very substances which are essential to health and life. In some of our cases the caloric value of the food was as high as 120 calories per kilo, body weight, but nevertheless there was a development of scurvy, accompanied by loss of weight and failure of nutrition.

In this connection we must mention the very interesting and suggestive studies of Funk. This author has coined the word "vitamines" for substances which are essential to the health and life of the body, and the lack of which produces a group of diseases which he has termed the "avitaminosen," including beriberi, scurvy, pellagra and rickets. The vitamins, Funk asserts, are crystallized nitrogen containing bodies of very complicated structure which are chemically defined, but concerning the exact structure of which we as yet know little. They are essential to life, although present in very small amounts. Such is the definition which Funk gives of the substances which he considers play an important and even vital part in nutrition.

Similar studies have been made by others, notably Stepp, who terms these substances "lipoids," by which he means substances soluble in alcohol and in ether. He also found that animals could not live when deprived of these substances. Although these "vitamines" have not been satisfactorily isolated from a chemical point of view, and exception has therefore been taken to the term, there is no doubt from experiments on animals that these substances play an important role in the nutrition of the body. When they are removed from the diet the animals develop various nutritional disturbances, and regain their normal condition only when they are again added to the diet. These vitamins are thermolabile and are supposed to constitute a group of which there are various members. It is probable that one of this group is the vitamin which prevents the development of scurvy. It would also seem that this material is supplied in the mother's milk, and that this accounts for the fact that nursing infants do not develop scurvy.

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