

If We Would Have Health

MARGARET WHISTLER

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"An orange a day will keep the doctor away," would be a more correct statement than is the old adage with which we are all familiar. Knowledge of the merit of orange juice in the diet is very recent and has come to us as a result of research and experimental work with laboratory animals and with children. Just a few years ago oranges were eaten simply because they were palatable and offered a change in the diet. They were "good to eat" and so people ate them. That perhaps is still a reason for their popularity but at the same time there are other factors to consider.

Some of the first investigations with orange juice were made in 1916 and 1917, considering orange juice a valuable addition to the diet because it contained minerals and was recognized as a mild laxative. A little later when investigators were discovering the presence in certain foods of the so-called "food accessory substances" or vitamins and their role in the prevention and cure of deficiency diseases, such as scurvy, beriberi and rickets, experiments were again performed with orange juice. These experiments first pointed out the fact that orange juice furnished an antiscorbutic substance.

McCollum and Pitz, in 1917, fed fresh

orange juice, orange juice neutralized with sodium hydroxide, and orange juice neutralized and heated for one hour, and came to the conclusion that in all cases the animals were benefitted by the addition of the orange juice to the diet.

They attributed the efficiency of orange juice as an antiscorbutic, as they say, to its "content of sodium and potassium citrates both of which possess laxative properties." That these citrates were the antiscorbutic factor was later disproved (1918) by Hess and Unger who found that artificial orange juice made of citrates failed to protect or cure animals of scurvy. However, later two other

scientists, Cohen and Mendel, proved quite conclusively that fresh orange juice is a most effective agent in the prevention and cure of curvy. Guinea pigs which had developed scurvy were fed 1.5 c. c. per day of fresh orange juice with the result that there was a marked gain in weight and disappearance of scorbutic signs. When the orange juice was discontinued the weight fell once more and scurvy redeveloped, indicating that fresh orange juice contains enough vitamin C to be a good antiscorbutic.

After this scurvy-protecting potency of fresh orange juice had been established the next step was to determine what oth-

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er, if any, vitamins were present, whether ageing, bottling, or drying destroyed its antiscorbutic power and the role of orange juice in the diet of the human. In brief the following fact have been established by different experimentors:

(1) Vitamins A, B and C are present in fresh orange juice and conserved in part at least, undeteriorated by drying. Volume for volume orange juice is as rich in vitamin B as is milk, but is less rich in vitamin A. (Osborne and Mendel)

(2) Orange juice allowed to age for more than three months in the refrigerator was found to have lost some of its antiscorbutic power.

(3) Byfield, Daniels and Loughlin state that orange juice owes its growth stimulating power to its antineuritic potency (vitamin B) rather than to its antiscorbutic factor (vitamin C). They became convinced of this thru experiments with artificially fed babies.

(4) Orange juice dried almost instantly by spraying into vacuum chamber at

75-80 degrees C and not allowed to remain in the drying chamber longer than two hours was found to be effective both in the prevention and cure of scurvy. This dried orange juice is still effective after three and one-half months' storage. (Giwens and McCluggage). The fact that orange juice can be dried without destroying its vitamin content, if used commercially should make oranges much more available to the general public. Only a small part of the oranges actually produced each year are placed on the market, due to a large waste of fruit which cannot be packed. For this reason oranges are an expensive food and can be afforded only by a few, comparatively speaking. Since drying does not harm either the antiscorbutic or the antineuritic factor, a large percentage of the crop which would otherwise be wasted could be dried and put on the market in compact form at a reasonable price to the consumer, making this food available to all.

All of these experiments, results, and conclusions would be of little value if we were not able to make final application of them to the problem of human nutrition. The fact that orange juice has a growth stimulating effect should be significant to us when we consider that more than one-third of our school children are underweight and malnourished. Of course there are supplementary causes of malnourishment—physical defects, lack of parental control, fatigue and ignorance, but there is an evident relation between the kinds and amounts of food eaten and the state of nutrition of the child. Studies have been made of underweight school children, their diets and now supplementary school lunches, especially of milk or oranges, or both, may



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remedy their condition of malnutrition. Such experiments have been carried on in Berkeley, California, by Margaret Chaney, in Fort Dodge, Iowa, by the Public Health department and in Ames by Frances Newell and Dr. Elizabeth Miller.

In Miss Chaney's experiment the underweight children were divided into five groups. The first group was given a mid-morning lunch consisting of one-half pint of milk and two graham crackers; second group one medium sized orange and two graham crackers; third group, one-half pint of milk and one orange with fourth pint bottled fresh fruit orangeade two graham crackers; fourth group, one-fourth pint bottled fresh fruit orangeade and two graham crackers; fifth group, nothing, to serve as a check on the experiment. In their degree of efficiency these lunches ranged as follows: Orange, first; milk and orange, second; milk, third and orangeade, last. As Miss Chaney says, "Oranges seem most efficacious in producing a gain in weight. Milk while it produced a favorable increase in weight, is not the only food valuable for the mid-morning lunch. The less marked gain in weight which milk produced in this test may be due to its retarding effect on the appetite."

The same results are not always obtained in these experiments with school children, probably because their diet has not been adequately controlled. The only part of their diet which can be controlled is the mid-morning lunch. For example, we have the results and conclusions of the Fort Dodge experiment which are quite different from those obtained in Miss Chaney's experiment. On a lunch of milk and oranges, the Fort Dodge children showed an average gain per pu-

pil of 32 ounces; on milk alone, 15 ounces, and on oranges alone, only one ounce. In one school the results were not so decidedly in favor of the double diet and the principal was rather non-plussed as to the reason. She finally discovered that the children to whom milk alone was being given were bringing their own oranges in the afternoon and eating them at recess. If it was a good thing they were not going to "lose out." This would indicate that these experiments are not conclusive but merely suggestive in a general way of the benefits of orange juice to underweight children. The conclusions drawn from the Fort Dodge experiment were:

(1) "That milk or its equivalent is a necessary part of every child's diet; oranges are not a substitute for milk.

(2) "Milk is not always effective by itself. Many children who had been generously supplied with milk at home and had failed to gain, gained when oranges were added to the diet.

(3) "Orange juice or its equivalent is a necessary element in the child's nutrition and is a valuable supplement to milk, especially when milk is pasteurized."

The experiments which instigated Miss Chaney's and the Fort Dodge studies are interesting to us because they were carried out in Ames, by Miss Newell under Dr. Miller's direction. Underweight children in an Ames school were selected and given physical examinations. "Each mother was requested to reserve portions of food during an entire day at the beginning and at the close of the experimental period, which were duplicates of the amounts eaten by the child. This food was then weighed. The diets of these un-

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derweight children were found to be especially deficient in calories. Other deficiencies were in vitamin B and C, and iron. If it had not been for the milk furnished at the school the vitamin A and calcium content would have been low. Protein intake was adequate in nearly all cases. Following are two diets given for illustration:

Breakfast	Lunch	Dinner
I Cocoa-1 cup		
Bread-3	slices	Olemarga-
Apple	Meat	rine
Cinnamon	Potatoes	II None
rolls-2	Cinnamon	Beefsteak
Cocoa	rolls-2	Potatoes
Bread-2	slices	Gravy

The medical examinations disclosed many defects among these underweight children. "The high percentage of absences from school as compared with the average for all the children confirmed the statement of the school nurse that underweight children were especially susceptible to colds, tonsillitis and any disease epidemic in the school."

"Beginning February first, 45 c. c. of orange juice were given each child daily at 11 a. m. Friday the children received two oranges to eat Saturday and Sunday at noon." This program was continued until April 25th except for one week of spring vacation in March. During this period the percentage of expected gain was 105 or a 5 percent increase over the previous period when no oranges were given. On April 25 the orange juice was discontinued for three weeks with the result that there was an average loss of 0.35 pounds per child. The orange juice was resumed again May 16 for the two remaining weeks of school with a resulting average again of 0.5 pounds per child. All children received a pint of milk daily with the exception of the last three weeks when delivery at school was discontinued.

"That over-activity and fatigue are important factors preventing gain in underweight children is indicated by the rapid rise in the weight curve during the spring vacation followed by an equally sudden drop in the first week following the return to school."

Miss Newell and Dr. Miller conclude their article by saying: "Experimental work where conditions of laboratory control prevail is essential to a definite knowledge of the effect of dietary additions on stimulation of growth in under-

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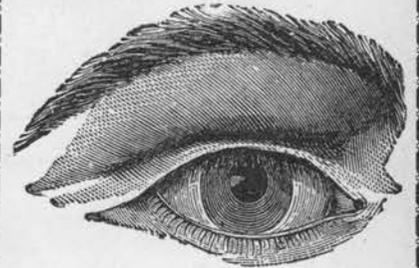
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weight children. This work has demonstrated, however, an unmistakable rise in the weight cure of such children, produced by the daily administration of 45 c. c. of orange juice. This result may be the effect of added vitamin A, B, and C, or of inorganic substances or produce some other change such as a shift in the acid-base equilibrium."

From these experiments we may draw the following conclusions:

First: Oranges are a valuable source of vitamins A, B, and C, especially of vitamin C, which is the antiscorbutic vitamin. For this reason they are an excellent supplement in the diet of children in protecting against scurvy.

Second: The antiscorbutic potency of orange juice is not destroyed by drying. This fact is important in that it points the way to a possible means of making oranges more available.

Third: Oranges are especially valuable in supplementing milk in the mid-morning school lunches. They do not take the place of milk but since they provide the antiscorbutic vitamin are of special value when pasteurized milk is used.

Fourth: Feeding oranges may be effective in correcting malnutrition in underweight children. When we are confronted with the fact that during the war 32 percent of the men examined for military service were found to be defective due to malnutrition at some time of life and that of a million school children of New York City examined recently only 173,000, or one out of every five, were normal as regards nutrition; then it would seem that this point would bear further investigation and research.

If future experiments show even more conclusively than these first experiments that orange juice will help correct malnutrition and if by means of drying or bottling it can be made available to all classes of people, one more step will have been made for the betterment of our nation for as we improve our children so we improve our nation.

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