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Further Observations on Effects of Various Fruits on Intestinal Flora of White Rats.

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Weinstein and Weiss[1] reported that banana, apple and raisins when fed to white rats subsisting on a high-protein diet consisting solely of raw chopped lean beef are able to bring about a change in the intestinal flora from a type in which non-aciduric bacteria predominate to one in which *L. acidophilus* is the outstanding organism. It was our purpose in the work presented here to further enlarge the group of fruits studied and to determine to what extent the ability to alter the intestinal flora is a general property of the fruit family or whether it is limited to certain members.

The bacteriological methods and feeding procedures used in the experiments to be described here are the same as those reported previously by Weinstein and Weiss. All of the animals were fed 12 gm. of lean chopped beef daily until repeated stool examinations revealed the absence of *L. acidophilus* from the intestine. At this time the fruit to be tested was added to the meat diet of one group of animals in 4 gm. amounts daily and 6 gm. to the diet of another group. Periodic fecal examinations were made and the *L. acidophilus* content of the feces determined.

The fruits used were cranberry, strawberry and tomato, supplied to us in the dehydrated form by a commercial concern engaged in their preparation.

Ten rats were fed cranberry-powder. One group of 5 rats received 12 gm. of meat plus 4 gm. of the powder; another was fed 12 gm. of meat with 6 gm. of the dried fruit. Two rats were used as controls; they subsisted on a diet of lean chopped beef with no added carbohydrate. Four of the 5 rats receiving 4 gm. of dried fruit underwent a change in their intestinal flora after 2 weeks of feeding. The animals were found to harbor *L. acidophilus* in quantities ranging from 50 to 95% of the total viable intestinal organisms. The fifth animal did not show any change in the fecal bacteria. Four of the 5 animals receiving 6 gm. of the dried fruit also showed a change in their intestinal flora from a predominantly non-aciduric type to one in which *L. acidophilus* was found to be the predominating or-

[1] Weinstein, Louis, and Weiss, James E., *J. Infect. Dis.*, 1937, **60**, 1.

ganism. The percentage of *L. acidophilus* in the intestine of these animals varied from 20 to 90% of the total viable organisms. The fifth animal showed no change in the type of bacteria present in the intestine when fed the dried fruit for the period equivalent to the time required to alter the intestinal bacteria of the 4 other animals. The lower percentages of *L. acidophilus* present in the animals subsisting on the larger amounts of the dried fruit cannot be explained at present. The controls which were fed lean chopped beef alone showed no *L. acidophilus* during the entire experiment.

Ten animals were fed dried cranberries; 5 received 4 gm. of the fruit, in addition to the 12 gm. of meat, while the remaining rats were fed 6 gm. of cranberry in addition to their basal ration. All of the animals receiving cranberry were found to have undergone a change of their intestinal flora to a type in which *L. acidophilus* was numerically predominant within 3 weeks. In the group which was given 4 gm. of the dried fruit the percentage of *L. acidophilus* ranged from 10% to 60%. In those receiving 6 gm. of the fruit, it was found to constitute 60 to 90% of the total viable intestinal bacteria. The controls which received only chopped meat with no added fruit showed no *L. acidophilus* in their intestine throughout the course of the experiment.

Ten animals were fed 4 and 6 gm. of tomato-powder. Although the experiment was allowed to continue until the tomato had been fed in the diet for a period of 8 weeks, no changes were observed in the intestinal flora of these animals. *L. acidophilus* could not be detected in the experimental or control animals at any time during which the feeding took place.

From the results given above it can be concluded that other fruits than banana, apple and raisins have the property of altering the intestinal flora of white rats. The reasons for the failure of tomatoes to alter the intestinal bacterial picture are not apparent at the moment.