LXIV. THE ANTI-SCORBUTIC PROPERTIES OF CONCENTRATED FRUIT JUICES. PART IV.

BY ARTHUR HARDEN AND ROBERT ROBISON.

(Received July 27th, 1921.)

IN earlier communications [1919, 1920] we have shown that orange juice can be evaporated to a dry residue without suffering any loss of the anti-scorbutic accessory factor, and that the product retains its potency in a very considerable degree after two years' storage in a dry atmosphere at room temperature.

The effect of storage at higher temperatures (29° C.) has now been investigated and, from the results obtained, it is evident that the accessory factor is much more rapidly destroyed under such conditions.

This particular sample of orange juice was dried in December 1919 and was found to afford complete protection from scurvy when fed to guinea-pigs in daily doses of 0.15 g., equivalent to 1.5 cc. of the original juice. The very hygroscopic solid was transferred as rapidly as possible to a screw-top glass jar, which was then placed in a desiccator for a few days before being closed down. In spite of these precautions it is probable that the material absorbed some moisture, for on placing the jar in the incubator, slight softening was seen to take place and the top layer of the substance gradually darkened in colour, owing presumably to oxidation. The jar was kept at a uniform temperature of 29° until February 1921, *i.e.* during 14 months, after which further animal tests were begun. The material was then in the form of a hard toffee-like mass but was found to contain 8 % of water.

A number of guinea-pigs were fed on the usual basal ration of oats, bran and autoclaved milk, together with doses of the dried juice of 0.15 g., 0.3 g., 0.45 g., and 1 g., equivalent to 1.5 cc., 3 cc., 4.5 cc., and 10 cc. of the original juice. All the animals developed scurvy but those receiving the highest dose did not show any symptoms until the 24th day and were still alive on the 63rd day of the experiment. Some measure of protection was therefore given by this amount of the dried juice, but it is evident that more than 85 % of the anti-scorbutic accessory factor had been destroyed during storage under the above conditions. Tests were also carried out with some of the same batch of dried juice that had been stored in a desiccator at room temperature during a similar period, 14 months. Two guinea-pigs, each receiving 0.15 g. daily, showed normal growth for about 50 days but thereafter remained practically stationary in weight. They were killed on the 81st day and symptoms of scurvy were found. A guinea-pig which received a daily ration of 0.3 g.,

equivalent to 3 cc. of juice, showed no signs of scurvy after 81 days, though this animal also failed to exhibit normal growth during the last 20 days of the experiment.

In the experiments previously described it was found that a daily ration of 0.5 g. of dried juice that had been stored during two years at room temperature afforded complete protection from scurvy. It would appear, therefore, that under the conditions detailed above the loss of the anti-scorbutic accessory factor is of the order of 50 % of the amount originally present in the juice.

REFERENCES.

- Harden and Robison (1919). *J. Roy. Army Med. Corps*, 48.
— (1920). *Biochem. J.* 14, 171.