the bear liver had only a very slight antirachitic effect.

It is therefore confirmed that the toxic substance in polar bear liver is identical with vitamin A, and that ingestion of large quantities of polar bear liver leads to hypervitaminosis A.

Livers of snow hare and walrus, which are considered non-poisonous by the Eskimos, contained very small amounts of vitamin A, whereas the liver of Greenland fox, known to be poisonous, contained 12,000 I.U. vitamin A./gm. liver.

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¹ Rodahl, K., and Moore, T., *Biochem. J.*, **37**, 166 (1943).

Hypervitaminosis A and Scurvy

THE similarity between the clinical picture of hypervitaminosis A in rats and that of scurvy has been pointed out by Vedder and Rosenberg¹, who found that ascorbic acid offered protection against excess of vitamin A; and also by Moore and Wang², who failed, however, to detect any abnormality in the ascorbic acid metabolism in their hypervitaminotic rats.

As an extension of previous investigations^{3,4}, the condition of hypervitaminosis A has been subject to detailed studies in rats, mice, guinea pigs, rabbits, dogs and chicken. Within a few hours after single doses in the range 50–100 I.U. vitamin A./gm. body-weight, symptoms of acute intoxication occurred in the form of general malady, changes in the pelts, drowsiness, muscular weakness and decreased activity. Continued administration of the same dose during a longer period caused symptoms of chronic intoxication. A number of these clinical symptoms as well as post-mortem findings were identical with those observed in human scurvy, such as muscular weakness, pains in limbs, scattered small haemorrhages apparently due to abnormal capillary permeability, haematuria, intestinal bleeding with diarrhoea, subperiosteal haematomata, epistaxis, blood extravasations into the muscles, susceptibility to infection, inconstant hypochrome anaemia, hepatic and renal damage, widening of the costochondral junction, characteristic X-ray findings, and changes in the teeth such as hyperaemia, haemorrhages, vacuoles and deposits of calcium in the pulp, as well as degeneration and disarrangement of the odontoblasts and amorphous calcification of the inner part of the dentine. Even the microscopical picture of the long bones may to some extent resemble that of scurvy. In the majority of cases, abnormally low ascorbic acid contents were found in the serum, adrenals and liver.

The clinical picture and the post-mortem findings in guinea pigs given excess of vitamin A, and in those given a scorbutic diet, were very similar. Thus in both cases there was absence of normal gain in weight, hyperaemia and haemorrhages—particularly muscular haemorrhages in the hind legs, as well as bleeding in the knee joints. The bone abnormalities were similar, as judged by roentgenograms and microscopical examination, and in both cases the bones were brittle. The ash and mineral content of the bones was practically identical. Similar findings were revealed in the kidneys by microscopical examination, such as scattered red blood cells outside the capillaries and

in the space of Bowman's capsule, and slight degeneration of the renal tubules. Finally, the same low content of ascorbic acid in the liver and in the serum was detected in both cases. Furthermore, similar gross doses of vitamin A proved more toxic to guinea pigs given a scorbutic diet than in those given the usual adequate basal diet.

In a dog given 380 I.U. vitamin A./gm. body-weight daily during a period of 57 days, bleeding from the gums and swelling of the gingiva were also observed in addition to the symptoms already described for the rats. The ascorbic acid content of the blood was 0.7 mgm./per 100 ml. at the commencement of the experiment, and 0.0 mgm. at the end of 57 days.

It is thus evident that prolonged administration of excess of vitamin A in experimental animals produces a condition which resembles scurvy, although abnormality in the vitamin C metabolism cannot in any way be considered as the sole causative factor in hypervitaminosis A.

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¹ Vedder, E. B., and Rosenberg, C., *J. Nutr.*, **16**, 57 (1938).

² Moore, T., and Wang, Y. L., *Biochem. J.*, **39**, 222 (1945).

³ Rodahl, K., and Moore, T., *Biochem. J.*, **37**, 166 (1943).

⁴ Rodahl, K., *Nature*, see preceding communication.

Ascorbic Acid Content of Some Local Barbados Foods

THE West Indian diet normally contains a high proportion of starchy 'roots' and fruits such as yams, sweet potatoes, eddoes, breadfruit, banana, etc., but very few leafy green and yellow vegetables, and in some islands very little fruit. This means that, for many people, almost the only source of dietary ascorbic acid is that contained in these starchy roots and fruits. These foods do not contain a very high proportion of ascorbic acids; but, if very large quantities of them are eaten, even these small amounts will be of major dietary importance. It is by no means unusual for a West Indian diet to contain 1½ lb. or more of starchy vegetables, which would contain an appreciable quantity of ascorbic acid: for example, 100 gm. sweet potato contains 20 mgm. ascorbic acid and 500 gm. (1½ lb. approx.) contains 100 mgm. ascorbic acid, which quantity is well in excess of the average daily requirement. (Figures taken from Revised Dietary Requirements recommended by National Research Council.) No allowance has been made for possible losses in vegetables during cooking.

According to the "Tables of the Representative Values of Foods commonly used in Tropical Countries"¹, most of the starchy roots and fruits contain some ascorbic acid, with the exception of yams and eddoes. As these two foods figure so largely in the West Indian diet, it was decided to carry out a chemical assay of L-ascorbic acid (vitamin C) on some locally grown varieties. This investigation was later extended to include a number of local fruits and tinned fruit juices not listed in the above food tables, to discover whether they contained any significant quantities of ascorbic acid.

The chemical method followed was volumetric titration of vitamin C extract with 2:6-dichlorophenol-indophenol dye, as set down in A.O.A.C. methods². Sampling of the roots was carried out by coring them with a cork borer (size No. 9); the