4969

Inorganic Salts in Nutrition. III. Some Effects of Replacing Inorganic Salts in a Ration Poor in Ash.*

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It has previously been shown[1] that in rats 130 days old which, for the 90 days preceding the determinations, had been given an experimental ration extremely poor in inorganic salts and whose body weight had thereby been maintained at the level of 160±10 gm., there occurred striking alterations in the blood. When compared to animals of the same age which had grown at the usual rate, the stunted rats had blood with a striking increase in the number of erythrocytes, a marked decrease in relative concentration of hemoglobin and a significant diminution in the red cell volume. These changes have been shown to be independent of the concentration of the blood, the quantity of dietary protein consumed and the amount of total food eaten and have been attributed to the marked deficiency of mineral salts in the experimental ration which was otherwise adequate.

Data are now available on a few rats which, after having been given the same experimental treatment as those animals described above, were realimented with a qualitatively complete diet. This ration was so adjusted that, although the quantity of the indispensable factors—protein, salts and vitamins—ingested was the same as that consumed by a normal rat of the same weight, the energy intake was limited to prevent increase in body weight. The observed results appear in the accompanying table.

It is seen that the red cell count decreases progressively until at the end of six weeks it is somewhat below the normal level. Furthermore, at the end of the period of realimentation both the cell volume and the hemoglobin have made substantial increases toward the normal value.

The bloods of some of the experimental animals were examined for reticulocytes. In normal rats in the stock colony and in some of the control animals on adequate rations, the values for reticu-

* The first two papers in this series are, respectively, Smith, A. H., and Swanson, P. P., *Am. J. Physiol.*, 1929, xc, 517, and Smith, A. H., and Schultz, R. V., *Am. J. Physiol.*, 1930, in press.

[1] Smith, A. H., and Swanson, P. P., *Am. J. Physiol.*, 1929, xc, 517.

TABLE I.

	Beginning	Time Interval After Beginning Realimentation in weeks.				
		2	3	4	5	6
Average red cell count experimental rats, in millions	12.0	11.2	10.1	9.6	9.4	8.8
Average red cell count control rats, in millions	9.7					
Average hemoglobin experimental rats, gm. per 100 cc. blood	14.3					16.4
Average hemoglobin control rats, gm. per 100 cc. blood	17.4					
Average cell volume experimental rats, %	45					49
Average cell volume control rats, %	54					

locytes vary from 0% to 10%. In 5 "low salt" rats before realimentation the values were 18%, 21%, 14%, 21% and 28%; in one rat after 4 weeks of realimentation the value was 32%; in 2 rats after 5 weeks, 43% and 37%, and in the same 2 animals after 6 weeks realimentation the values were 33% and 27% respectively. Four other rats showed 26%, 18%, 9% and 4% in this period. It is apparent that, along with the other adjustments to the deficiency of inorganic salts in the ration, there occurs a marked reticulocytosis which seems to regress much more slowly than do the other abnormal conditions of the blood which were studied, possibly because the abundant salts in the ration during realimentation have acted as a stimulus to the production of reticulocytes, thus maintaining the high level observed after 6 weeks realimentation.

These observations lead to the conclusion that the hemopoietic mechanism is greatly influenced, directly or indirectly by strict limitation of inorganic salts in the diet. The data herein reported indicate further that the observed change in the blood under conditions of the experiment are due specifically to the deficiency in mineral salts.