tassium chloride (4.1 M) and hydrochloric acid solutions ranging in concentrations between 0.1 molar and 1 molar.

The salt bridge between the hydrogen and calomel elements used in our measurements was a saturated solution of potassium chloride.

3 (1463)

On the utilization of salep mannan.

By MARY SWARTZ ROSE.

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Some experiments on the utilization of salep mannan were reported in 1911.[1] It was found that this anhydride of mannose was not hydrolyzed by the enzymes of saliva, pancreatic and intestinal juice, nor by malt diastase, but disappeared almost completely from the human alimentary tract when eaten, the coefficient of digestibility in three out of four experiments being 100 per cent. and 94 per cent. in the fourth. Studies of the effect of fecal bacteria indicated that some of them could produce appreciable amounts of sugar from this polysaccharide, and stimulated further research as to its precise fate in the animal organism. Investigations were interrupted in 1914, when the war cut off the supply of salep, and what has been accomplished along several lines is now reported as it is doubtful when these studies can be resumed.

Four more determinations of the coefficient of digestibility were made, two on healthy young women and two on diabetics. The young women, consuming identical and uniform diets, free from cellulose, throughout a fore, mid, and after period, took in the mid period of three days 75 grams of salep mannan, equivalent to 61 grams of glucose. The coefficient of digestibility was 97 per cent. in one case and 95 in the other. A diabetic man given in one day 45 grams of salep mannan, with no other food but broth, coffee and whiskey, had a coefficient of 98 per cent. A diabetic boy fifteen years old, took in three days 33, 65 and 70 grams of

[1] *Trans. Conn. Acad. Arts and Sciences*, XVI, pp. 247–382, 1911.

mannan respectively, and the coefficient of digestibility was 96 per cent. This was the largest amount administered to any subject. There was in no case any discomfort from gas formation, or other evidence of fermentation.

A detailed study of the nitrogen intake and output in the experiments on the two young women showed an increase in the fecal nitrogen accompanied by a marked increase in the volume of dry feces. There was a slight fall in the urinary nitrogen in the salep period and an increase of 16 and 17 per cent. respectively in the after period. This may have been due to decrease in the urine volume in the salep period and a subsequent "flushing out."

There was no evidence of sugar formation in the diabetic organism. In one case 10 grams were given in a day with no other food but broth, coffee and whiskey, and in another 45 grams, the urine in both cases remaining sugar free. For a five-day period a fifteen-year-old diabetic boy was kept on a controlled diet, and salep averaging 56 grams per day given for three days. Salep did not stop the production of β-oxybutyric acid, which rose from 3.4 grams on the day before the salep feeding to 15 grams on the third day.

Glycogen storage in the livers of rabbits could not be demonstrated, though mannose has been shown to form glycogen reaidly. The animals were starved five or six days, then fed salep by stomach sound for from one to three days. They were killed twelve to fifteen hours after the last feeding, but only traces of glycogen were found after administration of as much as 30 grams of salep in a day. The largest amount was 35 milligrams, whereas a rabbit fed 15 grams starch as a control had 209 milligrams. In two rabbits 16 and 60 per cent. respectfully of the mannan was recovered from the alimentary tract and identified.

It was thought that since creatine elimination induced by starvation may be made to disappear by administration of calorically insufficient carbohydrate, carefully controlled experiments with rabbits might afford evidence as to the utilization of this mannan in metabolism. A series of experiments in which rabbits were starved from three to six days, then salep fed by stomach sound for two or three days, showed nothing especially significant

in the output of creatine, creatinine and total nitrogen, when these animals were compared with controls similarly treated, but fed soluble starch alone or combined with maltose or lactose in amounts equivalent to the salep administered. There was a faint tendency for creatine and total nitrogen to fall in the starch period, but the results cannot be considered conclusive.

Salep resembles inulin in its ease of acid hydrolysis, its resistance to digestive enzymes, and its failure to form sugar in the diabetic organism. It is not so fermentable as inulin.

4 (1464)

Growth and reproduction upon simplified food supply.

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Rats were fed rations consisting of white bread (made without milk or butter) either alone or with only one other article of food. Later, ground whole wheat was substituted for white bread in several cases.

In preliminary experiments with animals placed upon the experimental rations at the time of weaning, bread alone resulted in cessation of growth at once and death after about six weeks. With bread and meat there was some growth at first, but the survival period was only slightly longer than with bread alone; with bread and apple there was no growth, but the survival period was considerably longer; with bread and turnip there was continuous slow growth; with bread and milk there was continuous growth at a normal rate. In this case the bread and milk ration consisted of equal weights of fresh bread and market milk, making a food mixture in which the white bread furnished four fifths and the milk one fifth of the total calories. On this ration young rats of both sexes (taken at weaning time from mothers which were receiving mixed food) made normal growth and the males were capable of normal reproduction but the females usually failed to breed and none of them raised any young.

On a ration containing the same proportion of milk (about