## 207 (2167)

### The presence of a blood-sugar reducing substance in yeast.

By CASIMIR FUNK and H. B. CORBITT.

[*From the Research Laboratory of H. A. Metz, New York City.*]

In 1914 one of the present authors reported in collaboration with v. Schoenborn[1] that pigeons kept on a vitamine-free, artificially compounded diet, show complete disappearance of the glycogen in the liver and increased blood sugar. In one particular series of experiments the blood sugar amounted to 0.29 per cent. and no glycogen was found in the liver. In a few pigeons kept on the same diet one dose of vitamine B from yeast was injected intramuscularly with the result that liver was found to contain 0.6 per cent. of glycogen and the blood 0.19 per cent. sugar. This vitamine preparation, which proved to be very potent, was prepared in the following way: an evaporated alcoholic extract of yeast was precipitated with phosphotungstic acid, and the resulting dried precipitate treated with acetone. The insoluble fraction was decomposed with lead acetate and the filtrate freed from adenine by means of picric acid.

This observation gains much interest in view of the recent communications of Winter and Smith and also of Collip on the presence of an insulin-like substance in yeast and other starting materials.

For some time past we have been working on the same problem again. We have found that crude extracts of yeast and rice-polishings possess a blood-sugar increasing rather than decreasing action. When we took, however, yeast grown in the laboratory on a medium rich in vitamine D, then centrifuged and washed the cells, and after heating to 100° injected them subcutaneously into rabbits, we obtained in a number of instances in 3-4 hours blood-sugar decreases which amounted to 30-40 per cent. of the initial value. We agree with Collip that compared with insulin the action of the yeast substance is slow, but on the other hand it lasts longer which might prove of therapeutic ad-

[1] *J. Physiol.*, 1914, cccxxviii, 48.

vantage. We have not as yet succeeded in obtaining similar results with Fleischmann's yeast treated in the same way.

The slow and lasting action of the yeast substance suggests strongly its non-identity with insulin. It seems possible that the substance undergoes slowly a change into insulin. The demonstration of a blood-sugar reducing substance in various foods will perhaps explain the marked hyperglucemia that one of the authors has described in pigeons on a diet devoid of vitamine B (blood sugar of 30 normal pigeons was found to be 0.170 per cent., of 32 animals fed on polished rice 0,243 per cent., with occasional figures as high as 0.3-0.5 per cent.). It may be that the increase of sugar found is due to deficiency of an insulin-precursor in the food. If this should prove to be true diabetes might be caused by non-functioning of the pancreas, or theoretically, at least, by a deficiency of the insulin precursor in the food.

## 208 (2168)

### Extraction of vitamines from yeast and rice polishings using various water-miscible solvents.

By CASIMIR FUNK, BENJAMIN HARROW and JULIA B. PATON.

[*From the Biochemical Laboratory of Columbia University, College of Physicians and Surgeons, and the Research Laboratory of H. A. Metz, New York City*]

The comparative values of the following solvents in extracting vitamine from yeast were studied: ethyl alcohol (50, 60, 70, and 80 per cent.), methyl alcohol (60 to 70 per cent.), propyl alcohol (70 per cent.), butyl alcohol (70 per cent.), isobutyl alcohol (70 per cent.), acetone (70 per cent.), methyl ethyl ketone (70 per cent.) and acetic acid (70 per cent.). The extracts and *residues* were tested on pigeons and rats, and the extracts were also tested for their content of vitamine *D* (yeast growth), co-ferment, total nitrogen and total solids.

If inactivity of residue be taken as a criterion, then 70 per cent.