

[CONTRIBUTIONS FROM THE CHEMICAL LABORATORY OF PURDUE
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THE QUANTITATIVE DETERMINATION OF CARBOHY- DRATES IN FOOD STUFFS, II.

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IN a preceding number of this Journal a plea was made for a more definite knowledge of the constituents of the "nitrogen-free extract" of food stuffs, and a method of analysis was proposed for differentiating between the various carbohydrates included in that term.

The analytical data there presented were in part obtained in an investigation upon the carbohydrates of wheat and maize, done by the writer and published as Bulletin 34 of the Office of Experiment Stations, U. S. Department of Agriculture. This method of estimating carbohydrates was employed there for the first time, and was necessarily imperfect in some of its details. This was notable in the starch determinations, which gave results much too low. This error was noticed by the author, but too late to be corrected in the original paper. It was corrected, however, in the article referred to in the March number of this Journal, in which the scheme for analysis was first described in detail. The error consisted in the employment of too dilute acid for the hydrolysis of the starch products, previously rendered soluble by the action of malt extract upon the material under examination. Originally one cc. of concentrated hydrochloric acid to 100 cc. of the solution under treatment was employed. As modified on pp. 188-189 of the March number of this Journal, ten cc. of concentrated hydrochloric acid are added to 100 cc. of the solution and the whole heated for one hour in boiling water. This correction was made as the result of a comparative study of the strength of acid and duration of treatment necessary to completely change diastatic starch products into dextrose. At the time of going to print, the writer had been unable to complete the treatment of all the materials under investigation, according to this revision. The original starch data obtained with more dilute acid, were therefore presented and attention was called to their derivation on p. 193.

It is now possible to present the results obtained from the

original samples, using the corrected method of hydrolysis described on pp. 188-189, as follows :

NORMAL STARCH DISSOLVED BY MALT EXTRACT.

	Per cent.
Wheat I.....	57.62
Wheat II.....	56.27
Wheat flour I.....	67.99
Wheat flour II.....	67.76
Maize.....	65.45
Bread from Wheat I.....	53.54
Bread from Wheat II.....	53.62
Bread from Flour I.....	64.81
Bread from Flour II.....	64.12
Bread from Maize.....	61.64

It will be noted that the amounts of starch have been increased from fifteen to twenty per cent. over those originally given.

In the previous paper it is said, "In many cases it is believed that the total amount of carbohydrates thus definitely determined in food materials, will be found to be appreciably less than the nitrogen-free extract estimated by difference." This discrepancy, amounting to twenty or thirty per cent., as based upon the earlier and erroneous starch determinations, is diminished by the later results, but still exists to an extent which cannot be overlooked, as will appear from the following summary :

RESPECTIVE PERCENTAGES OF DIFFERENT CARBOHYDRATES IN DIFFERENT FOOD STUFFS.

	Sucrose.	Invert sugar.	Dextrin.	Soluble starch	Normal starch	Pentosans.	Crude fiber.	Total.	Nitrogen-free extract.
Wheat I.....	0.52	0.08	0.27	0.00	57.62	4.54	2.68	65.71	77.07
Wheat II.....	0.72	0.00	0.41	0.00	56.27	4.37	2.51	64.28	77.66
Flour I.....	0.18	0.00	0.90	0.00	67.99	0.00	0.25	69.32	83.54
Flour II.....	0.20	0.00	1.06	0.00	67.76	0.00	0.25	69.27	84.54
Maize.....	0.27	0.00	0.32	0.00	65.45	5.14	1.99	73.17	78.02
Bread (Wheat I)..	0.14	0.10	0.68	1.37	53.54	4.16	2.70	62.59	77.20
Bread (Wheat II)..	0.05	0.32	0.23	2.36	53.62	4.34	2.42	63.34	77.33
Bread (Flour I)...	0.06	0.37	0.27	1.99	64.81	0.00	0.34	67.84	82.94
Bread (Flour II)..	0.15	0.38	0.91	1.74	64.12	0.00	0.17	67.47	85.17
Corn bread (Maize)	0.16	0.19	0.00	2.80	61.74	3.54	2.22	70.75	77.81

This discrepancy may arise from one of two sources; *viz.*, 1.

Error in the determination of carbohydrates. 2. The existence of a substance which is free of nitrogen and is of a character not usually ascribed to carbohydrates and resistant to the ordinary reactions for such. While the first alternative is not excluded, the writer is inclined to the latter conclusion and expects to continue the investigation along this line.

NOTE.

Improvement in Drying Chambers.—In an ordinary copper drying chamber, or air-bath, the bottom is protected by a false bottom, usually of iron, supported at the four corners by the legs of the chamber. When heated by a burner the false bottom expands and cups, and thus breaks the heat connection with the true bottom, making the chamber more difficult to heat. This trouble may be entirely remedied by riveting the two bottoms in the center with one rivet, leaving the four corners to expand or contract, but still supported by the legs of the chamber. The burner should be placed immediately under the rivet. The writer has used chambers thus improved for some time with great satisfaction. Chambers with the improved bottom may be had of Eimer & Amend, New York. J. L. BEESON.

NEW BOOKS.

THE ENERGY OF LIVING PROTOPLASM. By OSCAR LOEW. Professor in the Imperial University, Japan. 1896. London: Kegan Paul, Trench, Trübner & Co.

After reviewing briefly the theories of the cause of vital phenomena held from the time of Plato to the present, and after giving a short history of the discovery of the cell, the author takes up the characteristics of protoplasm, and especially those by which this substance exhibits phenomena of sensation. This naturally leads to a discussion of the relations of proteids to protoplasm, and consequently to a sharp distinction between physiologically active and dead or reserve proteid matter. He considers that proteids yield the vital phenomena, and that living proteid matter undergoes a chemical change at the moment of death. After briefly reviewing the older theories respecting the constitution of the proteid molecule he concludes with the following: "It appeared to me that more insight into the chemical nature of the proteids