may lose its amylolytic power with no decrease, or even with an increase, of proteolytic activity.

We are again indebted to Messrs. Fairchild Brothers and Foster and to the Parke, Davis Company for material.

Summary (of this and the preceding paper).

A method is described for the purification of pancreatic amylase which on frequent repetition at different times has yielded a product of fairly uniform properties and activity.

This product showed a heat of combustion of 5568 calories per gram, and the following approximate composition: C 51.9, H 6.6, N 15.3, S 1.0, P 0.8, O (and undetermined), 24.4.

It gave a pronounced Hopkins-Cole tryptophane reaction and also typical protein reactions in the xanthoproteic and biuret tests and with Millon's reagent.

It is soluble in pure water and coagulates at about 70°, the coagulum showing a violet, and the filtrate a rose red, biuret reaction. This filtrate also gives a white, flocculent precipitate when poured into strong alcohol. This preparation shows the properties of an active protease as well as amylase and some activity as a maltase. The amylolytic property has been more fully investigated than the other two.

The amylolytic power undergoes rapid deterioration in pure water solution. In water containing small quantities of sodium chloride and disodium phosphate, or in 50% solution of alcohol or acetone, it deteriorates much less rapidly.

Tested under proper conditions at 40°, this material shows an amylolytic power of about 3500 on the new scale of diastatic power, about 5000 on the Lintner's scale, about 2,000,000 on Wohlgemuth's scale.

Acting at a concentration of 1 : 100,000,000 in a 1% starch solution, it converted 1,000,000 times its weight of starch to the erythrodextrin stage in 30 hours and within 96 hours had completely digested the starch and intermediate dextrins to products giving no reaction with iodine and had formed over 500,000 times its weight of reducing sugar. calculated as maltose.

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May, 1912.

[CONTRIBUTION FROM THE DEPARTMENT OF CHEMISTRY OF COLUMBIA UNIVERSITY. No. 209.]

THE HYDROLYTIC ACTION OF GLYCINE ON ETHYL BUTYRATE.

BY S. LIEBOWITZ.

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If the hydrolysis of fats and esters by lipases is caused by a protein-like body, the assumption may be made that certain specific groupings present in lipase are concerned in the hydrolysis. In a paper[1] published recently the results obtained in the hydrolysis of certain esters by a number of amino acids and polypeptides were described. At the suggestion of Dr. J. M. Nelson of this laboratory and Dr. K. G. Falk of the Harriman Research Laboratory, a more detailed study of the hydrolysis of ethyl butyrate by glycine was made.

The method of experimenting may be outlined briefly as follows: Three sets of solutions were made up for each experiment, one containing the requisit amount of glycine, weighed as solid or measured as standardized solution, and ethyl butyrate in water, one with the same amount of glycine in water, and one with the same amount of ethyl butyrate in water. The solutions were allowed to remain at the required temperature in a thermostat or at room temperature for the length of time indicated and then titrated (with phenolphthalein as indicator) with approximately 0.1 *N* NaOH solution after the addition of neutralized formaldehyde solution (formol method).[2] The amount of action was calculated from these results by subtracting the sum of the number of cubic centimeters of alkali used for the glycine solution alone and the ethyl butyrate solution alone from the amount of alkali used by the mixture, and adding 0.04 (as the end-point was attained twice in the blanks). The detailed experimental results will not be given here. The summarized results are shown in the following table. Column 1 contains the number of the experiment, column 2 the weight of glycine used in milligrams (either as weighed directly or as calculated from the standard solution). The letters following these weights refer to the normality of the sodium hydroxide solution used in titrating and in terms of which the final results are given, *a* referring to 0.0960 *N*, *b* to 0.0981 *N*. Column 3 indicates the number of cubic centimeters of ethyl butyrate used, columns 4 and 5 the duration in hours of the experiments at 35–40° and 20°, respectively, and column 6 the amount of hydrolysis of ethyl butyrate due to the presence of the glycine in cubic centimeters of the standard alkali used, or what is practically the same, the number of equivalents $\times 10^{-4}$ of acid produced from the ethyl butyrate due to the presence of the glycine. The solutions were made up to 25 cc. with water for experiments 1–23, and to 35 cc. for experiments 24–28. In experiments 24–28, enough sodium chloride was added to make the solutions normal with respect to it. Most of the results shown are the mean of duplicate experiments.[3]

[1] Falk and Nelson, THIS JOURNAL, 34, 828 (1912).

[2] For the details and explanations of using this method for determining the glycine in these experiments cf. Falk and Nelson, *loc. cit.*

[3] A large number of experiments for which the duration of the action was in the neighborhood of a week gave irregular results showing no action in some of the experiments. These results are not recorded here as evidently secondary influences complicated the reaction. This point will be studied further.

Expt. No.	Wt. of Glycine in mg.	Ethyl Butyrate in cc.	Time of Action.		Action in cc. Standard NaOH solution.
			at 35°-40°.	at 20°.	
1	116.0*a*	0.5	12	37	0.13
2	116.0*a*	0.5	22	..	0.01
3	145.1*a*	0.5	20	..	—0.08
4	353.0*a*	0.5	35	..	0.09
5	50–60*a*[1]	1.0	5	32–44	0.10
6	116.0*a*	1.0	12	37	0.20
7	116.0*a*	1.0	22	..	0.11
8	145.1*a*	1.0	20	..	0.03
9	145.3*a*	1.0	45	..	0.40
10	353.0*a*	1.0	25	..	0.25
11	359.6*a*	1.0	19	..	0.57
12	116.0*a*	2.0	12	37	0.27
13	116.0*a*	2.0	22	..	0.17
14	145.1*a*	2.0	20	..	0.16
15	353.0*a*	2.0	25	..	1.08
16	359.6*a*	2.0	19	..	1.12
17	116.0*a*	3.0	12	37	0.25
18	116.0*a*	3.0	22	..	0.32
19	145.1*a*	3.0	20	..	0.28
20	223.7*b*	3.0	23	..	0.94
21	223.7*b*	3.0	48	..	0.87
22	353.0*a*	3.0	25	..	1.06
23	359.6*a*	3.0	19	..	1.83
24	148.4*b*	1.0	43	2	0.22
25	150.6*b*	1.0	26	..	0.12
26	336.8*b*	1.0	20	..	0.37
27	336.8*b*	2.0	20	..	0.42
28	336.8*b*	3.0	20	..	0.30

The results in the table show that there is a marked hydrolytic action of ethyl butyrate due to glycine. There appears to be a very rough parallelism between the amount of action and the amounts of ethyl butyrate or of glycine used. The presence of sodium chloride had no effect.

ORGANIC LABORATORY.

NEW BOOKS.

A Text-Book of Inorganic Chemistry. By GEORGE SENTER. New York: D. Van Nostrand Company. 1911. 13×19 cm.; x+583 pp. Price, cloth, $1.75.

The author, who is lecturer on chemistry at St. Mary's Hospital, University of London, states:

"The book is designed for use in University, Technical Institute and other general classes on the subject, and contains all that is usually included in a B.Sc. Course." The subject matter is presented in thirty-seven chapters, of which the first twenty-five are devoted to general

[1] A number of separate experiments for which the mean action was taken.