

1917

The Action of the Amino Group on Amylolytic Enzymes

Elbert W. Rockwood
State University

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Recommended Citation

Rockwood, Elbert W. (1917) "The Action of the Amino Group on Amylolytic Enzymes," *Proceedings of the Iowa Academy of Science*, 24(1), 551-553.

Available at: <https://scholarworks.uni.edu/pias/vol24/iss1/78>

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THE ACTION OF THE AMINO GROUP ON AMYLOLITIC
ENZYMES.

(*ABSTRACT*)

ELBERT W. ROCKWOOD.

The work is a continuation of that reported last year on the action of the auxoamylases, the accelerators of starch splitting enzymes.

Anthranilic acid (orthoaminobenzoic acid) has been shown to increase the activity of the salivary starch-digesting enzyme. In a similar manner the isomers of the anthranilic acid were tested, the figures given below representing the relative amounts of digestive products formed.

NO. 45.

TIME OF DIGESTION.

	1 hour	3 hrs.	5 hrs.	7 hrs.	24 hrs.
Standard (no activator).....	3.6	6.0	10.8	11.5	20.9
Ortho acid	5.1	9.6	13.7	16.4	25.8
Meta acid	5.2	9.2	14.6	16.1	25.4
Para acid	4.5	9.2	13.5	16.2	26.4

All the isomers are seen to be auxoamylases. That is, the position of the amino radical in the benzene ring with reference to the carboxyl is immaterial in modifying the activity of the compound.

Inasmuch as the protein molecule is composed of a great complex of amino acids it might be surmised that upon hydrolysis it would become more active in its influence upon amylyolytic ferments than is the original protein. Two proteins, gelatine and serum albumin, were hydrolyzed by boiling with sulphuric acid and parallel digestions were run, one containing no protein, for a standard, one 0.5 gm. of the original protein and the third the same amount of hydrolyzed protein. The results are shown below :

NO. 47.

GELATINE.

	1 hour.	2 hrs.	4 hrs.	6 hrs.
Standard	5.1	8.9	13.2	15.3
Gelatine	9.5	15.5	21.8	21.4
Hydrolyzed gelatine	11.7	16.0	18.1	22.2

As the number of free amino groups in the gelatine molecule becomes greater the stimulating power appears to increase.

NO. 48.

SERUM ALBUMIN.

	1 hour.	2.5 hrs.	4.5 hrs.
Standard	1.8	4.6	7.3
Albumin	16.1	21.8	24.7
Hydrolyzed albumin	19.2	24.1	27.8

This protein acts similarly to the gelatine and its decomposition products.

The amines of the methane series also have the power of stimulating the digestive power of ptyalin. Three were tried, methylamine, CH_3NH_2 ethylamine, $\text{C}_2\text{H}_5\text{NH}_2$ and diethylamine, $(\text{C}_2\text{H}_5)_2\text{NH}$.

NO. 143.

	2 hrs.	4 hrs.	6 hrs.
Standard	8.5	13.0	15.0
Methylamine	21.6	24.4	24.4
Ethylamine	21.1	23.8	24.4
Diethylamine	21.6	23.9	24.9

Hence the activating effect is due to the nitrogen and not to the NH_2 as a group, since the derivatives of the group act as powerfully as the group itself. Trials were made also with the pentavalent nitrogen of the ammonium radical. Both ammonium salts of strong and weak acids were employed.

In all the experiments the reactions of the solutions were made neutral to litmus, with the amino compounds as well as with the ammonium salts.

Inasmuch as different samples of saliva were used the results from one series cannot be exactly compared with those of another; consequently several must be given.

Rockwood: The Action of the Amino Group on Amylolytic Enzymes

ACTION OF AMINO GROUP ON AMYLOLITIC ENZYMES 553

NO. 138.

	1 hour	2 hrs.	4 hrs.	6 hrs.
Standard	5.3	8.7	11.3	12.4
Ammonium sulphate	6.9	10.3	12.5	13.1
Ammonium thiocyanate	6.6	9.3	12.5	13.2
Ammonium acetate	4.6	6.2	9.8	10.2

NO. 140.

	1 hour.	2 hrs.	4 hrs.	6 hrs.
Standard	4.4	8.8	13.6	17.5
Ammonium nitrate	4.7	9.9	14.9	17.6
Ammonium oxalate	4.2	6.1	9.9	12.8

NO. 141.

	1 hour.	2 hrs.	4 hrs.	6 hrs.
Standard	10.9	14.0	15.8	17.4
Ammonium acetate	8.0	10.7	12.6	15.4
Ammonium chloride	15.7	17.8	18.9	20.0
Ammonium oxalate	8.3	11.5	15.7	18.7

NO. 142.

	1 hour.	2 hrs.	4 hrs.	6 hrs.
Standard	1.0	2.4	4.8	6.7
Ammonium malate	1.1	2.7	5.2	6.4
Ammonium tartrate	1.4	2.8	5.8	7.5

From the above it is seen that the ammonium salts of the strong acids (nitric, sulphuric, hydrochloric and thiocyanic) have a more marked effect than those of the weak acids (acetic, malic and tartaric); oxalic acid does not conform to the rule.

DEPARTMENT OF CHEMISTRY,
STATE UNIVERSITY.