EFFECT OF EPINEPHRINE AND ITS PRECURSORS ON ACTIVITY OF PROTEOLYTIC ENZYMES

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The mediator effect of biologically active neurotropic agents (epinephrine and acetylcholine) is based on interaction between the mediator and the receptor proteins-adreno- and cholinoreceptors.

It has been shown (Turpaev, Manukhin,1968) the similarity in responses of cholino- and adreno-receptors to the effects of factors influencing the protein molecule. It suggested existence of common receptor protein with two specific active centres and supported the idea on the part of conformational receptor protein alterations in the mode of mediatory processes.

It was reasonable to assume, that ability of neuromediators to react with proteins was not limited to the interaction with cholino- and adrenoreceptors, but might extend to other biologically active proteins, to enzymes, in particular. So, acetylcholine was shown (Demin,1955) to stimulate the activity of tissue proteolytic enzymes (cathepsins). It has been reported (Zubairov, Popova,1968) increase in activity of plasma arginine amino peptidase at

the contact of the enzyme with epinephrine, norepinephrine and pyrocatechol.

In the present study the activity of proteolytic enzymes of liver glycerol extracts and muscle water-saline extracts in relation to hemoglobin has been investigated by the method after Anson (1939), when epinephrine in concentration of 1.10^{-3}M was brought into the incubating medium.

Folin-Chiocalte reagent was used to challenge the colorimetric reaction that reveals the increment in protein decay products. The experimental results are presented in Table 1.

Table 1.

EFFECT OF EPINEPHRINE AND SOME AMINO ACIDS ON THE ACTIVITY OF PROTEOLYTIC ENZYMES OF LIVER AND MUSCLES

Test conditions	M±m	p	% change
Liver (control)	4.9±0.3		
+ epinephrine	9.5±0.4	0.001	+100
+ tyrosine	11.2±0.6	0.001	+120
+ phenyl-alanine	3.1±0.5	0.05	- 40
+ tryptophan	5.5±0.6	0.5	-
+ threonine	3.1±0.8	0.05	-
Muscles (control)	2.3±0.2		
+ epinephrine	3.9±0.3	0.02	+70
+ tyrosine	3.9±0.4	0.05	+50
+ phenyl-alanine	2.7±0.3	0.5	-
+ tryptophan	3.0±0.4	0.2	-
+ threonine	3.1±0.5	0.2	-
n	7	7	

Authenticity of differences and percent changes were determined in relation to the controls.

Epinephrine was found to stimulato considerably the activity of proteolytic enzymes of liver and muscles.

To settle the problem what chemical group of epinephrine molecule cause this effects on the activity of proteolysis we carried out similar experiments with structurally close substances such as tyrosine, phenyl-alanine and tryptophan. Tyrosine and phenyl-alanine were immediate precursors of epinephrine, while tryptophan was used because of highly reactive aromatic rings present in its molecule. The results in Table 1 also demonstrate that tyrosine stimulated activity of proteolytic enzymes as epinephrine did.

Phenyl-alanine, though similar in structure to epinephrine, did not exhibit any stimulating effect upon proteolysis, but rather inhibited proteolytic activity is the liver. Addition of tryptophan into the incubating medium had no effect on the activity of proteolytic enzymes.

In confrontation of the effects of epinephrine and investigated by us amino acids on the activity of proteolytic enzymes with peculiarities of chemical structure of these substances we came to the conclusion that stimulatory effect towards proteolysis belonged to substances having free hydroxy-group (epinephrine and its immediate precursor tyrosine).

Proceeding from these findings, in further experiments we added into the incubating medium hydroxy-aminoacid, threonine, which had no aromatic ring, but had free hydroxy-group. Threonine, however, did not increase activity of proteolytic enzymes of liver and muscles. Probably for proteolysis activation in the molecule of active agent to occur, a free hydroxy-group should enter the composition of the aromatic ring.

The in vitro experiments suggested the increase in

activity of proteolytic enzymes not to be connected with the synthesis of new enzyme molecules, but to be due to the activation of the enzyme under the interaction of substances of definite chemical structure with active or allosteric centre of the enzymatic protein.

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