



The role of biological activity of hydrohumate, produced from peat, in formation of adaptive response of rats under influence of chronic stress

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It is well known that humic compounds are the most distributed in nature among the organic matter. It is believed that humic polyphenol preparations, produced from the peat, represent adaptogenes and immunomodulators. But the total mechanism of their adaptogenic action is still completely unclear. In response to extraordinary irritant action, one of the most sensitive to stress and highly reactive systems of organism, endosomal-lysosomal cellular apparatus takes part. It is believed that humic compounds are able to penetrate through plasmatic membrane and by this way to affect on lysosomal proteases function. Among the wide range of lysosomal proteases, cysteine cathepsin L (EC 3.4.22.15) was in interest due to its powerful endopeptidase activity and widespread localization.

Purpose. The aim of the work was to investigate the influence of humic acids on intracellular proteolysis in blood plasma and heart muscle of rats in adaptive-restorative processes developing in rat organisms as a result of chronic stress action.

The experiment was held on Wistar's rats (160-200 g weight) which were divided into 4 groups: 1 – the control group; 2 – the animals which were received the hydrohumate with water (10 mg hydrohumate (0,1% solution) per 1 kg of weight) during 3 weeks; 3 – the group of stressed rats (test “forced swimming” for 2 hours); 4 – the stressed rats which received the hydrohumate. The activity of lysosomal cysteine cathepsin L was determined spectrophotometrically by usage 1% azocasein, denaturated by 3 M urea, as substrate.

It was obtained that under hydrohumate influence the activity of lysosomal cysteine cathepsin L in rat blood plasma changed on 20% in comparison with control group that is suggested to be caused by leakage of tissue cathepsins from organs and tissues and kidneys' filtration of these cysteine enzymes in urine. In rat heart tissues it was obtained that cathepsin L activity level was on 26,8% higher in rats which were under stress influence in comparison with indices of control group. Usage of hydrohumate led to the decreasing of cathepsin L activity level, obtained under stress action, with tendency to control indices in group of the stressed rats which received the hydrohumate. It is well known that under influence of lysosomal cathepsins, which by limited proteolysis take part into processes of genome activation, by changing activity of proper enzymes, for example DNA-polymerase, or deleting the protein-repressor, make a contribution to total instability of nuclear genome, induced by stress.

Conclusions. Mechanism of hydrohumate action on cathepsin L activity could be caused by possible binding with catecholamines, that results in membranotropic action and activation of intralysosomal proteolysis. The results obtained testify to the influence of hydrohumates on both the enzymes of lysosomes of rats' heart muscle and molecular mechanisms of adaptation and confirm the existing hypothesis about antistress action of humates.