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Experimental correction of pathological changes in salivary glands by multiprobiotic Symbiter® acidofilus under conditions of hypergastrinemia

Doświadczalna korekcja zmian patologicznych gruczołów ślinowych pod wpływem multiprobiotyku *Symbiter® acidofilus* w warunkach hipergastrynemii

INTRODUCTION

It is known that a longterm decrease of gastric secretion leads to the development of hypergastrinemia and to pathological changes in digestive organs. There is very important research of the ways to correct these undesirable consequences. Application of probiotics is one of such ways. In complex treatment of acid-dependent diseases of digestive organs probiotics are used. The usage of probiotics not only corrects infringements of digestive path microecology, but also positively influences the activity of immune and endocrine systems. Probiotic *Symbiter® Acidofilus* has polycomponent composition. Drug contains from 14 to 25 varieties of physiologically valuable microorganisms with different biological activity.

MATERIAL AND METHODS

The purpose of our research was substantiation of experimental efficiency of multiprobiotic *Symbiter® Acidofilus* for the correction of pathological changes in tissues of salivary glands tissues under conditions of hypergastrinemia. Experiments were carried out on 71 rat-males of "Wistar" line, weight 180–250g. Animals obtained omeprasole for 28 days (14 mg/kg of weight) and multiprobiotic *Symbiter® Acidofilus* (0.14 ml/kg of weight) together and separately. Development of hypergastrinemia verified by the maintenance of gastrin in blood plasma of rats (59.0±35.5 pg/ml – control group, in comparison with experimental animals – 170.7±90.7 pg/ml). In the homogenate of salivary glands we determined the activity of ornithinedecarboxylase (ODC), б-amylase, general proteinases, NO-ergic system and the maintenance of nitrites, molecules of average weight, oxidative modified proteins and ingibitors of the general proteinases.

RESULTS

Under conditions of long omeprazole introduction pathological changes in salivary glands tissues appear: intensification of free-radical oxidation, disbalance of proteolysis by decompensated type, increased activity of б-amilase, disbalance of polyamines and NO-ergic systems. We determined that the activity of NO-ergic system under conditions of correction was 1.18 times greater, than without correction, and the maintenance of nitrites – 1.02 times. Also correction of the hypergastrinemia by multiprobiotic *Symbiter® Acidofilus* led to the increase of the ODC activity 1.2 times more, б-amylase 1.08 times more and to the decrease of the maintenance of molecules of average weight 1.11 times, oxidative modified proteins 1.08 times and to the increase of the inhibitors of the general proteinases maintenance 1.06 times more.

Table 1. Metabolic changes in tissues of salivary glands under conditions of hypergastrinemia and its corrections by probiotic *Symbiter® Acidofilus*,(M ± m)

Groups of Animals / Methods	Omeprasole group	Omeprasole & Symbiter® Acidofilus group	Symbiter® Acidofilus group	Control group	
The activity of NO-synthase, мmol/g*min	5.76±0.25	6.77±0.15	3.90±0.08	3.97±0.11	$P_{4-1}<0.05$ $P_{4-2}<0.05$ $P_{4-3}>0.05$ $P_{1-2}<0.05$
The activity of ornithinedecarboxylase, nmol/g*min	244.5±10.5	293.9±8.3	269.7±9.7	269.0±8.0	$P_{4-1}>0.05$ $P_{4-2}<0.05$ $P_{4-3}>0.05$ $P_{1-2}<0.05$
The activity of general proteinases, мmol/g*min	0.383±0.018	0.391±0.008	0.332±0.006	0.327±0.01	$P_{4-1}<0.05$ $P_{4-2}<0.05$ $P_{4-3}>0.05$ $P_{1-2}>0.05$
The activity of б-amylase, mg/g*min	81.8±2.2	88.4±1.3	73.9±1.5	72.0±2.0	$P_{4-1}<0.05$ $P_{4-2}<0.05$ $P_{4-3}>0.05$ $P_{1-2}<0.05$
Maintenance of the average weight molecules, c.u.	0.321±0.024	0.290±0.012	0.228±0.009	0.243±0.016	$P_{4-1}<0.05$ $P_{4-2}<0.05$ $P_{4-3}>0.05$ $P_{1-2}>0.05$
Maintenance of the oxidative modified proteins, c.u.	0.484±0.023	0.449±0.012	0.338±0.017	0.363±0.026	$P_{4-1}<0.05$ $P_{4-2}<0.05$ $P_{4-3}>0.05$ $P_{1-2}>0.05$
Maintenance of the general proteinases ingibitors, g/kg	39.9±0.43	42.4±0.40	47.9±0.8	45.7±0.46	$P_{4-1}<0.05$ $P_{4-2}<0.05$ $P_{4-3}>0.05$ $P_{1-2}<0.05$
Maintenance of the nitrites, мmol/g	0.194±0.006	0.198±0.003	0.164±0.004	0.164±0.007	$P_{4-1}<0.05$ $P_{4-2}<0.05$ $P_{4-3}>0.05$ $P_{1-2}>0.05$

DISCUSSION

Nowdays researchers pay great attention to NO role in the development of many diseases. Therefore, research of the NO-ergic system of salivary glands under conditions of the hypergastrinemia is justified. Under conditions of long omeprazole introduction pathological changes in salivary glands tissues appear: increase in the activity of NO-synthase and the amount of nitrite-anion – a possible substrate for NO synthesis. Cell growth and differentiation require the presence of optimal concentrations of polyamines. ODC catalyses are the first and rate-controlling step in polyamine synthesis. In studies using cultures of Ehrlich ascites-tumour cells, we showed that the expression of ODC is subject to feedback regulation by the polyamines. Decrease of polyamine concentration in the cell results in a compensatory increase of ODC synthesis, whereas an increase of polyamine concentration results in suppression of ODC synthesis. These changes in ODC synthesis were attributed to changes in the efficiency of ODC mRNA translation, because the steady-state amount of ODC mRNA remained constant. Under conditions of long omeprazole introduction pathological changes in salivary glands tissues appear: disbalance of polyamines and NO-ergic systems. The use of multiprobiotic *Symbiter® Acidofilus* normalises the balance of the polyamines and NO-ergic systems.

Most reactive oxygen species (ROS) in living organisms are produced as byproducts of many processes. Being highly active, ROS interact with virtually all cellular components particularly modifying their properties. Functional consequences of protein modification by ROS depend on the nature of ROS and protein as well as particular conditions of their interaction. The process in which a protein is broken down, partially into peptides, or, completely, into amino acids, by proteolytic enzymes, is present in bacteria and in plants but most abundant in animals. Food proteins are attacked in the stomach by pepsin and in the small intestine mainly by trypsin and chymotrypsin from the pancreas. Proteolytic enzymes are secreted as zymogens, which are themselves converted by proteolysis to their active forms. Many other zymogens or precursors undergo proteolysis to form active enzymes or proteins (e.g. fibrinogen to fibrin). In cells, proteolytic degradation of old proteins is part of cellular homeostasis. Under conditions of long omeprazole introduction pathological changes in salivary glands tissues appear: intensification of free-radical oxidation, disbalance of proteolysis by decompensated type and increased activity of б-amilase. Experimental correction by multiprobiotic *Symbiter® Acidophilus* promotes normalisation of pathological changes in salivary glands of rats during long introduction proton pomp inhibitor because of free-radical oxidation and proteolytic processes are depressed.

CONCLUSIONS

Under conditions of long hypergastrinemia pathological changes in salivary glands tissues appear: intensification of free-radical oxidation, disbalance of proteolysis by decompensated type, increased activity of б-amilaze, disbalance of polyamines and NO-ergic systems. Correction of omeprazole-inducted hypergastrinemia using multiprobiotic *Symbiter® Acidofilus* normalises synthesis of regulatory polyamines, NO, б-amylase, proteolysis and reduces of the free-radical processes.

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SUMMARY

Under conditions of long omeprazole introduction pathological changes in salivary glands tissues appear: intensification of free-radical oxidation, disbalance of proteolysis by decompensated type, increased activity of б-amilase, disbalance of polyamines and NO-ergic systems. Experimental correction by multiprobiotic *Symbiter® Acidophilus* promotes normalisation of pathological changes in salivary glands of rats during long introduction of proton pomp inhibitor because free-radical oxidation and proteolytic processes are depressed, normalises balance of the polyamines and NO-ergic systems.

Keywords: salivary glands, omeprazole, hypergastrinemia, polyamines, NO-ergic systems, *Symbiter® Acidophilus*

STRESZCZENIE

W warunkach długotrwałego stosowania omeprazolu dochodzi do rozwoju zmian patologicznych w obrębie gruczołów ślinowych: intensyfikacji utleniania wolnych rodników, zaburzeń równowagi proteolizy typy dekompensacyjnego, wzrostu aktywności 6-amylazy, zaburzenia równowagi systemów poliamin I NO-ergicznego. Doświadczalna korekcja z zastosowaniem *Symbiter® Acidophilus* promuje normalizację zmian patologicznych w gruczołach ślinowych szczurów podczas długotrwałego stosowania inhibitora pompy protonowej, ponieważ utlenianie wolnych rodników i procesy proteolityczne są hamowane i normalizowana jest równowaga systemów poliamid i NO-ergicznego.

Słowa kluczowe: gruczoły ślinowe, omeprazol, hipergastrynemia, poliamidy, system NO-ergiczny, *Symbiter® Acidophilus*