

Impact of Various Antihistamines on Changes in the Activity of Pancreatic Digestive Enzymes of the Rat against the Background of Anaphylactic Shock

Ismoilov SR*, Fayzullaev BR and Ismailov AU

Urgench Branch of the Tashkent Medical Academy, Department of Pharmacology and Clinical Pharmacology, Urgench, Uzbekistan

***Corresponding Author:** Ismoilov SR, Urgench Branch of the Tashkent Medical Academy, Department of Pharmacology and Clinical Pharmacology, Urgench, Uzbekistan.

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Abstract

It was found that against the background of anaphylactic shock, noticeable changes occur in the spectrum of activity of pancreatic enzymes, which can affect the breakdown and assimilation of the main components of food. Antihistamines (dimedrol, diazoline, suprastin, fenkarol, zaditen), introduced in the process of causing anaphylactic shock, significantly correct the observed changes in the activity of the studied enzymes. The effectiveness of the corrective action of fenkarol and, especially, zaditen, are superior to other remedies.

Keywords: Antihistamines; Anaphylactic Shock; Digestive Enzymes; Diazoline; Dimedrol; Fenkarol; Suprastin; Zaditen; Pancreas

Introduction

Allergy is one of the important medical and social problems of the healthcare system. Many researchers pay special attention to the problem of allergies [3]. It is known that with allergic diseases of the body, the state of various organs and systems changes and the digestive tract belongs to such systems [1]. According to the literature, the digestive tract is not only an assimilation system, but also a place that interacts with various allergens coming from food, and being a barrier, prevents the penetration of such harmful factors into the internal environment. In this process, an important place is occupied by the splitting and assimilation of the main products of vital activity in the intestine [4]. Namely, in the small intestine, food products are subjected to the necessary processing under the influence of hydrolytic enzymes of the pancreas and the mucous membrane of the small intestine and, on the one hand, the absorption of vital foods for the body occurs, on the other hand, it protects itself from the effects of exogenous allergens. Violation of the activity of hydrolytic enzymes of the gastrointestinal tract, in turn, can lead to the penetration of foreign products with antigenic properties into the internal environment [5].

But there is insufficient data in the literature on the systematic characterization of the functional state of digestive enzymes of the pancreas in allergic processes. There is also no information about the effect of antihistamines used in modern medical practice for the prevention and treatment of allergic diseases on the hydrolytic function of the digestive system in allergic organisms [2].

In this regard, we set the task to study the effect of antihistamines of various chemical structures used in medicine on the activity of digestive enzymes of the pancreas (alpha-amylase, lipase and protease complex) responsible for the stage of hydrolysis of carbohydrates, fats and proteins, against the background of anaphylactic shock.

Method of Research

Experiments were carried out on 336 white rats of a mixed population of both sexes weighing 120 - 200g. Anaphylactic shock was caused by the method of ADO (1978). To do this, sensitization was first induced by thrice subcutaneous administration of chicken egg protein (CEP) to rats every other day. On the 21st day of sensitization, an experimental model of anaphylactic shock was called. The activity of pancreatic enzymes on the background of shock was studied immediately after the development of the clinical picture of shock and on the 6th, 24th, 48th and 72nd hours after it.

Against the background of causing anaphylactic shock, antihistamines were used daily, starting from the first day of antigen administration, i.e. for 26 days. To determine the effect of antihistamines on the activity of pancreatic enzymes against the background of anaphylactic shock, this activity was studied at the same time as in shock without using of remedies. Also, antihistamines were administered for therapeutic purposes within 7 days after the development of the clinical picture of shock and the activity of pancreatic enzymes was studied on the 1st, 3rd and 7th days after the permissive injection of antigen.

For the study, the following antihistamines of various chemical structures were selected: from ethanolamines - dimedrol, from tetrahydrocarbolines - diazoline, from ethylenediamines - suprastin, from quinuclidine derivatives - fenkarol and from benzocycloheptatiophene derivatives - zaditen, which differ sharply from each other in their pharmacological properties. They were administered by a metal probe orally in the morning before feeding the animals. In all series of experiments, Dimedrol, diazoline, suprastin, fenkarol and zaditen were used in doses of 40, 50, 20, 50 and 1 mg/kg, respectively. The control group animals were given an equivalent amount of distilled water. During all the series of experiments, animals that had previously starved for 20 hours were killed by decapitation (7 individuals from the experimental and control groups).

The activity of digestive enzymes of the pancreas was determined by photoelectrocalorimetric methods widely used in gastroenterology (A. M. Ugolev, *et al.* 1969, A. A. Lazdynysh., *et al.* 1975), the protein content in the pancreatic tissue was determined by the method of O. H. Lowry, *et al.* (1951).

Statistical processing of the obtained results was carried out on a personal computer using the application software package for IBM PC "Statgrafics" according to the Student's criteria with the calculation of arithmetic mean values (M), their standard errors (m) and confidence indicators of differences in the compared values (P).

Results and Discussion

Against the background of an experimentally induced model of anaphylactic shock, violations in animal behavior were observed in the form of increased aggressiveness, rapid breathing, various convulsions, and in 5% of cases, the death of rats within the first 6 hours after shock (in 9 out of 170 rats with induced shock without remedies). When opening these animals, there was pulmonary edema, hemorrhage in the liver and in the small intestine, multiple erosions and ulcers in the mucous membrane of the stomach and small intestine. In animals that survived, when opening the abdominal cavity after decapitation, hyperemia, edema, multiple erosions and ulcers were noted in the stomach and small intestine mucosa and there were no visible abnormalities in the pancreas.

On the part of digestive enzymes, pronounced disorders were also determined. So, immediately after the development of the clinical picture of shock, the specific activity of the protease complex was sharply inhibited. During the first day after the shock, there was a strong increase in the activity of the enzyme. On the second day of experiments - a sharp inhibition of the enzyme activity, and on the third day it was at the level of control values. Specific lipolytic activity immediately after the development of the shock pattern remained within the normal range. During the first day after the shock, there was a strong induction. On the second and third days of experiments there was a

strong decrease in the activity of the enzyme. The specific activity of alpha-amylase was sharply inhibited in all periods of shock (Figure 1).

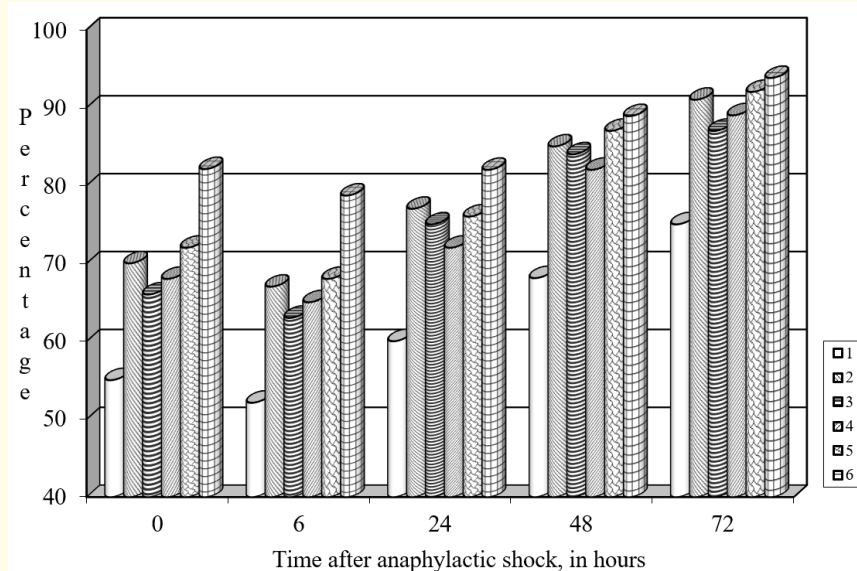


Figure 1: The effect of antihistamines on the specific activity of alpha- amylase in anaphylactic shock, where: 1-anaphylactic shock, 2, 3, 4, 5 and 6 - respectively dimedrol, diazoline, suprastin, fenkarol and zaditen, used in the process of causing shock. The effectiveness of the remedies was noted as a percentage in relation to the control taken for 100.

In anaphylactic shock, the mass of the pancreas did not change, but the concentration and total protein content in it increased markedly. In the first and second days of the experiment, the concentration and total protein content in the gland tissue increased, which affected the total reserve of pancreatic enzymes.

So, anaphylactic shock contributed to pronounced changes in the activity of digestive enzymes of the pancreas, which led to a sharp violation of the digestive process in the intestine in the form of steatorrhea, maldigestion and malabsorption.

Antihistamines, introduced in the process of causing anaphylactic shock, had a significant corrective effect on the specific and general activity of digestive enzymes caused by shock. In this case, the effectiveness of the corrective action of fenkarol and, especially, zaditen surpassed the other antihistamines.

The natural recovery of the activity of digestive enzymes in the pancreatic homogenate after the induced shock occurred in the following form: the specific activity of the protease complex was restored by day 3, and lipase and alpha-amylase-by day 7 after the shock.

While studying antihistamines for therapeutic purposes after the development of the clinical picture of anaphylactic shock for 7 days, it was found that they had a less pronounced corrective effect on the specific and general activity of digestive enzymes of the pancreas, than when they were administered in the process of causing shock. But all the same, they accelerated the processes of restoring the activity of digestive enzymes and on the 3rd day after the shock, there was a complete restoration of the activity of all enzymes under the influence of antihistamines. However, it was found that dimedrol and fenkarol showed a stronger protective effect in comparison with other remedies.

To sum up, we can say that the results we obtained during the experiments should be taken into account in the treatment of patients with allergic diseases.

Conclusion

1. Against the background of anaphylactic shock, noticeable violations of the enzyme-synthesizing and secreting functions of the pancreas were found.
2. Antihistamines have a noticeable protective effect on the activity of digestive enzymes of the pancreas, but their effect is insufficient to completely eliminate the existing shifts in the intestine.
3. When using antihistamines against the background of causing anaphylactic shock zaditen and fenkarol show a strong, dimedrol, diazoline and suprastin-a weak corrective effect to the observed violations in the activity of digestive enzymes of the pancreas and when using them for therapeutic purposes after causing anaphylactic shock, dimedrol and fenkarol have a relatively strong, and zaditen, diazoline and suprastin-a less pronounced protective effect.

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