

PHARMACOLOGY

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THE IMPACT OF EPICHLOROHYDRIN, ECHINACEA PURPUREA EXTRACT AND THIOTRIAZOLINE ON THE PYLORIC GLANDS OF THE STOMACH IN RATS

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Abstract: The study involving white male rats was performed to assess the pattern of epichlorohydrin action on the pyloric gland of the stomach and evaluate the possibility of Echinacea purpurea extract and thiotriazoline administration for the correction of changes developing in the pyloric glands. Prolonged epichlorohydrin inhalation was shown to trigger a decrease in the length of the pyloric glands in rats. A decrease in the length of glands occurred within thirty days after discontinuation of inhalation. Echinacea purpurea extract and thiotriazoline administration in rats not exposed to epichlorohydrin was accompanied by an increase in the length of the pyloric glands, which persisted after discontinuation of administration of each agent. Echinacea purpurea extract and thiotriazoline administration secondary to epichlorohydrin inhalation reduced the degree and duration of the effect of a decrease in the length of the pyloric glands caused by epichlorohydrin. Thiotriazoline was shown to have a more significant corrective action.

KeyWords: stomach, pyloric glands, epichlorohydrin, Echinacea purpurea extract, thiotriazoline



INTRODUCTION

The state of the gastric mucosa depends on various environmental factors such as temperature, hypoxia, vibration, electromagnetic radiation and some other [2, 4, 6, 10]. A significant amount of various substances which are man-made pollutants enters the human body. As a result of exposure the changes occur in the stomach, triggering the development of diseases [1, 9]. Epichlorohydrin is one of such substances. The products manufactured on the basis of epichlorohydrin include paints, varnishes, adhesives, synthetic fibers, ion exchange resins, epoxy resins, rubbers. Due to its volatility epichlorohydrin is capable of polluting the air and entering the body, producing a negative impact on human health [3, 7, 8]. Epichlorohydrin is known to be able to influence the state of the gastric mucosa [5]. However, the features of action of epichlorohydrin on the pyloric glands are not investigated. Contemporary scientific literature offers no data on the possibility of using antioxidants and adaptogens to correct changes occurring in the pyloric glands.

2 PURPOSES, SUBJECTS AND METHODS:

2.1 Purpose

The aim of the study was to study characteristics of epichlorohydrin action on the pyloric gland of the stomach, to evaluate the possibility of using Echinacea purpurea extract and Thiotriazoline to correct the changes in pyloric glands.

2.2 Subjects

The trial involved albino outbred sexually mature adult male rats. The rats were divided into six experimental groups with thirty rats in each group. Group I rats constituted the control group. Group II rats were administered epichlorohydrin in a dose of 10 MPC (10 mg/kg) by inhalation for two months, five days a week for five hours a day. Group III rats were given Echinacea purpurea extract in a dose of 200 mg per kg of the body weight through a gastric tube for two months, five days per week. Group IV rats were administered thiotriazoline in a dose of 117.4 mg per kg of the body weight as an injection of 2.5% solution

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intraperitoneally for two months, five days a week. Group V rats were exposed to epichlorohydrin and Echinacea purpurea extract, and Group VI rats were exposed to epichlorohydrin and thiotriazoline according to the above described procedure.

2.3 Methods

After two-month administration of epichlorohydrin, Echinacea purpurea extract and thiotriazoline, under chloroform anesthesia, six rats from each experimental group were taken out of the experiment on the first, seventh, fifteenth, thirtieth and sixtieth day. The stomach was fixed in 10% solution of neutral formalin. Histological processing was performed according to the standard method by dehydration in ethanol solution followed by alcohol extraction with xylene. The specimens were set in paraffin. In order to study the gastric wall, its cross sections obtained on sliding microtome were stained with hematoxylin and eosin by Van Gieson method. Microscopy was carried out by a laboratory Micros microscope MC 100 series (Austria). The height of the pyloric gastric glands of rats was determined using Microvisible software. Excel program was used for the statistical analysis of the results. Significance of differences was assessed by Mann-Whitney U test. The differences were considered significant at $p < 0.05$.

Conflict of interests

There is no conflict of interests.

3 RESULTS AND DISCUSSION

The length of the pyloric glands of the stomach in rats after inhalation of epichlorohydrin decreased compared to the same indicator in intact rats of the control group on the first day by 32.6% ($p < 0.01$), 31.6% ($p < 0.01$) on the seventh day, 26.1% ($p < 0.01$) on the fifteenth day of, and by 10.5% ($p < 0.01$) on the thirtieth day. Temporar dynamics of changes was found in the length of the pyloric glands in rats of the experimental group undergoing epichlorohydrin administration. It was manifested by a gradual increase in this indicator by 49.2% ($p < .01$) from the first day to the sixtieth day of the study (Table 1).

On the first and on the seventh day after the cessation of Echinacea purpurea extract administration the length of the pyloric glands of the stomach in rats was greater than the length in intact rats of the control group by 13.4% ($p < 0.01$) and 15.0% ($p < 0.01$), respectively. The comparison of this indicator value in rats treated with Echinacea purpurea extract in different periods of observation revealed a decrease in the length of the pyloric glands by 10.9% ($p < 0.05$) in the period from the first to the sixtieth day (Table 1).

The length of the pyloric glands of the stomach in rats after thiotriazoline administration in comparison with the length of the pyloric glands in intact rats of the control group was more on the seventh day by 4.9% ($p < 0.05$), by 11.9% ($p < 0.01$) on the fifteenth day, by 5.6% ($p < 0.05$) on the thirtieth day, by 5.0% ($p < 0.05$) on the sixtieth day. The length of pyloric glands in rats treated with thiotriazoline was increasing in the period from the seventh to the fifteenth day by 9.9% ($p < 0.01$), but the differences in this indicator in the period from the first to the sixtieth day were not statistically significant ($p > 0.05$) (Table 1).

Table 1.
The length of the pyloric glands of the stomach in rats
($M \pm MSD$, μm)

Day of observation	No of rats per group	Gp1	Gp2	Gp3	Gp4	Gp5	Gp6
1	n = 6	231.57 ± 13.50	156.18 ± 12.04 *	262.64 ± 10.67 *	241.89 ± 10.65	204.54 $\pm 8.77^*$ #	217.79 ± 10.23 #
7	n = 6	226.82 ± 10.70	155.21 ± 10.17 *	260.92 ± 14.38 *	237.93 ± 11.13 *	210.27 ± 18.81 *#	208.21 $\pm 9.78^*$ #
15	n = 6	233.33 ± 12.37	172.33 $\pm 9.11^*$	243.01 ± 12.68	261.16 ± 13.17 **	219.26 ± 13.75 #	237.71 ± 10.82 #
30	n = 6	237.64 $\pm 6.93^x$	212.59 ± 12.74 *	243.87 ± 8.03	250.98 $\pm 8.82^*$	247.67 $\pm 8.35^*$ #x	240.48 $\pm 8.98^{\#}$
60	n = 6	233.35 ± 11.63	233.06 ± 10.44 x	233.89 ± 10.42 x	244.91 ± 11.74 *	234.62 ± 11.55 x	237.80 $\pm 9.85^x$

Notes:

- * - $p < 0.05$ as compared to the indices in rats of the control group;
- # - $p < 0.05$ as compared to the indices in rats undergoing epichlorohydrin inhalation;
- x - $p < 0.05$ as compared to the indices in rats of the same experimental group at different periods of observation.

The length of the pyloric glands of the stomach in rats following epichlorohydrin inhalation and Echinacea purpurea extract administration was reduced on the first day by 11.7% ($p < 0.01$), by 7.3% ($p < 0.05$) on the seventh day, but increased on the thirtieth day by 4.2% ($p < 0.05$) in relation to the length of the pyloric glands in intact rats of the control group.

In comparison with the length of the pyloric glands in rats undergoing epichlorohydrin inhalation, the length of pyloric glands in rats treated with epichlorohydrin and Echinacea purpurea extract was increased on the first, seventh, fifteenth, and thirtieth day by 31.0% ($p < 0.01$), 35.3% ($p < 0.01$), 27.2% ($p < 0.01$), and by 16.5% ($p < 0.01$), respectively. Following the cessation of epichlorohydrin inhalation and Echinacea purpurea extract administration, the experimental group was found to have changes in the length of the pyloric glands. In the period from the first day to the thirtieth day this indicator value increased by 21.1% ($p < 0.01$), whereas in the period from the thirtieth day to the sixtieth day it decreased by 5.3% ($p < 0.05$) (Table 1).

The length of pyloric glands in rats after discontinuation of inhaled epichlorohydrin and thiotriazoline administration compared with length of pyloric glands in intact rats of the control group was lower on the seventh day by 8.2% ($p < 0.05$). In conditions created after the action of epichlorohydrin and thiotriazoline this indicator was higher than in rats undergoing epichlorohydrin inhalation, by 39.4% ($p < 0.01$) on the first day, by 34.1% ($p < 0.01$) on the seventh day, by 37.0% ($p < 0.01$) on the fifteenth day, and by 13.1% ($p < 0.01$) on the thirtieth day. In the period from the first day to the sixtieth day of the study the length of the pyloric glands in the experimental group of rats treated with epichlorohydrin and thiotriazoline increased by 9.2% ($p < 0.05$).

Scientific data obtained in the study is consistent with the results of earlier trials [5] and give a possibility to demonstrate that epichlorohydrin causes the development of changes in the gastric mucosa.

4 CONCLUSIONS

1. Long-term inhalation of epichlorohydrin triggers a reduction in the length of the pyloric gastric glands in rats. Reduction in the length of glands occurs within thirty days after discontinuation of inhalation.

2. Echinacea purpurea extract administration in rats not exposed to epichlorohydrin was accompanied by an increase in the length of the pyloric glands which persisted for seven days after discontinuation of extract administration.

3. Thiotriazoline causes an increase in the length of the pyloric glands in rats not exposed to epichlorohydrin which was observed from the seventh to the sixtieth day after the agent administration.

4. Echinacea purpurea extract and thiotriazoline administration secondary to epichlorohydrin inhalation reduces the degree and duration of the effect of reduction in the length of the pyloric glands caused by epichlorohydrin. Thiotriazoline was found to have a more significant corrective action.

Prospects for further research. Continued studies of patterns in epichlorohydrin action on the gastric mucosa and its structural components can provide additional scientific information on the mechanisms of changes facilitating the elaboration of experimental basis for the informed choice of the ways to develop effective methods for the correction of changes triggered by the exposure to epichlorohydrin and other xenobiotics.

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