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State of duodenal mucosa in rats after epichlorohydrin long-acting

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Abstract

Introduction. A significant problem of modern humankind is the problem of environmental pollution. One of the anthropogenic pollutants is epichlorohydrin (ECH). However, the character of the effect of ECH on the duodenum was not studied.

The aims of the study are the investigation the changes in duodenum due to the long-term effects of ECH in rats.

Material and methods of the research. Experimental rats of 1-st group were rats for control. The rats of the 2-nd group received ECH. Rats of group 3 received Echinacea purpurea EP extract. Rats of the 4-th experimental group received thiotriazoline. Rats of the 5-th group received ECH and EP extract. Rats of the 6-th group received ECH and thiotriazoline.

Results of the research and their discussion. Under action of epichlorohydrin the thickness of the duodenal mucosa decreases. EP extract, as well as thiotriazoline, cause an increase in the thickness of the duodenal mucosa of rats not receiving epichlorohydrin. In case of thiotriazoline use, the increase in the thickness of the duodenal mucosa was more expressiveness and longer. It was established that the administration of the EP extract, as well as the use of thiotriazoline on the background of action of epichlorohydrin leads to a decrease

in the expressiveness and duration of decrease the duodenal mucosa thickness induced by the influence of epichlorohydrin.

Conclusions. The results indicate the possibility of using these drugs in order to correct of the epichlorohydrin's effects.

Key words: duodenum, epichlorohydrin, Echinacea purpurea extract, thiotriazoline, rats.

Состояние слизистой оболочки двенадцатиперстной кишки крыс после длительного воздействия эпихлоргидрина

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Резюме

Введение. Существенной проблемой современного человечества является проблема загрязнения окружающей среды. Одним из антропогенных загрязнителей является эпихлоргидрин (ЭХГ). Однако характер влияния ЭХГ на двенадцатиперстную кишку не изучался.

Целью исследования является изучение изменений в двенадцатиперстной кишке в связи с долгосрочными введением крыс ЭХГ.

Материал и методы исследования. Экспериментальными крысами 1-й группы были крысы группы контроля. Крысы 2-й группы получали ЭХГ. Крысам группы 3 вводили экстракт эхинацеи пурпурной (ЭП). Крысы 4-й экспериментальной группы получали тиотриазолин. Крысы 5-й группы получали ЭХГ и экстракт ЭП. Крысы 6-й группы получали ЭХГ и тиотриазолин.

Результаты исследования и их обсуждение. Под действием эпихлоргидрина толщина слизистой оболочки двенадцатиперстной кишки уменьшалась. Экстракт ЭП, а также тиотриазолин вызывали увеличение толщины слизистой оболочки двенадцатиперстной кишки крыс, не получающих эпихлоргидрин. В случае использования тиотриазолина увеличение толщины слизистой оболочки двенадцатиперстной кишки было более выраженным и более продолжительным. Установлено, что введение экстракта ЭП, а также использование тиотриазолина на

фоне действия эпихлоргидрина приводит к уменьшению выраженности и длительности уменьшения толщины слизистой оболочки двенадцатиперстной кишки, вызванной влиянием эпихлоргидрина.

Выводы. Результаты исследования указывает на возможность использования этих препаратов для коррекции эффектов эпихлоргидрина.

Ключевые слова: двенадцатиперстная кишка, эпихлоргидрин, экстракт эхинацеи пурпурной, тиотриазолин, крысы.

Стан слизової оболонки дванадцятипалої кишки щурів після тривалого впливу епіхлоргідріну

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Резюме

Вступ. Суттєвою проблемою сучасного людства є проблема забруднення навколишнього середовища. Одним з антропогенних забруднювачів є епіхлоргідрин (ЕХГ). Однак характер впливу ЕХГ на дванадцятипалу кишку не вивчався.

Метою дослідження є вивчення змін у дванадцятипалої кишки у за умов довготривалого введення щурам ЕХГ.

Матеріал і методи дослідження. Експериментальними щурами 1-ї групи були щури групи контролю. Щури 2-ї групи отримували ЕХГ. Щурам групи 3 вводили екстракт ехінацеї пурпурової (ЕП). Щури 4-й експериментальної групи отримували тіотриазолін. Щури 5-ї групи отримували ЕХГ і екстракт ЕП. Щури 6-ї групи отримували ЕХГ і тіотриазолін.

Результати дослідження та їх обговорення. Під дією епіхлоргідріну товщина слизової оболонки дванадцятипалої кишки зменшувалася. Екстракт ЕП, а також тіотриазолін викликали збільшення товщини слизової оболонки дванадцятипалої кишки щурів, які не отримували епіхлоргідрин. У разі використання тіотриазоліну збільшення товщини слизової оболонки дванадцятипалої кишки було більш виразним і тривалішим. Встановлено, що введення екстракту ЕП, а також використання тіотриазоліну на тлі дії епіхлоргідріна призводило до зменшення виразності і

тривалості зменшення товщини слизової оболонки дванадцятипалої кишки, викликаної впливом епіхлоргідріну.

Висновки. Результати дослідження вказують на можливість використання цих препаратів для корекції ефектів епіхлоргідріну.

Ключові слова: дванадцятипала кишка, епіхлоргідрин, екстракт ехінацеї пурпурової, тіотриазолін, щури.

Introduction. A significant problem of modern humankind is the problem of environmental pollution. Anthropogenic pollutants contribute to the development of diseases. The state of the environment affects the course of diseases of the organs of the digestive system. One of the anthropogenic pollutants is epichlorohydrin (ECH). It is known that ECH affects the morphofunctional state of the stomach. However, the character of the effect of ECH on the duodenum was not studied.

The aims of the study are the investigation the changes in duodenum due to the long-term effects of ECH of rats and the evaluation the effectiveness of the use of Echinacea purpureum (EP) extract and thiotriazoline for the purpose of correction of the disorders.

Material and methods of the research. White male rats were used for txperimental modeling of the duodenum wall state. Experimental rats were divided into 6 groups of 30 rats in each group. The rats of 1-st group were rats for control. The rats of the 2-nd group received ECH. Rats of group 3 received EP extract. Rats of the 4-th experimental group received thiotriazoline. Rats of the 5-th group received ECH and EP extract. Rats of the 6-th group received ECH and thiotriazoline.

Rats were removed from the experiment at the 1-st, 7-th, 15-th, 30-th and 60-th day after completion of the 2-months administration of the investigated chemicals. Fragments of the duodenum were processed according to the standard histological methods. The preparates were stained with hematoxylin-eosin and by the method of Van Gieson.

Investigation of the duodenum was carried out using a laboratory microscope of the MS 100 series of Micros (Austria). The "Microvisible" software (version 1.11.10) was used to determine the thickness of the duodenal mucosa. Statistical analysis of the results of experiments was carried out using the STATISTICA-10 program. Determination of the validity of the differences was carried out using the U Mann-Whitney criterion. Differences were considered to be significant at $p<0.05$.

Results of the research and their discussion. The thickness of the duodenal mucosa of rats was decreased after the action of ECH compared with the thickness of the duodenal mucosa in rats of the control group. The decrease was by 19.2% ($p<0,01$) on the 1-st day, by 15.9% ($p<0.01$) on the 7-th day, by 12,6% ($p<0.01$) on the 15-th day, by 6.4% ($p<0.05$) on the 30-th day, by 3.6% ($p<0.05$) on the 60-th day. The thickness of the duodenal mucosa was increased by 20.5% ($p<0.01$) from the 1-st to the 60-th day after the end of the ECH administration (Table).

The thickness of the duodenal mucosa of rats under the conditions of the EP extract action was greater than in control group rats. On the 1-st day the increase was 4.6% ($p<0.01$). The thickness of the duodenal mucosa decreases by 3.6% ($p<0.05$) from the 1-st to 30-th day after the end of EP extract administration (Table).

The thickness of the duodenal mucosa of rats was increased after the action of thiotriazoline compared with the thickness of the duodenal mucosa in rats of the control group. The increase was by 6.05% ($p<0.01$) on the 1-st day, by 4.28% ($p<0.05$) on the 7-th day, by 4.34% ($p<0.01$) on the 15-th day. The thickness of the duodenal mucosa decreases by 3.7% ($p<0.01$) from the 1-st to 60-th day after the end of thiotriazoline administration (Table).

The thickness of the duodenal mucosa was decreased by 10.1% ($p<0.01$) on the 1-st day, by 7.2% ($p<0.01$) on the 7-th day, by 4.9% ($p<0.01$) on the 15-th day under the influence of ECH and EP extract compared with the duodenal mucosa thickness in the control group of rats. The thickness of the duodenal mucosa was increased by 11.3% ($p<0.01$) on the 1-st day, by 10.3% ($p<0.01$) on the 7-th day, by 8.8% ($p<0.01$) on the 15-th day, by 5.2% ($p<0.05$) on the 30-th day, by 3.7% ($p<0.01$) on the 60-th day, under the influence of ECH and EP extract compared with the thickness of duodenal mucosa in rats, which were administered with ECH. The thickness of the duodenal mucosa of rats, which were administered with ECH and EP extract, was increased by 12.3% ($p<0.01$) from the 1-st to the 60-th day of the study (Table).

The thickness of the duodenal mucosa in rats, which were under the influence of ECH and thiotriazoline, was decreased by 5.7% ($p<0.01$) on the 1-st day and by 4.4% ($p<0.01$) on the 7-th day compared with the thickness of the duodenal mucosa in the rats of the control group. The thickness of the duodenal mucosa in rats, which were administered with ECH and thiotriazoline, was increased by 16.6% ($p<0.01$) on the 1-st day, by 13.7% ($p<0.01$) on the 7-th day, by 12.7% ($p<0.01$) on the 15-th day, by 5.7% ($p<0.01$) on the 30-th day, by 3.6% ($p<0.05$) on the 60-th day compared with the thickness of the duodenal mucosa in rats received ECH. Between the 1-st and the 60th day after the end of the administration of ECH and thiotriazoline the thickness of the duodenal mucosa increased by 7.0% ($p<0.01$). The

thickness of the duodenal mucosa in rats, which were injected with ECH and thiotriazoline, was increased by 9.4% ($p<0.05$) on the 1-st day compared with the thickness of the duodenal mucosa in rats which were received ECH and EP extract (Table).

Table

The thickness of the duodenal mucosa, μm (M±SCO)

Group number	Day of research				
	1-st day	7-th day	15- th day	30- th day	60- th day
1 (n=6)	713,26 ±13,66	716,82 ±9,63	719,20 ±12,95	714,23 ±15,85	720,34 ±11,58
2 (n=6)	576,59 ±17,34^{x}	602,74 ±15,80^{x}	628,68 ±13,07^{x}	668,60 ±20,65^{x}	694,65 ±18,73^{x}*
3 (n=6)	746,20 ±17,09 ^{x}	731,57 ±14,65	729,60 ±13,20	718,97 ±19,88*	721,98 ±20,38
4 (n=6)	756,42 ±15,16^{x}	747,49 ±23,24^{x}	750,44 ±20,85^{x}	732,94 ±17,54	728,48 ±10,34*
5 (n=6)	641,48± 15,37$^{x\#}$	664,90± 17,25$^{x\#}$	684,25± 20,84$^{x\#}$	703,47± 19,01$^{\#}$	720,23± 13,24$^{\#}$*
6 (n=6)	672,31 ±19,94$^{x\#+}$	685,46 ±19,51$^{x\#}$	708,47 ±16,95$^{\#}$	706,67 ±13,74$^{\#}$	719,48 ±17,64$^{\#}$*

Notes: 1) ^{x} – $p<0,05$ – comparison with rats of control group (1-st group).

2) $^{\#}$ – $p<0,05$ – comparison with rats which were administered with ECH (2-nd group).

3) * – $p<0,05$ – comparison in one group rats in different days of the study.

4) $^{+}$ – $p<0,05$ – comparison with rats which were administered with ECH and EP extract (5-nd group) and rats which were administered with ECH and thiotriazoline (6-nd group).

Conclusions

1. There are disorders in the state of the wall of the duodenum in rats after epichlorohydrin long-acting. Epichlorohydrin causes decreasing the thickness of the duodenal mucosa. The expressiveness of the changes decreases over time.

2. Extract of Echinacea purpurea, as well as thiotriazoline, cause an increase in the thickness of the duodenal mucosa of rats on which epichlorohydrin did not act. The growth of the thickness of the mucous membrane in the case of the use of thiotriazoline is more expressiveness and long.

3. The use of Echinacea purpurea extract on the background of action of epichlorohydrin results in a reduction of the expressiveness and duration of decreasing in the thickness of the duodenal mucosa induced by the action of epichlorohydrin.

4. The use of thiotriazoline in conditions of epichlorohydrin administration reduces the expressiveness and duration of decreasing the thickness of the duodenal mucosa that arose

under the action of epichlorohydrin. These effects of thiotriazoline are more expressive than the similar effects of Echinacea purpurea extract.

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