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COMBINED EFFECT OF ETHYLTHIOSULFANYLATE AND VITAMIN E ON THE ENZYMATIC ACTIVITY OF AMINOTRANSFERASES IN RAT BLOOD PLASMA UNDER THE TOXIC EFFECT OF CR(VI)

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Cr(VI) is a potent prooxidant that causes damage, apoptosis and necrosis of liver cells by stimulating inflammatory processes and imbalancing the pro/antioxidant status of hepatocytes [1]. The enzymatic activity of blood plasma aspartate aminotransferase (AST) and alanine aminotransferase (ALT) is an important indicator of the structural and functional state of the liver in Cr(VI) poisoning [2]. Antioxidants suppress the hepatotoxic effect of Cr(VI) by stimulating antioxidant enzymes and inhibiting lipid peroxidation (LP) processes [1]. Ethylthiosulfanylate (ETS) is an organosulfur synthetic compound of the thiosulfonate class [3]. Our previous studies have established that ETS at a dose of 100 mg/kg body weight (b.w.) contributed to the normalization of blood ALT activity in laboratory rats under conditions of 7-day Cr(VI) intoxication. However, the effect of ETS in a similar dose is insufficient to normalize the activity of blood AST and ALT after 14 days of toxic exposure to Cr(VI) [4]. Therefore, it is also important to investigate the effectiveness of ETS in combination with other antioxidants under the toxic effect of Cr(VI) and to assess the potential benefits of the corresponding combined effect.

Aim. To investigate the peculiarities of the effect of ETS in combination with vitamin E on the enzymatic activity of AST and ALT in rat blood plasma under the toxic effect of Cr(VI).

Methods. The study was performed on male Wistar rats divided into 6 groups of 5 animals each. Animals of group I (control) were injected intraperitoneally (i.p.) daily with 150 µL of physiological saline for 7 days. Group III were injected daily i.p. with $K_2Cr_2O_7$ dissolved in 150 µL of physiological saline in the amount of 2.5 mg Cr(VI)/kg b.w. for 14 days. Group II were administered 1000 µL of oil daily intragastrically (i.g.) for 14 days, after which 150 µL of physiological saline was administered daily for 7 days. Group IV were administered 1000 µL of vitamin E oil solution [20 mg/kg b.w.] daily for 14 days, followed by 150 µL of physiological saline daily for 7 days. Groups V, VI were injected daily with 1000 µL of ETS oil solution [100 mg/kg b.w.] and vitamin E [20 mg/kg b.w.] for 14 days, after which 150 µL of physiological saline was injected daily for 7 days (group V) or $K_2Cr_2O_7$ for 14 days (group VI). The material for the study was the blood of rats, in which the activity of AST, ALT and de Ritis coefficient were determined. The obtained digital data were processed statistically with the help of Microsoft EXCEL program using the ANOVA method.

Results and Discussion. We have found a significant increase in the activity of AST and ALT in the blood plasma of rats after 14 days of toxic exposure to Cr(VI) (group III) by 40 and 122%, respectively, compared to the control group (group I) (Fig. 1.). It is known that Cr(VI) stimulates inflammatory processes in hepatocytes by increasing the expression of IL-1β, IL-6, TNF-α [1] and causes oxidative stress, which can cause hepatocyte damage and release of aminotransferases from liver cells into the blood plasma [5].

A significant decrease in the de Ritis coefficient in the blood plasma of rats after 14 days of exposure to Cr(VI) (group III) by 37% compared to the control was found, which is consistent with the literature [6].

Combined exposure to ETS and vitamin E by subsequent 14-day exposure to Cr(VI) (group VI) led to a significant activation of AST and ALT in the blood of animals by 24 and 61%, respectively, compared to group II. However, the activity of AST and ALT in the blood plasma of animals of group VI (24 and 61%) relative to group II was by 16 and 61% lower than the activity of the corresponding enzymes in the blood of animals of group III (40 and 122%) compared to group I. It is known that the effect of ETS enhances the antioxidant status of the liver by inhibiting the LP processes, activating antioxidant enzymes and accumulating the GSH pool [3]. In turn, vitamin E effectively protects cell membranes from damage by reactive oxygen species and activates the Keap1/Nrf2 signaling pathway, which leads to activation of the antioxidant system and cytoprotective mechanisms in hepatocytes [7].

Perhaps, it is the antioxidant and hepatoprotective properties of ETS in combination with vitamin E that can contribute to the stabilization of the activity of blood aminotransferases in rats during a 14-day period of Cr(VI) poisoning.

Conclusions. Thus, the combined effect of ETS [100 mg/kg b.w.] and vitamin E [20 mg/kg b.w.] contributed to a twofold decrease in the activity of AST and ALT during 14-day toxic exposure to Cr(VI).

In turn, according to our previous studies, the single effect of ETS [100 mg/kg b.w.] was not sufficient to reduce the activity of blood AST and ALT in rats under 14-day toxic exposure to Cr(VI).

Key words: Cr(VI), thiosulfonate, vitamin E, aminotransferases.

Author contribution. BIK carried out: determination of biochemical indicators, calculation of average values and standard errors, statistical analysis of data, interpretation and description of data, search and analysis of literature by topic.

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