

STUDY OF THE INFLUENCE OF MANGANESE UPON SULFHYDRIL GROUP CONTENT IN RAT ERYTHROCYTES

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The marked oxidation-reduction properties of manganese can influence upon the donor-acceptor processes and by this way upon the functional state of the erythrocytes.

Sulfhydryl groups (SH-groups) are one of redox-system regulators known. They are components of erythrocyte proteins, sulfur-containing amino acids, and glutathione. They are very important for the activity of numerous cell enzymes (5). SH-compounds play an essential role in the metabolism, in erythrocyte integrity maintenance (7), as well as in restoration of the active functional state of globin (4). The changes of SH-groups under the influence of various chemical factors present one of the indexes determining erythrocyte vitality (1, 6, 9, 14).

It is interesting to study SH-group concentrations when the influence of manganese on the functional state of erythrocytes is considered.

Material and methods

The study covered 126 sexually mature white male rats of Wistar breed with a mean weight of $125 \pm 10,0$ g (70 rats were manganese treated and 56 ones were controls). The animals were poisoned every day for a period of 40 days per os by using soft probe with 4 per cent $MnCl_2 \cdot 4H_2O$ solution in a dose of 50 mg/kg b. w. that is $1/100$ LD₅₀. They were killed by decapitation on the 8th, 15th, 20th, 25th, 30th, and 40th day, respectively. These terms were selected according to the data available about manganese ion absorption through the gastro-intestinal tract.

Erythrocyte mass was obtained by threefold washing with 0,9 per cent saline and centrifugation at 4 °C with 2600 revolutions per minute for 10 min (3). SH-groups were amperometrically determined in erythrocyte haemolysate after N. Ivanov's modified method (11). The results obtained are processed according to the method of variation analysis.

Results and discussion

SH-group concentration in erythrocytes of the control animals varies about a mean one of $7,61 \pm 0,63 \cdot 10^7/10^9$ U. These results are demonstrated on fig. 1. One can see that SH-groups in the erythrocytes of animals poisoned are reliably less ($p < 0,02$) in the first examination (on the 8th day). There are marked deviations in 62,5 per cent of the samples studied. On the 15th day after treatment SH-group content increases significantly ($p < 0,05$). These values are maximal during the whole period of the experiment. In comparison to the control level there are abnormalities in any animals treated (100 per cent). After the 15th day SH-group concentration diminishes and reaches its minimal level on the 25th day

when there are deviations in 88,9 per cent of the samples studied. However, after the 25th day there is an increase of SH-group concentration up to levels near to these of the control animals.

These results show that under manganese influence some changes in SH-group concentrations set in. Their primary reduction is probably due to the changes

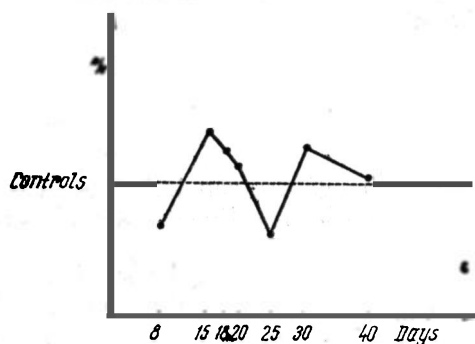


Fig. 1. Changes in the content of SH-groups (% against the controls)

of the physico-chemical state of the proteins (2, 9). It could be supposed that free SH-groups sink because of conformation alterations and some of them cannot be, therefore, determined by the method used. This presumption concerns any erythrocyte proteins including enzyme proteins, too.

SH-group concentration increase on the 15th day can be explained with the primary stimulating effect of manganese (8) that is confirmed by the considerable activation of thiol enzymes glucose-6-phosphate dehydrogenase and pyruvate kinase both (12).

Exposition prolongation causes opposite changes which are probably related to functional and structural alterations in blood cells.

The established increase of SH-group content during the second stage of the trial could be considered a result of an involvement of compensatory-adaptation mechanisms. However, their clarifying requires further investigations concerning manganese action on SH-groups containing compounds in erythrocytes during longer period of time.

On the basis of the data received it can be concluded that manganese applied in a dose of 50 mg/kg b. w. induces changes with phasic character in erythrocyte SH-group concentration in conditions of a subacute experiment.

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**ИЗУЧЕНИЕ ВЛИЯНИЕ МАРГАНЦА НА СОДЕРЖАНИЕ
СУЛЬФИДРИЛЬНЫХ ГРУПП В ЭРИТРОЦИТАХ КРЫС**

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РЕЗЮМЕ

Прослеживается динамически концентрация сульфгидрильных групп в эритроцитах 126 половозрелых белых крыс, которые ежедневно в течение 40 дней подвергались отравлению $MnCl_2$ в дозе 50 мг/кг телесного веса при введении через рот. Животные декапитировались в восьмой, пятнадцатый, двадцатый, двадцать пятый, тридцатый и сороковой дни. Сульфгидрильные группы определялись в гемолизате эритроцитов амперометрическим способом.

Полученные результаты указывают на периодичность изменений в концентрациях сульфгидрильных групп. Устанавливается первоначальное достоверное уменьшение сульфгидрильных групп в восьмой день с последующим последовательным увеличением. В пятнадцатый день отмечаются максимальные стоимости за весь период исследования. После пятнадцатого дня снова наблюдается постепенное уменьшение.