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INFLUENCE OF DISPLACEMENT STRESS ON GLUTATHIONE LEVEL IN THE LIVER AND KIDNEY OF RABBITS

Short communication

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ABSTRACT

The experiment was conducted on 90 rabbits aged 3 months and of body weight 2.5 kg, which were divided into three genetic groups: New Zealand White, Zobor and Nitran. Experimental animals were transferred to new cages every day for 30 days. The concentrations of reduced glutathione in the liver and kidney of rabbits decreased, but not significantly.

Key words: glutathione, rabbits, displacement stress

INTRODUCTION

Social stress in livestock production can appear in many forms. Much of this stress is in response to the competition among animals for limited or controlled resources. Animals respond to changes in their environment by a variety of interlocking anatomical, physiological, biochemical, and behavioral adaptation mechanisms (Bhatnagar and Dallman, 1998; Meister, 1995; Morrow-Tesch et al., 1994; Sohal and Weindruch, 1996).

This paper analyzes the possible changes in the concentration of reduced glutathione in the organs of three genetic groups of rabbits under the influence of displacement of animals from cage to cage. Attention was also paid upon factors influencing the animals for a very long time. However, the problems of stress reactivity require further research depending on genetic differentiation of investigated animals.

Glutathione has profound importance in cellular homeostasis and is also necessary for diverse cellular functions (Anderson, 1997; Bray and Taylor, 1993; Cai at al., 2003; Dringen et al., 2000; Schulz et al., 2000). GSH plays a role in diverse biological processes as protein synthesis, enzyme catalysis, transmembrane transport, receptor action, intermediary metabolism and cell maturations (Jocelyn, 1972; Kołątaj, 1993; Meister, 1995; Meister, 1994; Potačková et al., 2003).

MATERIAL AND METHODS

The study was carried out on 90 three-month old male rabbits having the body weight 2.5±0.3 kg. The animals were maintained in the breeding farm of the Research Institute of Animal Production in Nitra, Slovak Republic.

The rabbits belonged to three genetics groups: New Zealand White, Zobor, and Nitran. All the animals were fed in a standard manner with industrial protein mixtures only. They had constant access to water and were provided with a good veterinary care. The experiment consisted of disturbing the animals by displacing them from cage to cage daily for 30 days. Displacement of animals was carried out always between 8.00-11.00 a. m. The control groups of rabbits were not displaced.

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After 30 days the animals were slaughtered by breaking the spinal cord. Liver and kidney were taken for examination. Liver was subjected to perfusion by a solution of physiological salt cooled to 4°C. Homogenization was performed in 0.1 M phosphate buffer (pH 7.4) with 10 mM EDTA, in a Potter type homogenizer with a teflon piston at 200 rot./min. Homogenates were centrifuged for 15 min. at 12 000 rot/min. in a Janetzky centrifuge K-24. After deproteinization by 10% trichloroacetic acid in supernatants the level of glutathione in mM/g of tissue were determined by the Ellman,s (Ellman, 1959) method. The substrates used were purchased from Sigma. Extinction values were recordered on a Specol photometer at the wavelenght 412 nm.

Statistical analyses were carried out with ANOVA, Fisher,s test, and t-test. Differences were accepted as significant at $p< 0.05$.

RESULTS AND DISCUSSION

As can be seen from Table 1, the level of GSH in the control groups was higher in the liver than in the kidney. This phenomenon suggests the existence of differential metabolic rate in the studied organs. It may be determined by adaptive processes too, because the organs studied are functionally different.

As can be seen from the table, the animals of three genetic control groups did not show differences.

Reduced glutathione levels in the liver and kidney of the all animals did not differ significantly. However, a decrease in GSH level was observed in the kidney of New Zealand rabbits to 85%, Zobor rabbits to 83% and Nitran rabbits to 88%. In the liver, the concentrations decreased analogously to 83%, 91% and 91%, respectively.

Many publications suggest that different kinds of stress result in reduction in the concentration of reduced glutathione in animal organs (Bhawaj et al., 1998; Grattagliano et al., 2000; Madrigal et al., 2001).

Severe decrease in glutathione concentration was noticed also in our earlier investigations after starving, immobilizing, crovding and transporting of pigs (Świderska-Kołacz et al., 1997; Świderska-Kołacz and Kołątaj, 1994).

Minor differences in glutathione level in the studied tissues after transfer of rabbits were caused by adaptative processes in biochemical reaction of stress and/or by long time of experiments. It is, therefore, possible to suppose that displacement stress (transfer) is "weaker".

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Table 1: The influence of displacement stress on glutathione concentration (mM/g) in the liver and kidney ($\bar{x}$ ± SE and percent) of rabbits

Race	Group		Liver		Kidney	
			$\bar{x}$ ±SE	%	$\bar{x}$ ±SE	%
New Zealand White	control	n =15	14.41 ± 2.14	100	9.09 ± 1.09	100
	experimental	n =15	11.95 ±1.02	82.92	7.74 ± 1.01	85.09
Zobor	control	n =15	13.09 ± 1.09	100	9.39 ± 1.29	100
	experimental	n =15	11.85 ± 1.23	90.54	7.88 ± 0.99	83.93
Nitran	control	n =15	12.90 ± 1.40	100	9.19 ± 1.31	100
	experimental	n =15	11.80 ± 2.01	91.49	8.12 ± 1.14	88.32

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