The Effect of the Slaughter Method, Inbred, Age and Race on the Glutathione Level in some Organs of Rabbits (short communication)

Summary
Seventy day old New Zealand rabbits had a significantly higher level of glutathione /GSH/ in the liver, kidney and muscle than the animals aged 140 days. The random and inbred mated New Zealand rabbits revealed higher its concentration than those of the Bay Black breed.
Injection of 10% MgSO$_4$ solution caused an increase of glutathione level in the studied liver, kidney and muscle.

Key Words: rabbit, glutathione, age, inbred

Introduction
Glutathione /GSH/ has an essential influence on the directions and intensity of some metabolic processes (ASSMANN et al., 1998; BRAY and TAYLOR, 1993; FOX et al., 1996; SEN, 1997; SMITH et al., 1996; SUZUKI et al., 1998 ). As the role of GSH in organism is significant, the aim of this study was to determine its content in organs of the model animals, such as rabbits, depending on breed, age, mating as well as the slaughter method.

Material and Methods
The study was performed on 120 rabbits of the New Zealand White breed. The animals were 70 day old and 140 day old, weighed 0.8-1.2 kg and 2-2.0 kg suitable, mated inbred (the parents: brother x sister, father x daughter, mother x son) and random, and 60 rabbits of Black Bay breed, aged 140 days, weighed 2.0-2.5 kg also mated randomly and by inbreeding. The animals were kept in standard cages in ventilated farm room of temperature 18°C and 50:50 dark/light in the Department of Genetics and Methods of Animal Improvement of the Academy of Agriculture in Cracow.
The animals were fed standard industrial granulated fodder for rabbits, a diet consisting of 15% protein and hay ad libitum according to farm system of feeding. They had the access to water too. The all individuals had the good veterinary nurse. The animals of first subgroup were killed by breaking their spinal cord with strong blow (classical method) while in the second subgroup by injection of 2 ml/kg b.w. 10% solution of MgSO$_4$ to the ear vein. After the administration of MgSO$_4$ or the blow the animals were allowed to bleed. The control subgroups were the rabbits slaughtered by the „classical method”.

After slaughter, always in the time 10:00-12:00 a.m. tissue slices of liver, kidney and muscle (musculus longissimus dorsi at the height of the last rib) were homogenized in a glass Potter homogenizer cooled to 4°C in 10 ml of 0.25 M saccharose containing 10 mM EDTA. Homogenates were centrifuged for 15 minutes in a Janetzki K-24 centrifuge under 12 000 g./min.

After deproteinization by 10% trichloroacetic acid in supernatant the level of glutathione by the ELLMAN method (1959) was determined. The substrates were produced by Serva Company.

Extinction values were recorded on a Specol photometer at the wavelength 412 nm. The results obtained were calculated statistically according to the test-Student.

Results

Table 1 shows that 70 day old animals of the New Zealand group had a statistically

<table>
<thead>
<tr>
<th>Age</th>
<th>Mating</th>
<th>Liver</th>
<th>Kidney</th>
<th>Muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 days</td>
<td>Random</td>
<td>145.1±204.0'</td>
<td>755.7±59.0'</td>
<td>427.3±76.9'</td>
</tr>
<tr>
<td></td>
<td>Inbred</td>
<td>1368.8±161.6</td>
<td>754.5±66.1</td>
<td>398.4±47.3'</td>
</tr>
<tr>
<td>140 days</td>
<td>Random</td>
<td>803.8±26.0</td>
<td>440.9±3.8</td>
<td>240.6±6.8'</td>
</tr>
<tr>
<td></td>
<td>Inbred</td>
<td>779.7±73.9</td>
<td>418.9±80.9</td>
<td>189.9±51.6'</td>
</tr>
</tbody>
</table>

Table 2

<table>
<thead>
<tr>
<th>Mating</th>
<th>Slaughter</th>
<th>Liver</th>
<th>Kidney</th>
<th>Muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random</td>
<td>Classical method</td>
<td>1451.4±204.0</td>
<td>755.7±59.0</td>
<td>427.3±76.9'</td>
</tr>
<tr>
<td></td>
<td>MgSO$_4$</td>
<td>1901.5±161.5</td>
<td>1061±117.6</td>
<td>596.9±83.6'</td>
</tr>
<tr>
<td>Inbred</td>
<td>Classical method</td>
<td>1368.8±161.6</td>
<td>754.5±66.1</td>
<td>398.4±47.3'</td>
</tr>
<tr>
<td></td>
<td>MgSO$_4$</td>
<td>1485.5±273.8</td>
<td>1020.1±53.9</td>
<td>558.9±72.6'</td>
</tr>
</tbody>
</table>

The statistically confirmed differences between the groups of rabbits killed classically and MgSO$_4$ administration.
higher level of GSH than 140 day old ones. GSH level in the liver, kidney and muscle was somewhat higher in the random than in the inbred animals. The GSH level was statistically higher in the liver than kidney and muscle and higher in the kidney than in the muscle.

Table 2 and 3 inform that of the GSH level in all of studied organs was higher after magnesium sulfate administration. Besides, NZ animals had in all organs the higher GSH concentration than BB rabbits.

Table 3
The level (x±S_d) of GSH in the liver, kidney and muscle (nM/G of tissue) of 140 day old mated inbred and random New Zealand and Black Bay Breed rabbits, killed classically and by 10% MgSO_4 injection; n in each subgroup=15

<table>
<thead>
<tr>
<th></th>
<th>Classic method</th>
<th>Random</th>
<th>Inbred</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MgSO_4</td>
<td>MgSO_4</td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liver</td>
<td>803.8±26.6</td>
<td>1301±200.6</td>
<td>779.7±73.9</td>
</tr>
<tr>
<td>Kidney</td>
<td>440.8±99.8</td>
<td>801.8±198.6</td>
<td>418.9±80.9</td>
</tr>
<tr>
<td>Muscle</td>
<td>240.3±60.8</td>
<td>319.3±54.2</td>
<td>189.9±51.7</td>
</tr>
<tr>
<td>Black Bay Breed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liver</td>
<td>789.9±72.0</td>
<td>858.5±86.9</td>
<td>703.7±63.7</td>
</tr>
<tr>
<td>Kidney</td>
<td>197.7±60.5</td>
<td>206.9±70.9</td>
<td>205.0±64.9</td>
</tr>
<tr>
<td>Muscle</td>
<td>182.5±27.3</td>
<td>201.9±34.1</td>
<td>151.1±33.1</td>
</tr>
</tbody>
</table>

Discussion

The results obtained revealed in the majority of cases the significant changes of GSH concentrations under the influence of the slaughter method, the kind of mating, age and breed. These phenomena can suggest the existence of a differentiated metabolism rate in the studied organs depending on age, breed, the degree of relationship. It may be determined by adaptation possibilities too, because the organs studied are functionally different (JOCELYN, 1972; SWIDERSKA-KOŁACZ and KOŁATAJ, 1994). In the animal cells the glutathione level seems to be dependent of age (LENARTOWICZ et al., 1996).

It is known, younger animals have a higher metabolism rate, and the glutathione is, amongst others, connected with their higher red-ox potential in the cells (BRAY and TAYLOR, 1993; BROWN, 1994; FOX et al., 1996). Our experiment would confirm this suggestion because the 70 day old rabbits had a higher level of thiol groups than 140 day old ones.

The earlier studies of KOŁATAJ et al. (1979) revealed that in the content of sulphydryl compounds in the blood and some organs of hens and chickens were inter-breed differences. New Zealand rabbits from our experiment had a higher level of glutathione than the animals of the Bay Black breed. In all the studied organs of inbred rabbits was the level of thiol groups lower than in the randomized animals. It is known that the homozygosity in animals is not favourable. It may be due among others, that
lower glutathione level in the inbred rabbits may be interpreted in the connection with the inbred relationship.

An analysis of stress caused by „classical” slaughter and narcosis by 10% solution of MgSO$_4$ revealed a higher level of glutathione after MgSO$_4$ injection. Probably it is the result of antistress action of Mg$^{2+}$ ions (EVANS et al., 1996; LEHR, 1981; SEELIG, 1980). The role of Mg$^{2+}$ in defensive processes as an antistress and antitoxic factor was discussed by DURLACH (1991). It has been found that Mg$^{2+}$ has an effect on the release of neurotransmitters, counteracting the effect of calcium. Mg$^{2+}$ ions weaken probably stress reaction by participation in intracellular degradation of catecholamines too.

Application of MgSO$_4$ as a slaughter medium has proved that it is more favourable than the classical method of hitting the neck by a bar. In the case of slaughter by narcosis the animal is only subjected to injection MgSO$_4$ to the ear vein conducted in a possibly mild and stress-free way. During „classical” slaughter the animal is turned down by the head, suspended in the air. It receives a blow in the neck and it is subjected to a strong stress action from the side of central nervous system and peripheral stressors. Besides, after the blow occur preagonal tetanic convulsions, prolonged muscle contractions which are not favourable for the subsequent consume quality of meat because they change the picture of muscle glycolyse processes.

In connection with these suggestions we would like to propose the MgSO$_4$ administration in the conditions of slaughter without the stress.

Acknowledgement

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