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Original Paper

The impact of including rest time between transport and slaughter on the IGF-1 and cortisol concentration in the blood serum of barrows

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The aim of our experiment was to observe the differences of IGF-I and cortisol concentrations in the blood serum of pigs when killed immediately after transport and after a 48 hour stay in a slaughterhouse. We tested 24 Large white barrows from one breed with the average weight of 105 kg. The first group went through a 2 hour long transport before slaughter. After being delivered to the slaughterhouse, the barrows were killed immediately. After transport, the second group was stabled for 48 hours in a stabling space near the slaughterhouse and the barrows were killed after that. There were 12 animals in each experimental group. Blood samples were taken immediately after slaughter. We used the ELISA method to determine IGF-I and cortisol concentration in the serum. The IGF-I concentration in the serum was significantly lower (*hhh* <0.01) in the barrow group that was killed after the 48 hour stay in the stabling space near the slaughterhouse, as opposed to the barrow group that was killed immediately after transport. The cortisol concentration in the serum of both experimental groups did not display significant differences. Our results indicate that stabling animals in a waiting stabling space near the slaughterhouse can cause a long-lasting stress instead of relax.

Keywords: IGF-I, cortisol, pig, serum, stress

1. Introduction

Pig breeding aims to select individuals with good growth parameters. IGF-I is one of the growth factors that are connected with muscle growth (Horvat and Medrano, 1995; Yu et al.,1995). This growth factor provides muscle cells with differentiation by binding to their specific IGFR receptors (Oksjerg et al., 2004). This binding activates intracellular mechanisms which have anti-apoptotic effect and are connected with cell survival. They also activate the cell reparation anabolic processes (Ikonen, 2001; Farmer et al., 1991). A long-lasting absence of IGF-I can disturb this mechanism, which leads to pathogenic changes in the development of cell metabolism. Exposure to physical or mental stress leads to a decreased IGF-I concentration in the blood (Petrák, 2006; Debreceni and Petrák 2007; Petrák et al., 2011). The concentration of cortisol represents markers connected with catabolic processes in organisms (Suzuki et al., 2004). After stress, its concentration is increasing (Petrák et al., 2011).

The aim of the paper was to verify whether it is appropriate to provide animals in a slaughterhouse with time to rest after their transport to support the renewal of IGF-I concentration in their blood circulation.

2. Material and methods

Experimental animals: The experiment took place in The Experimental Centre of The Department of Special Animal Husbandry. There were 24 Large white barrows from one breed with the average weight of 105 kg. Every pig included in the experiment was a dominant homozygote selected according to the polymorphism of the RYR-1 gene. Both the first and the second group included 12 animals. Animals from the first tested group were killed within 2 hours after their transport to the slaughterhouse. The stress was simulated by a 2 hour long transport and a short-time stay in the slaughterhouse. After transport, animals from the second tested group were placed near the slaughterhouse for 48 hours and then they were killed. When delivered to the slaughterhouse, the animals were fed. The feeding stopped 24 hours before slaughter.

Sample taking: The blood was taken during the killing from a bleeding cut after an electric shock. Free serum was gained and it was coagulating by laboratory temperature until it created blood coagulums (after 4 hours). Serum with blood coagulums was removed by suction and pipetted into aliquot amounts and then frozen to -20 °C until their next processing.

Determination of the IGF-I and cortisol concentration: Observed parameters were quantitatively evaluated using the immunoenzymatic method. The IGF-I was analyzed using anti-stuff and chemicals from the IDS Company. The cortisol was analysed using anti-stuff and chemicals from the Biovendor Company. IGF-I and cortisol concentration was measured on a microplate reader – the DV990BV4

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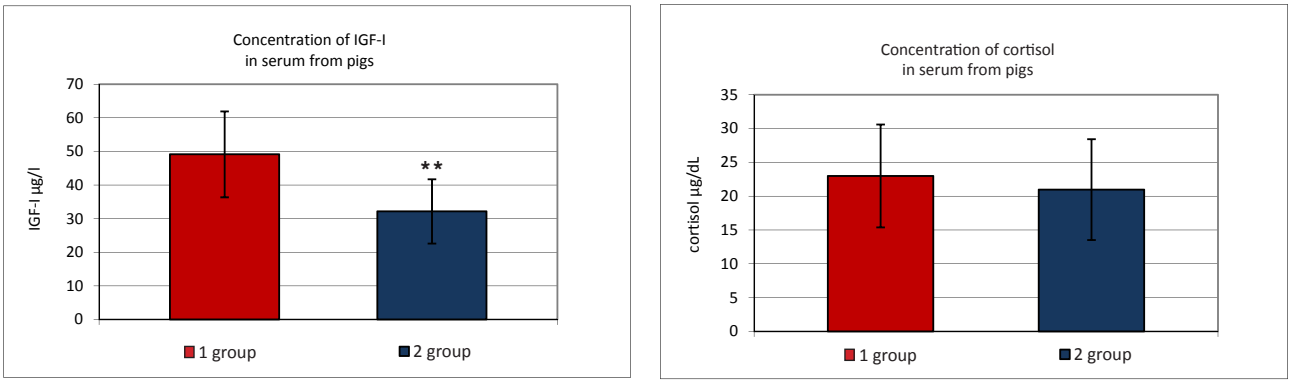

Figure 1 The change of IGF-I and cortisol concentrations in the serum of pigs immediately after transport and after a 48 hour rest

1st the first group: animals from the first tested group were killed within 2 hours after the transport to the slaughterhouse; 2nd the second group: animals from the second tested group stayed in stables near the slaughterhouse for 48 hours and then they were killed. The level IGF-I of significance is (p <0.01++)

model. Statistical significance between groups was tested using a *t*-test.

3. Results and discussion

The experiment proved that the average IGF-I concentration in the first group serum was 49.14 µg l^{-1}. In the second group where animals rested for 48 hours in stabling spaces near the slaughterhouse, the average IGF-I concentration reached 32.16 µg l^{-1}. When comparing these results using the t-test, we found out they reached a significant statistical difference at the level of ($p \leq 0.01$). However, no significant differences were found in the average cortisol concentrations of both observed groups. In the first group, the cortisol concentration was 22.98 µg dL^{-1} and in the second group, we measured a cortisol concentration of 20.97 μg^{-1} dL^{-1} (Figure 1). The difference between both tested groups in IGF-I concentration reached the level of (p <0.01++). When observing cortisol concentrations, we have not recorded statistically significant differences.

The rest time after transport was supposed to refresh the physiological losses of animals which were created by stress; in this case the transport to the slaughterhouse. Acute stress evokes a significant decline in IGF-I concentration in the serum which was determined by Farmer et al., 1991 who measured the decline of IGF-I concentration in serum in the amount of 21% during the 60th minute after stress. A further declining tendency was determined. Our results focus on the significant decline of IGF-I concentration in the second group. This effect is probably connected with the active uptake of IGF-I from the circulation. According to literary sources, a basic IGF-I concentration level should be much higher (Weiler et al., 1998; Gondreta et al., 2005; Suzuki et al., 2004). Cortisol takes part in the development of catabolic processes in organisms. In the second group, average cortisol values were at the level where they are considered to be stress values (Hizume et al., 2006; Yoshioka et al., 2004). In spite of the fact that the animals from the first group were given a 48 hour rest, the cortisol concentration did not return to its basic value – it maintained the increased stress values. This fact suggests that the animals had in fact no rest, but they were in permanent stress and in their organisms, catabolic processes connected with protein degradation were activated. However, as the stabling places were not directly in the slaughterhouse, we can consider these changes in the serum to be stress evoked by a change of environment.

4. Conclusions

Our results suggest that having a 48 hour rest after transport is not relaxing for animals; it deepens the stress load after the transport to the slaughterhouse. Because of this, we can say that the rest time after transport to the slaughterhouse is not necessary and it is more appropriate to kill the animals as soon as possible.

5. Acknowledgements

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6. References

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