The influence of stress on milk production and its quality

J. Sokol[1], J. Golian[2], E. Dudrikova[3], D. Rajsky[1] & L. Lorincak[1]

[1]Regional Veterinary and Food Administration, Zavarska 1,
918 21 Trnava, Slovak Republic
E-mail: kvstt@svssr.sk

[2]The Slovak University of Agriculture, A. Hlinku 2,
949 01 Nitra, Sloval Republic
E-mail:jozef.golian.AF@uniag.sk

[3]University of Veterinary Medicine, Komenskeho 73,
040 01 Kosice, Slovak Republic
E-mail: dudrik@uvm.sk

Introduction

In the breeds of animals producing raw materials and foodstuffs of animal origin there occur different stress situations. The animals are influenced by the stress factors of different intensity and duration.

The stress situations in beef cattle often leads to the decrease of production, growth, changes in sexual functions, the decrease of resistance to secondary infections.

This work describes the stress situations in relation to milk production and its quality (the way of stabling, cool and warmth, starving, immobilization, transport and physical strain).

The objective of this work was:

- General analysis of the stress situations in animals producing raw materials and foodstuffs of animal origin;
- Analysis of the stress situations in beef cattle;
- Formulating the basis requirements for the creation of optimum living conditions for animals and
- Formulating the individual elements of the system of animal complex care.

Material and methods

Materials and methods were used in compliance with the provisions of the Act 488/2002 Coll., relevant approximation decrees of the Government of the Slovak Republic of the year 2003, Council Directives 92/65/EEC as amended by the Decision of the Commission 95/176 EC and the Decision of the Commission 2001/298, Council Directive 90/425/EEC, as amended by other directives.

Results and Discussion

General Analysis of Stress Situations

New knowledge of the course of stress reaction required revaluation of the original conception. At present the stress is characterized as a specific reaction of organism to the stimuli which threaten homeostasis (Sokol et. al., 2004).

Stress (strain reaction) is a complex response of the organism to acting of stressor.

The main hormonal mechanism of stress is activation of the hypothalamus - sympathicoadrenal system – adrenal medulla axis and activation of hypothalamus (CHR) - adenohypophysis (ACHT) – adrenal cortex (glucocorticoids) axis.

Laboratory examination of the endocrine function of hypothalamo – adenohypophysal system includes:

1. determinations of basal concentrations of adenohypohysis hormones in plasma
2. determinations of hormones of their target glands
3. functional tests

In connections with the problems of stress we must take into consideration also:

- the importance, influence and function of stress proteins, which are responsible for the protection of cells against impairment (Whithey et al., 1999; Coss and Limnemans, 1996; Musch et al. 1999)
- the influence of stress on immune functions, mainly the relation of intensive and long-term stress to single strain
- the influence of immune system on the stress axis (active substances produced by thymus – thymosin and thymoprotein).

Stress situations in beef cattle

They often lead to the decease of production and growth, changes in sexual functions, decrease of the resistance to secondary infections and increase of susceptibility to these infections.

The most important stress situations include:

- Way of stabling
- Cold and warmth
- Warmth and milk production
- Malnutrition stress in cows
- Starving
- Transport of heifers and milk cows
- Physical strain
- Relation to immunity
- Glucocorticoid diabetes of calves
- Microclimatic stress
- Environmental stress
- Catecholamines and glucocorticoids
- Catecholamines

- Activation of b-adrenoreceptors
- Glucocorticoids
- Increased level of cortisol in milk cows with post-delivery paresis, which may deteriorate the disorders of immunity11
- Energetic strain with the development of hyperglycaemic and hyperinsulinemic ketosis, which evokes ketoses of type II16
- Disorder of calcium homeostasis of milking cows17-19 caused by a high consumption of calcium for the production of colostrum and milk and
- Syndrome of peripatal crisis of milking cows.

Conclusion

The stress situations occurring in the breeds of milking cows have an important influence on their health, comfort and production.

In these connections it is necessary to:

- Provide optimum living conditions and to minimize the influence of individual stressors;
- Apply the system of complex care of animals in the chain: man – producer – consumer – economy, legislation and social consensus;
- To objectivise other influences of the environment on stabled animals and related changes of clinico-biochemical processes and immune functions;
- To verify new diagnostic procedures and methods and to introduce them to the laboratory practice.

References

Coss, R. A., Linnemans, W.A.M., 1996: The Effects of Hyperthermia; 12:173-196.

Koubkova, M., 2000: Stresova reakce, apoptoza a nekroza bunek, jejich vzajemný vztah-review. Veterinarstvi, 11/2000.449-451.

Musch, M. W., Sugi, K., Straus, D., Chang, E. B., 1999.: Heat-shock Protein 72 protects Against Oxidant-induced Injury of Barrier function of human Colonic Epithelial Cao2/bbe Cells. Gastroenterology; 117:115-122.

Sokol, J., Golian, J., Rajsky, D. ,Hanzel, S. ,Letovanec, P., 2004: Stresove situacie pri hovädzom dobytku a postupy ich mozneho ovplyvnovania *(Stress Situation in Beef Cattle and Procedure of their Possible Influencing)*. In: Zbornik prednasok a posterov z Medzinarodnej konferencie Dni vyzivy a veterinarnej dietetiky VI – Aktualne otazky vyzivy, produkcie a zdravia hospodarskych zvierat, 7.-8. september 2004. Kosice, UVL, 2004: 86-90. ISBN 80-8077-009-3.

Whitley, D., Goldberg, S. P., Jordan, W. D., 1999 : Heat Shock Proteins- A Review of the Molecular Chaperones. J. Vasc. Surg., 1999; 29:748-751.