

BEHAVIOUR OF SOWS AND PIGS IN A COURSE OF THE LACTATION PERIOD**Mirjana Joksimović-Todorović, Slavča Hristov, Vesna Davidović***Faculty of Agriculture, Zemun–Belgrade, 11080 Serbia*
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Physiological condition activating maternal behaviour is very complex, because it is caused by changes in endocrine and nervous systems. Sows are different from other mammals, so that sows bear a large number of mature babies, capable of suckling immediately. The beginning of suckling is initiated by the sow. By squealing the sow calls the pigs, which by tactile excitation of teats lead to secretion of milk. During the gestation the sow is increasing the body reserves to accommodate the production of milk post partum. Post partum anabolic processes become catabolic, giving priority to the dairy gland in relation to other tissues. The levels of catabolic processes during lactation depend on the dietary value of secretion. Maximum secreted milk takes place between the 2nd. And the 3rd week. Sows lose in the body mass and it causes changes in the value of some blood parameters. The level of glucose in plasma is low (it is decreasing for more than 50%), while the level of urea is high, due to huge proteins available. It can also be noticed that there is a high mobilisation of the body fat, an increasing level of the NEFA (non-esterified fatty acid). Secretion of milk is under control prolactin and oxytocin. Oxytocin affects the maternal behaviour and prolactin is linked with suck timing. Sows have necessity to be devoted mothers. They maintain regular suckling in order to reduce cross-suckling (pigs suckling other sows).

Key words: behaviour; sow; pig; lactation**ОДНЕСУВАЊЕ НА МАТОРИЦИ И СВИЊИ ВО ТЕКОТ НА ЛАКТАЦИСКИОТ ПЕРИОД**

Со активирањето на мајчинството, физиолошката состојба станува многу комплексна, бидејќи е предизвикана од промени во ендокриниот и нервниот систем. Маториците се разликуваат од другите цицачи по тоа што одгледуваат бројно потомство, способно веднаш за цицање. Почетокот на цицањето е инициран од маторицата. Маторицата со звуци ги повикува прасињата коишто притискаат на брадавиците, што доведува до секреција на млеко. За време на бременоста маторицата ги зголемува телесните резерви за да овозможи производство на млеко по породувањето. Анаболичките попартусни процеси стануваат катаболички, при што приоритет има производството на млеко во однос на другите процеси. Нивото на катаболичките процеси за време на лактацијата зависи од хранливата вредност на млекото. Максималното излучување на млеко е помеѓу 2-та и 3-та недела. Маториците губат на маса и се покажуваат промени во параметрите на крвта. Нивото на глукоза во плазмата е ниско (намалено е за повеќе од 50%). Нивото пак на уреа е високо, што се должи на високото ниво на протеини. Исто така е забележано дека постои висока мобилизација на телесна маст и зголемено ниво на NEFA (неестерифицирани масни киселини). Секрецијата на млеко е под контрола на хормоните пролактин и окситоцин. Окситоцинот дејствува на мајчинското однесување, а пролактинот е поврзан со времето на цицање. Тие овозможуваат редовно цицање, за да се оневозможи и вкрстено цицање (прасиња да цицаат од други маторици).

Клучни зборови: однесување; маторица; свиња; лактација**INTRODUCTION**

Hormonal changes, prior and post parturition do impel the sow to build a nest. It is one of the main characteristics of sow behaviour started by an individual 24 h or 15 h prior parturition at the

latest (Damm et al., 2003), and it is the result of increased secretion of prostaglandin F_{2alfa} (Burne et al., 2001). Enclosed housing systems hinder this need which is frustrating to sows, especially in the phase when pregnant sows are being removed into buildings in which they are kept individually in

impacted boxes (Vučinić and Hristov, 2002; Hötzel et al., 2005). In order to avoid these stress situations, a week prior parturition it is necessary to supply sows with suitable material for nest building-up (Stanković et al., 2007). The use of jammed boxes in farrowing houses represents the problem discussed for many years with the purpose to protect the welfare of both sows and piglets (Hristov et al., 2001).

The increased level of cortisol can indicate frustrations when the sows deprive themselves of natural behaviour (Mason et al., 2001; Thodberg et al., 2002). Numerous physiological and biochemical studies have been used for the estimation of welfare and they are mostly concerned with the determination of the adrenal gland and hypophysis hormones concentration, especially glucocorticosteroids (GK) in blood (Hristov and Bešlin, 1991; Hristov et al., 2008). Increased levels of cortisol, insulin and thyroid hormones indicate the presence of stress (Joksimović-Todorović et al., 2007). Changes occurring in the hypothalamus-hypophysis-adrenal cortex system or the vegetative nervous system are not reflected in the form of some psychological reaction but they are reflected on the homeostatic metabolic processes and the animal immunity system (Joksimović-Todorović et al., 2008).

It is necessary to bring the sow into a certain condition by the farrowing term. Diets must be of good quality, protected against contamination and development of mycotoxins (Jokić et al., 2003; Joksimović-Todorović et al., 2004; Petrović et al., 2007). After parturition the organism of the individual passes from anabolic to catabolic state when sows lose their body mass and the concentrations of some hormones, concentration of glucose, urea and non-esterified fatty acids (NEFA) in blood (Algers and Uvnäs-Moberg, 2007) change. The most intensive catabolic processes in sows occur in the 3rd and 4th lactation week when piglets reach the plateau in their daily liveweight gain.

METABOLIC CHANGES IN SOWS FROM THE PREPARTAL PERIOD TO WEANING

Maternal ability represents complex interactions between different forms of behaviour and physiological characteristics. Factors that influence sow maternal behaviour are litter size, vitality, health and regime of nutrition. Sows differ from other domestic mammals because they bring forth a large number of mature young capable of imme-

diately suckling. Suckling is initiated by the sow by calling the piglets making some grunting sounds while piglets try to stimulate sow's teats for milk ejection by tactile teasing (Vučinić and Radenković-Damjanović, 2000). During gestation mother's body reserves are increasing in order to provide milk production after parturition. After parturition the organism passes from anabolic into catabolic state so that the mammary gland gains priority in relation to other tissues (Špinka et al., 2002). The level of catabolic processes during lactation depends on the nutritive value and quantity of milk secreted and it is most intensive between the 2nd and the 3rd lactation week. Sows lose their body mass and there also occurs the change in the concentration of some blood plasma ingredients (lower activity of lipoproteinlipases and the rate of fatty acids synthesis) even when sows are fed ad libitum. Diet intake cannot compensate completely the needs for milk production and the energy balance is usually negative. High demands for energy lead to abundant catabolic processes especially in the third week (Kraetzl et al., 1998).

Glucose – During lactation the level of glucose in plasma is low since about 50% glucose is used by the mammary gland for milk production. The level of glucose in blood may be increased in the first week of lactation but after that it significantly decreases in the third and fourth week. It is possible that glucose is not directly used from the body reserves for milk production since pigs obtain high levels of starch by nutrition.

Urea – High levels of urea indicate the use of high levels of muscular proteins although this assertion is inconsistent and is not in direct relationship with the loss of the body mass.

Unsaturated fatty acids as a product of fats metabolism are a reliable sign of the catabolic state and only small quantities come from food. The level of NEFA increases at the end of gestation and it is the highest in the middle and at the end of lactation. Their concentration is used mostly as a measure of energy status post-parturition and catabolism of fats in sows (Hulten et al., 1993).

SOW ENDOCRINE SYSTEM

Maternal behaviour and metabolic processes are partly under the control of the endocrine system. Building-up of nest for farrowing is induced by the increase of the concentration of prolactin, while the increase of oxytocin is perceived at the end of nest building. Maintaining of lactation

depends on the level of prolactin, while the oxytocin is essential for the reflex of secreting milk. Concentration of oxytocin increases abruptly during suckling, it reaches peak levels during milk ejection when the stimulation of teats by piglets is sufficient. After milk ejection the oxytocin returns to its basic level.

Prolactin is the most important hormone which promotes and maintains lactation. The level of prolactin increases in the last week of gestation and attains maximal concentration immediately prior parturition and in the first two weeks of lactation (Kraetzel et al., 1998). Secretion of prolactin is stimulated by teats massage, its concentration increases gradually, not abruptly as it is the case with the level of oxytocin, and the greatest confirmed level is 10–20 min after suckling. During lactation the level of prolactin decreases as a consequence of reduced teats massage. This has a positive effect on the number of insuline receptors in the mammary gland, and it is thought that it plays a role in determination of metabolic functions, especially in arranging sources for milk production.

Insulin is a promoter of glucose and amino-acids utilization from the peripheral body tissues by the reduced use of nutritive matters for the milk production. The insuline reduction during maximal lactation is a physiological response to the abundant use of glucose for the milk production. Levels of insuline are higher in sows that have lost less body mass during lactation so that catabolic processes are of less intensity (Kraetzel et al., 1998). Insulin directly effects milk production because after parturition the number of insuline receptors in the fat tissue decreases while their number in the mammary complex increases considerably. This leads to reduced lipogenesis in the fat tissue, but increases the sensitivity of the mammary tissue against insuline in spite of its reduced concentration in plasma.

MORTALITY IN PIGLETS

Mortality in piglets is ethically and economically unacceptable in modern pig production. Research must be focused towards reducing this problem. Mortality in piglets is directly or indirectly associated with maternal abilities; such as piglets starvation, crushing of piglets and other factors to which they are exposed during the lactation period. Farrowing in the jammed housing system has decreased the mortality of piglets but on the

other hand by this system a welfare of sows is influenced in a negative way. Building nests and natural parturition are impossible in this housing system because of which situation the sows undergo stress situation (level of cortisol and adenocorticotropine hormone is increased) (Broom and Johnson, 1993). The impacted housing system has also negative consequences on the health of pigs (incidence of the MMA syndrome) and difficulties during farrowing (prolonged farrowing especially in gilts) (Hristov et al., 2008).

Mortality in piglets differs depending on the housing system. Expressed in percentages it ranges from 10 and 20% (perinatal mortality, starvation and crushing). Hungry piglets stay longer on teats trying to stimulate milk secretion. These piglets are more easily crushed by mother or they die of starvation and/or trauma caused by mother. Starvation is a cause of piglets death in about 50% of cases being the greatest on the first day after farrowing. Approximately about 75% of the total mortality occurs in the first week of lactation. Physical factors such as suffocating in the course of parturition, trauma, starvation and septicaemia are the most often causes in the first four days of the life of piglets. Viral and bacterial infections are the causes of piglets mortality in the later period of lactation.

BEHAVIOUR OF PIGLETS DURING NURSING

Social hierarchy is being established by piglets immediately after their birth. The first pair of teats which produce more milk than other teats are sucked by the dominant piglets. They save their places during suckling and behave aggressively towards piglets who try to take over their places. Suckling includes several phases. First the sow makes grunting sounds by which it calls piglets to come and then they arrange themselves in a certain way. In the beginning the piglets squeeze teats by their mouths, hit them by head, and then hold them tightly, drawing them into their mouths and making vacuum. In this way milk reaches the cistern of the mammary complex and piglets are starting to suckle very rapidly (Špinko et al., 2002). At the expiration of one hour the previous suckling piglets wake up and initiate suckling again. The sow lies down on its sides allowing in this way hungry piglets to suckle again. In order to have successful suckling the piglets indicate to the sow by their behaviour that they are all present and ready for suckling (Vučinić, 2006).

Not every breast-feeding is successful. Unsuccessful breast-feeding is recognized by more intensive sow grunting during the entire time of the breast-feeding. It is caused by non-releasing oxytocin in which case the milk may not reach the mammary cistern. Permanent and intensive sow grunting may indicate the presence of pain in the mammary gland or that the release of oxytocin was omitted. In these cases the sow does not allow the access to piglets or she lies down on its abdominal side. By lying on the stomach the sow is cooling its mammary complex in case the acute inflammation has occurred there.

CONCLUSION

Behaviour of animals depends on cognitive, neurophysiological, motor, motivation components and subjective feelings. In order that sows could express their natural behaviour it is necessary to provide them with quality diet in sufficient quantities, suitable space and protection against infective and non-infective diseases. If the environment is less restrictive the sows can express their natural behaviour but if maternal ability is impaired it cannot be compensated by subsequent improvement of environment.

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