MONITORING THE RISKS OF SOME PHYSIOLOGIC FACTORS OF LACTATION IN PIC SOWS ON THE HEALTH OF SUCKLING PIGLETS

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Abstract

The influence of the major physiological factors (age, weight at first farrow and some genotypic, phenotypic and environmental characteristics) on prolificacy and sow lactation capacity as well as the growth and health indices in piglets was monitored on a PIC industrial multiplication farm with a breeding effective of 200 sows and a total of 255 farrows, in 2011. Evaluations were based primarily on quantification of biometric parameters of the farrows. Am overview of the data regarding the influence of age (farrow rank) on milk production in sows revealed a maximum production level in the 2nd or 3rd lactation in correlation with increased prolificacy (11.9 or 11.7) and lactation capacity (65 and 64) respectively with reduction of mortality in piglets (3.6% and 3.7%). The evolution of these indices revealed that sows can be effectively exploited in the first 5 lactations, after which advancing age significantly limits milk production. Achieving the first fertile optimal age of first farrowing (233-238 or 348-353 days) also contribute to ensuring milk production. The lactation curve was characterized by an upward phase in the first 7-10 days, a plateau of about 10 days and a downward phase, consisting of slow decrease milk production followed by its marked reduction around weaning. In last year the total recorded farm losses (10.2%) were represented largely by mortality in suckling piglets (45%).

Key words: health and growth indices, lactation risks, PIC sows, piglets.

INTRODUCTION

Health status of the lactate sow and piglets is influenced by several intrinsic or extrinsic factors, which in certain conditions can generate real risks (Cotruţ, 1986; Ghergariu and Baba, 1990). The progress achieved in monitoring lactation risk factors is well known for cattle and other ruminant species (Peeler, 1987; Sheldrake and Mc Gregor, 1990; Knight and Peaker, 1982). In recent decades these developments have been observed in the case of lactating sows with piglets, leading to significant reduction of losses during the lactation- weaning period (Ognean et al., 2010). In this context it is important to mention that the level of milk production in sows is extremely high, reaching over an average lactation period of 8 weeks, approximately 68-77 kg dry matter. This nutrient rich substrate composed of 23-26 kg of protein, 24-27 kg of fat, 3.5 to 4 kg minerals and 17.5 to 20 kg lactose ensures a piglet weight-gain of up to 5 times in the first month and 10 -12 times in the second month. After the 21st day the piglet becomes dependent on additional feeding. A sow with 10 piglets has to produce around 10-12 kg milk/day and needs 1 kg compound feed per 100 kg body weight and 0.4 to 0.5 kg for each piglet that suckles (Polen, 2007). It is essential for the newborn piglet to maintain normal glycemia levels. The period between the farrow, when transplacental transfer of glucose ceases and suckling is extremely critical, as stabilization of the newborn is dependent upon its own hepatic glycogen reserves. Thus the presences of an adequate hepatic glycogen reserve at birth a factor for increasing the survival rate during this transitional period. Glucose level decline occurs immediately after birth and lasts 1-3 hours, due to the fact that hepatic glycogen reserves are rapidly depleted, being offset by an increased gluconeogenesis, of approximately 10% within hours from birth, (Pabst and Rothktter, 1999).

MATERIALS AND METHODS

This study was conducted in order to identify some of the risk factors acting on prolificacy and suckling ability of lactating sows, after correlating age and weight at first farrow with certain genotypic and phenotypic characters, respectively monitoring some growth and health indices in piglets. To this end observations and investigations were made in a PIC multiplication farm (Coroi Sânmartin, Mureş), with a total number of 2463 of pigs, in 2011. Research has been conducted on samples of breeder sows (n=200) with suckling piglets and relied on quantifying the evolution of some biometric parameters of the piglets, resulted from a total farrowing number of 255. The newly farrowed sows and those with suckling piglets were kept in the farrowing ward in adequate compartments with proper maintenance and

feeding. A farrowing group consisted of the farrowings that occurred in no more than 2 days, managed by the same caregiver.
Investigations were performed in the form of surveys to record data and observations that were followed, according to necessity, by clinical examination and sampling for hematological, biochemical and morpho-pathological investigations. The investigations were focused on the health monitoring of lactating sows and suckling piglets in the feeding and maintenance conditions of the farrowing-nursery ward, namely temperature, humidity and air flow when using fans and humidifiers during heat waves. The influence of some pathological factors on the health of lactating sows and piglets was determined as well based on the development of the data from the "movement reports" respectively from Eurohyb computerized management. Data recorded included aspects regarding the influence weight, age, weaning conditions, namely individual and collective compartments on the unit lactating sow-suckling piglets, in which the sows were kept during insemination and the first month of gestation.
Individual and mean data were subjected to statistical analysis using current statistical processing software (Graph Pad Instant V3.0, V4.0 Graph Pad Prism, Microsoft Excel, Variance and covariance study) and calculating the mean, standard deviation and probability index p.

RESULTS AND DISCUSSION

The data from correlative interpretation of the first fertile breeding age and body development of the sows at first farrowing, stage of lactation, body weight and some genotypic, phenotypic or environmental characteristics (Table 1), was the basis for the following analysis of potential risks resulting from certain physiological factors, which influence lactation in sows and consequently the health of the suckling piglets.
Analysis of the data regarding the correlation of age with body development of the sows at first farrowing showed significant influence on milk production. Regarding this factor it should be mentioned first that the age when the first fertile mount occurred decreased with increasing weight group of the sows. Thus, concerning the influence of age (farrowing rank), we found that the maximum production level was achieve in the 2nd and the 3rd lactation, which were positively correlated with increased prolificacy (11.9 to 11.7), suckling capacity (65-64) and reduced mortality (3.6% - 3.7%).

Also an essential index proved to be the lactation curve. This included an upward phase in the first 7-10 days of lactation, followed by a plateau of about 10 days, in which the milk production remained at the highest level, a downward phase, characterized by a slow decline of milk production and a marked reduction up to weaning. The obtained results showed that, the period of lactation influences milk composition, respectively a slight decrease in protein content, minerals and especially fat during the upward phase and the increase of the same parameters during the downward phase, similar developments being noted by other researchers in the field (Cotruţ, 1984; Cotruţ, 1986; Polen, 2007; Boe, 1993).

Achieving an adequate body weight exerted a major influence on milk production that acted in conjunction with age; an increased body weight resulted in positive effects by augmenting the abdominal volume and hence feed intake capacity. Achieving optimal age at first fertile mounts (233-238 days) respectively at first farrowing (348-353 days) corresponded to breed standards and the provided conditions. The high level of milk production in PIC sows was also ensured by achieving an optimal correlation between the age at first farrowing and body development. Thus, achieving a weight between 120 and 130 kg at the first fertile mount in sows ensured a proper gestation and a large number of piglets at farrowing. Correlating genetic characteristics of breed with the provided maintenance and feeding standards led to the development of highly productive indices. Thus, the L03 line of sows gave an outstanding farrowing rate performance (85%), total prolificacy (12.7 piglets/farrowing), the number of farrows (2.11/year, with 27pigs/year/sow) and mean piglet weight at farrowing (1.7 to 2.1 kg).

Prolificacy analysis revealed that the number of piglets farrowed and sucked can significantly influence milk production, sows with 12-15 piglets producing 25-35% more milk than those with 8-10 piglets, because in smalls farrows the milk produced in the first 3-4 days is not entirely consumed, this factor negatively influencing milk production (Pârvu, 2003).

Statistical analysis of the data regarding genetic factors, phenotypic and environmental factors reveled close correlations between the weight at farrow and weight of the piglets at 21 days (rfxy = 0.494) and between number of live piglets and size of the farrow at 21 days (rfxy = 0.487), summed action of these factors ensured a higher level of lactation capacity.

Behavioral observations of 20 farrows of suckling piglets during the first 72 hours after birth, showed that the newly farrowed piglets with body weight less than the mean weight of the farrow made smaller weight gains, suggesting loss of competition for the mammary glands with higher milk production and therefore a reduce consumption of colostrum/milk. It was also found that the usage of the pair of mammary glands, according to their anatomical position decreased in the order 1-8, smaller piglets getting those with low milk production, leading to a strong correlation (rxy = 0.686) between body weight and the amount of milk consumed.

Daily monitoring of the main microclimate factors, led to the use of fans equipped with water dispensers during heat waves. Thus, after the controlling the temperature-humidity parameters an improvement, of 10-20%, was obtained in the breeding index.

The consequences of the cumulated action of the risk factors, shown in Table 1, are relevantly expressed by the development of losses in the piglets. Mortality losses occurred predominantly in the first week of life, and were often due to crushing of piglets by the sows, especially in large farrows, followed by mortality due to digestive diseases, correlated in some cases with agalactia in the sows. Cases of diarrhea syndromes in pigs were sporadically reported, beginning with the second week of life, the main pathogen being E.coli. The affected piglets showed mild forms of diarrhea, which were sensitive to antibiotic therapy (Gentocin or Spectam). In the analysis of the cumulative action of the investigated risk factors was also observed their negative influence on individual milk consumption in the first days of life. The consequence of this reduction in energy and structural intake led to morphological and functional changes of the mucosal integrity of the small intestine and consequently in its permeability, with the onset of diarrhea (Lloyd et al, 1998; Bailey et al, 1998; Kok and Ahn, 2007; Rooke et al, 2002).

Agalactia in sows was expressed predominantly mammary edema and reduced milk production and did not exclude developments such as mastitis-metritis-agalactia type syndrome (MMA). One of the severe effects of MMA syndrome is the production of lipopolysaccharides, and their passing from the circulation into the colostrum (Bertschinger et al., 2000). Fewer were the cases reporting strictly mammary lesions (localized in the nipple or even mastitis), sometimes they were associated with hormonal infertility. Changes seen in hypoxemic piglets were correlated with the following negative effects found by other researchers in the field (Sheldrake and Mc Gregor, 1990): reduced vitality due to general malnutrition caused by disruption of the sow-piglet relationship, affecting the energy and material balance of feeding capacity and morpho-functional integrity of the digestive tract and annexed glands.

Monitoring the effect of various risk factors on health of the unit lactating sows- suckling piglets made remarkable progress in recent decades, leading to fewer losses during the lactation-weaning period (Ognean et al., 2010). In this context also fall the results of the final analysis regarding the main health and production indices recorded in the investigated farm where the reduced rate of annual losses through mortality (10.2%) reveals a good control of the risk factors. Regarding this aspect it is relevant to mention that from the total losses only 45% were recorded in the piglet category, 40% in growing youth and 15% in case of testing youth and commercial pigs.

Metabolism in pregnant sows is characterized by intensified anabolic synthesis processes in order for the body to cope with its needs and those of the developing fetuses. Thus a reduction in the concentration of glucose, cholesterol, total lipids and serum calcium can be observed. The physiologically high intake during processes lactopoesis and lactogenesis leads to higher metabolic losses in lactating sows than in other species. The highest losses are observed in energy and mineral metabolic profile. In this context also fall the results of behavioral observations that made on 20 farrows during the first 72 hours after birth. The data showed that piglets with a body weight at birth below the mean weight of the farrow made smaller weight gains, suggesting loss of competition for mammary glands with higher milk production and respectively a reduced consumption of colostrum/milk.

Also noticed was the fact that usage of the pairs of mammary glands according to their anatomical position decreased in the order 1-8, accounting for smaller piglets getting those with lower milk production. Statistical analysis of this data revealed a strong correlation (rxy=0.686) between body weight and the amount of milk consumed by the piglets.

Typically, average daily gain of piglets with body weight below the mean weight of the farrow is less than the mean weight gain of the group, suggesting that smaller piglets loose the competition for mammary glands with more milk in favor of bigger ones (Rada, 2010). Also the age, at which the maximum number of new cases of diarrhea appeared, was variable, being dependent on the number of piglets and frequency of parturition, respectively the number of mammary glands with edema, hypo- and agalactia in the first days after farrowing. Hypoxia at birth and hipogalaxia had a convergent effect on piglets, triggering malnutrition and non-infectious diarrhea. Thus, in a farrow during in the first days of life the

piglets showing signs of diarrhea were those with parturition hypoxia and those malnourished especially in the 2-4 days of life.
Metabolic status of piglets with diarrhea is characterized by weight loss, reduce glycemia and morphological changes of the intestinal mucosa, especially the jejunum, which is associated with a negative energy and protein balance, triggering non-infectious or nutritional diarrhea. A small number of piglets may appear a mild osmotic transient diarrhea due to excessive consumption of milk. Diarrhea in the first days of life is generally triggered by malnutrition and is caused by hypoxia and/or hipogalaxia in sows affected by mammitis mastitis-metritis-agalactia (Rada, 2010).
As shown in mortality distribution analysis, the losses caused by crushing of the piglets prevailed. This was seen especially in large farrows, in which the piglets either were not able to avoid the sows or did not have enough room on the rest bed and were crushed by their mothers. This also concludes that reducing this percentage is almost impossible. Diarrhea due to E.coli infection was the second leading cause of suckling piglet mortality. Regarding the efficacy of the used therapies, it is important to mention that all farrows responded well to the usual treatments.

Table 1. Correlations between the characteristics influencing nursing ability in sows

Couple of characters	Correlation			Regression
	Phenotype	Genotype	Environmental	
Total no. of nipples Total no. of functional nipples	0.463	0.459	0.469	0.696
Total no of functional nipples No piglets/group at 21 days	0.767	0.169	0.826	1.046
Total no. of functional nipples Weight/group at 21 days	0.451	0.360	0.443	5.055
Wright/group at farrow Weight/group at 21 days	0.494	0.551	0.529	3.158
No of live piglets at farrow No piglets / group at 21 days	0.487	0.764	0.526	0.889
No piglets / group at 21 days Individual weight at 21 days	-0.336	-0.247	-0.317	-0.613
Daily feed intake Weight/group at 21 days	0.630	0.439	0.321	1.412

CONCLUSIONS

Influence of age (farrowing rank) on milk production in PIC sows highlighted maximal levels in the 2nd and 3rd lactation and their correlation with the highest rates of prolificacy (11.9) and lactation capacity (65), respectively with reducing mortality rates (3.6%);

Feed ration of sows during lactation and gestation was characterized initially by an increased energy and reduced protein level, being mineral balanced in the second and third part of gestation, respectively an increased energy and protein level in the final part, when very rapid development must be ensured;

Milk production performances in PIC sows were also insured by realizing optimal age at first fertile mount (233-238 days) respectively at first farrowing (348 to 353 days);

The optimal conditions provided by the farm have enabled high productivity indexes, farrowing rate reached 85%, prolificacy 12.7 piglets/farrowing and the number 2.11 farrows/year, with 27 piglets/year/sow and average weight at farrow between 1.8 and 2.1 kg;

Lactation curve presented an upward phase in the first 7-10 days, a plateau of about 10 days and a descending phase of slow decrease in milk production, followed by a sharp decline around weaning;

Prolificacy analysis revealed that the number of piglets farrowed and sucked can significantly influence milk production, sows with 12-15 piglets producing 25-35% more milk than those with 8-10 piglets, because in smalls farrows the milk produced in the first 3-4 days is not entirely consumed, this factor negatively influencing further milk production;

Statistical analysis of the influence of genetic, phenotypic and environmental factors revealed a strong correlation between weight of the piglets at farrow and weight the piglets at 21 days (rfxy = 0.494), between the number of live piglets and size of the farrow at 21 days (rfxy=0.487) and a very important influence on the ability of suckling;

Distributed by category the mortalities prevailed in suckling piglets (45%), followed by growing youth (40%), youth in testing (7%) and commercial pigs (8%);

Usage frequency of the anatomical pairs of mammary glands decreased in the order 1-8, smaller piglets getting access to those with lower milk production, resulting in a positive correlation between body weight and the amount of milk consumed by the piglets (rxy = 0.686).

Abrupt weaning procedure at the age of 28-35 days, gave very good results PIC farms, consisting in the transfer of piglets in the youth compartment and of the sows in the breeding compartment, prior a 24 hour diet the day before weaning;

Analysis of the causes producing mortality in piglets from farm A showed as predominant causes crushing (55%), diarrhea syndromes, especially E.coli infections (35%), starvation (7%) and less due to other cause (3%).

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