PARTICULARITIES OF LACTATION IN SOW
WITH MAJOR IMPACT UPON SUCKLING
PIGLET'S HEALTH

PH.D THESIS ABSTRACT

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INTRODUCTION

Swines have 3-10 pairs of mammary glands, made up of 2-3 galactophore systems that develop intensely 4 days before parturition. This period corresponds to lactogenesis, initiated by the stimulatory action of prolactin and regression of progesteronemia (Hurley, 1989). Monitoring lactation, as a health surveillance action in sows and piglets, represents a high actuality concern of the current research and field practice (Ognean et al., 2011). Progress acquired in swine raising is dependent upon diversification and improvement of methods in risk assessment and management, which may affect lactating sows with piglets (Sărândan et al., 2009; Vlasiu et al., 2012).

In sows, lactation status requests are more important than in other mammalian species; galactopoiesis and lactogenesis, requiring a higher energy and mineral consumption (Acie et al., 1999). During galactopoiesis, sow mammary epithelium synthesize and secrets daily, in the form of milk proteins, an amount of material equivalent to 15% of her body weight. The predominance of catabolic processes in lactating sows justify why, in their case, it should be correlated the energy and nutrient requirements with the milk production and weight loss (Ognean et al., 2013). Under poor feeding, weight loss in lactating sows can reach 40%, which seriously affects their productive performance. Combined fodder requirement in full lactation sows can reach 6-7 kg/day, depending on age and weight and, especially, on the number of piglets (Ladoşi, 2007).

Keywords: sows, hemato-biochemical profile, lactation, piglets, risks.

GOAL, MOTIVATION AND RESEARCH OBJECTIVES

The main goal of the research conducted in this thesis is focused on achieving further progress in correlative assessing of the main health and production indices in lactating sows with piglets. This paper answers the specific secondary purposes, such as: developing procedures to harvest and test sow milk secretion, or assessment models for milk production and the influence of various physiological and risk factors, on lactation in breeding sows.

Elements of originality of this study also include major milestones that his motivation was based on. In this regard, were proved of major importance, the collection and testing procedures implemented in sow milk (lactocytogram method and evaluation of physicochemical profile method), supplemented by assessing milk production in swines. Unique character and originality presented those models for assessing the capacity of breastfeeding and the influence of intrinsic and extrinsic factors on lactation in sows reared in intensive systems. In the same context they can fit, models used in risk analysis that may affect sow lactation and milk intake in suckling piglets. A high degree
of originality should be given also to the correlative assessment of blood glucose levels in sows and newborn piglets in the first hours after parturition.

**General objectives** of the thesis targeted the following aspects:

- Implementation of new techniques in the collection and testing of sow milk;
- Analysis of key relevance of the main hemo-biochemical profile indexes, in assessing health status in lactating sows;
- Adapting some cyto-morphological tests to the particularities of sow milk;
- Evaluation of lactocytogram relevance in monitoring health evolution during lactation in sows with suckling piglets;
- Evaluation of correlative influence of physiological, genetic and phenotypic factors upon lactation in sows maintained in intensive system;
- Monitoring breastfeeding ability in correlation with productive performance and weight loss in breeding sows;
- Evaluation of blood glucose level in calving sows and newborn piglets;
- Evaluation of milk production in sows based on quantifying weight gain in piglets;
- Analysis of risk factors that may affect lactation in sows, in correlation with milk consumption and the incidence of diarrheal syndrome in suckling piglets.

**STRUCTURE OF THESIS**

PhD Thesis entitled "**Particularities of lactation in sows with major impact on piglets health**" is structured, according to the standards set by the Doctoral School of Veterinary Medicine Cluj-Napoca, in two parts: the first - intended bibliographic documentation, and the second - researches. The two parts totalize seven chapters, which runs on a total of 242 pages; the first 3 chapters include bibliographic documentation and the following 4 chapters include own researches.

**Part I** summarizes the bibliographic studies, structured into 3 chapters, which runs on 63 pages, grouping the main actualities in the area of raising lactating sows and suckling piglets. In bibliographical studies, they are concentrated and explained the morphofunctional, metabolic, behavioral and managerial principles underlying the investigations in Part II.

**Part II** includes own researches, organized in four chapters, particularly relevant to the investigated domain. Their unfolding goes through the subdivisions assigned to synthetic presenting of followed objectives, of materials and methods used, the results achieved, discussions and interpretations made, and also partial and final conclusions (if necessary, recommendations), drawn from investigations. The part of research concludes with a bibliography, which includes 194 bibliographic titles, conclusive for the analysis of obtained results.
RESEARCH METHODOLOGY AND RESULTS

Chapter II.1. Entitled "Analysis of the main hematological and biochemical indices of blood and milk of the sow" includes investigations whose primary purpose was to assess the relevance of the main blood tests (hematology, biochemistry) and milk tests (physico-chemical) in monitoring the health of lactating sows and piglets, respectively prevent the inherent risks in lactation.

The research consisted of biochemical testing (of blood samples) and physico-chemical testing (of milk samples) collected from a sample of 15 PIC sows with suckling piglets, subject to monitoring changes in health status and lactation. The tests were performed with automated analyzers (Abacus Junior Vet and VetScan) for blood, respectively Ekomilk M for milk, using fresh samples collected from clinically healthy animals, without significant changes in hemoleucogram. Individual and mean data were statistically analyzed using the usual programs (GraphPad InStat V3.0, V4.0 GraphPad Prism and Microsoft Excel), coupled with advanced statistical and graphical processing (OriginPro 8.5) resulting statistical correlations, essential for assessing the relevance of the tested parameters.

The results showed wide variations in the investigated parameters. The erythrocyte indices showed significant oscillations, but average normal hematocrit (38.93%), except for six cases which showed minor deviations. These were associated with slight decreases in mean hemoglobin concentration (8.20 ± 0.676 g/dl); total number of RBCs (6.22 T/L) and erythrocyte medium constants fluctuating in physiological ranges, with rare decreasing tendencies (Fig.1).

![Fig. 1. Evolution of erythrocyte mass indexes in lactating sows](image_url)

Leucograms revealed normal levels of total white blood cells (6.9-17.3 G/L), less in 3 sows with leukocytosis (23.23-30.03 G/L), and in what concerns the distribution of leukocytes subpopulations, monocytes predominance was revealed (16-27%) and rare cases of neutrophilia (40-41%), lymphocytosis (50-51%) or eosinophilia (16%) (Fig. 2).
Investigated metabolic profile indices showed medium values sometimes located outside the reference values for swines, in general. Deviations were reported without pathological connotation, that outlined several features characteristic in lactating sow. These were attributed to the evolution of protein profile indices, which showed concentration of proteinemia values (7.0 to 9.8 g/dL) in the upper physiological limits, associated with the increase of albuminemia (4.8 to 6.5 g/dL) and decreases of globulinemia, in the majority of cases (1.3 to 2.7 g/dL) (Fig. 3).

Characteristic aspects were present also in the evolution of enzymatic parameters, expressed by normal levels of aspartate aminotransferase (63.0 U/L), with significantly higher values if one sow (233 U/L), significant increases in concentrations of GGT (99.2 U/L).
U/L) and predominantly levels within the limits of physiological limits of alkaline phosphatase (50.26 IU) (Fig. 4). Evaluation of non-protein nitrogen substances revealed normal averages in case of urea (14.0 mg/dL) located in some cases below the physiological, and the average high creatine levels (1589.1 U/L), with some significant overshoot of the normal. The ionogram was characterized by normal levels of calcemia (9,653 mg/dL), phosphatemia (8,907 mg/dL) and magnesemia (2.48 mg/dL).

We have given particular relevance also to proportions of sow milk biochemical components, including 7.97% (from 5.37 to 13.3%) protein, 8.18% (from 1.71 to 14.5%) fat and 13.67% (10.8 to 19.9%) non-fat dry matter.

Characteristic evolutions were found on the main physical parameters of milk, indicating values of 1.043 (1.028 to 1.076) for density, 0.28 °C (-0.954 to 0.744 °C) for freezing point and 2.14% (0 to 10.3 %) for added water (Fig.5). These results were interpreted in comparison with consulted bibliographical sources, which revealed that there is still insufficient data on the physico-chemical and morphological components of sow milk (Ognean et al., 2010, Olmos et al., 2010)

![Fig. 4. Evolution of some enzymatic parameters in lactating sows](image)

![Fig. 5. Evolutions of main physico-chemical parameters in sow milk](image)
Chapter II. 2. "Cytomorphological testing characteristic to sow milk" is designed to evaluate the cytomorphological profile of milk in order to implement a monitoring strategy for lactation in breeding sows reared in intensive farms. Achieving this goal required focus of investigations on major goals, such as:

- Adapting of the main procedures of collection and cytomorphological examination of milk to the specific of sow lactation;
- Characterization of morphological and functional components of lactocytogram in sow during lactation;
- Assessing the relevance of cyto-morphological parameters of milk in health surveillance for lactating sows and piglets;
- Analysis of cytomorphological dominants significance for investigating pathological sow milk secretions;
- Implementation of cytomorphological tests, of relevance for the investigation of milk production in ruminant species, in sow breast exam.

The experiment organization was focused on investigating a sample of lactating sows with suckling piglets (n = 55), from several groups of calving, which were investigated in the previous chapter. The research consisted of conducting a general clinical examination and extensive observations to monitor the health and the evolution of lactation, supplemented with cyto-morphological investigation of milk samples, collected from 15 sows, by injection of oxytocin (n=10), respectively along with the feeding of 2-3 piglets (n = 5). Typical tests for milk secretions were performed by using lactocytogram model (Ogneau et al., 2011), followed by assessing relevance of the main cytological parameters in mammary gland health and milk secretion surveillance. Data obtained underlies an extensive characterization of cytomorphological profile of sow milk, and also the conditions of use for cytology tests in health surveillance of swine lactation compared with ruminant species.

The results of this research complements bibliographical knowledge in the field, which still provides very few available data concerning cytomorphology of sow milk. This fact, in addition to the novel character, gives also a touch of originality to our research, as seen from the following summary of features on the morphology and physiology of the cell population in sow colostrum and milk. The lactocytogram method proved to be an easy and relevant test for mamary health surveillance during lactation in sows. The evolution of the average values of the cell population in milk showed a predominance of macrophages (40.87 %), followed by lymphocytes (31.0 %) PMN leukocytes (15.8 %) and epithelial cells (12.33 %) (Fig. 6).
Fig. 6. Distribution of individual and average values of component cell populations in lactocytogram of sow

A particularly relevance was given to the increased frequency of unidentifiable cell formations (++) and to the increase in proportion of macrophages, with the advancing lactation (30-60 %). Among the PMN leukocyte subpopulations, prevailed neutrophilic granulocytes (75-100 %), with some cases of a good representation of eosinophils (0-25 %) or even basophils (0-5 %). The extent of PMN leukocyte increased in 4 sows (20-43 %), of which one was with significant granulocytopenia (43 %) and high microbial load. Macrophage population was characterized, in addition to quasi-majoritary proportion, by a high percentage of active cells (33 %), indicating a high defensive potential of the mammary gland in sow.

Microscopic examinations were the basis of an extensive morpho-physiological characterization of cell configuration in sow milk, from which we summarize to present the most convincing aspects. This way, we considered relevant for the first stage of lactation in sow, the abundance of acinar lactocytes and the low frequency of cells detached from the epithelium milk ducts, or other types of epithelial cells. Most epithelial cells reported were large, integer, uni-or binucleated cells, surrounded by voluminous cytoplasm mass, slightly basophilic, with numerous microspherules of fat, getting frequently a sparkling and rarely ring appearance (Fig. 7).
Fig. 7. Aspect of lactocytes in advanced state of activity (L-C), of lymphocytes (L) and macrophages with lipophage character (M-L) from milk sediment (MGG stain; x100).

From morphological and functional aspects characteristic to leukocyte populations highlighted in sow milk, are to be mentioned the advanced states of activity or lipophage character of some macrophages, expressed significantly by increase in its cytoplasmic volume and sparkling appearance, namely phagocytosis of fat spherules. We rarely reported macrophage metaplasia or macrophages converted in colostral bodies. In several samples of milk and colostrum we highlighted conglomerates of unidentifiable cell formations or cellular debris, among leukocytes and integer epithelial cells, or even colostral bodies.

Chapter II.3., entitled "Analysis of several physiological factors, specific to the mother sow – suckling piglets relationship ", had as main objectives:

- Analysis of influence of the main physiological factors upon lactation in sows;
- Monitoring breastfeeding capacity, in connection with the productive performances of breeding sows; Study of factors with major impact on the milk ejection control and breastfeeding in sows;
- Monitoring the postpartum evolution of glycemia in sows and newborn piglets;
- Evaluation of milk production in sows, by quantifying weight gain of piglets;
- Analysis of health status of the couple mother sow – piglets, by correlating the weight gain realized by the group of piglets, with weight loss of the lactating sow.

Achieving these objectives required the organization of a study, based on conducting extensive surveys to monitor lactation in breeding sows from two intensive farms: Multiplication Farm A, whose actual jelly of 186 PIC sows achieved 411 births/year with a total of 5238 piglets (4946 weaned piglets), returning 27.1
piglets/year/sow, and Fattening Farm B, whose actual jelly of 696 PIC sows achieved an annual total of 13346 piglets, returning 19.17 piglets/year/sow. These included health surveillance on "nests" of lactating sows with suckling piglets, during stages of maternity population: parturition, breastfeeding and weaning. The investigations were focused on recording data and observations centered on the real situation on field, including the results of clinical and laboratory exams (hematology, blood chemistry and morphopathology), detailed in Chapter II.1. Farm A researches were completed with investigations meant to assess milk production in sows, originally performed on a preliminary batch of lactating sows with suckling piglets (n=18), which served as a model for the final estimations on the entire actual farm jelly (n=186). Also inside the Farm A has been done monitoring of glycemia evolution on a sample of parturient sows (n = 15) and on their newborn piglets (n=150) using the Accu-Chek Active equipment.

Summary of data regarding the influence of age (calving rank) on milk production in sows showed that the maximum production level is reached at the 2nd or 3rd lactation. According to the data recorded on the farm, it is correlated with increased prolificacy (11.9) and feeding capacity (65) respectively with mortality decrease in suckling piglets (3.6 %) (Fig. 8).

![Fig. 8. Correlation of average values for breastfeeding capacity with calving rank in breeding sows](image)

The overall analysis of tracked production and reproduction indices revealed that sows can be harnessed effectively in the first five lactations, age advancing significantly limiting milk production. Achieving first fertile mating, namely first calving, at the optimum age (233-238, respectively 348-353 days) also contributed to ensuring milk production. Lactation curve was characterized by an upward phase in the first 7-10 days, a plateau of approximately 10 days and a downward phase, consisting of slow decrease in milk production, followed by its reduction, accentuated around weaning. Special
conditions provided on the Farm A, led to the achievement of high levels of calving rate (85%), prolificacy (12.7 piglets/farrowing), the number of births/year (2.11), number of piglets/year/sow (27) and piglet weight at birth (1.8-2.1 kg). Annual losses recorded in this farm were not significant (10.2%) compared with accepted standards, the majority (45%) of mortalities was in suckling piglets category.

The results obtained in the appraisal of milk production at PIC sows from Farm A contain novelty regarding the calculation model which was used and the recorded data; they showed average values of 7,912 liters of milk/day, which represented a total of 253,186 L during the 32 days of lactation. Compared with consulted bibliographies, our recorded values reflect superior production potential of PIC sows comparing to other races (Oganean et al., 2013). In the context of racial peculiarities, there must be analyzed also the increased glycemia average values in piglets in the 1-5 hours interval (85.2 ± 22.37 mg/dl) and in 10 to 15 hours after birth (106.4±5.83 mg/dL) (table 1), which, in our studies, had an evolution correlated with the development of a biometric indices, in general. Average glycemia values in mother-sows were characterized instead by less important increases. They ranged between 50-133 mg/dL, in only a few cases exceeding the physiological limits of the species and category.
Table 1. Glycemia values in piglets batches, at 1-5 hours (initial) and at 10-15 hours after birth (final) and of body weight at birth (iniţial) and at weaning (final)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Weight(^i) (kg)</th>
<th>Glycemia(^i) (mg/dl)</th>
<th>Weight(^f) (kg)</th>
<th>Glycemia(^f) (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot 1 (n = 13)</td>
<td>1,738</td>
<td>98,923</td>
<td>7,333</td>
<td>100,616</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,138</td>
<td>14,499</td>
<td>0,359</td>
<td>8,781</td>
</tr>
<tr>
<td>Lot 2 (n = 13)</td>
<td>1,8</td>
<td>96</td>
<td>7,285</td>
<td>104</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,147</td>
<td>17,306</td>
<td>0,791</td>
<td>7,417</td>
</tr>
<tr>
<td>Lot 3 (n = 13)</td>
<td>1,685</td>
<td>94,231</td>
<td>7,283</td>
<td>95,846</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,408</td>
<td>17,838</td>
<td>0,799</td>
<td>19,274</td>
</tr>
<tr>
<td>Lot 4 (n = 13)</td>
<td>1,833</td>
<td>112,417</td>
<td>6,975</td>
<td>110,333</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,227</td>
<td>12,078</td>
<td>0,691</td>
<td>7,966</td>
</tr>
<tr>
<td>Lot 5 (n = 12)</td>
<td>1,554</td>
<td>86,923</td>
<td>7,292</td>
<td>105,154</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,357</td>
<td>17,299</td>
<td>2,158</td>
<td>9,607</td>
</tr>
<tr>
<td>Lot 6 (n = 13)</td>
<td>1,769</td>
<td>99,385</td>
<td>7,169</td>
<td>108,625</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,184</td>
<td>13,593</td>
<td>0,622</td>
<td>9,078</td>
</tr>
<tr>
<td>Lot 7 (n = 12)</td>
<td>2,075</td>
<td>102,083</td>
<td>7,792</td>
<td>105,667</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,076</td>
<td>6,402</td>
<td>0,405</td>
<td>6,315</td>
</tr>
<tr>
<td>Lot 8 (n = 13)</td>
<td>1,8</td>
<td>109,923</td>
<td>7,646</td>
<td>115,158</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,122</td>
<td>7,308</td>
<td>0,504</td>
<td>6,780</td>
</tr>
<tr>
<td>Lot 9 (n = 13)</td>
<td>1,866</td>
<td>104,167</td>
<td>7,272</td>
<td>117,417</td>
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<tr>
<td>St.dev</td>
<td>0,172</td>
<td>9,656</td>
<td>2,120</td>
<td>9,090</td>
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<tr>
<td>Lot 10 (n = 13)</td>
<td>1,815</td>
<td>92,769</td>
<td>7,7</td>
<td>109,846</td>
</tr>
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<td>St.dev</td>
<td>0,199</td>
<td>18,226</td>
<td>2,176</td>
<td>17,411</td>
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<td>Lot 11 (n = 13)</td>
<td>1,883</td>
<td>104,667</td>
<td>7,633</td>
<td>119,667</td>
</tr>
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<td>0,175</td>
<td>16,511</td>
<td>0,556</td>
<td>18,855</td>
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<tr>
<td>Lot 12 (n = 12)</td>
<td>1,8</td>
<td>93,75</td>
<td>7,489</td>
<td>106,769</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,105</td>
<td>7,534</td>
<td>0,609</td>
<td>7,452</td>
</tr>
<tr>
<td>Lot 13 (n = 12)</td>
<td>1,736</td>
<td>86,571</td>
<td>6,992</td>
<td>106,769</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,321</td>
<td>15,589</td>
<td>2,624</td>
<td>30,481</td>
</tr>
<tr>
<td>Lot 14 (n = 14)</td>
<td>2,0</td>
<td>99,272</td>
<td>7,645</td>
<td>111,727</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,054</td>
<td>4,859</td>
<td>0,508</td>
<td>6,929</td>
</tr>
<tr>
<td>Lot 15 (n = 11)</td>
<td>1,733</td>
<td>71,111</td>
<td>7,4</td>
<td>97,555</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,123</td>
<td>19,212</td>
<td>0,505</td>
<td>5,854</td>
</tr>
<tr>
<td>Lot 16 (n = 9)</td>
<td>1,737</td>
<td>102,111</td>
<td>7,489</td>
<td>91</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,109</td>
<td>18,811</td>
<td>0,321</td>
<td>21,354</td>
</tr>
<tr>
<td>Lot 17 (n = 9)</td>
<td>1,72</td>
<td>85,2</td>
<td>7,5</td>
<td>106,4</td>
</tr>
<tr>
<td>St.dev</td>
<td>0,130</td>
<td>22,375</td>
<td>0,349</td>
<td>5,834</td>
</tr>
</tbody>
</table>
Chapter II. 4. entitled "Monitoring of some risk factors involved in the relationship mother sow–suckling piglets", was focused on identifying and managing specific risks of breastfeeding-weaning period, with the main objectives:

- Analysis of the risks generated by the action of genetic, phenotypic and environmental factors upon the productive performance of lactating sows;
- Investigation of risk factors that may affect the control mechanism of lactoejection and breastfeeding in sows;
- Analysis of factors that may affect average daily gain of piglets during neonatal and lactation period;
- Correlation of factors that may influence individual consumption of colostrum / milk to piglets with diarrhea syndrome within the first days of life;
- Monitoring the action of nutritional and technological factors with major impact in the pathology of lactation in sows;
- Monitoring the effects of fans and water sprays on temperature, humidity and air currents in swine maternities;
- Analysis of managerial risks, that can affect health and productive performance of sows and suckling piglets during lactation and weaning.

Research conducted in this chapter supplement the results of previous investigations, with the detailed analysis of the key risk factors that may affect lactation and some production and reproduction indices in lactating sows (fecundity /fertility ratio correlated with the score of sows at weaning and at the end of previous lactation). According to the aim pursued, in organizing these studies, we focused mainly on the identification of risk factors that may influence the productive performance of lactating sows, including some genotypic or phenotypic characters, specific to PIC hybrids, respectively some indices of growth and health in suckling piglets.

In monitoring the risks mentioned, we used mainly logistics, materials and recording systems of the endowment of those 4 farms included in study (two factory farms-A and B, and 2 micro household- C and D).

According to the targets set, there were carried out surveys to monitor risk factors and health surveillance in nests of lactating sows and suckling piglets, during stages of populating the maternity, parturition, lactation and weaning. Depending on the field situation, there were collected biological samples or fodder samples, on which there where performed, by case, clinical examination sometimes completed by haematological, biochemical and morphological investigations. Tests and observations performed during surveys and investigations, aimed to obtain accurate data for the proposed and pursued objectives. Collected data were finally analyzed statistically, using computer and biostatistics programs, presented in previous chapters, determining: average, minimum, maximum, median, standard deviation, standard error, upper and lower confidence interval of 95%.
From all results ensemble, there are some issues with immediate practical implementation perspective. In this context enroll the increase in milk production, prolificacy and breastfeeding capacity of PIC sows, following the implementation of some measures to reduce risk factors on lactation. Thus, to the reduction of the inherent risks action, contributed the zoohygiene and feeding optimal conditions, provided in PIC farms, which lead to increased calving (85%), prolificacy (12.7), the number of births/year (2.2) number of piglets /year/sow (27.1) and the average weight of piglets at birth (1.8-2.1 kg) (Fig. 9).

Statistical analysis of the action of genetic, phenotypic and environmental correlations revealed links between weight at birth and weight of the lot at 21 days (rfxy = 0.494) respectively between the number of living piglets and size of the lot at 21 days (rfxy = 0.487).

In PIC farms, mortalities prevailed in suckling piglets (45 %), followed by growing youth (40 %), youth in testing (7%) and commercial pigs (8 %) (fig.10). On the contrary, in the microfarms mortality had higher frequency in growing youth (46.6 %) than in suckling piglets (28.3 %) and commercial pigs (23.0 %). A few sows (5%) have been reported to develop mamary disease, commonly located on the nipples, mastitis is extremely rare and often associated with hormonal infertility. Integration of fans with water spray systems in the microclimate maintenance systems, in order to reduce the negative effects of temperature and humidity during the heatwave, improved breeding indices by 10-20 % in farm A. Decrease of milk production in "over 6" calving rank, confirmed the fact that advanced age is one of the intrinsic risk factors.
A major positive influence on the main productive indices in lactating sows was exercised by increasing body weight of lactating sows, thereby providing increased abdominal volume and thus increased fodder consumption. Increasing the number of piglets in a lot didn’t prove to be a stressing factor, but a stimulative effect on galactopoesis; sows with 12-15 piglets produce about 25% more milk than those with 8-10 piglets. In less numerous lots of piglets, we found that in the first 3-4 days all milk produced is not consumed. Productive longevity of PIC sows was estimated to four lactations, after which occur most reforms. The analysis of the causes of mortality in suckling piglets on the farm A showed predominance of crushing by the mother sows (55%) and diarrhea syndromes (35%), compared to those given by starvation (7%) or other causes (3%).

![Mortality Chart]

**Fig. 10.** Evolution of losses by mortality on swine categories in Farm A

According to the observations made, newborn piglets with body weight below the lot, have made smaller gains, indicating that they had lost the competition for the high milk-productive nipples. Anatomical and histopathological, in piglets that died by malnutrition in the first week of life, we reported parturition hypoxia correlated with reduced vitality. Evolution of digestive disorders in piglets was correlated with MMA syndrome, which increases production of lipopolysaccharides and their release into the fetal circulation and colostrum. Sporadically, there have been reported in piglets since the second week of life diarrheal syndromes of colibacilar ethiology, sensitive to antibiotics (Gentocin or SPECT). Some pregnant sows had abortions in the last period of gestation, or birth with unviable products, reforms are often due to infertility and poor state of maintenance. In some over-or underweight sows, respectively with podal conditions, discomfort generator, poor feeding and breastfeeding, we signaled also the evolution of MMA syndrome (0.45%), expressed mainly by breast swelling and hipogalax.
In Farm C were reported births of underweight, nonviable or dying piglets, with clinical manifestations and lesions of mycotoxicoses associated with isolation of fungi (Aspergillus, Penicilium) from fodder and bedding. Histopathologically, most of dead pigs in Farm C had renal changes, expressed by tubular granular vacuolar degeneration, necrobiosis, congestion and interstitial edema in the renal parenchyma. Compared with the data consulted (Mabry, 1996), we appreciate the efficiency of implementing the procedure of sudden weaning at 32 days, in farm A, achieved by transferring piglets in youth compartment and in compartment of sows waiting for mating.

**GENERAL CONCLUSIONS AND RECOMMENDATIONS**

Summarizing the results obtained, we were able to formulate 22 general conclusions, from which of most importance are:

1. The hematological profile of the lactating sows was characterized by small variations of the erythrocytes levels, associated sometimes with the tendency of monocytosis (16-27%), neutrophilia (40-41%), lymphocytosis (50-51%) or even eosinophilia (16%);

2. Characteristic variations were observed during the sows lactating period, expressed by a tendency of higher levels of the total proteins (7.2 – 8.6 g/dl) and isolated for AST (233 U/L) and GGT (20.0-179.0 U/L), and also higher levels of the creatinine (685.00-4512.0 U/L) and decreased levels of the uremia (9.0-17.0 mg/dl).

3. Physico-chemical analyzes showed normal values for sow milk, regarding protein (7.97%), fat (8.18%), unfat dry substance (13.67%), density (1.043 g/cm³), freezing point (0 28 ° C) and added water (2.14%);

4. The structure of sow lactocitogramae showed the macrophages prevailed (40.87%) compared to lymphocytes (31.0%), PMN leukocytes (15.8%), epithelial cells (12.33%) and unidentifiable cell formations(+ +);

5. Highlighting the increasing proportion of macrophages with the advancing lactation (30-60%), respectively of neutrophilic granulocytes (43%) in milk with high microbial load, gave relevance to the lactocytogram in sow mammary health surveillance;

6. Epithelial cells were frequently individualized as integer entities, uni- or binucleated, with bulky, low basophilic cytoplasmic mass, and numerous fat microspherules;

7. Influence of calving rank on milk production in PIC sows revealed achievement of maximum levels in second and third lactations, which correlated with high levels of prolificacy (11.9) and reduced mortality levels in suckling piglets (3.6%);
8. Lactation curve was characterized by an upward phase in the first 7-10 days, a plateau of approximately 10 days, followed by a downward phase, which, after a slow evolution, ended with a sudden decrease around weaning;

9. Significant correlations between the values of the piglets batch’s weight at birth and at 21 days ($r_{xy} = 0.494$), respectively between the number of living piglets and the size of the lot at 21 days ($r_{xy} = 0.487$), reflected the high level of breastfeeding capacity in PIC sows;

10. The average milk level production for the lactating sows from a PIC farm reached 7.912L/day and 253.186 L/lactation (32 days) respectively;

11. Average glycemia values in newborn piglets were $85.2 \pm 22.37$ mg/dl in the first 5 hours, followed, within 10 to 15 hours after calving, by a growth to $106.4 \pm 5.83$ mg/dl;

12. Glycemia values in sow mothers have evolved between 50-133 mg/dl, in several cases exceeding the physiological limits of the species and category;

13. In few sows, we reported the development of superficial mamary disease, mostly located at the teat, which rarely or complicated MMA syndrome (0.45%) or other forms of mastitis;

14. Productive longevity in PIC sows was assessed at four lactations, based on genetic, productive and health criteria;

15. Analyzing the incidence of the causes generating death among suckling piglets, it was revealed the prevalence of two main causes: the piglets being crushed by the sows (55%) and the diarrheic syndrome (35%).

Several recommendations were formulated, from which it can be reminded:

1. Assuring the milk production in the reproduction sows requires to respect the optimum age for the first successful reproduction (233-238 days), respectively for the first birth (348-353 days);

2. We consider implementing the fast weaning at an age of 28-35 days, in the industrial pig farms to be beneficial;

3. We recommend using of spray fans to reduce the negative effects of temperature and humidity during the heatwave, on the reproductive indices in sows from jelly;

4. In the atypical syndromes, with piglets being underweight, non-viable or dying at birth, we recommend completing the etiological investigations with isolates of the fungus which produce myco-toxicosis, in fodders and bedding;

5. Regarding the piglets dead in the first week of life, caused by parturition hypoxia and reduction of vitality, we recommend confirming the state of malnutrition by means of histopathology;
6. We consider to be of great importance to improve the rearing conditions, and also the feeding and farrowing conditions in order to prevent the evolution of the MMA syndrome, diseases of the limbs and other pathological problems which can affect mainly the lactating sows, both under or overweight.

SELECTED REFERENCES


