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The influence of birth mass and age of suckling piglets on erythrocyte parameters

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ABSTRACT

The preweaning period is the most critical phase in pig production. During that period the production parameters of small birth mass piglets are the poorest and losses are the heaviest. In this study red blood cell characteristics were investigated in suckling piglets of normal and small birth mass, regarding the various changes occurring after birth related to organ development, colostrum intake, degradation of fetal erythrocytes and parental globulins, acquirement of immunocompetence, environmental changes, stress, and other factors. The average values of erythrocyte numbers obtained in both groups of piglets after birth were below the lower threshold of the reference range for pigs and only reached it at 14 (piglets of normal birth mass) or at 21 days of age (small birth mass piglets). The average erythrocyte count at the end of the suckling period was significantly higher ($P<0.01$) than values established on the first day of life. The increase recorded is probably a result of accelerated erythropoeisis in young animals after degradation of fetal erythrocytes. A significantly higher value ($P<0.01$) of hematocrits was recorded in both groups at the end of the suckling period in comparison with the first day. Only in the group of small birth mass piglets was there a statistically significant higher haemoglobin value ($P<0.01$) on the 21st day compared with the 1st day of life. All piglets had significantly lower values ($P<0.01$) of erythrocyte parameters (MCV, MCH and MCHC) at weaning than on the first day of life. Piglets of normal birth mass had significantly larger number of erythrocytes ($P<0.05$) and lower MCV value ($P<0.05$) at 7 days of age, and significantly lower MCV and MCH ($P<0.01$) in relation to low birth mass piglets at two weeks of age.

Key words: suckling piglets, birth mass, age, haematological parameters, kinetics

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Introduction

In modern pig production most significant losses occur in suckling and weaned piglets (BALENOVIĆ et al., 1994; BALENOVIĆ et al., 2002). UREMOVIĆ and UREMOVIĆ (1997) consider losses from 8-10% of piglets during suckling to be normal. Furthermore, 60-80% of total mortalities in the perinatal period occur during the first three days of life (SVENDSEN, 1992; WALDMANN, 1995; TUCHSCHERER et al., 2000). The main reasons for losses are infectious diseases, mistakes in technological processes, inadequate nutrition, unsuitable housing, inadequate management and rearing (UREMOVIĆ and UREMOVIĆ, 1997; CUTLER et al., 2006). At birth, piglets usually weigh 1.3-1.4 kg. Low birth mass piglets within individual litters are more susceptible to disease and stress, their production parameters are poor and their losses heavy (PEŠIĆ et al., 1990; UREMOVIĆ and UREMOVIĆ, 1997; CUTLER et al., 2006). 11% more piglets with birth mass below 1000 grams are stillborn and more than 17% die during the first 24 hours (CUTLER et al., 2006).

Many changes in hematological and biochemical parameters occur after piglets are born, related to organ development, colostrum intake, degradation of fetal erythrocytes and parental globulins, acquirement of immunocompetence, environmental changes, stress, and other factors (WADDILL et al., 1962; UPCOTT et al., 1973; EGELI et al., 1998; EVANS, 2000; THORN, 2000; VALPOTIĆ, 2004). Hence, the average values mentioned by other authors represent a broad range, especially on the first day of life (EGELI et al., 1998; THORN, 2000). Some of these values vary from reference values established for pigs (THORN, 2000).

There are many studies investigating these parameters in adult pigs, especially sows and growing/finishing pigs, but only a small portion includes the category of suckling piglets (EGELI et al., 1998). THORN (2000) alleges that many changes regarding blood cells occur after birth. MILLER et al. (1961) found that erythrocyte number, hemoglobin concentration, and hematocrit value, within a few days of age, fall by 30 to 38% after the expansion of plasma volume, probably because of blood dilution after colostrum intake. Suckling piglets usually have 3-8% reticulocytes and 5% erythrocytes with nucleus. This number decreases with piglet maturation. Blood from young pigs often contains many large polychromatic cells, nucleated red cells and Howell-Jolly bodies. The number of red blood cells and hemoglobin concentration increases to reach the adult level at about 5 months of age (THORN, 2000).

The aim of this study was to present the kinetics of erythrocyte parameters in piglets of normal and small birth mass during the suckling period.

Materials and methods

The study was conducted during June 2005 at a pig farm located in the region of Slavonia in the Republic of Croatia. The analysis of haematological parameters included 68 piglets (Yorkshire and Swedish Landrace crossbreeds) from birth until weaning.

Piglets were divided into two groups according to their body mass: 34 with small birth mass (less than 1000 g) and 34 with normal birth mass (1000 g and more). To diminish the effect of external factors such as housing and feeding systems, genetics, sex and sow milk production, each low birth mass piglet (one or more) selected from its litter had a piglet of normal birth mass from the same litter as control. On the first day of life the piglets were tattooed and their tails and teeth were removed. On the third day the male piglets were castrated and all piglets were administered an injection of iron supplement. Prestarter feed mixture was offered on day seven. Weaning was performed between 21-25 days.

One millilitre (1.0 mL) of blood was sampled from the superior vena cava (vena cava cranialis) into sterile vacutaner beakers with disodium salt ethylene diamine tetraacetic acid (EDTA) as an anticoagulant for hematological analysis. Samples were collected between 9.00 and 11.30 in the morning. Hematological analysis was conducted within 24 hours of sampling. Analysis of hematological parameters was performed on day 1 (day of birth was taken as day 0 of life), 7, 14 and 21 of life.

Hematological parameters were analyzed with the Serono-Baker Diagnostics System 9000+ (Inc. Cascade Drive, Allentown, Pennsylvania 18103, USA) automatic analyzer. Erythrocyte and erythroblast number, hemoglobin concentration and hematocrit value were determined, and values of erythrocyte indices: mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were calculated.

Statistical analysis was performed with Statistica 7 (StatSoft Inc., 2005) software. Basic data analysis of investigated parameters was performed with the usual methods of descriptive statistics. Normality of distribution was verified with the Kolmogorov-Smirnov test. Variance analysis defined the significant differences between individual consecutive measurements and between the value at the end of suckling period (4th sampling) and the one at birth (1st sampling). ANOVA Repeated Measures and Unequal n HSD test for post-hoc analysis was used for hematological parameters that followed normal distribution, while Friedman ANOVA and Kendall Coeff. of Concordance was used for parameters that did not follow normal distribution. The kinetics of individual parameters within each group was interpreted in this way. Significant differences between the parameters of the two experimental groups that followed or did not follow normal distribution were established with the Student t-test, and the Mann-Whitney U-test, respectively.

Results

Average numbers of erythrocytes and erythroblasts, hemoglobin concentration and hematocrit values, and erythrocyte indices (MCV, MCH, MCHC) in both groups are presented in Tables 1 and 2, and Fig. 1. Average values obtained were compared to literature data and the kinetics of certain parameters that vary considerably during the trial period are commented on.

Table 1. Number of erythrocytes and erythroblasts, haemoglobin concentration and hematocrit value in suckling piglets (means ± SD)

Age in days (n = N° of piglets)	Erythrocytes (10^{12}/L)		Erythroblasts (10^{9}/L)		Hemoglobin (g/L)		Hematocrit (L/L)	
	piglets of normal birth mass	piglets of small birth mass	piglets of normal birth mass	piglets of small birth mass	piglets of normal birth mass	piglets of small birth mass	piglets of normal birth mass	piglets of small birth mass
1 (n = 34/34)	3.80 ± 0.78	3.48 ± 0.74	0.13 ± 0.29 (0 -1.04)	0.18 ± 0.45 (0-2.35)	86.09 ± 14.94	79.74 ± 13.93	0.26 ± 0.05	0.24 ± 0.05
7 (n = 32/29)	4.29 ± 0.70	3.93^{**} ± 0.53	0.58^{a} ± 0.92 (0-2.72)	0.81^{a} ± 1.32 (0-6.26)	97.65^{a} ± 15.81	93.14^{a} ± 11.29	0.31^{a} ± 0.05	0.30^{a} ± 0.04
14 (n = 32/26)	5.19^{a} ± 0.63	4.88^{a} ± 0.67	0.10^{a} ± 0.37 (0-2.03)	0.08^{a} ± 0.17 (0-0.59)	102.10 ± 13.26	108.28^{a} ± 13.23	0.33 ± 0.05	0.35^{a} ± 0.05
21 (n = 32/23)	5.19^{x} ± 0.76	5.08^{x} ± 0.85	0.06 ± 0.19 (0-0.90)	0.09 ± 0.26 (0-0.91)	93.19^{aa} ± 14.55	100.22^{x} ± 16.47	$0.30^{aa.x}$ ± 0.06	0.33^{x} ± 0.06

Asterisks indicate statistically significant differences from the piglets with normal birth mass: *P<0.01; **P<0.05.

[a] indicate a statistically significant difference (P<0.01) in relation to the previous time period

[aa] indicate a statistically significant difference (P<0.05) in relation to the previous time period

[x] indicate a statistically significant difference (P<0.01) in relation to the value recorded on day 1

Table 2. Erythrocyte indices (MCV, MCH, MCHC) in suckling piglets (means ± SD)

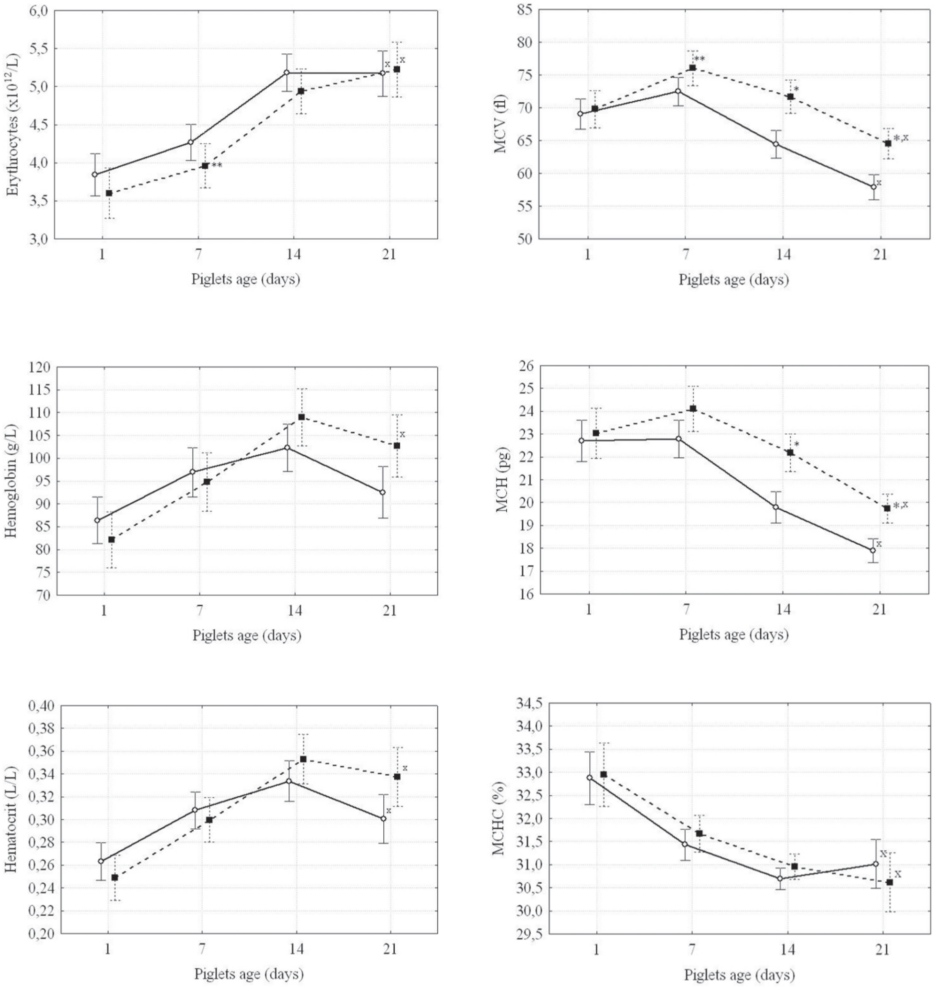
Age in days	MCV (fL)		MCH (pg)		MCHC (%)	
(n = N° of piglets)	piglets of normal birth mass	piglets of small birth mass	piglets of normal birth mass	piglets of small birth mass	piglets of normal birth mass	piglets of small birth mass
1 (n = 34/34)	69.24 ± 5.71	69.80 ± 6.38	22.85 ± 2.07	23.25 ± 2.68	32.99 ± 1.12	33.44 ± 2.90
7 (n = 32/29)	72.61 ^{a} ± 5.66	75.5** $^{.a}$ ± 5.15	22.82 ± 2.05	23.84 ± 2.07	31.42 ^{a} ± 0.71	31.53 ^{a} ± 1.06
14 (n = 32/26)	64.30 ^{a} ± 5.32	72.16* $^{.a}$ ± 5.58	19.72 ^{a} ± 1.74	22.33* $^{.a}$ ± 1.88	30.66 ± 0.62	30.94 ± 0.68
21 (n = 32/23)	57.89 $^{a.x}$ ± 4.69	64.30* $^{.a.x}$ ± 5.49	17.98 $^{a.x}$ ± 1.28	19.82* $^{.a.x}$ ± 1.69	31.12 ^{x} ± 1.43	30.86 ^{x} ± 1.48

Asterisks indicate statistically significant differences from the piglets with normal birth mass: *P<0.01; **P<0.05.

^{a} indicate a statistically significant difference (P<0.01) in relation to the previous time period

^{aa} indicate a statistically significant difference (P<0.05) in relation to the previous time period

^{x} indicate a statistically significant difference (P<0.01) in relation to the value recorded on day 1



—○— piglets of normal birth mass - - ■ - - piglets of small birth mass

Fig. 1. Kinetics of red blood picture during the suckling period (mean ± SD). Asterisks indicate statistically significant differences from the piglets with normal birth mass: *P<0.01; **P<0.05; × indicate a statistically significant difference (P<0.01) in relation to the value recorded on day 1.

Discussion

The average erythrocyte count in one day old piglets recorded in both groups of our investigation (Table 1) is in agreement with the results from EGELI et al. (1998) ($3.85 \pm 0.65\times10^{12}$/L), while other authors presented somewhat larger average values ranging from 3.99-6.4×10^{12}/L (MILLER et al., 1961; WADDILL et al., 1962; BROOKS and DAVIS, 1969; UPCOTT et al., 1973; THORN, 2000). The average erythrocyte count in 7 day old piglets is in accordance with the results from BROOKS and DAVIS (1969), THORN (2000), and ŠPERANDA (2004) in the group of low birth mass piglets (average values range from 4.0-4.5×10^{12}/L). Lower values (3.75-3.88×10^{12}/L) were presented by UPCOTT et al. (1973) and ŠPERANDA (2004) in the group of normal birth mass piglets. Higher average values (4.91-5.15×10^{12}/L) were presented by MILLER et al. (1961). The established values of average erythrocyte count in all 2 weeks old piglets are somewhat higher than in the trial by ŠPERANDA (2004), (4.48-4.54×10^{12}/L), and lower than in UPCOTT et al. (1973), ($5.87 \pm 0.54\times10^{12}$/L). The average erythrocyte count in 21 day old piglets (both groups) is in agreement with the results from MILLER et al. (1961), SVETINA et al. (1994), EGELI et al. (1998), ŠPERANDA (2004) and THORN (2000) for 20 day old piglets, whose average values range from 4.9-5.85×10^{12}/L.

As presented in Table 1, the acquired values of average erythrocyte count in suckling piglets are below or within the lower reference range for pigs (5.0-8.0×10^{12}/L) (THORN, 2000).

The low number of erythroblasts (Table 1) obtained from certain blood samplings did not show a normal distribution. The appearance of erythroblasts, as immature forms of erythrocytes, in peripheral blood is probably a result of increased erythropoesis in newborn animals after the accelerated degradation of fetal erythrocytes. If the average erythroblast number is calculated as a percentage of erythrocytes, the results obtained are in accordance with the ones mentioned by UPCOTT et al. (1973) for the piglets' first week of life (0.0%)

In our investigation we observed an increase in erythrocyte count during the first two weeks and stagnation in the third week (Fig. 1). Thereby the total erythrocyte count was continuously lower in low birth mass piglets. By observing the entire suckling period, a significant difference ($P<0.01$) in the total erythrocyte count was recorded in that a significantly larger number of erythrocytes was present in the blood on day 21 than at birth. An increase in the number of erythrocytes is a direct result of the accelerated erythropoesis of newborn animals, that is, degradation of fetal erythrocytes and their replacement with newly synthesized ones. For this reason it is possible, in young animals, to find a small portion of undeveloped erythrocyte forms (reticulocyte, erythroblast) entering peripheral circulation from the bone marrow.

MILLER et al. (1961) describe a 30% increase in plasma volume after birth, firstly as a result of globulin absorption from colostrum, and secondly as a result of the rapid growth rate of pigs and biosynthesis of serum albumin. According to their opinion, this increase in plasma quantity could be responsible for a 25% reduction of the hemoglobin, hematocrit, and erythrocyte count within 3 days of age. The results of BROOKS and DAVIS (1969) show that there is a drop in the erythrocyte count after birth, as well as hemoglobin and hematocrit values during the first 48 hours, and their slow growth until day 6 of life.

Average hemoglobin values obtained in all one day old piglets (Table 1) are in agreement with the results of UPCOTT et al. (1973) and EGELI et al. (1998), whose average values range from 79.0-87.0 g/L. Average hematocrit values in piglets with normal birth mass are in accordance with the results of RAMIREZ et al. (1963) and EGELI et al. (1998) (0.26-0.27 L/L) whereas lower values were obtained in the group of small birth mass piglets. Larger values were reported by GARDINER et al. (1953), MILLER et al. (1961), WADDILL et al. (1962), BROOKS and DAVIS (1969), OLOWOOKORUN and MAKINDE (1980), and SVENDSEN et al. (1991), whose average values of hemoglobin and hematocrit concentration range between 94.2-129.0 g/L and 0.33-0.47 L/L, respectively. Similar hemoglobin concentration as in our 7 day old piglets was recorded by MILLER et al. (1961), BROOKS and DAVIS (1969), THORN (2000) in 6 day old piglets, and ŠPERANDA (2004) in piglets with low birth mass. They found that average hemoglobin value ranged from 80.0-99.0 g/L. Lower values (76.2-81.1 g/L) were reported by GARDINER et al. (1953), UPCOTT et al. (1973), and ŠPERANDA (2004) in piglets with normal birth mass, while OLOWOOKORUN and MAKINDE (1980) reported a higher value (115 ± 30 g/L). At this age the acquired values of hematocrit are in accordance with the results from GARDINER et al. (1953), RAMIREZ et al. (1963), and ŠPERANDA (2004) for low birth mass piglets, and are within 0.27-0.35 L/L. Hematocrit values recorded by ŠPERANDA (2004) in piglets with normal birth mass were lower from ours (0.25 ± 0.05 L/L), while MILLER et al. (1961), BROOKS and DAVIS (1969), had somewhat larger values (0.34-0.36 L/L). Average hemoglobin value obtained in 14 day old piglets is lower than the one reported by OLOWOOKORUN and MAKINDE (1980), (118 ± 25 g/L), and larger than average values from UPCOTT et al. (1973), and ŠPERANDA (2004), (94.41-95.8 g/L). Average hematocrit values in both piglet groups are within the range recorded by GARDINER et al. (1953) for 15 day old piglets, and RAMIREZ et al. (1963) (0.27-0.35 L/L). The hemoglobin concentration in 21 day old piglets is lower than values reported by EGELI et al. (1998), ŠPERANDA (2004) and THORN (2000) in 20 day old piglets (99.0-102.0 g/L), as well as the average hematocrit value (0.32-0.34 L/L). MILLER et al. (1961) obtained higher values of above mentioned parameters (103.0-106.0 g/L and 0.35 ± 0.003 L/L for hemoglobin and hematocrit, respectively).

During the research period in both groups an increase in hemoglobin value was observed up to 14 days of age, followed by a decrease (Fig. 1). As a result of such kinetics, no significant difference in hemoglobin value was recorded at weaning regarding values established after birth. GARDINER et al. (1953) recorded a drop in hemoglobin value during the first week, followed by a slight increase in the second week. In agreement with the kinetics of erythrocytes, hemoglobin and hematocrit, MILLER et al. (1961) report an increase in these values after a single injection of iron-dextrin at 3 days of age. According to the same authors, the hemoglobin and hematocrit values at weaning are similar to ones before iron supplementation, while the erythrocyte number is somewhat higher. OLOWOOKORUN and MAKINDE (1980) note that hemoglobin value decreases during the first week, but with no significant difference regarding the values on the first day of life. After this period there is a gradual increase until the fourth week.

As in the case of hemoglobin levels, there is a notable increase in hematocrit values until 14 days of age, followed by a decrease (Fig. 1). During the entire suckling period there was a significant difference ($P<0.01$) in total hematocrit value resulting in significantly larger values at weaning than at birth. GARDINER et al. (1953) allege that the hematocrit curve follows the hemoglobin curve during the first two weeks of the piglet's life, with a drop in the first week and a gradual increase in the second week. RAMIREZ et al. (1963) investigated the fact that the hematocrit value significantly decreases ($P<0.01$) in the first 6 hours after birth, and reaches a minimal level 48 hours after birth. These kinetics are a result of a dilution of cell components with plasma. The same authors mentioned a significant increase ($P<0.01$) from 5 days of age until the second week after which no significant changes were observed. This increase in hematocrit is partially a result of a decrease in the erythrocyte count and the administration of iron supplement at 3 days of age. Similar changes were observed by MILLER et al. (1961).

The obtained values of mean corpuscular volume (MCV) in both groups of one day old piglets (Table 2) are in agreement with data presented by WADDILL et al. (1962), UPCOTT et al. (1973), EGELI et al. (1998) and THORN (2000), which found average MCV to be between 66-69.4 fL. MILLER et al. (1961) recorded lower MCV values (64.8-64.9 fL). Mean corpuscular haemoglobin (MCH) as well as mean corpuscular haemoglobin concentration (MCHC) established in our trial (Table 2) is somewhat larger from average values obtained by other authors (MILLER et al., 1961; WADDILL et al., 1962; UPCOTT et al., 1973; EGELI et al., 1998; THORN, 2000). They state the range for MCH and MCHC to be between 19.4-21.8 pg, and 30.2-31.0%, respectively. A similar MCV value (71.55 ± 5.88 fL) was recorded by ŠPERANDA (2004) in 7 day old piglets of normal birth mass. Lower average values, ranging from 59.3-67.0 are given by MILLER et al. (1961), UPCOTT et al. (1973), THORN (2000) and ŠPERANDA (2004) in low birth mass piglets. The average MCH value obtained from our study is higher than the average values of other authors (MILLER et al., 1961; UPCOTT et al., 1973; THORN, 2000; ŠPERANDA, 2004) which establish a range between 17.9-21.47 pg. The average MCHC value acquired is in agreement with the results of UPCOTT (1973) and ŠPERANDA (2004) which recorded average values in a range from 30.1-32.6%. Lower values (in the range of 28.2-29.1%) are obtained by MILLER (1961), and THORN (2000) for 6 day old piglets. Average values of MCV and MCH for 14 day old piglets are lower than data noted by ŠPERANDA (2004) (66.36-67.81 fL, and 20.68-21.43 pg, respectively). UPCOTT et al. (1971) determined lower MCV and MCH values, 48.7 ± 3.48 fL and 17.4 ± 2.12 pg, respectively. These authors established somewhat higher MCHC values ranging from 31.1-31.6%. Similar values of erythrocyte indices MCV and MCH in 21 day old piglets were obtained by MILLER et al. (1961), EGELI et al. (1998), and ŠPERANDA (2004). They mention average MCV values in the range of 58.2-64.7 fL, and MCH from 17.7-19.68 pg. THORN (2000) states somewhat higher values in 20 day old piglets (76.0 fL MCV and 21.0 pg MCH). Average MCHC values of 21 day old piglets are in agreement with results mentioned by EGELI et al. (1998) and ŠPERANDA (2004) (ranging from 30.2-31.1%), while MILLER et al. (1961) and THORN (2000) state lower values ranging from 27.6-29.3% .

In this investigation we established an initial increase of MCV up to 7 days of age, followed by a continual decline until the end of the preweaning period (Fig. 1). The initial increase was more pronounced in the group of low birth mass piglets and significantly larger value ($P<0.05$) was recorded from the 7th day, in contrast to normal birth mass piglets. This value was maintained until the end of suckling ($P<0.01$). In both groups a significant difference was observed between values established before weaning and after birth ($P<0.01$). The kinetics displayed may be interpreted by the increased erythropoesis in the first days of life resulting in infiltration of immature erythrocytes from bone marrow to the blood. The subsequent fall of MCV could be attributed to an increase of plasma volume. As stated by MILLER et al. (1961), MCV values decrease somewhat during the first 2 days of life due to an increase of serum osmotic pressure. This increase is the result of a build-up of serum protein content caused by protein absorption from colostrum. Afterwards, there is a rise in MCV up to 10 days of age, again followed by a gradual decrease, reaching minimal values at the age of 3 months. Similar changes during the same period were recorded by ULLREY et al. (1959) although their values were somewhat higher than from MILLER et al. (1961).

As in the case of MCV kinetics, it is evident that after an initial rise of MCH up to 7 days of age, a continual decline until weaning was observed in both groups (Fig. 1). Recorded values were larger in the group of low birth mass piglets and this difference was statistically significant ($P<0.01$) on days 14 and 21. During the entire suckling period there was a significant difference ($P<0.01$) between MCH in the first and last sampling, thereby this value is significantly lower at weaning than at birth. These kinetics are in agreement with the research by MILLER et al. (1961) who state that the level of MHC in newborn piglets slowly decreases during the suckling period reaching a minimal level prior to weaning. According to them, the 25% reduction of MCH in general follows a relatively similar MCV reduction magnitude in this period.

In all piglets we noted a decrease in MCHC value up to 14 days of age (Fig. 1). This decline continued in small birth mass piglets, whereas a slight increase was recorded during the third week in normal birth mass piglets. Upon this, by overlooking the entire suckling period, we found significantly lower MCHC at weaning than on the first day of life ($P<0.01$). The described kinetics of MCHC is an outcome of less pronounced changes in hemoglobin value as compared to hematocrit, and since MCHC is inversely proportional to hematocrit value, there is a decline during the suckling period. MILLER et al. (1961) recorded that the average value of MCHC in newborn and adult animals was above 30%. They also state that the only period during which this value was constantly lower was the suckling period, with minimal values observed at weaning.

Conclusion

The supposed changes of hematological parameters in newborn piglets are associated with organ maturation and development, degradation of fetal erythrocytes and maternal globulins, increased erythropoesis, acquirement of immunocompetence by colostrum intake, etc. Obtained values of average erythrocyte numbers in suckling pigs were below or within the lower threshold of the reference range for pigs. An increase of erythrocyte number was recorded from the first day probably resulting from accelerated erythropoesis in newborn animals, so the average erythrocyte number at the end of suckling period was significantly higher ($P<0.01$) than values obtained on the first day of life. The higher hemoglobin value at the end of the suckling period was not significant regarding the first day of life, while hematocrit increase during the same period was significant ($P<0.01$). As the value of MCHC is inversely proportional to hematocrit value, the recorded decrease in the suckling period was significant ($P<0.01$). The significantly lower value ($P<0.01$) of MCV observed at the end of the suckling period in relation to the first day after birth could be the outcome of increased osmotic pressure caused by serum proteins absorbed from colostrum. Looking at the entire preweaning period, there was also a significant difference ($P<0.01$) in MCH between the first and last sampling, so this value was significantly lower at weaning than at birth. We anticipate that the cause of these variations and kinetics is the same as in the case of MCV.

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SAŽETAK

Razdoblje sisanja u prasadi predstavlja presudnu fazu svinjogojske proizvodnje. U ovom istraživanju utvrđeni su hematološki pokazatelji odojaka od prasenja do odbića. Nakon prasenja dolazi do različitih promjena, koje su u vezi sa sazrijevanjem i razvojem organa, uzimanjem kolostruma, razgradnjom fetalnih eritrocita te majčinih globulina, stjecanjem imunokompetentnosti, okolišnim promjenama, utjecajem stresa i drugim čimbenicima. Dobivene vrijednosti prosječnog broja eritrocita odojaka nakon prasenja nalazile su se ispod, a tek u dobi od 14 dana unutar donje granice referentnog raspona za svinje. Prosječan broj eritrocita na kraju razdoblja sisanja bio je statistički značajno veći ($P<0,01$) od vrijednosti utvrđene prvog dana života. Ustanovljeni porast mogao bi biti posljedica ubrzane eritropoeze u novoprasene prasadi nakon razgradnje fetalnih eritrocita. Statistički značajno veća vrijednost ($P<0,01$) na kraju razdoblje sisanja, u odnosu na prvi dan utvrđena je i za vrijednost hematokrita. Zabilježene su i statistički značajno manje prosječne vrijednosti ($P<0,01$) eritrocitnih indeksa (MCV, MCH, MCHC) kod odbića nego prvog dana nakon prasenja.

Ključne riječi: odojci, porodna masa, dob, hematološki pokazatelji