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Artículos Originales

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Los procedimientos dentales postnatales afectan la ganancia de peso y el bienestar de los lechones

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Abstract:

Objective. We carried out this study to evaluate weight gain (WG), mortality, blood serum proteins (BP), facial lesions of littermates submitted to different teeth procedures. **Material and Methods.** The experiment was performed in a commercial breeding farm. Were used 15 sows, allotted into three groups: control, where piglets' teeth were kept intact (IT); teeth clipping (CT); and teeth grinding using an electric grinder (GT). We evaluated WG, BS (five males/litter), mortality, low viable piglets rates and facial lesions in piglets. Additionally, we evaluated sows' backfat thickness (P2) and teat lesion score. BP data, lesion score and WG were assessed individually. For WG, the initial weight and the litter size were used as covariates. Regarding other variables, we used the average of the litter. When there were differences, the means were compared using Duncan test ($p<0.05$). **Results**. In the first week, GT piglets presented higher WG. In the second week, CT presented worst WG. In the first two weeks as in the total period, CT piglets presented worse WG than the GT. Mortality and low viable piglets rates were not influenced. After the fourth day, CT and GT treatment reduced facial lesions. There was no effect on BP. Treatments did not influence P2 and teat lesion score. **Conclusions.** Treatments did not have influence on mortality, low viable rates, BP of the piglets and P2 and teat lesions score. CT treatment decreased weight gain and IT increased face lesions score.

Keywords: clipping teeth, grinded teeth, facial lesions, maternity procedures.

Resumen:

Objetivo. Este estudio fue realizado para evaluar la ganancia de peso, mortalidad, proteínas plasmáticas (BP), lesiones faciales en los lechones y en las cerdas, grasa dorsal (P2) y lesiones en los pezones en lechigadas sometidas a diferentes manejos dentales. **Materiales y métodos**. La investigación fue conducida en una granja comercial de cría. Fueron utilizadas quince cerdas, divididas en tres grupos: control, en el cual los dientes de los lechones permanecieron intactos; descolmille con alicate; descolmille con limadora eléctrica. Nosotros evaluamos WG, BP (cinco machos/lechigada), mortalidad, lechones de baja viabilidad y lesiones faciales en

los lechones. En las cerdas, nosotros evaluamos P2 y la escala de lesiones en los pezones. Los datos de BP, escala de lesiones y WG fueron evaluados individualmente. Para el WG, el peso inicial y el tamaño de la lechigada fueron considerados. Acerca de las otras variables, nosotros usamos el peso promedio de la lechigada. Cuando hubo diferencias, las medias fueron comparadas usando la prueba de Duncan ($p<0.05$). **Resultados.** En la primera semana, los lechones del GT presentaron mayor WG. En la segunda semana el CT presentó la peor WG. En las dos primeras semanas así como en el período total, los lechones del CT presentaron peor WG de que los del GT. La mortalidad y los lechones de baja viabilidad no fueron influenciados. Después del cuarto día, el CT y el GT redujeron las lesiones faciales. No hubo efectos en BP. Los tratamientos no influenciaron P2 y las lesiones en los pezones. **Conclusiones.** Los tratamientos no influenciaron en la mortalidad, lechones de baja viabilidad, BP de los lechones y en la escala de lesiones en los pezones de las cerdas. CT redujo la ganancia de peso y IT aumentó las lesiones faciales.

Palabras clave: descolmille con alicate, descolmille con limadora eléctrica, lesiones faciales, manejo en la maternidad.

INTRODUCTION

In industrial swine production, in the first few days of life, piglets receives different several procedures. These may include castration, tail docking, teeth resection and ear notching (1). These procedures involve tissue damage and, therefore, are potentially painful for the piglets (2).

Piglets are born with eight sharp teeth, which may cause facial lesions to other piglets and sows' teat during breastfeeding. Therefore, teeth resection is perform to minimize these problems (3, 4) in the first few days, by grinding or clipping the needle teeth (third incisors and the canines) to gum line (2).

European Union (5) accepts teeth resection only when there is evidence of sows' teat injury or piglets' injury (on ears or tails), because they may cause stress and pain (3).

As pain compromises animal welfare, it is desirable to improve these procedures, replacing them by alternative methods (2). When available, management practices should be adopted to eliminate the need for full implementation of these procedures (4). Several questions remain unanswered about the effects on the overall welfare of piglets, and there is little information describing the effects of the different methods for the execution of the same procedure. That is, the literature is not yet conclusive as to the recommendation of the teeth management (6).

Due to the small number of recent studies that evaluated dental management in piglets of modern sows in Brazil, we evaluate weight gain, blood serum proteins and variables related to the behavior and welfare of piglets, submitted to different dental procedures at birthday.

MATERIAL AND METHODS

Ethical aspects. Ethics Committee of the Santa Catarina State University (protocol 01.36.15) previously approved the present study.

Study site. The experiment was conducted in a commercial farrowing unit farm (27°10'S and 51°50'O at 660 m). We chose the litters of 15 crossbred sows (Landrace x Large White selected for high reproductive performance), from first to sixth parity. We transfer sows, one week before of the expected delivery day, in pens equipped with wooden creep (0.8 x 0.8 x 0.8 m) heated with an incandescent light bulb (100 W). Sows received commercial diet according to farm management.

Experimental design and analysis. We adopted a completely randomized design, with five sows per treatment. Treatments consisted of intact teeth or control (IT), where there were no procedures on the teeth; clipping teeth using side-cutting pliers (CT); and grinding teeth (GT) using a high-speed rotary grinder (Dremel ® rotary tool, 125 W, 33.000 RPM, fitted with head polishing abrasive stone point tip, China). The teeth (third incisors and the canines) were resected in order to standardize 2 to 3 mm above gum level (6).

Soon after birth, the piglets were identified with a nontoxic marker in the back. We performed teeth procedures after the first breastfeeding according treatment. When necessary, we performed cross-fostering in the litters of the same treatment (until 24 hours after birth).

Blood serum proteins analysis were made using 10 mL of blood samples, collected by jugular venipuncture on the tenth day of life. Aiming to minimize stress, blood samples were collected only from males (five per litter). Trained personnel collected blood samples within 10 to 30 s after the piglet being picked up.

Blood samples was centrifuged for three minutes (1.500 g) to obtain the serum, put into plastic micro tubes and frozen (-20ºC) for latter measurement of total proteins, albumins and globulins. To quantify total proteins and albumins, we used the Bromocresol Biuret and Green colorimetric methods, respectively. The globulins concentration was obtained by the difference between total proteins and albumins. Blood tests readings were performed with the Bio-2000 biochemical analyzer model Bio-2000 (BioPlus ®), with commercial kits (Analisa ®).

Every week up to 21 days, we analyzed individual piglet weight by an electronic scale (± 5 g). Low viable piglets rates (piglet with injured and not accepted by other farms) and mortalities rates (stating the cause) in the different treatments were recorded. In addition to the aspects studied in the piglets, we measured the sows' backfat thickness (SMTU 100 Microem ®, Campinas – Brazil) at delivery and weaning day.

Facial lesions were scored on a scale from 1 to 3, where animals with a score 1 did not present lesions or had a few ones, and animals with a score 3 had many lesions. They were assessed every two days using individual digital photographs and the adaptation of the methodology of Fraser and Thompson (7) and Jansen et al (8).

Additional piglet procedures. Cool tail docking, metaphylactic oral treatment for coccidia control (1 mL totrazuril 5%), iron dextran injection (200 mg) and castration following the farm routine performed at the third day of life. The litter received additional commercial diet for piglets from 10 days after birth.

Environmental variables. Dry bulb temperature (DBT), wet bulb temperature (WBT) and black globe temperature (BGT) were registered (08 am, 12 pm and 6 pm). We used an analog thermo-hygrometer and a black globe thermometer (±1°C) in geometric center of the farrowing facilities. Additionally, Black Globe Temperature-Humidity Index (BGTHI) values were calculated.

Statistical analysis. Data was submitted to the Kolmogorov-Smirnov test and the errors presented normal distribution ($p>0.05$) and analyzed based on a completely randomized design. The data obtained in the blood serum proteins test, face lesion score and weight gain were evaluated using piglet as experimental unit. Concerning weight gain, the piglet initial weight and litter size were used as covariates. For the other variables, litter was experimental unit. When a treatment effect was detected ($p<0.05$), the Duncan test was used to compare treatment means.

RESULTS

Environmental variables. The mean values of Black Globe Temperature Humidity Index (BGTHI) in the farrowing unit were 70.4, 70.4 and 71.5 for the 08H00Min, 12H00Min and 18H00Min, respectively (Table 1).

TABLE 1

Table 1. Environmental variables in the experimental period.

Variables	08h00min	12h00min	18h00min
Dry bulb temperature, °C	21.9 ± 2.3	24.0 ± 3.6	23.1 ± 2.7
Wet bulb temperature, °C	19.8 ± 1.7	20.5 ± 1.8	20.4 ± 1.5
Black globe temperature °C	22.2 ± 2.1	23.8 ± 3.3	23.2 ± 2.5
Black Globe Temperature-Humidity Index	70.4	70.4	71.5
Relative humidity, %	81.4	71.3	77.1

Performance and mortality. In the first week, piglets with grinded teeth presented greater weight gains ($p<0.05$) (Table 2). In the second week, the piglets with clipped teeth showed the worst weight gain ($p<0.05$).

TABLE 2.
Table 2. Birth body weight and weight gain (kg) of piglets.

Period	Intact	Clipping	Grinding	Averages	P value
	Birth body weight, kg				
Birth	1.42	1.44	1.54	1.47	NA
	Weight gain, kg1				
1st week	1.21 b	1.25 b	1.39 a	1.28	<0.01
2nd week	1.56 a	1.28 b	1.51 a	1.44	0.01
3rd week	1.47	1.39	1.50	1.45	0.29
0-14 days	2.77 ab	2.53 b	2.90 a	2.72	0.01
0-21 days	4.24 ab	3.93 b	4.40 a	4.17	0.03
1 NA-not analyzed; Means with different lowercase letters in the line differ according to Duncan test ($p<0.05$).					

In the first two weeks, as well as in the whole period, the piglets of the clipping teeth treatment showed worse weight gain compared to the animals of grinded teeth one ($p<0.05$).

The treatments did not have an influence on mortality rate and low viable piglets rate ($p>0.05$) (Table 3).

TABLE 3
Table 3. Litter size, pre-weaning mortality rate and sows backfat thickness (P2).

	Treatments1				
Variables	Intact	Clipping	Grinding	Averages	P value
Litter size	12.2	13.5	14.4	13.4	NA
	Pre-weaning litter mortality, %				
1st week	7.6	5.4	10.8	7.8	ns
2nd week	0.0	3.4	1.3	1.7	ns
3rd week	0.0	0.0	0.0	0.0	-
14 days	7.6	8.7	12.1	9.4	ns
21 days	7.6	8.7	12.1	9.4	ns
Mortality and low viable	11.0	17.4	17.3	15.3	ns
	Sows backfat thickness (P2), mm				
P2 at delivery day	9.0	9.0	7.8	8.6	ns
P2 at weaning day	8.4	7.7	7.0	7.7	ns
1 NA-not analyzed, NS-not significant.					

Piglets' facial lesion score. Clipping and grinding the teeth decreased the facial lesion score ($p<0.05$) after the fourth day (Table 4).

TABLE 4.
Table 4. Piglets' facial lesion score.

Days	Facial lesion score1				
	Intact	Clipping	Grinding	Averages	P value
0	1.00	1.00	1.00	1.00	-
2	1.02	1.00	1.00	1.01	ns
4	1.07 a	1.00 b	1.00 b	1.02	<0.05
6	1.07 a	1.00 b	1.00 b	1.02	<0.05
8	1.11 a	1.00 b	1.00 b	1.04	<0.05
10	1.11 a	1.00 b	1.00 b	1.04	<0.05
12	1.11 a	1.00 b	1.00 b	1.04	<0.05
14	1.11 a	1.00 b	1.02 b	1.04	<0.05
16	1.15 a	1.00 b	1.02 b	1.06	<0.05
18	1.31 a	1.00 b	1.02 b	1.11	<0.05
20	1.35 a	1.06 b	1.05 b	1.15	<0.05
1NS-not significant; Means with different lowercase letters in the line differ according to Duncan test ($p<0.05$).					

Blood serum proteins. The treatments had no effect ($p>0.05$) on the blood serum proteins evaluated (Table 5).

TABLE 5.
Table 5. Piglets blood serum proteins.

	Treatments1				
Variables, mg/dL	Intact	Clipping	Grinding	Averages	P value
Total proteins	5.51	5.58	5.64	5.58	ns
Albumins	1.85	1.90	1.95	1.90	ns
Globulins	3.66	3.68	3.69	3.68	ns
1 NS-not significant.					

Effects on the sows. The treatments did not influence ($p>0.05$) the backfat thickness at P2 (Table 3) and there were no differences ($p>0.05$) in the teat lesion score.

DISCUSSION

Environment variables. During the experimental period, the BGTHI values were lower than 72, the maximum recommended for sows (9), and 82, the minimum for piglets (9).

Nevertheless, pens had a wooden creep, equipped with incandescent light bulb (100 W) for heating, which are enough to maintain thermal comfort and to avoid hypothermia in piglets (10). Therefore, environmental conditions during the experiment were favorable.

Performance and mortality. The largest weight gains in the first week of the piglets with grinded teeth treatment could be associated with the absence of mouth and face lesions, as well as the greater comfort provided to the sows during breastfeeding. The results differed from those obtained by Van Beirendonck et

al (11). In their study of different teeth procedures, they did not find differences in the weight gain in normal weight piglets during the first week.

The lower gain obtained in the second week in the clipping teeth treatment group could be related to the removal or fracture of the teeth enamel, with consequent exposure of the dental tubules and possible bacterial colonization (12), which may hinder the milk intake, associated with pain and decrease piglet weight gain.

On the other hand, the results in the second week differ from those found by Marchant-Forde et al. (6) who observed piglets with intact teeth had tendency to improve the gain weight until the fourteenth day of life than piglets with grinded teeth. Furthermore, they found no differences between intact and clipping teeth treatments, results that are controversial to those obtained in this study.

When evaluating the performance of piglets with clipped teeth against simulated treatment, Zhou et al. (13) verified higher body weight at 21 days in clipped teeth piglets. However, from 21 to 70 days, pigs with simulated treatment presented higher daily weight gain. Available information on the implications of chronic pain, infection risk, mortality rates and welfare are yet limited (4). Yet, they could support the results obtained for the welfare of piglets with clipped teeth.

Results of the first fortnight and the entire period were worse in the clipped teeth treatment than the grinded one. This ratifies the hypothesis previously discussed that clipping could have compromised the tooth structure and made difficult the intake of milk.

The absence of effects on the mortality rate and low viable piglets differed from the results found by Hansson and Lundeheim (3). Their study observed a higher mortality in piglets with intact teeth treatment on the first and second weeks of life.

Nevertheless, the absence of influence on mortality was similar to the results obtained by Van Beirendonck et al. (11). They did not find differences in the mortality rates between piglets with intact or grinded teeth. The inconsistency of information in the literature may be related to other factors, such as the facilities, sow management, and the crossbreeding line maternal ability. These aspects may have interfered in our results, what shows the need for specific recommendations for each crossbreeding line or farm.

Skin lesions. Due to the absence of sharp teeth, we were expecting a lower number of face lesions resulting from fights and competition during breastfeeding in the piglets with dental procedures, and this was confirmed. However, only piglets from one intact teeth litter had facial lesions. These results showed the heterogeneity on family behavior of the same genetic crossbreeding line. Occurrence of skin lesions on the front of piglets' bodies during weaning has a positive correlation with agonistic behavior (14).

The results obtained ratify the hypothesis presented by Sutherland (4) that an alternative for routine teeth procedures is to perform them only in littermates with greater risks to the health and welfare of piglets and sows associated to the maintenance of intact teeth. In the previously quoted paper (13), when evaluating the performance of piglets with clipped teeth or simulated procedures, no differences were found for wounds in the body of pigs at 70, 110 and 160 days of life after teeth procedures.

Blood serum proteins. The absence of effects of the treatments on blood serum proteins at 10 days suggests that there was no infectious reaction in the piglets.

However, blood collection was performed at the tenth day after birth, and this may have minimized possible effects of teeth procedures on these variables. Similarly, the face lesion score was higher after the second week, reinforcing this hypothesis. Therefore, regarding performance and the lesion scores results obtained in this study, we suggest that in future studies blood collections should be done a few days after teeth procedures, in order to evaluate colostrum intake, and in periods near weaning, so that possible bacterial colonization with consequent alteration of globulin levels could be better identified.

Effects on the sows. Despite not being the main objective of this study, changes at P2 are an important indicator of sow milk production, and were not influenced ($p>0.05$) by the teeth procedures studied (Table 3). However, this variable, as well as mortality rate, have multifactor influence and in future works should be explored.

The treatments did not influence ($p>0.05$) teat lesion score. This is contrary to the results obtained by Hansson and Lundeheim (3), who observed bigger teat lesion incidence on sows with litters that had their teeth kept intact, compared to grinded teeth ones.

We can conclude that different teeth procedures did not influence the mortality rate, the blood serum proteins at 10 days old piglets, as well as the sow backfat thickness and teat lesion score. Clipping the teeth impaired performance and the intact teeth increased the occurrence of facial lesions in the piglets.

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