

Consequences of tooth wear of piglets on the weight gain of piglets and sows in the maternity phase

Dela Ricci, G¹*; Trindade Neto, M.A.¹; Dalla Costa, O.A.²; Titto, C.G.¹; Almeida, T.W.¹ e Maganhe, B.L.¹

¹Departamento de Zootecnia. Universidade de São Paulo. Pirassununga. Brasil.

²Embrapa Suínos e Aves. Concórdia. Brasil.

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Correspondencia a los autores/Contact e-mail:
giseledelaricci@usp.br

SUMMARY

The objective of the present study was to evaluate the incidence and prevalence of lesions in the face of piglets and the subsequent effects on their performance. The treatments used were the maintenance and wear of incisors and canines. Evaluations were performed on the second and fourth day after birth and three times a week until weaning. The lesions were classified as type A and B. Conventional methods were used to analyze the zootechnical parameters and body temperature was measured in the ventral and dorsal region of the piglets, twice a day. The chi-square test was used to evaluate the effect of treatment on the prevalence of piglets with Type A and Type B lesions. Mean values of body temperature and weight gain per treatment were compared by Fischer Means Test. In relation to weight gain, a variance analysis was performed considering the location of the effects and the treatment. The percentage total lesions found in piglets in both treatments was 39.2%. Type B lesions accounted for 20.5%. Significant differences were found for the periods evaluated. In this study, severe lesions were found in piglets with teeth, however, the use of wear tooth is unnecessary, as there are lesions that occur in this practice due to poor management of piglets and sows during lactation. Female weight gain after farrowing and lactation was not affected by maintenance of intact teeth or by weaning, as well as gain of piglets after birth and weaning. However, for piglets at weaning, there was a trend, since the weight found at site I was higher than site II and III. It is concluded from the results of this study that tooth wear should be performed only when necessary.

Estimativa de la incidencia y frecuencia de lesiones faciales en lechones y sus subsiguientes efectos sobre el aumento de peso

RESUMEN

El objetivo del presente estudio fue evaluar la incidencia y frecuencia de lesiones en la cara de los lechones y los efectos subsiguientes en su rendimiento. Los tratamientos utilizados fueron el mantenimiento y el desgaste de incisivos y caninos. Las evaluaciones se realizaron el segundo y cuarto días después del nacimiento y tres veces a la semana hasta el destete. Las lesiones se clasificaron como tipo A y B. Para el análisis de los parámetros zootécnicos, métodos convencionales y temperaturas corporales obtenidos de las regiones ventral y dorsal de los lechones dos veces al día. La prueba de chi cuadrado se utilizó para evaluar el efecto del tratamiento sobre la prevalencia de lechones con lesiones de tipo A y tipo B. El análisis de temperatura de los lechones fue el aumento de peso a través del efecto período fijo, la semana y el tratamiento con la comparación de los medios por PDIFF. En cuanto al desempeño, se realizó un análisis de varianza considerando los efectos de la finca y el tratamiento. Para ambos tratamientos, el promedio de la evaluación de cuatro semanas mostró que las lesiones tipo A se encontraron en el 39,2% de los lechones y las lesiones tipo B en el 20,53%. Se encontraron diferencias significativas en los períodos evaluados. El peso de las camadas al salir de la maternidad, para locales y tratamientos también fueron significativos. En este estudio, se encontraron lesiones graves, sin embargo, el desgaste es innecesario, con gran atención se volvió a las maniobras erróneas que perjudican a los lechones y cerdas.

INTRODUCTION

On the teat order, stronger and heavier piglets usually have more opportunities to win the competition for the front teats, while the lighter or subordinated ones breastfed in the posteriors, where there is, usually, less milk (McBride et al., 1965; Hartsock, Grave, 1976; Scheel et al., 1977). In addition to the better potential for milk production, in front glands provide a more comfortable position for suckling when compared to

posterior ones, what makes them more disputed (Gill and Thomson, 1956; Hemsworth et al., 1976a). According to Mores et al (1998), piglets are born with eight teeth, four canines and four premolars, which are salient and projected to the outside of the oral cavity.

The practice of clipping or grinding the teeth is common and is usually held in the early hours of piglets' life aiming to reduce skin lesions in piglets and in the mammary apparatus of reproductive females

during lactation. Despite the benefits from the reduction of skin injuries in piglets, this procedure results on the removal or fracture of tooth enamel, what might predispose animals to infection due to the tooth pulp exposure (Barcellos, 1990). In the early days of the sucklings, teeth reduction causes severe pain, leading animals to stress and decrease in productive performance (Bates et al., 2003). Dental alterations are noticed especially after the mismanagement of wear or cutting of the teeth (Sobestiansky, 2007).

The maintenance of teeth has been adopted based on data that indicates the handling of cutting and wear of the teeth as a factor for increased mortality during the maternity period, once it reduces the ability of the piglets to compete for teats and milk. There are, however, questions regarding the practice, suggesting a higher incidence of injuries arising from disputes among piglets (Weary and Fraser 1999; Bates et al., 2003). Considering the importance of the topic on whether or not to wear the teeth and concerns about the welfare of suckling piglets, this study seeks to assess the incidence and frequency of lesions on the face of the piglets and the subsequent effects on piglet performance in the maternity sector.

MATERIAL AND METHODS

The study was conducted on three farms, two research farms and a commercial one, from August 2012 to April 2014. The study was approved by the ethics committee for the use of animals under the number 3029/2013 of the University of Sao Paulo, campus Fernando Costa, in Pirassununga. In total, 750 piglets of commercial strains were evaluated, being 399 piglets for the teeth wearing treatment and 407 for the maintenance of the teeth. It was not considered differences among sex of the sucklings. The weaning of the piglets was carried out, on average, at twenty-eight days of age.

In the three places, biosafety, nutrition and management programs were followed for the lactating mother and suckling piglets in accordance with the previously program defined by the farms, without adjustments or modifications performed under the experimental protocol performed. After the birth of the piglets, litters were standardized adopting weight and treatment as criteria for the organization of lactating females in the maternity rooms. The females were randomly distributed within treatments.

Treatments directed to the piglets were divided into maintenance of intact incisors and canines of newborn piglets and summit wear of the incisors and canine teeth of piglets at two days old. By agreement, the evaluation places were suggested to adopt the wear technique that ensures greater exposure of the teeth, exposing the oral cavity of the piglets as much as possible, so that the device does not lead to mouth sores (Lewis and Boyle, 2003; Koller, 2006). The wearing equipment used was the Dremel® (USA), used at its maximum rotation speed.

After the grinding procedure of the teeth, the oral cavity of the piglets were examined for the presence of lesions in the gums, tongue, or in relation to its teeth (Bollwahn 1965; Straw et al., 1999), aiming to evaluate the ability of the handler.

Piglets submitted to the treatments also underwent other procedures such as castration (males), ear notching and tail docking. It was opted for the non-treatment of lesions with specific medications, but exceptions were accepted in cases of severe injuries associated to health impairment and to not compromise the swine welfare.

Lesions were evaluated in terms of intensity, depth and severity and according to the degree, in other words, severity of the lesion, presence of blood and impairment of the face by the wound.

To determine injuries levels on the faces of the piglets, the following parameters were evaluated: presence or absence of lesions (ulcers), lesion intensity (mild, moderate and severe) based on what is proposed by Brown et al. (1996) and Dalla Costa et al. (2013 a,b), **Table I**. The same piglet could present lesions of different classifications.

The evaluations were performed on the second and fourth days after birth, and three times a week until weaning, according to the number of piglets within the litters evaluated, individually. Lesions were classified as type A lesions, defined for grades 0 and 1; Type B lesion for grades 2, 3 and 4. By convention, the pictures of lesions were named as i, ii, iii, iv, indicating the advance of lesions over a period, so there is no conflict with the type of lesions previously classified as type A and type B.

Ventral, dorsal and rectal temperatures of the sows and ventral and dorsal of piglets were measured twice a day, during morning and afternoon periods by the

Table I. Classification of degrees of lesions in the face of piglets in the maternity phase (Clasificación de los grados de lesiones en la cara de los lechones en la fase de maternidad).

Degree	Lesion	Intensity of Lesion	Teat impairment
0	Absent	No lesions	No impairment
1	Present	Light	No impairment
2	Present	Moderated	Partial impairment
3	Present	Severe	Total impairment
4	Present	Severe	Total impairment, with loss of tegumentar tissue

Source: Adapted from Dalla Costa et al (2013ab)

use of infrared thermometer. For the analysis of performance parameters, conventional methods were adopted for the record of weight gain. Litters were weighed on the date of entry and exit from the maternity sector.

STATISTICAL METHODOLOGY

The chi-square test was used to assess the treatment effect on the prevalence of pigs with Type A and Type B lesions. The mean score for lesions was calculated for each litter (sow), and this variable was analyzed by repeated measures analysis, considering farm, sex, effects of treatment, the age of the piglets, the interaction of these factors and 16 kinds of variances and covariances matrix structures, using the Proc Mixed©

Statistical Analysis System (Xavier, 2000). The structure used in the analysis was chosen based on the lowest value of the Akaike Information Criterion (AIC). The estimation method used was the restricted maximum likelihood. The development of the analysis to the interaction effect of treatment and age of piglets was performed using the F test to compare the treatment effect within age ($P=0.05$).

The analysis of the temperature of the piglets was performed through the fixed period effect, treatment and week with means compared by Fischer Means the test t Student. As for performance, an analysis of



Figure 1. Mismanagement by the teeth wear equipment and absence of lesions from disputes among piglets (Manejo inadecuado por el equipo de desgaste de los dientes y ausencia de lesiones de disputas entre lechones).

variance was performed considering the effects of farm and treatment.

RESULTS

In relation to the lesions found on the faces of the piglets, on the maintenance treatment of the teeth, type A lesions add up to 50,6% (206 animals) and lesions type B 28,2% (114 animals), on average. For the treatment of teeth wear, lesions type A represented 26,3% (113 animals) and type B 11,9% (47 animals), on average, respectively. In general, for both treatments in which the suckling piglets were subjected to, on the average of the four-week evaluation, Type A injuries were found in 39,2% of the piglets and B-type lesions in 20,5%.

During the first week, the presence of type A lesions found on the face of piglets were 33% and the type B injuries were 17,3%. In week II, the presence of type A lesions observed were 30,5% and type B lesions were about 11,0%, with a slightly decrease on the intensity of injuries. In the third week, 27,3% were for the type A and 7,8% for type B lesions on the face of the piglets. For the fourth week, the declines on the intensity of the lesions remained with 20% for type A lesions and 3,4% for type B ones.

Piglets from both treatments showed low intensity lesions (scratches) immediately after birth, and are illustrated in **Figure 1**. The sequence of the figures represents evolution an involution of lesions during the 21 days of permanence of the animal at the maternity phase.

The wound caused by the mismanagement from the handler can be observed, however, with absence of lesions on the face of the piglets. It can be noticed the progressive presence and curative of the lesions. Lesions of 13,7% of the piglets submitted to the treatment of teeth maintenance were treated. In both treatments evaluated, it was observed initial lesions light, due to initial disputes for the teats with greater milk production among all litters studied.

TEMPERATURE ANALYSIS

VENTRAL AND DORSAL TEMPERATURE OF PIGLETS

The ventral temperature was not influenced by the evaluation schedules, weeks and maintenance treatments of tooth wear (P>0.005). The average temperature found for tooth wear was 38.1°C and for tooth maintenance of 38.5°C.

The temperature of the back was influenced by the evaluation periods, with 38.8°C for morning and 36.3°C for afternoon (P<0.001). However, the week and the treatments did not interfere in the dorsal temperature (P>0.005).

In relation to the weeks, the highest overall mean was found for week III (36°C) and the lowest for week IV (35.8°C). For the experimental schedules, higher and lower mean temperatures were observed in the afternoon with 39°C and 37.6° C in the morning, respectively.

VENTRAL, DORSAL AND RECTAL TEMPERATURE OF FEMALES

The ventral temperature was not influenced by the weeks, periods and treatments used for the piglets, with higher averages for the treatment of teeth maintenance (36.5°C) in relation to tooth wear (35.7°C) (P>0.005). In relation to the periods, the highest mean was obtained in the morning (36.7°C) and lower for the afternoon (36.6°C) (P>0.005).

The dorsal temperature of females had only influence of the evaluation weeks (P<0.005). The highest mean was observed for the morning (35.1°C) in relation to the afternoon (35.0°C). The mean dorsal temperature for the wear treatment of teeth with 35.3°C and 34.9°C for the tooth maintenance treatment (P<0.005).

Rectal temperature differed statistically only in relation to weeks of evaluation (P<0.001). The highest average was found for the afternoon (38.6°C) in relation to the morning (38.5°C) (P>0.005). In relation to the average observed for rectal temperature, tooth wear treatment presented a mean of 38.6°C and tooth maintenance of 38.5°C (P>0.005).

The highest overall mean was found for week IV (36.8°C) and lower for week I (36.5°C). According to Radostits et al. (2002) body temperature of the swine ranges from 37.8 to 38.5°C. In this study, regardless of the treatment used, the lesions and their intensities did not cause a significant increase in body temperatures for infants and mothers. The increase in temperature over the weeks may be related to the lactation phase, feed consumption by females and bioclimatology of feedlot.

It was evidenced that the erroneous handling inside the confinement can interfere, even in a moderate way, in the quality of life of the piglets and matrices. Higher superficial temperatures of the back were observed in piglets, due to the bad use of the incubator, which had high intensity heating lamps or the behavior of the piglets in the sun at certain times of the day. In addition,

Table II. Effect of wear or integrity of piglets' teeth on the postbirth weight of females and piglets at weaning (28 days) (Efecto del desgaste o la integridad de los dientes de lechones sobre el peso post parto de hembras y lechones al destete (28 días).

Weight gain in maternity	Tooth Maintenance	Tooth Wear	Pr > F
Post childbirth-Female	249.31±9.62	255.00±4.41	0,5585
28 days- Female	226.17±9.37	236.50±5.94	0,3590
At birth- Litters	17.12±0.55	17.19±0.56	0,9782
28 days- Litters	65.16±2.57	71.85±3.21	0,0595

tion, very low ventral temperatures were observed in piglets, due to the cleaning water that remained inside the bays, generating problems in the females, or the lack of a bulb in the incubator.

WEIGHT GAIN

Females weight gain after calving and weaning was not affected by maintenance of intact teeth or by weaning, as well as piglet gain after birth and weaning ($P>0.005$), see **Table II**.

For the weight gain of the females after calving until weaning, the experimental sites did not interfere in the gain ($P>0.005$). However, for piglets at weaning, there was a trend, because the weight found at site I was greater than at site II and III, which were statically equal, see **Table III**.

DISCUSSION

The choice of a specific gland in the breast tissue occurs within the first few minutes after birth. Between three and seven days, the choice of a teat in the mammary gland is already defined. Once the order of teats is established, the piglets will occupy the same tit or teat pair until weaning, and new disputes are rarely encountered by different glands, maintaining a preference for those previously chosen (Rosillon-Warnier e Paquay, 1984).

In this study, low intensity lesions on piglet faces were observed in both treatments. This can occur due to the age of the piglets (evaluation time), since the wear of the teeth is only done after the first forty-eight hours of birth. In this initial period of life, with low energy reserves in their bodies, newborn piglets need to acquire via colostrum energy and the desired amounts of immunoglobulins (Straw et al., 1998; Robert e Martineau, 2001; Pieters et al., 2008).

Piglets maintained with their intact teeth have a higher number of lesions facials and more severe than litter of cut teeth (Fraser, 1975). The wear of the teeth reduces the frequency of facial lesions of the piglets and the mammary matrix apparatus (Hutter et al., 1993), and also a reduction in the mortality rate (Maass, 1995). However, cutting or wearing procedures are responsible for the entry of microorganisms that cause significant damage to the piglets' health (Hutter et al., 1993). In a study with 170 daughters, where the use of the cut of the teeth was performed only on low-birth-weight piglets, while the remaining litter piglets were

kept with intact teeth, only 0.6% of the sows presented injuries to the mammary system (Robert et al., 1995). The evaluation of the procedures for cutting, wearing and maintaining intact teeth of newborn piglets until weaning, from 30 litters and their respective matrices were observed at intercalated dates, showing that the higher frequency of lesions in the mammary apparatus were caused, especially for piglets kept with intact teeth (Brookes and Lean, 1993).

In the farms where the experiment was conducted, the procedures were always carried out by the same team, which was trained and had experience in the handling of suckling piglets, besides being supervised by a specialist. The wear of the teeth was carried out with caution to avoid wounds and fractures in the gums and teeth, which occurs mainly if the procedure is performed very close to the gums (Weary and Fraser, 1998).

Broods that are maintained with whole teeth show a greater number of facial lesions and are more severe than littermates with cut teeth (Fraser, 1975). Teeth wear reduces the frequency of facial lesions in piglets and female mammary glands (Hutter et al., 1993), and there is also a reduction in the mortality rate (Maass, 1995). However, cutting or wearing procedures are responsible for the entry of microorganisms that can cause significant damage to the piglets' health (Hutter et al., 1993).

The body temperature of the pigs varies from 37.8 to 38.5°C (Radostits et al., 2002), showing that, regardless of the treatment, the lesions and their intensities, there was no significant increase in body temperatures for piglets and matrices. It was evidenced that the erroneous handling inside the confinement can interfere, even in a moderate way, in the quality of life of the piglets and matrices.

Higher superficial temperatures of the back were observed in piglets, due to the bad use of the incubator, which had high intensity heating lamps or the behavior of the piglets in the sun at certain times of the day. In addition, very low ventral temperatures were observed in piglets, due to the cleaning water that remained inside the bays, generating problems in the females, or the lack of a creep area (Martins and Costa, 2008).

According to Brown et al., 1986, the weight gain of piglets submitted to dental wear and the presence of intact teeth during breastfeeding did not show significant differences between the treatments (Brown et al., 1996). Hutter et al. (1986) indicated that there was a

Table III. Effect of place on the weight of the female after calving and weaning and of piglets (litters) after birth and weaning (28 days) (Efecto del lugar en el peso de la hembra después del parto y el destete y de los lechones (camadas) después del nacimiento y el destete (28 días).

Weigth	Experimental Site			Pr > F
	I	II	III	
Post childbirth- Female	256.41±6.02	243.78±31.1	249.50±5.92	0,6834
28 days- Female	232.81±6.93	229.56±29.4	229.54±6.94	0,9387
At Birth- Litters	16.71±0.65	17.00±0.68	17.75±0.57	0,4804
28 days - Litters	73.71±2.26	63.57±9.50	63.42±2.90	0,0027

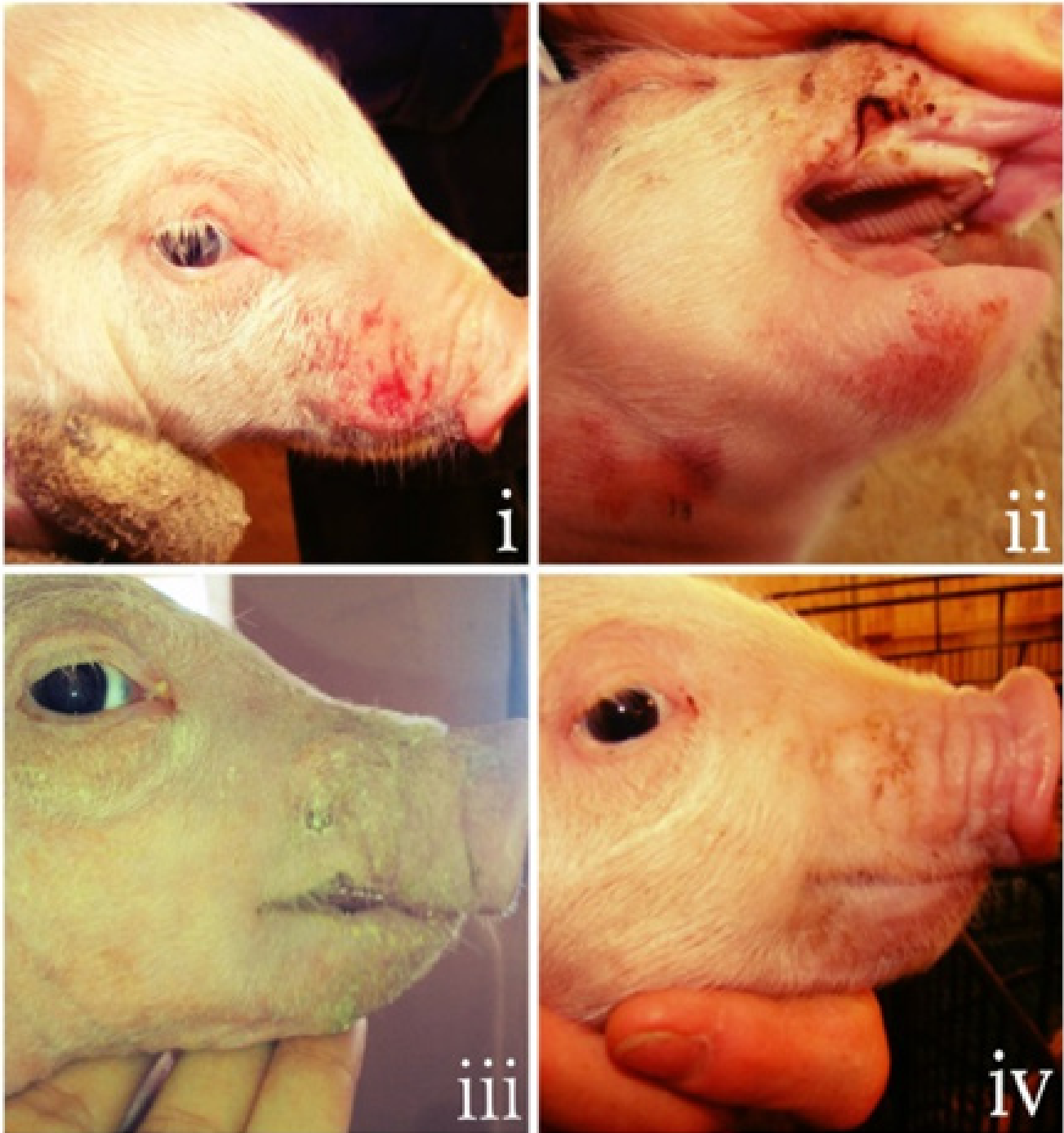


Figure 2. Evolution and involution of lesions caused by disputes for the teats by the suckling on the treatment of maintenance (Evolución e involución de las lesiones causadas por disputas de los tetines por la succión en el tratamiento de mantenimiento).

higher incidence of lesions in the mammary gland of females with litters and intact teeth was not enough to reduce zootechnical performance (Hutter et al., 1994). In agreement with these results, when evaluating the effect of the dental wear in suckling piglets on the performance of breeding females and piglets, there was no significant effect on the daily gain and total weight of piglets and mothers until the time of weaning (Dela Ricci et al., 2012). However, Weary e Fraser (1999) observed that piglets with intact teeth overcame those with sharp teeth, indicating that the injuries and pains caused by the cutting of the teeth would be the major

disadvantage of this procedure, compromising the productive development of the piglets.

The grinding procedure of the teeth is not indicated, even with fewer injuries to pigs, as this, as well as other types of interventions to the piglets during the first days of life, would stress the animal by causing them acute and intense pain in the pigs, negatively influencing the performance of both the bed and the mother (Bates et al., 2003).

In view of the earlier mentioned, other studies are necessary to evaluate the interaction of genetics, envi-

ronment and adequate management of piglets' teeth, since factors such as maternal capacity, aggressiveness, piglet size and physiology and thermal stress of pigs can significantly interfere in the results. In addition, the environment can affect the food intake of reproductive females and, together with genetics, influence the amount of milk produced, which can affect the results of lesions on the face and in the mammary gland of females, making nutrition another important factor to be analyzed.

CONCLUSIONS

Keeping whole pigs' teeth as well as withdrawal in the first few days after birth cause significant lesions that can be aggravated depending on the type of management used with the piglets and sows. The care with this stage of breeding is of singular importance, since the damages can be consequences in the next phases.

The results of piglet and females weight gain as well as descriptions of lesions for the phases, indicate that tooth wear as well as tooth maintenance are procedures that should be performed with the help of a technician, since alternatives may be used, which avoided acute and chronic pain and reduced animal welfare.

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