Investigação

PREVALENCE OF GASTRIC LESION IN PIGS

Prevalência de lesões gástricas em suínos

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ABSTRACT

Abstract: Gastric lesions are a common problem in intensive pig production and it is often detected at slaughter. The current study aims to evaluate the prevalence of gastric lesions in finishing and breeding pigs at the time of slaughter. It was conducted in a slaughterhouse in Franca region – São Paulo State, from October to November 2013 and in July 2014. Four hundred (400) stomachs from slaughtered pigs were analyzed for the presence of macroscopic lesions suggesting gastric ulcer. Scores from 0 to 4 were attributed to the stomachs depending on the extent of the lesions, namely: score 0- Normal stomach; score 1- stomach showing parakeratosis; score 2- stomach showing active or chronic ulcer covering less than 33% of the Pars oesophagea; score 3- stomach showing active or chronic ulcer covering from 33 to 66% of the Pars oesophagea; score 4- stomach showing active or chronic ulcer covering more than 66% of the Pars oesophagea. Score-3 lesions – i.e., lesions showing active or chronic ulcer covering from 33 to 66% of the Pars oesophagea - were most frequently found, thus corresponding to 43.2% (173/400) of the evaluated organs. Few stomachs (5/400) showed intact mucosae, i.e., they were score 0, and corresponded to 1.25% of the evaluated stomachs. It was concluded that the prevalence of gastric lesions in pigs from intensive system pig farm was 98.75% and that the active or chronic ulcer covering from 33 to 66% of the Pars oesophagea was the most frequently found lesion.

Keywords: ulcer, stomach, parakeratosis, piglet, swine

RESUMO

As lesões gástricas são um problema comum na produção intensiva de suínos e é, frequentemente, detectada durante o abate. Com este estudo objetivou-se avaliar a prevalência de lesões gástricas em suínos após o abate. O trabalho foi realizado em um abatedouro-frigorífico na região de Franca – SP, compreendendo o período de outubro a novembro de 2013 e julho de 2014. Foram analisados 400 estômagos de suínos abatidos para observar-se a presença de lesões macroscópicas sugestivas de úlcera gástrica. De acordo com o grau das lesões foram atribuídos escore de 0 a 4, onde: escore 0: estômago normal, escore 1: estômago com paraqueratose; escore 2: estômago com presença de úlcera ativa ou crônica abrangendo menos de 33% da Pars oesophagea; escore 3: estômago com presença de úlcera ativa ou crônica, abrangendo 33 a 66% da Pars oesophagea; escore 4: estômago com presença de úlcera ativa ou crônica abrangendo mais de 66% da Pars oesophagea. As lesões mais frequentemente encontradas foram de escore 3, ou seja, presença de úlcera ativa ou crônica que abrangia 33 a 66% da Pars oesophagea, correspondendo a 43,2% (173/ 400) dos órgãos avaliados. Poucos estômagos (5/400) apresentavam mucosas íntegras, ou seja, escore 0, correspondendo a 1,25% dos estômagos avaliados. Assim, a prevalência de lesão gástricas em suínos procedentes de granja suinícola com sistema intensivo de criação é de 98,75%, sendo que a lesão mais frequentemente encontrada foi a úlcera ativa ou crônica que abrange 33 a 66% da Pars oesophagea.

Palavras-chave: úlcera, estômago, paraqueratose, leitão, suíno

INTRODUÇÃO

Gastric lesions such as erosion and ulceration are common conditions especially in fattening pigs from intensive pork production (CAPPAL et al., 2013) and it is most commonly observed in 4 months old animals, which correspond to the period of fastest growth in pigs (RAMIS et al., 2006).

Ulcers that are observed in pig stomach affect the “pars oesophagea” and can cause acute gastric haemorrhage which result in either slow growth possibly due to chronic ulceration (FRIENDSHIP, 2014) or death (MELNICHOUK, 2002). Stomach lesions have a worldwide distribution (has been described in Spain, England, Denmark, Italy, Colombia, Brazil, Canada, Nigeria, Gana, South Africa, Australia) (MAKINDE and GOUS, 1998; MELNICHOUK, 2002; RAMIS et al., 2006; KOPINSKI and MCKENZIE, 2007; RODRIGUEZ et al., 2008; ARAÚJO JÚNIOR et al., 2012; SWABY and GREGORY, 2012; CAPPAL et al., 2013; HERSKIN et al., 2016; LARYEA et al., 2016; OMOTOSHO et al., 2016).

The primary cause of gastric ulcers is still unknown, but researchers consider that the etiology of gastric ulcers in pigs is multifactorial and its main causes are the physiological aspects of the species, the diet ingredients and the diet type (pelleted), the disruption in feed intake, fasting period and the resident microbiota and an increase in fluidity of the stomach contents (ERICKSON et al., 1980; AMORY et al., 2006; HAESBROUCK et al., 2009; SANT’ANA et al., 2011, FRIENDSHIP, 2014; MÖBELER et al., 2014). In addition, stressing factors over the animals during their productive period such as such as social stress from mixing, rearing in confinement, high stocking densities, the type of lying surface provided for the pigs during the

finishing phase and concurrent diseases (KRAKOWKA and ELLIS, 2006; AMORY et al., 2006; RAMIS et al., 2005; THE PIG SITE, 2014) or during their transportation may trigger ulcerative and chronic esophagogastric lesions (SANT’ANA et al., 2011) that, depending on the extent, lead to severe bleeding in the gastrointestinal tract as well as to death.

So, these kinds of stomach lesions can indicate the welfare conditions that pigs are submitted. Nowadays, there is growing interest in using findings from post-mortem meat inspection as indicators of on-farm and preslaughter animal welfare (SWABY and GREGORY, 2012).

Since there is a lack of updated epidemiological information on gastric ulcers and few studies have been conducted on this subject in the State of São Paulo, the current study aims to establish the prevalence of gastric lesions in pigs from a intensive system pig farm that were slaughtered in a slaughterhouse in Franca region - SP, as well as to determine the severity of the lesions in the Pars oesophagea and to compare these to those previously reported.

Material and Methods

All procedures were performed in compliance with the Registration Protocol CEUA / UNIFRAN 038/13 approved by the Ethics Committee on Animal Research at Universidade de Franca. The development of this research consisted on a quantitative and qualitative study of the macroscopic features of 400 stomachs from finishing and breeding pigs from an intensive system pig farm established in Franca – SP region were evaluated. The study was conducted in Franca region - SP, and random visits were made to the slaughterhouse from October to November 2013 and in July 2014.

The pigs were sent for slaughter at 120 days of age and had a average body weight of 105 kg. The animals were slaughtered in a pig-specialized slaughterhouse - under municipal inspection - in Franca – SP region which slaughters, an average of 3000 pigs each month. Pigs were subjected to pre-slaughter fasting for 12 hours, before being taken to the slaughterhouse where they were housed in the lairage without water depth system, water fountain or feeder until the time of slaughter, which was carried out in compliance with humane slaughter regulations.

Subsequently, the stomachs were taken from the slaughter line on a consecutive basis from the slaughterhouse and sent to the viscera inspection room. Then, they were emptied, gently washed and subjected to visual and palpation assessments in order to verify the presence and the features of the gastric lesions. The stomachs were opened by incision along the greater curvature. Next, they were cleaned in water and their cardiac region – i.e. “pars oesophagea” - was macroscopically examined. Thus, scores from 0 to 4 were attributed to them according to the methodology described by Morés et al. (2000) based on the gross morphological appearance of the Pars oesophagea: score 0 – Normal stomach - Pars oesophagea showing smooth epithelium and white glistening normal gastric mucosa; score 1- Parakeratosis - Pars oesophagea showing light to dark yellow discoloration and proliferated, rough and dull epithelium; there may be small erosions; score 2: Presence of active or chronic ulcer covering less than 33% of the Pars oesophagea; score 3: Presence of active or chronic ulcer covering from 33 to 66% of the Pars oesophagea; score 4: Presence of active or chronic ulcer covering more than 66% of the Pars oesophagea.

Prevalence (p) was obtained by the ratio between the number of lesions of a certain score (d) at a given time and the total of

evaluated organs (n) at a given time ($p=d/n$). Data about the prevalence of each lesion extent in the total of evaluated organs were evaluated and subjected to descriptive statistics.

Results

The prevalence of gastric lesions in pigs slaughtered in Franca region - SP rated 98.75% (395/400) (Figure 1). Score-1 lesions (Figure 3) were observed in 16.5% of the animals (66/400) (Figure 1) and score-2 lesions (Figure 4) were found in 23% (92/400). Score-3 lesions (Figure 5), i.e. active or chronic ulcers covering from 33 to 66% of the Pars oesophagea, were most frequently observed, corresponding to 43.25% (173/400) of the evaluated organs. Intact mucosae, i.e., score 0 (Figure 2), represented only 1.25% (5/400) of the evaluated organs. Score-4 lesions, i.e. presence of active or chronic ulcer covering over 66% of the Pars oesophagea, represented 16% (64/400) of the animals (Figure 6).

Figure 1: Percentage of macroscopic lesion scores in finishing pigs and in culling sows from a farrow-to-finish farm that were sent to be slaughtered in a slaughterhouse in Franca region - SP, from October to November 2013 and in July 2014.

Figure 2: Score 0: Normal stomach - Pars oesophagea showing smooth epithelium; normal gastric mucosa.

Figure 3: Score 1: Parakeratosis - Pars oesophagea showing proliferated, rough and dull epithelium, and there may be small erosions.

Figure 4: Score 2: Presence of active or chronic ulcer covering less than 33% of the Pars oesophagea.

Figure 5: Score 3: Presence of active or chronic ulcer covering from 33 to 66% of the Pars oesophagea.

Figure 6: Score 4: Presence of active or chronic ulcer covering over 66% of the Pars oesophagea.

Discussion

The gastroesophageal ulcerations diagnosis in pigs was based on anatomopathological features typical of this disease, according to Morés et al. (2000). Thus, Ramis et al. (2006) reported that the gastroesophageal ulceration is found in pigs during the rearing and finishing phases (between 2-3 and 4-6 months of life) as well as in adult animals.

The prevalence could be higher if it is considered that this study included only animals in processing plant and did not consider the frequency of those that died from gastroesophageal ulceration in its different stages of growth on farms, as previously reported by other researchers (MELNICHOUK, 2002).

The type of injuries found, hyperkeratosis and the

presence of active or chronic ulcer covering less than 33% of the Pars oesophagea, presence of active or chronic ulcer covering from 33 to 66% of the Pars oesophagea, presence of active or chronic ulcer covering from 33 to 66% of the Pars oesophagea and presence of active or chronic ulcer covering over 66% of the Pars oesophagea (Figure 1) indicate a pathogenesis process with different stages, beginning with hyperkeratosis, erosion and finally becomes ulceration, as suggested by Rodriguez et al., 2008.

Different prevalence of gastric lesions rates has been reported in different surveys in Brazil and in other countries. The most recent study in the region of Franca was conducted in 1999 by Carvalho et al. who reported a prevalence of 64% of gastric lesions in pigs sent to slaughter in Ribeirão Preto, a city located 90 km away from the region evaluated in this study. Oliveira et al. (2009) reported a prevalence of 28.7% of gastric lesions of different degrees in 80 piglets in nursery phase slaughtered in a slaughterhouse in Rio Grande do Sul. Also, Oliveira et al. (2010) and Araújo Junior et al. (2012) reported a prevalence of 89.7% and 42% of gastric lesions in pigs sent to slaughter in Rio Grande do Sul State and Parana State, respectively. The prevalence of gastric lesions in the present study (98.75%) was higher than those reported in the past years.

In Colombia, Rodriguez et al. (2008) established a prevalence of swine gastric ulcer of 34.88% in animals slaughtered at the abattoir. Research conducted in England by Swaby and Gregory (2012) reported a prevalence of 79.8% of gastroesophageal ulcers of different degrees in 9827 slaughter pigs from 60 farms. Majekodunmi et al. (2013) examined stomachs of 100 slaughtered pigs from an abattoir in Nigeria 21 (21%) of them had chronic ulcers. The findings of gastric ulcers reported in Brazil and in other countries are much higher than those obtained in this survey, which the presence of active or chronic ulcer represented 16% (64/400) of the animals (Figure 1).

The high prevalence of score-3 esophageal lesions found in most of the evaluated animals could be explained by several factors, since the etiopathogeny of ulcerative lesions in pigs' stomach is multifactorial (EMBAYE et al., 1990; AMORY et al., 2006; FRIENDSHIP, 2014). These factors include type and frequency of feeding; diet and nutritional components; feed particle size offered to the pigs (MONTICELLI et al., 1996) such as finely ground and pelleted diets (MÖßELER et al., 2014), disruption in feed delivery to a pen or a barn (FRIENDSHIP, 2004); high stocking densities in the piggery; and respiratory diseases (rhinitis, tracheitis, mycoplasmosis, circovirus) (FRIENDSHIP, 2014) that lead to poor appetite and help increasing histamine levels, thus increasing the prevalence of the disease (STOLF, 2012). Ulcers can also develop as a result of stomach colonization by *Helicobacter* sp. (RODRIGUEZ et al., 2009; PROIETTI et al., 2010; DE COOMAN et al., 2014) or *Arcobacter* sp. (OLIVEIRA et al., 2010), favored by inadequate hygiene conditions (KRAKOWKA et al., 2005), as well as environmental contamination with dust or ammonia, as well as thermal stress (STOLF, 2012; MARQUES et al., 1989). According to Ramis et al. (2006), the season of the year may also influence the incidence of gastric ulcerations, since it is more observed in autumn and winter than in spring and summer, time when the herein used data were collected.

Overall, score-1 lesions (Figure 3) were observed in 16.5% of the animals (66/400) (Figure 1) and score-2 lesions (Figure 4) were found in 23% (92/400) of them during the present experiment. These numbers may have emerged from the stress caused by feed withdrawal prior to slaughter, loading, transportation and unloading (MAKINDE and GOUS, 1998). Oliveira et al. (2009) consider that parakeratosis (score-1 lesion) precedes the gastroesophageal ulcer.

Swine diet composition may also trigger gastric lesion development. Erickson et al. (1980) consider that oats and barley are lesser ulcerogenic than corn and wheat, because of their

composition. It could partially explain the herein found results, since the feed given to the pigs in the present study was usually of the branny type, which uses wheat and corn as predominant energy components.

The practice of just providing food to the animals once a day forces a fasting period of almost 24 hours. This type of feeding management may cause score-2 (Figure 4) score-3 (Figure 5) and score-4 (Figure 6) gastric lesions in finishing-phase animals. According to Stolf (2012), mismanagements such as fasting for over 24 hours or non-punctual feeding management generate competition for food and difficulty in accessing the manger. These mismanagements may also lead to gastric lesions due to continuous hydrochloric acid production. Dry feed provision is another often observed practice in pig feeding. Such practice may lead to the occurrence of parakeratosis-type lesions (score 1) (STOLF, 2012).

The results found in the current study differ from the data presented by Dalla Costa et al. (2006) who reported 47.1% of animals showing normal gastroesophageal mucosa; 41.9% showing parakeratosis; 10.5% showing score-2 gastroesophageal lesions; and only 0.5% showing score-3 lesions.

The assessment done in the slaughterhouse to check the condition of the organs is of great value because it shows and quantifies the lesions in the "Pars oesophagea" in the stomachs of the examined pigs. The findings are a warning to pig farmers and they allow preventing gastric ulcers or milder lesions that compromise the productive performance of the animals and impair their weight gain. Therefore, it is necessary to be careful at the time of choosing the location to the facilities as well as to pay

attention in aspects such as handling, nutrition, health, ambience, welfare, transportation and slaughter of animals in order to produce high quality animals and to minimize losses. Nowadays, stomach examination is not part of the meat inspection service in Brazil, so if it would to be adopted as a welfare feature it would need to be done as an additional procedure. Actually, economics and welfare concerns justify the monitoring of gastric lesions at slaughterhouses in order to diminish or eliminate the major risk factors and, if it is decided in future to introduce welfare features into post-mortem swine meat inspection, gastric lesions found in slaughterhouses should be included.

There is a high prevalence of gastric lesions in finishing and breeding pigs slaughtered in Franca region, which rates 98.75%. The most prevalently observed lesion was the active or chronic ulcer, which covered from 33 to 66 % of the Pars oesophagea, thus corresponding to 43.25% of the animals. Further investigations should determinate the presence *Helicobacter* sp. or *Arcobacter* sp. in gastric ulcers observed in slaughtered pigs and establish whether the pig farms in Brazil have indigenous management and feeding conditions that affect the occurrence of gastroesophagic ulcers.

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