Original paper

ESOPHAGOGASTRIC ULCER IN PIGS ON COMMERCIAL FARMS

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Abstract

Intensive swine production in modern conditions of breeding and use of technological processes has influenced the occurrence of wide range of breeding and technopathy diseases. One of the most abundant breeding diseases declared in literature as an independent disease is esophagogastric ulcer characterized by erosions and ulcers in mostly esophagogastric part and rarely in mucous part of stomach. Esophagogastric ulcer is a disease of multifactorial etiology caused by genetic predisposition, diet, and presence of certain pathogenic microorganisms (for example *Helicobacter pylori*). The goal of our research was to examine the frequency of esophagogastric ulcer in pigs on commercial farms. One commercial farm has its own slaughterhouse for producing meat of fattened pigs. In our experiment we used 103 pigs in fattening with body weight between 100 and 107 kg and aged from 6 to 7 months. In the process line of slaughterhouse we established thickening of esophageal surface, hyperkeratosis, nonstructural yellow surface in 37 of total of 103 animals, while erosion of esophageal part of stomach, surface damage which does not include damage of muscular layer of mucous membrane, was present in 29 of 103 animals. Ulcers of esophageal part of stomach which affect total thickness of mucosal membrane were present in 4 of 103 examined animals.

Key words: *commercial farms, esophagogastric ulcer, pigs*

Introduction

Esophagogastric ulcer occurs most commonly as an independent disease in pigs. The largest number of cases was recorded in sows and finishing pigs. It can be said that the incidence of esophageal ulcers is the most significant in young males aged about 8 weeks. A great number of articles suggest that the most frequent occurrence of ulcers is in swine body weight from 40 to 90kg (Lončarević et.al., 1997; Šamanc, 2009). According to some sources, frequency of occurrence of the ulcer in pig suggests the most common body weight of 60kg, then, from 70 to 100kg the incidence is falling and rising again in pigs heavier than 100kg. Primitive breeds of pigs are far more resistant than the noble ones in which the disease is far more common. There was a significantly higher incidence of these lesions in pigs of Duroc breed than in the Yorkshire breed (Guise et al., 1997). The goal of our research was to examine the frequency of esophagogastric ulcer in pigs on commercial farms.

Material and methods

Commercial farm has a slaughterhouse and in this particular case there is no transport and handling of animals in depot prior to slaughter. On the slaughter line 103 animals were examined chosen by method of accidental choice. The average age of animals was between 6 and 7 months and the body weight varied between 100 and 110 kg. The stomach was opened, freed of content and washed with water in order to see the inner part of mucus. The photo was taken of all the samples and they were processed for histological analysis.

Results and discussion

The stomach of pig has the shape of bag and it is located in transversal way in abdomen. Two parts can be differed - left or cranial and right or pyloric. There are also two surfaces (cranial and caudal), two edges (dorsal and ventral) and a central part *corpus ventriculi.*There are two openings on the stomach, one connecting with oesophagus –*ostium cardiacum* and one leading to small intestine-*ostium pyloricum*. Dorsal edge is a concave one and it is known as *curvatura ventriculi minor*, located between oesophagus and duodenum. Ventral edge is convex and bigger known as large curvature-*curvatura ventriculi major.* In order to make the inner part of stomach visible the cut was made across *curvatura ventriculi major.* In the inner part there are cutaneus and glandular part of mucosa. This type of stomach is known as composite stomach – *ventriculus compositus.* The part of stomach containing only cutaneous mucosa located arround the cardia is named *pars oesophagica* or *proventricularis*. Other part of stomach containing glandular mucosa is the glandular stomach –*pars glandularis*. The border line between one type of mucosa and the other has the obvious difference in the color.

The results of occurence of esophagogastric ulcer in investigated swine on the slaughter line are given in Table 1.

Table 1. *The occurence of esophagogastric ulcer in swine on the slaughter line*

Fattening pigs	Number of examined pigs	Age	Body weight (kg)	Positive	Negative
Total	100	6-8 months	100-110	24	76

In Table 2 we present the number of positive results of ulceration presence in relation to the age category.

Table 2. *Number of positive animals in relation to age*

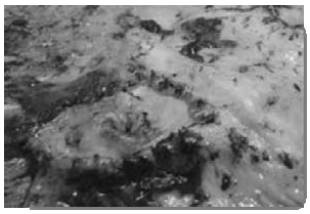
	Number of animals	Positive results of ulceration presence
Animals from 6-7 months	51	10
Animals older than 7 months	49	14

The results of histological examination of esophageal part of stomach on the salughter line are given in the Table 3.

Table 3. *Histological examination of esophageal part of stomach on the slaughter line*

The findings	Number of positive animals	Number of tested animals
Thickness of esophageal surface of mucosa-Hyperkeratosis, non-structural yellow surface	37	103
The erosions of esophageal surface of mucosa-surface erosion which do not get to *Muscularismucose*	29	103
The ulcerations of esophageal surface of mucosa-damage of whole depth of mucosa	4	103

In pictures 1, 2, 3 and 4 we presented the founded changes in mucosa.



Picture 1. *Ulcer which is obviously separated from healthy mucosa*

Picture 2. *Hyperkeratosis of the cutaneous mucosa surface*

Picture 3. *Erosions of mucosa/ different sizes and shapes*

Picture 4. - *Mucosa of esophageal area without changes*

On esophagogastric stomach area the established changes mostly consist of different numbers and range with erosions or without erosions. The lining of the affected had changed color (tawny, yellow-green or gray). Its area is roughly thickened and wrinkled, like the oak bark and therefore surpasses the mucous membrane environment. Along with this, there were erosions which were different**.** This shape and size changes usually began with that of the periphery of the *margo plicatus*, spreading into the center and affecting the entire lining. When there was independent erosion, as for the major destructive changes- ulcers of deeper nature, we occasionally found them alone, and many times combined with other pathological alterations. The most frequently we found chronic ulcers, which were round, oval or irregular in shape, with extensive lesions. They looked like many small ulcers merged into one large that was often spread to the whole esophageal region. The edges of the ulcer were prominent and sharp. The crater was covered with a layer of necrotic mass. Ulcer color is gray to brown chocolate. Sometimes the blood clot was glued to the base of the ulcer. Bottom of the chronic necrotic ulcer crater was covered with purulent-fibrous exudate. In several samples we found edema in the submucosa around the edges of ulcers in the form of cut watermelon slices. In most chronic ulcers the areas in the process of rehabilitation can be observed, as well as fields that are pathologically active. Surface repair patches are characterized by the presence of connective tissue in the bottom of the crater and *cicatrisatio*-regeneration of epithelium at the edges of the ulcer. Ulcers were found in alterations whose localization was mostly in the folds of mucous membrane or their foot, and rarely were scattered throughout mucosa, often accompanying mucosal fold along its length. Rarely have we found round oval ulcers, as well as incorrectly rectangular ones. Size varied. Shallow ulcers lining resembled cracked bark and deep ulcerations had the look like a sultry of mucosa with some sharp object. Walls were irregular, jagged, while they were inflamed and edematous**.** In the bottom of the crater there is the necrotic mass of dirty yellow color or small blood clot of darker color.

Etiological factors that contribute to the emergence of diseases can be classified into several groups, some of which stand out as the most important like food and polyvalent stress (Kopinski et al., 2007; Bojkovski et al., 2010, 2011). Food can significantly contribute to the occurrence of ulcers, particularly for hogs. Infestation is common, because of the commercial reasons and the concentrated feed for pigs with increased proportion of corn at the expense of barley and oats. Meals with finely minced and powdered food with a large number of small particles favor the occurrence of cutaneous mucous membrane processes on proventriculus (esophageal) and erosions in the other part of the stomach. This means that the meal does not contain a greater percentage of coarse particles, lacking natural wear and restoring cutaneous epithelial lining of proventricular part of the stomach (Šamanc, 2009). Disorder in the renewal of the epithelium could be the result of long-term acidosis related to the chemical processes of digestion, and less influenced by the gastric juice. During degradation of starch under the influence of microorganisms, large amounts of lactic acid which has a corrosive effect are made, and they are likely to cause initial appear-acute cutaneous erosions on the mucosal surface. It was observed that the state of stress, caused by overcrowding the facility, and the conditions, drastically changed environmental conditions (especially temperature) as a result of changes in the appearance of gastric mucosa in a larger number of animals. Many authors point out that stomach ulcers in pigs, like ulcers in people, develop under the influence of various stresses. Under modern conditions of production, pigs are exposed to many nonspecific stimuli, which cause tension among them, fear, pain, etc. This acts as a stressor and psychosomatic physical nature, requiring intermittent or continuous adaptation of animals

given environmental conditions and its frequent changes. Esophagogastric ulcer would therefore have to be included in the group of diseases whose causes are the result of the general adaptation syndrome. Observations concerning the state of stress caused by cramped living space, sudden temperature changes, transportation, room in the depot before slaughter, mixing of animals who do not know a new unfamiliar environment. In pigs with esophagogastric ulcer it violated the neuroendocrine regulation in terms of reduced secretion of pituitary hormones and increased thyroid secretion of cortisol. Given that the stress states increased corticotropin secretion of endocrine changes described correlations can be interpreted as a contribution to the neuro stress is very important in the pathogenesis of peptic ulcer disease **(**Krakowka et al., 1998 **)**. Microbiological examination of material from the ulcer showed that there are often fungus *Candida* species. Experimental work has shown that *Candida albicans* is a normal resident flora of pig stomach and turns off its role in ulcer development (Krakowka et al., 2006). Today it is considered to belong to the group of *Helicobacter heilmanii* very important enteropathogenic microorganisms in pigs that have an important role in the formation of gastric ulcers in these animals. Although these microorganisms invade the pars oesophagica and do not use toxic destruction of cellular elements, it attributes their role in the pathogenesis of the lesion. One way ulceration action of bacteria could be their ability to produce lower fatty acids. Lower fatty acids quickly pass through the outer barrier of gastric mucosa and increase the acidity of gastric contents. The primary cause of infectious diseases has not been proven nor is it typical for pigs. Several different causes are associated with the occurrence of disease in pigs, but the exact cause has never been confirmed. In a few cases the gastric ulcers were found in pig circovirus lesions (Ivetić et al., 2002). Gastric ulcers are associated with the emergence of swine influenza and swine respiratory disease complex especially during the summer months (Gagričin and Došen, 2004). Regardless of the fact that the cause or risk factors will reduce the effects of normal gastric function. Abnormal fluid content of the stomach is the result of changes in pH that normally exists between terminal part of the esophagus and pylorus. The result is an intense secretion of gastric acid. The increased acidity of gastric juices irritates the esophageal lining part and leads to initial changes squamous epithelium (hyperkeratosis), which can further lead to ulceration. Clinical picture accompanying esophagogastric ulcer is usually correlated with the stage of development and intensity of pathomorphological changes in the pars esophagica. In per acute cases, without the appearance of clinical symptoms, the animals die suddenly. In acute cases skin and mucous membranes are very pale. Some animals grind their teeth because of pain in the stomach, taking less food. They retreat into the corners of rooms, reluctant to move and usually lie. In some cases, it may be noted that they vomit. An influence of acid in the blood is black vomit. Faeces are dark. In sub-acute and chronic cases the disease is longer and symptoms are milder. The animals are anemic, taking less food and gradually become thin. Occasionally dark faeces can be noticed. Often the only indication of the existence of ulcers is occasional occurrence of constipation due to hard stools. In fact most of the pigs are sub clinically ill and the incidence of disease can be determined only at the slaughter line. Clinical effects of ulcers are usually associated with blood loss. Similar clinical symptoms that accompany esophagogastric ulcer happen also in cases of dysentery, salmonellosis, TGE, intestinal adenomatosis, coccidiosis and others. Bacterial and viral infections are usually manifested with fever and sickness in a large number of animals at the same time, in contrast to the esophagogastric ulcer, in which the temperature is within the normal range and which occurs sporadically (Milić, 1968). If esophagogastric ulcer is not timely diagnosed and appropriate treatment is not taken, the disease, after a shorter or longer period, ends lethally.

Pigs suspected to have ulcers should be separated into separate boxes. Treatment of anemia may include application of vitamin K although hemostatic effectiveness of the therapy is questionable. In some cases, antacid agents (aluminum hydroxide or magnesium silicate) can be successfully applied. As in all cases of symptomatic treatment, it is recommended to provide infusion solutions or preparations based on iron and vitamin B complex. Change of diet and a higher percentage of fiber in the diet contribute to a faster recovery from illness. In addition, the food needs to be kept in order to prevent fungal growth and thus prevent the creation of unsaturated fatty acids. Prevention is based on the exclusion of risk factors, minimizing stress and improving nutrition in terms of changes in the composition and the adjustment of time of a meal is beneficial as well. Quality of food ingredients must be acknowledged, especially if food is long standing or of poor quality. Successful control of swine respiratory disease complex will reduce losses in ulcerative gastroenteritis on some industrial pig farms (Filipović, 2009).

Conclusion

Pathology of pigs is a very dynamic discipline and control and health protection must be an integral part of each program. It is very important to access technological and production diseases whose detection and suppression is not a legal obligation, but an economic necessity. In the process line of slaughterhouse we have established thickening of esophageal surface, hyperkeratosis, nonstructural yellow surface in 37 animals out of total of 103 animals, while erosion of esophageal part of stomach, surface damage, which does not include damage of muscular layer of mucous membrane, was present in 29 of 103 animals. Ulcers of esophageal part of stomach which affect total thickness of mucosal membrane were present in 4 of 103 examined animals.

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