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THE NECROTIC ENTERITIS BY CLOSTRIDIUM PERFRINGENS IN SUCKLING PIGLETS: PRACTICAL OBSERVATIONS, CONTROL AND DIAGNOSTICS*

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SUMMARY: The outbreaks of enteritic infections in piglets caused by Clostridium perfringens belongs to the disease group with marked age incidence i.e. it occurs in suckling piglets aged to 7 days, usually on 2nd or 3rd day. At necropsy, the predominant pathomorphological lesions are most frequently observed in small intestine, especially in jejunum. However, in some cases the pathomorphological lesions may macroscopically be absent. For that reason, diagnostic criteria should consider: the disease history data, clinical signs, pathomorphological lesions and bacteriologic findings. The material for research consisted of eight diagnosed cases of necrotic enteritis in piglets deriving from swine farms. In total 69 piglet carcases were submitted to necropsy. In typical cases the presence of bloody content in small intestine were observed. In a certain number of examined piglets necropsy did not reveal typical pathomorphological changes. Applying laboratory testing (anaerobic cultivation) in the most examined cases Clostridium perfringens was detected in tissue samples.

Key words: piglets, necrotic enteritis, *Clostridium perfringens*

Introduction

Clostridium perfringens is a Gram-positive, spore forming bacterium that can cause a variety of toxic-specific lesions in domestic and wild animals as well as in humans. Owing to its ability to produce spores under adverse environmental conditions, it is one of the most widespread potential bacterial pathogens in nature as well as in the gastrointestinal tract of most animal species [6]. Based on the production of 4 major toxins, alpha (CPA), beta (CPB), epsilon (ETX) and iota (ITX), *Clostridium perfringes (C. perfringens)* isolates are classified into 5 toxino-types (A-E) [2]. Two other toxins, enterotoxin (CPE) and beta2 (CPB2) can be produced by all types of *C. perfringens*, although they are not used in typing [4]. *C. perfringens* type C infection occurs in all swine-producing areas of the world and causes hemorrhagic, often fatal, necrotic enteritis in young piglets [3]. Enteric disease caused by these organisms impact producers, veterinary practitioners, and diagnosticians, despite long-term availably of immunoprophylactic products for swine protection [4]. In view of the high morbidity and mortality rates, disease cause of serious financial losses in pig rearing [5].

Material and Method

The material for this research included eight swine farms, where certain disorders and health problems in suckling piglets were detected. Depending on the specificity of each evaluated case and available material, the applied research methods included: anamnestical and clinical evaluation, pathomorphological examination, standard laboratory testing for detection the presence of aerobic and anaerobic bacteria in the organs and tissue samples derived from diseased and died suckling piglets.

Results and Discussion

The achieved results can be classified in 3 categories: the problem of herd parity structure and hygienic conditions in the piggery, introducing of new breeding animals on the farm and inappropriate vaccination programm.

On the first three examined farms, applying control of anamnestic data, the health problems and increased mortality in suckling piglets were discovered. Clinically in suckling piglets, 5-10 days after farowing, the occurence of severe diarrhoea and signs of body dehydratation were evident. Despite the fact that the piglets were therapeutically treated, there was no evident respond to applied medication and they died. Depression of growth rate was a feature in survived nursed piglets. On one of the evaluated farms, the sows are vaccinated during pregnancy but recently the vaccine has been changed (i.e. vaccine from another producer was introduced). Applying data control, the difference in vaccine composition was noticed: the old one had 3 types of toxoid C. perfringens (type B and purified

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toxoid type C and D) while the newly applied contains only one type of C beta-toxoid. By clinical examination in the piglets from the first litter sow, bloody diarrhoea in the first day of life was detected. In the piglets aged 11-15 days, a yellow-brownish-colored diarrhoea, accompanied by staining of peritoneum was evident. In the 4-days old litters, traces of the reddish-brown diarrhoea on the piggery floor was discovered. Applying control of anamnestic data, it was disovered that severe diarrhoea in piglets was most frequently in the litters deriving from first litter and older sows. In many cases poor hygiene, the presence of wet, lumpy feed in the swine feeder-place was established.

On the third examined swine farm, the problem in the piggery were the drinker-place, which are situated on the opposite side from slope of the floor. Because of this, the floor is constantly wet and the hygine maintance is difficult to achive. The pathomorphological examination of the dead suckling piglets revealed lesions dominantly on the mucosal surface of the digestive tract: hemorrhagic and diphteroid-necrotic gastritis, hemorrhagic and necrotic enteritis. By microbiological testing (anaerobic cultivation) on tissue samples deriving from dead suckling piglets the presence of *C. perfringens* was detected.

Sow feces contains small numbers of type-C organisms and these multiplay rapidly in the small intestine of piglets, out-competing other bacteria and becoming the dominant organisms in the population [4]. Oral infection of piglets, in most cases through teats smeared with feces, leads to replication of *C. perfringens* type C in the intestines, resulting in the production of toxins (exotoxins). The β-toxin is not degraded because of the low synthesis of digestive enzymes by piglets and the high anti-trypsin content of the sows milk. It consequently has a decisive influence on the pathogenesis of necrotic enteritis [5]. Death is likely due principally to effects of intestinal damage and toxemia. Hypoglicemia and secondary bacteriemia due to *C. perfringens* or *Escherichia coli* may rise the fatality rate. Clinical disease can be peracute, acute or chronic, with signs of depression and bloody diarrhea, which begins 8 to 22 hours after exposure to *C. perfringens* type C [4]. Clinical signs vary according to immune status and age of affected piglets. Disease is most common in 3-day-old piglets, but may appear as early as 12 hours after birth. Most peracute affected piglets develop hemorrhagic diarrhea. Piglets become weak, move with reluctance, and rapidly become moribund, risking crushing by the sow. Many are found dead within 12-36 hours of birth. But death occurs in some animals without diarrhea being seen [3]. Chronic disease (usually in older animals) can persist for 1 or 2 weeks, and is characterised by persistent diarrhea without blood and dehydration[4, 6]. Pathomorphological lesions are typically in jejunum and ileum but they may extend anterior to the pylorus and posterior to the proximal colon. Gross mucosal lesions are redish or black in color, with intense hemorrhage and gas bubbles in the intestinal wall. Hallmark lesions are profound mucosal necrosis and emphysema in small intestine [3].

On the fourth and the fifth examined swine farm, the health problems in sukling piglets were connected with the purchasing of breeding animals (gilts). Despite the fact that all gilts derived from one farm, after farrowing all litters died in the first 2 days of life. Clinically, severe dehydration, depression, piglets cohorting, the yellow or light brown-colored diarrhoea were observed. In some animals the purple-red-colored watery feces was evident already on the first days of life. Eventually, all farrowed litters died. The pathomorphological examination of the dead suckling piglets revealed: catarrhal gastritis, angry purplish-red colour of jejunum (i.e. colour like rot-cherry). In some cases the small intestine had snaky appereance of affected intestinal loops, the presence of emphysema in the intestinal wall or extensive whitish sedimet (gypsum like content) were observed. Applying anaerobic cultivation, from the organs and tissue samples derived from died sukling piglets, *C. perfringes* was isolated.

Preventing introduction of disease by screening of replacement stock is likely not a viable option. Type C in normal sow feces accounts for only a tiny percentage of the total population of *C. perfringens*; it nearly always goes undetected by any but highly specialized methods, which are impractical for screening large numbers of animals [4,5]. Outbreaks often follow the introduction of infected breeding stock and disease persists in herds for up to 2 months, but, where new stock is constantly introduced, outbreaks may continue for up to 15 months. Typically, three or four litters or part of a litter in a herd may be affected by severe disease. Also, herds may be infected with the organism but typical disease may be absent. In some cases this results from early treatment with antimicrobials, but most commonly it results from the increasing practice of including *C. perfringens* type C toxoid in vaccines given to sows. Where protective antibody is present in the colostrum at adequate levels, no disease will be seen. Where levels are inadequate or intake is insufficient, the clinical signs may develop slightly later and be mild and difficult to recognise [3].

On the last three examined swine farms, by control of epizootical and anamnestical data, certain irregularities in the immplementation of immunoprophylactic measueres were found. The sows are vaccinated but not accordings the manufacturer recommendation (i.e. only once before farrowing). In suckling piglets aged 5 days the signs of diarrhoea are observed but not in all litters. Applying control of piggeries, it was establish that there is a full-floor, with straw-bedding while the boxes are separated by the wooden-wall. By clinical examination, it was establish that diseased piglets are aged 5-15 days, dehydrated, with loss of body condition. Nursing is minimal and piglets rapidly lose condition, become gaunt and weak. They have reddish-brown to yellow-brauwn-colored diarrhoea, accompanied by staining of perineum and reddening, swelling of the anus. Similar clinical findings was registrated on another swine farm, where some of the sows were by mistake unvaccinated. A large number of piglets die in 12 to 24 hours after farrowing but without signs diarrhoea. On the eight examined farm, previous years sows were vaccinated but lately the dam vaccination was interrupted. Also, in the past, antimicrobials were administered to sows before and after farrowing to prevent infection of piglets. After farrowing, the piglets have good birth weight but

pinky-colored diarrhoea occurs already on the second day of life. Treatment with antimicrobial is of little use in diseased piglets and they eventually die. By patomorphological examination in dead suckling piglets, the distinct lesions on small intestine were evident: snaky appereance of affected intestinal loops and the presence of emphysema (i. e. gas bubbles) in the intestinal wall. The jejunum of affected piglets is swollen with an angry purplish-red colour, with bloodstained fluid content. In some cases the mucosal surface of small intestine was covered by a grayish-yellow deposits and the intestinal wall is thickened and friable. Also, hemorrhagic gastritis, diffuse haemorrhage on the kidneys, enlargened and reddened mesenteric lymph nodes were found. By laboratory testing *C. perfringens* was detected in the examined tissue samples.

Disease occurs epizootically in non-vaccinated populations. With increased herd immunity, disease may become enzootic, with mild cases developing over a period of months. Continued appearance of acute disease suggests herd immune deficiency (such as by frequent introduction of immune-naïve gilts) or failure of piglets to receive adequate amounts of colostrum [4]. Vaccination of sows with the toxoid vaccine and administration of a penicillin preparation in the piglets leads to a drastic reduction in piglet losses [5]. Diagnostic criteria-mortality pattern, clinical signs of disease, examination of mucosal and intestinal content smears, and gross lesions are sufficient basis for a presumptive diagnosis of *C. perfringens* type-C enteritis in piglets. More detailed herd infection history, exclusion of other causes of necrotic enteritis and bacteriological culture may be needed to establish a presumptive diagnosis in chronic cases. Final diagnosis should be based on bacteriological culture of intestinal contents (isolation of large numbers of *C. perfringens* followed by genotyping of isolates) and-or CPB detection. Chronic cases may be culture negative, and if positive, often yield a mixture of type-C and type-A organisms [4].

The occurence of the disease may be favoured by a number of factors which are conductive to accumulation of *C. perfringens* type C in a given stock. Group keeping of pregnant sows, simultaneous farrowing of larger groups of sows, group treatment of nursed piglets, using antibiotics to which *C. perfringens* is primarily resistant are some of those contributive factors [1]. The case fatality rate varies with the form of the disease, but 100% mortality in litters of nonimmune sows is not unusual, and total herd mortality may be as high as 50-60%. When herd immunity rises, due to exposure of sows to infected piglets, disease may become enzootic. Milder cases occur over a period of months in individual herds, but continued appearance of acute disease usually indicates a deficiency in herd immunity (e.g., repeated introduction of naive gilts or sows) or failure of piglets to receive adequate levels of specific antibody in colostrum [3].

Conclusion

The disease can be effectively prevented by vaccination of the pregnant sows, by re-evaluation and correction of the environmental conditions and management system because they potentially may have considerable influence on the disease occurence. The ubiquitous character of these organisms makes eradication of the clostridial diseases virtually impossible and necessitates control by prophylactic measures. The early age at which disease occurs, the rapid course and typical necropsy findings suggest the diagnosis, which can be readily confirmed by laboratory examination. When an outbreak occurs all pregnant animals should be vaccinated to provide colostral immunity to their progeny. For the protection of piglets two sow vaccinations, i.e. 5 and 3 weeks before farrowing are used. Treatment is of litlle use in animals with clinical signs, and prophylaxis is the preffered approach. Antimicrobials can be administered to sows before and after farrowing to prevent infection of piglets. Beside this, an implementation of adequate hygiene measures before, during and after farrowing, preparation and maintenance of farrowing-boxes are important. It should be noted that first farrowing sows and older sows may have some problems in starting normal lactation. The problem can be solved by timely rotation and equalization of the litter.

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