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Asian Journal of Animal and Veterinary Advances



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Prevalence and Major Pathogen Causes of Dairy Cows Clinical Endometritis in Northeast China

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ABSTRACT

The prevalence of clinical endometritis in dairy cows was surveyed in Northeast China between March 2012 and August 2012. A total of 1370 apparently healthy dairy cows were detected from three provinces (Heilongjiang, Jilin and Liaoning) that locate in Northeast China. All uterine swabs and samples of vaginal mucus were collected and all of them were microbiologically analyzed. The results showed that the overall prevalence of clinical endometritis in dairy cows was 17.4% and the prevalence is similar in three different province which Heilongjiang (16.7%, 90/540), Jilin (17.6%, 74/420) and Liaoning (18.3%, 75/410). The prevalence in intensively reared dairy cows (11.9%, 107/900) was lower than that in semi-intensively reared dairy cows (28.1%, 132/470) ($p < 0.05$). The dominant bacterial isolates in the study were *Staphylococcus aureus* (21.8%), *Streptococcus* sp. (19.2%) and *Arcanobacterium pyogenes* (15.0%). The results of this survey indicated the presence of clinical endometritis in dairy cows in Northeast China and rearing system is an important factor to affect the clinical endometritis in dairy cows in Northeast China and *Staphylococcus* species was major pathogen.

Key words: Clinical endometritis, prevalence, major pathogen, dairy cows, rearing system

INTRODUCTION

Clinical endometritis is a complex and important infectious disease of postpartum dairy cows throughout the world. Affected cows have prolonged days to first service and days to pregnancy (Borsberry and Dobson, 1989). Clinical endometritis causes significant economic losses because of decreased reproductive performance, increased feed intake per lactation, reduced milk yield and increased culling rate (Gilbert *et al.*, 2005). Clinical endometritis can be defined as an inflammation of the endometrium later than 3 weeks postpartum (Sheldon *et al.*, 2006). It is characterised by the presence of purulent (>50% pus) or mucopurulent (approximately 50% pus, 50% mucus) uterine exudate in the vagina, 21 days or more postpartum and is not accompanied by systemic signs (LeBlanc *et al.*, 2002). Endometritis is an inflammation of the endometrial lining of the uterus without systemic signs, which is associated with chronic postpartum infection of the uterus with pathogenic bacteria, primarily *Arcanobacterium pyogenes* (Bondurant, 1999; Lewis, 1997).

Northeast China, one of the most important milk-producing regions, has the largest number of dairy cows and produces more than one-sixth of milk in the whole country. In view of this background, the objective of the present investigation was to determine the prevalence of infection, impact of risk factors and isolate the dominant bacterial causal agents of clinical endometritis in dairy cows in Northeastern China.

MATERIALS AND METHODS

Uterine swab collection: Total 1370 dairy cows that were not systemically ill, within 21±1 days postpartum were detected from Heilongjiang Province, Jilin and Liaoning province in Northeast China between March 2012 and August 2012. Uterine swabs were collected as described by Williams *et al.* (2005), in the mean time, samples of vaginal mucus were collected as described by Sheldon *et al.* (2002a). One hundred milliliter were collected in sterile universal tube and transported in ice immediately to the Veterinary Clinical laboratories of Jilin University.

Vaginal mucus sample collection: Immediately after collection of each uterine swab, the mucus content of the vagina was evaluated using a method that does not cause iatrogenic uterine bacterial contamination as described by Williams *et al.* (2005). The vaginal mucus was assessed by one person (IMS) for colour, proportion and volume of pus and a character score assigned as follows: (0) clear or translucent mucus (1) mucus containing flecks of white or off-white pus, (2) <50 mL exudate containing 50% white or off-white mucopurulent material and (3) >50 mL exudate containing purulent material, usually white or yellow, but occasionally sanguineous.

Diagnosis of clinical endometritis: The examination of the contents of the vagina for the presence of pus is the most useful procedure for diagnosis of uterine infection (Williams *et al.*, 2007). The procedures and interpretations were performed according to Plontzke *et al.* (2011) and the results being scored as 0, Trace (T), 1, 2 or 3 depending on the intensity of reaction. Sample with a vaginal mucus score of 0 or T were considered negative while those with vaginal mucus scores of 1, 2 or 3 were considered as positive. If more than one quarters of cow were positive, it was pooled sample of the quarters subjected to culture. Any samples that were not processed immediately after the vaginal mucus test were kept at 4°C for microbiological examination within 24 h of collection.

Microbiological procedures: All uterine swabs of vaginal mucus positive samples were analyzed microbiologically as described by Huszenicza *et al.* (1999). Positive samples were cultured on a blood agar plate and MacConkey agar plate. All plates were incubated aerobically at 37°C and examined for growth at 24 h. Bacteria were identified by using colony morphology, hemolytic pattern on blood agar media and further microscopic examination (Gram staining), standard biochemical methods (catalase, haemolysis, coagulase test with rabbit plasma and so on).

Statistical analysis: Statistical analysis of clinical endometritis in dairy cows from different administrative regions and management systems were analyzed by χ^2 -test with excel (Microsoft® Excel, 2003). The differences were considered statistically significant when $p < 0.05$.

RESULTS AND DISCUSSION

Prevalence: In the present study, the prevalence of clinical endometritis in dairy cows was 17.4%, with the following distributions: 16.7% in Heilongjiang province, 17.6% in Jilin province and 18.3%

in Liaoning province (Table 1). Some researchers reported that the prevalence of clinical endometritis ranged from 17-29% in China (Li *et al.*, 2010). The result in present study was relative lower than average level in China. The result show that three different province with similar lower prevalence (16.7, 17.6 and 18.3%) indicated the raising management level were better than other province in China.

Rearing systems: The prevalence in intensively reared dairy cows was lower than that in semi-intensively reared animals ($p < 0.05$), with the following distributions: 11.9% in intensively raised dairy cows, 28.1% in semi-intensively dairy cows, respectively (Table 1). These findings are in close relation with earlier reports (De la Sota *et al.*, 2008; Mee *et al.*, 2009). Dairy cows are raised intensively in large farms (>500) or semi-intensively by individual families (<50) in Northeast China. In intensive farms, cows were maintained under relatively good management. The cultivation environmental sanitation, the raising management level is in the advanced standard in the intensive farms, has the reasonable athletic field and has the strict disinfection medicinal bath measure, has stably skilled, the technical quality high veterinarian troop and to secretes the cow to carry on the dairy herd improvement. In semi-intensive farms, cows were maintained in dirty and muddy common barns with bedding materials that favor the proliferation and transmission of endometritis pathogens. The environmental sanitation, the raising management level to be irregular, does not have the athletic field, some peasant households match the concentrated feed by the dried egg yolk corn straw, does not feed the thick green fodder or unusual thick green fodder supplies and transforms frequently, the non-medicinal bath measure, all of them can cause endometritis.

Bacterial isolation: Important uterine pathogenic bacteria are associated with more severe clinical disease, increased endometrial inflammation and reduced fertility (Bonnett *et al.*, 1993; Farin *et al.*, 1989). Of the 239 uterine swabs subjected to bacteriological examination, 2.0% (5) showed no bacterial growth. The most frequently isolated pathogen was *Staphylococcus aureus* (21.8%), followed by *Streptococcus* sp. (19.2%), *Arcanobacterium pyogenes* (15.0%), they were the dominant isolates identified (Table 2). In the study, *Staphylococci* were the major clinical endometritis inducing dominant pathogens detected. *Staphylococcus aureus* was the predominant pathogens involved constituting (21.8%) of all isolates. Similarly, the same findings were reported in dairy cows (Foldi *et al.*, 2006). Some experts also found *Staphylococcus aureus* was predominant cause of clinical endometritis in dairy cows (Williams *et al.*, 2007). The prevalence

Table 1: The prevalence of clinical endometritis in dairy cows was surveyed by uterine swabs according regional and management systems in Northeast China

	No. examined	No. positive	Prevalence (%)
Regional			
Heilongjiang province	540	90	16.7
Jilin province	420	74	17.6
Liaoning province	410	75	18.3
Rearing system			
IR dairy cows	900	107	11.9
SIR dairy cows	470	132	28.1
Total	1370	239	17.4

IR: Intensively raised, SIR: Semi-intensively raised

Table 2: Dominant bacterial isolates identified from clinical endometritis in dairy cows

Types of bacterial isolates	Number	Percentage
<i>Staphylococcus aureus</i>	51	21.8
<i>Streptococcus</i> sp.	45	19.2
<i>Escherichia coli</i>	31	13.2
<i>Arcanobacterium pyogenes</i>	35	15.0
<i>Fusobacterium necrophorum</i>	18	7.7
<i>Prevotella melaninogenica</i>	15	6.4
<i>Proteus</i>	13	5.6
<i>Bacillus</i> sp.	16	6.8
<i>Bacteroides</i> sp.	10	4.3
Total	234	100.0

of *Streptococcus* sp. was 19.2% that it was the second predominant isolate next to *S. aureus*. The finding is in close relation with earlier reports (Sheldon *et al.*, 2002b). In many modern dairy herds, opportunistic bacteria such as *Arcanobacterium pyogenes* are frequently associated with clinical endometritis and *Arcanobacterium pyogenes* could be described as emerging pathogens (Miller *et al.*, 2007). In particular, *Arcanobacterium pyogenes*, *Fusobacterium necrophorum* and *Prevotella* sp. act synergistically to cause more severe clinical signs (Ruder *et al.*, 1981; Olson *et al.*, 1984).

The severity of postpartum endometritis is dependent in part on the pathogenicity of bacteria present; although, establishment and persistence of uterine infection is also influenced by the uterine environment, genetic factors and the animal's innate and acquired immunity. The recognised uterine pathogens, *Arcanobacterium pyogenes*, *Escherichia coli*, *Fusobacterium necrophorum*, *Prevotella melaninogenica* and *Proteus* species are associated with greater endometrial inflammation and more severe clinical uterine disease (Bonnett *et al.*, 1991; Griffin *et al.*, 1974; Olson *et al.*, 1984; Ruder *et al.*, 1981). Other potential uterine pathogens or opportunistic contaminant bacteria in the uterine lumen do not have this same relationship (Williams *et al.*, 2005). Therefore, the survey of clinical endometritis in dairy cows and isolation of infected dairy cows will be an effective measure on dairy farms.

In the study, environmental pathogens for *Streptococcus* sp. and *E. coli* were isolated. Animal management systems may be the reason that environmental pathogens were isolated in this study. The intensive and in semi-intensive dairy farms are incidence of environmental pathogens was higher than that in pastured dairy cows.

CONCLUSION

The clinical endometritis in dairy cows is relatively low in Northeast China, could lead to great economic loss and affect dairy cows health. Therefore, to reduce the prevalence of clinical endometritis cows has become a priority. In the survey we found that the prevalence significantly difference in different rearing systems. Therefore, rearing system is an important factor to affect the clinical endometritis in dairy cows in Northeast China. In this study predominant clinical endometritis pathogen was *Staphylococcus* sp. which is the most prevalent contagious endometritis pathogens. Therefore, the survey of clinical endometritis in dairy cows and isolation of infected dairy cows will be an effective measure.

ACKNOWLEDGMENTS

This study was supported by a grant from the National Natural Science Foundation of China (No. 30972225, 30771596), the Research Fund for the Doctoral Program of Higher Education of China (No. 20110061130010) and "十一五" science and technology research of The Education Department of Jilin province (No. 516).

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