MASTITIS IN SHEEP

MASTITÍDY U OVIEC

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Abstract
The sheep milk production has a well-established tradition in Southern and Eastern Europe, in the Middle East and in North Africa. There is a large literature on mastitis worldwide, related to dairy cattle, but much less information is available connected with dairy sheep. Mastitis is the inflammation of the udder that usually develops as a result of intramammary infection, which is the invasion and multiplication of pathogenic micro-organisms in the mammary gland. Mastitis is important from a lot of perspectives including economic (mortality of ewes and lambs, reduced milk production, impaired growth rate of lambs and the costs associated with treating infected animals), hygienic (risk of bacterial infections) and legal aspects (regulations on raw milk standards). Last but not least, it has an effect on sheep welfare across different ranges of sheep production and management systems in Europe. The annual incidence of clinical mastitis in small ruminants is generally lower than 5%. The incidence of subclinical mastitis in sheep and goats has been estimated at 5-30% per lactation or even higher. Reports are inevitably different according to different breeds, rearing systems, environment and experimental designs. Somatic cell counting for detecting mastitis is the most established relatively low-cost practical method used in bovine dairy production. It would also be appropriate to use it to monitor udder health and milk quality for dairy sheep in addition to being used for scientific research.
Keywords: sheep, dairy ewes, mastitis, somatic cell score

INTRODUCTION

Although sheep dairying is present all over the world, sheep milk production has a well established tradition in Southern and Eastern Europe, in the Middle East and in North Africa (Berger et al., 2004; Pirisi et al., 2007) where sheep milk is mainly used for cheese making. In the USA it was unheard until about 25 years ago, and although is growing rapidly, is still limited (Berger et al., 2004; Thomas and Haenlein, 2004). The increase of international trade of foodstuffs makes even more necessary to ensure the safety of the products placed on the market in order to pursuit a high level of protection of public health. It concerns food business operators, official control and consumers. The quality of milk in the primary production is essential in order to prevent the risk of food-borne diseases in the dairy products chain. With the term milk quality is meant its composition (butterfat and protein) and its hygienic quality (bacterial count and somatic cell count).

RESULT AND DISCUSSION

There is a large literature on mastitis, relative to dairy cattle, but much less information is available for dairy sheep. Most of the research has been carried out in Mediterranean countries, where the dairy sheep has a long tradition. The reports are inevitably different according to the different breeds, rearing system, environment and experimental designs. The annual incidence of clinical mastitis in small dairy ruminants is estimated to be less than 5%, whereas the prevalence of subclinical mastitis ranges between 5-30% or higher in some cases (Bergonier and Berthelot, 2003). In dairy sheep, good udder conformation is associated with a decreased risk of mastitis (Casu et al., 2010; Makovický et al., 2015).

Little is known on the incidence of intramammary infections in dairy ewes. Mastitis is inflammation of the udder that usually develops as a result of IMI. Intramammary infection is the invasion and multiplication of potentially pathogenic micro-organisms, usually bacteria, in the mammary gland. An immune response in the mammary gland usually follows infection, such that the number of leucocytes in the affected gland increases and clinical mastitis may result (Albenzio et al., 2002; Pereira et al., 2018; Takano et al., 2018; Zafalon et al., 2018; Tvarožková et al., 2021). According to Bergonier and Berthelot (2003), mastitis is important from three perspectives, which are economic (mortality of ewes and lambs, reduced milk production, impaired growth rate of lambs and the costs associated with treating infected animals), hygiene (risk of bacterial infections) and legal aspects (regulations on raw milk standards).

Several studies have investigated clinical mastitis (Onnasch et al., 2002; Fragkou et al., 2014; Queiroga, 2017; Li et al., 2019), subclinical mastitis (McDougall et al., 2002; Alba et al., 2019; Alekish et al., 2018; Vasileiou et al., 2019) and intramammary infections in ewes (Ariznabarreta et al., 2002; Ombarak and Elbagory, 2017; Skoufos et al., 2017a). Subclinical mastitis decreases milk production of dairy sheep (Saratsis et al., 1999; Gonzalo et al., 2002; Skoufos et al., 2017b).

The increase in leucocytes in response to bacterial IMI is measured as an increase in milk somatic cell count (SCC) which is the number of somatic cells per millilitre of milk. The vast majority of somatic cells in milk are leucocytes, predominantly neutrophils (Lafi, 2006; Klimešová et al., 2017). The somatic cell count of milk is thus often used as a proxy indicator of both clinical and subclinical mastitis (Sordillo et al., 1997; McDougall et al., 2002; Tančin et al., 2016, Tančin et al. 2017a,b; Bramis et al., 2016; Hofmannová et al., 2018; Albenzio et al., 2019; Tvarožková et al., 2019). In bovine dairy production, somatic cell counting is the most established, relatively low cost, practical method (Schukken et al., 2003) to monitor udder health and milk quality and has long been used as an indicator of IMI not just at the herd level (bulk milk) (Barkema et al., 1997) and cow level (Green et al., 2006) but also, in research, at the individual gland level (Green et al., 2004). Whilst SCC is widely used as an indicator of IMI in commercial dairy ruminants (Schukken et al., 2003; Peeler et al., 2003), it is rarely employed as a method for investigating udder disease in commercial suckler ewes, other than for research purposes (Clements et al., 2003).

Level of SCC elevation (Pantoja et al. 2009), or the presence of clinical signs define the bacterial species as a minor or major intramammary pathogen. High mammary gland SCC in dairy ewes associated with bacterial IMI have been observed even in the absence of other clinical signs and some bacterial species provoke a greater inflammatory response than others. Highest SCCs in ewes have been associated with Mannheimia haemolytica, Streptococcus agalactiae and S. aureus (Ariznabarreta et al., 2002). Sheep milk samples collected from uninfected gland 2-3 % of the overall SCC are epithelial cells, 10-35% polymorphonuclear neutrophil leukocytes (PMNL), 45-85% are macrophages and 11-20% lymphocytes (Bergonier et al., 2003). Thus, white blood cells represent the most prevalent cell type in milk. Somatic cell are used as an indication of udder health (Gonzalo et al., 2002; Baranovič et al., 2018; Makovický et al., 2013; 2014; Vršková et al., 2015; Tančin et al., 2017; Uhrinčať et al., 2019; Tvarožková et al., 2019; 2020) and its measure is becoming one of the main parameter to determine milk quality and the price of raw milk within the dairy industry (Pirisi et al., 2007).

Intramammary infections (IMI) can lead to clinical and sub-clinical diseases in sheep (Gelasakis et al., 2015; Zafalon et al., 2016), with mild to excruciating pain (when the udder is palpated), impacting their productive performance to varying degrees, and potentially affecting the animals' well- being. Pathologically, bacteria and viruses have been widely reported (and occasional instances of fungi or yeast) to cause IMIs. More than 130 bacteria species have been linked with IMI in dairy cows, and a similar number is probable in ewes as 20 – 30 bacteria species have been widely discovered in the udder of IMI-infected suckler ewes (Marogna et al., 2010; Mork et al., 2007). According to Menzies et al. (2013), the quantity and type of somatic cells (leucocytes) in milk vary with the magnitude of udder infections. IMIs are mostly caused by predisposing factors, which emanate from farm-level practices. Minimizing contact between infected and non-infected ewes to ensure a disease-free flock is unlikely to be practical on extensive farms. Generally, good health status in ewes will support efficient control of IMIs by preserving an effective immune system.

As described by Fragkou et al. (2014), mastitis can be diagnosed with clinical examination, bacteriological tests, cytological examination of milk by using fluor-optoelectronic counters and microscopic cell counting), and indirectly by using electrical conductivity, imaging techniques (ultrasonography, endoscopy, infrared thermography), California mastitis test (CMT) and Whiteside test (WST) (Fragkou et al., 2007).

Many studies have linked poor udder conformation to IMIs. In particular, a poorly shaped udder which may be difficult for lambs to suck, may predispose the teats to bruises and lesions during active suckling events. Menzies and Ramanoon (2001) showed that poor udder shape lead to ineffective milk evacuation, and increased proneness to IMIs. The frequency of IMI predisposition was not clearly explained but irregular glands (i.e. deep and pendulous udder) with horizontally placed teats showed increased susceptibility to mastitis and high SCC was found in ewes that had pendulous udder (Casu et al., 2010; Gelasakis et al., 2012).

Previous studies have indicated that mastitis is a disease of high economic importance and one of the most important disease affecting sheep welfare across different ranges of sheep production and management systems in Europe (Berg et al., 2014; Gelasakis et al., 2015).

CONCLUSION

Milk production is the principal trait affecting profitability of dairy sheep and goat industry, and therefore breeding programs mainly focus on milk production traits. Moreover, Legarra et al. (2007) reported that susceptibility to mastitis is one of the reasons for culling in sheep. Barillet et al. (2001) reported a 5% frequency of culling due to clinical mastitis and a 10% frequency due to subclinical mastitis. Generally, the incidence of clinical mastitis varies between 20 and 40% per cow/year (Heringstad et al., 2000); whereas the annual incidence of clinical mastitis in small ruminants is generally lower than 5%.

The incidence of subclinical mastitis in sheep and goat has been estimated at 5-30% per lactation or even higher (Bergonier and Berthelot, 2003). Mastitis in dairy sheep results mainly from bacterial infections whose reservoir is generally in the udder or teat and transmission between ewes is increased by milking. Somatic cells occur normally in milk of both cattle and small ruminants. The distribution of SCC is positively skewed; whereas, conventional statistical methods usually assume normally distributed data. In order to obtain a distribution which closely resembles a normal distribution, the SCC is log-transformed to somatic cell score (SCS). The formula widely used is: SCS = log2(SCC/100) + 3 (Ali and Shook, 1980).

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Abstrakt

Výroba ovčieho mlieka má osvedčenú tradíciu v južnej a východnej Európe, na Blízkom východe a v severnej Afrike. Celosvetovo sú početné publikácie o mastitíde hovädzieho dobytka, ale oveľa menej informácií je dostupných v súvislosti s dojnými ovcami. Mastitída je zápal vemena, ktorý najčastejšie vzniká v dôsledku intramamárnej infekcie, čo je množenie patogénnych mikroorganizmov v mliečnej žľaze. Mastitída je významná z mnohých hľadísk, napr. ekonomických (úmrtnosť oviec a jahniat, znížená produkcia mlieka, zhoršená rýchlosť rastu jahniat a náklady spojené s liečbou infikovaných zvierat), hygienických (riziko bakteriálnych infekcií) právnych aspektov (predpisov o štandardoch surového mlieka) a v neposlednom rade má vplyv na dobré životné podmienky oviec naprieč rôznymi systémami chovu oviec v Európe. Ročný výskyt klinickej mastitídy u malých prežúvavcov je vo všeobecnosti nižší ako 5%. Výskyt subklinickej mastitídy u oviec a kôz sa odhaduje na 5-30% alebo vyššiu hodnotu za laktáciu. Správy sa nevyhnutne líšia podľa rôznych plemien, spôsobov chovu, prostredia a metódy výskumu. Počítanie somatických buniek na detekciu mastitídy je najuznávanejšou relatívne nízkonákladovou praktickou metódou používanou v produkcii hovädzieho mlieka. Bolo vhodné (okrem vedeckého výskumu) túto metódu využiť aj na sledovanie zdravia vemena a kvality mlieka u dojných oviec.

Klíčová slova: ovce, dojnice, mastitída, počet somatických buniek

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