Livestock Science 172 (2015) 79–84

Contents lists available at ScienceDirect

Livestock Science

journal homepage: www.elsevier.com/locate/livsci

Short communication

Efficacy of an herbal granule as treatment option for neonatal Tibetan Lamb diarrhea under field conditions

Shengkun Li [1], Dongan Cui [1], Shengyi Wang, Hui Wang, Meizhou Huang, Zhiming Qi, Yongming Liu *

Lanzhou Institute of Husbandry and Pharmaceutical Sciences of Chinese Academy of Agricultural Sciences, No. 335, Jiangouyan Street, Qilihe District, Lanzhou 730050, Gansu Province, PR China

ARTICLE INFO

Article history:
Received 4 September 2014
Received in revised form
21 November 2014
Accepted 24 November 2014

Keywords:
Diarrhea
Herbal therapy
Lamb
Alternative remedies

ABSTRACT

Diarrhea is the leading cause of death in neonatal lambs. Herbal remedies are believed to address the conditions. We tested whether an herbal granule had a beneficial efficacy on neonatal lamb diarrhea in this study. The herbal granule was extracted from a combination of *Coptis chinensi*, *Magnolia officinalis*, *Atractylodes lancea*, *Prunus mume* and *Poria cocos* with a concentration of 1.0 g crude herb/g. Two hundred and sixty-six 3–10 day old lambs within 24 h from their first onset of diarrhea were randomly divided into one of two treatment groups (A and B), with animals receiving either herbal granule orally in group A ($n=117$) or oxytetracycline and pepsin orally in group B ($n=109$) two times daily for a maximum of 5 days at which time lambs were eligible for exit. Thirty lambs with no clinically visible pathological conditions and with no diarrhea diagnosis were availed as the normal controls (group C) to evaluate the growth performance of lamb herds during the 45-days following the treatment. Although statistically non-significant ($P=0.063$), more lambs (103/117) recovered from diarrhea in group A than in group B (85/109). We found that lambs treated with the herbal granule experienced reduced days to recovery from diarrhea (3.1 ± 0.8 vs. 3.5 ± 0.6 days, $P<0.01$), reduced the diarrhea-associated mortality (5.1% vs. 13.8%, $P<0.05$), and reduced recurrence rate (8.7% vs. 24.4%, $P<0.01$) during the diarrhea episode compared to the controls in group B. The live body weight of lambs were higher in group A than in group B at days 15 (4.1 ± 0.9 vs. 4.1 ± 1.1 kg, $P<0.05$), 30 (6.8 ± 1.0 vs. 6.3 ± 1.3 kg, $P<0.01$) and 45 (10.7 ± 1.3 vs. 8.7 ± 1.7 kg, $P<0.01$) following the treatment. Additionally, the live body weight of lambs at days 45 (10.7 ± 1.3 kg vs. 10.6 ± 1.2 kg, $P>0.05$) following the treatment were higher in group A than in group C. Herbal granule used in this study might have a beneficial clinical effect under these study circumstances. Thus, herbal granule could represent a potential effective treatment strategy for neonatal lamb diarrhea.

1. Introduction

Neonatal lamb diarrhea is a common problem for sheep enterprises worldwide (Scott, 2007). A study at the U.S. Sheep Experiment Station showed that diarrhea accounted for 46 percent of lamb mortality (Schoenian, 2007). Additionally, diarrhea poses a major risk factor for the accumulation of feces on fleece at the breech (perineal region), which in turn results in aggravating the outbreaks of cutaneous myiasis (Morley et al., 1976; French et al., 1994; Hall and Wall, 1995; Bisdorff and Wall, 2008), increasing the risk of carcass contamination with enteric microbes associated with meat spoilage and human food poisoning (Greer et al., 1983;

* Corresponding author. Tel.: +86 931 2115268; fax: +86 931 2115268.
E-mail address: myslym@sina.com (Y. Liu).
[1] Shengkun Li and Dongan Cui contributed equally to this work.

http://dx.doi.org/10.1016/j.livsci.2014.11.010
1871-1413/

Hadley et al., 1997). Therefore, effective treatments for diarrhea symptom are crucial for animal healthy and economic benefits in sheep enterprises.

Many anti-diarrhea medications, including antibiotics and anthelmintics are commonly used to control of diarrhea in small ruminant animal, however, the problem of the resistance against antibiotics and anthelmintic tend to be increasingly due to overrated use in clinical practices (Hodgson et al., 1999; Dance et al., 1987; Palmer et al., 2001; Besier and Love, 2003; Suter et al., 2005). Antimicrobic treatment for diarrhea in lambs could cause the release of excess endotoxins and delay the clinical evolution of diarrhea lambs (Jiménez et al., 2007). Gómez et al., (2008) demonstrated that administering antibiotics orally may damage the normal flora and actually prolong the diarrhea. Current studies indicates that neonatal diarrhea syndrome has multifactorial in etiology involving the animal, management practices, and infectious agents, e.g. E. *Coli*, *Salmonella* sp., *Cryposporidum* sp. and Rotavirus (Muñoz et al., 1996; Andrés et al., 2007; Sargison, 2004; Causapé et al., 2002; Wani, et al., 2004). Additionally, neonatal lambs do not have fully functioning immune systems, and which elevates the difficulty for the prevention and control of lamb diarrhea. Thus, diarrhea remains therapeutic challenge in neonatal lambs. Herbal remedies are believed to be effective for many disorders in clinical practices (Jiang, 2005; Grayson, 2011).

According to traditional Chinese veterinary medicine (TCVM) theory, neonatal diarrhea syndrome is always considered a disorder of the entire gastrointestinal tract due to the disharmony between the spleen and the stomach in neonatal small ruminants, and TCVM could provide a practical and effective way to address this condition (Editorial Committee of Encyclopedia of China's agricultural, 1991). The herbal granule used in this study was developed from an herbal formula, which was designed according to the therapeutic principle of "clearing away heat and toxicity materials, relieving diarrhea with astringents" for treatment neonatal diarrhea syndrome in TCVM (Editorial Committee of Encyclopedia of China's agricultural, 1991). The herbal granule consists of *Coptis chinensi*, *Magnolia officinalis*, *Atractylodes lancea*, *Prunus mume* and *Poria cocos*. Our previous study indicated that administering herbal granule orally does not to be toxic in acute toxicity tests (maximum daily dose = 40 g/kg bw) in mice according to Hodge and Sterner scale (CCOHS, 2005) (results not published).

The hypothesis of the present study is that neonatal Tibetan lambs affecting with diarrhea treated with the herbal granule will experience reduced days to recovery from diarrhea, reduced the diarrhea-associated mortality, and reduced recurrence rate during the diarrhea episode compared to the controls. The aim of this study was to evaluate the efficacy of the herbal granule as an alternative option for lamb diarrhea, and to assess subsequent growth performance in neonatal Tibetan lambs affecting with diarrhea under field conditions.

2. Materials and methods

2.1. Herbal granule preparation

The herbal granule in this study consists of five herbs—80 g of *C. chinensi*, 60 g of *M. officinalis*, 60 g of *A. lancea*, 90 g of *P. mume*, and 50 g of *P. cocos*. The herb quality criteria were congruent to the Veterinary Pharmacopoeia of the People's Republic of China (Chinese Veterinary Pharmacopoeia Commission, 2010). After pre-processing with washing, drying and chopping, the mixture was decocted with 10 times purified water in 100 °C for 1.5 h for three times, and the extracted liquid were concentrated to 340 mL. Finally, the herbal granule was prepared according to a standardized procedure to produce a granule with a final concentration of 1.0 g crude herb/g.

2.2. Study population

The clinical trial was conducted between January and May 2014 in Gansu province, northwest of China, which was conducted in spring as it is the season with the increased incidence of lamb diarrhea syndrome in this area. A total of 5 semi-intensive sheep commercial farms with approximately 600 local Tibetan breed ewes were included in this study, and they were managed under a semi-intensive husbandry system with similar health, nutrition and husbandry practices. All lambs were under veterinary supervision to ensure for colostrum intake directly from their dams in the first 1–6 h after birth, and were reared with the ewes for 4–6 weeks before being weaned. During the experimental period, the enrolled sheep flocks presented natural outbreaks of diarrhea affecting neonatal lambs in the first 1–15 days of life, with a prevalence of 15–40.0%.

2.3. Enrollment criterion

Treatment groups included Tibetan lambs born from January 2014 till May 2014, with lamb diarrhea syndrome diagnosis. Diarrhea was diagnosed based on the parameters fecal consistency score (FCS) and the condition of the Tibetan lambs, and clinical diagnosis was done by a veterinarian (Li) who had no knowledge of the experimental groups. Particularly, the lambs enrolled in this study developed diarrhea for the first time between 3 and 10 days of age (Gómez et al., 2008; Joshua et al., 2012). For the purpose of presented study, FCS was between 3 and 5 using a scale of 1 (hard dry fecal pellet) to 5 (liquid/fluid diarrhea) previously described protocol (Greeff and Karlsson, 1997), the degree of a dehydration between 5% and 10% according to a previously described protocol (Hassan, et al., 2014), and lamb attitude score between 1 and 2 using the clinical scoring scale of 1 according to the protocol described by Glover et al. (2013).

2.4. Experimental protocol

This study was designed as a randomized controlled trial. Upon enrollment, all animals were weighed and received a clinical examination for each lamb, including the rectal temperature (°C), fecal consistency, attitude score and degree of dehydration. Particular, the enrolled lambs were clinically examined by a veterinarian prior to enrollment to identify no any other congenital or pathological conditions (e.g. omphalitis, arthritis or pneumonia). During the study period, 266 lambs within 24 h from their first onset of diarrhea were randomly divided into one of the two treatment groups (A, $n = 117$, B, $n = 109$) in blocks that ranged from 3 to 9 lambs depending on the number of