

Scientific Report

The frequency of photosensitization in a dairy cattle herd infected by *Leptospires*

Talebkhani Garoussi, M.

Department of Clinical Sciences, School of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran

Correspondence: Department of Clinical Sciences, School of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran. E-mail: garoussi@ferdowsi.um.ac.ir

Summary

Leptospirosis is a bacterial zoonotic disease, which can induce hepatic lesions. Photosensitization (PS) maybe is the result of accumulation of photodynamic agents in unpigmented area of the skin exposed to sunlight which occurred due to hepatic lesions. An outbreak of leptospirosis was occurred in a dairy cattle herd complex with 760 dairy milking cows in March (1990). Totally, 412 cows (54.21%) showed clinical signs including fever, systemic mastitis, haemoglobinuria, jaundice, lameness, abortion and stillbirth. The microscopic agglutination test (MAT) was used for diagnosis of leptospirosis. The herd was infected with *Leptospira interrogans grippityphosa*, *L. interrogans icterohaemorrhagiae*, *L. interrogans pomona*, *L. interrogans canicola* and *L. interrogans hardjo*. Only one (0.13%) cow showed PS in the unpigmented skin dorsum. MAT showed that she was infected with *L. interrogans pomona*, *L. interrogans hardjo* and *L. interrogans icterohaemorrhagiae* with titre of 1 : 3200 of antibody. In spite of the high incidence of leptospirosis, the frequency of PS was too low.

Key words: Photosensitization, Leptospirosis, Dairy cattle

Introduction

Leptospirosis is a zoonotic disease caused by members of the genus *Leptospira* (Ellis, 1994). Photosensitization (PS) is the disease caused by the sensitization of the superficial layers of lightly unpigmented skin exposed to sunlight. The pathogenic *Leptospires* are classified into one species of *Leptospira interrogans* which consists of 212 serovars arranged into 23 serogroups (Radostitis *et al.*, 2000). Leptospirosis is suspected of being a preliminary to PS. Leptospiral serovars usually are *L. interrogans pomona* or *L. interrogans hardjo*. However, *L. interrogans grippityphosa* and *L. interrogans icterohaemorrhagiae* are common leptospiral serovars in bovine infection (Talebkhani Garoussi *et al.*, 1997; Radostits *et al.*, 2000). *L. interrogans canicola* infection has also been recorded in cattle (Talebkhani Garoussi *et al.*, 1997; Radostits *et al.*, 2000).

Materials and Methods

Clinical findings

Leptospirosis was occurred in a large industrial dairy cattle herd complex in north-west of Iran with 760 milking Holstein dairy cows in March (1990). It was initiated by systemic mastitis. The mammary secretions in some affected cows were red to yellow-orange-coloured or contained blood clots. The udder was limp and soft. One of the characteristic findings was the marked drop in milk production and thick milk in all four quarters without apparent physical change in the udder. The sudden drop in milk production affected more than 50% of cows at one time and caused a precipitation fall in the herd milk. The decline lasted for up to 6 weeks, but individually, milk production returned to normal within 10-14 days.

Laboratory diagnosis

Microscopic agglutination test (MAT) was

used for the *Leptospira* diagnosis as described by Cole *et al.*, (1976). Sera were screened against 22 alive antigens.

Control

Strategies for the control of leptospirosis in this outbreak could take limitation of occurrence. They were included: (1) Identification of infected animals with clinical manifestations and subsequent treatment with dihydrostreptomycin (12.5 mg/kg, IM) twice daily for 3 days, (2) Antibiotic therapy of the entire herd with no clinical signs at the one time with dihydrostreptomycin (25 mg/kg, IM), (3) Vaccination of the whole cows with *Leptospira* bacterin contained 5 above-mentioned serovars (Grand Laboratories, Inc.), repeated after 6 months and followed by annual revaccination and (4) Implementation of tight hygiene management including reduction of rat population and wildlife, keeping the corrals dry and more hygiene.

Results

The MAT showed that the animals were infected by *L. interrogans pomona*, *L. interrogans hardjo*, *L. interrogans grippotyphosa*, *L. interrogans icterohaemorrhagiae* and *L. interrogans canicola*. In total, 412 cows (54.21%) showed clinical signs including fever, anorexia, jaundice, haemoglobinuria, mastitis, lameness,

abortion and stillbirth. The incidence of mortality rate was 3.28% (25 cows). Twelve cows (1.57%) showed clinical symptoms on two occasions during the next 2-3 months period. Necrotic dermatitis occurred on the teats of 13 (1.71%) cows.

Only one 4-year-old cow (0.13%) showed PS in unpigmented skin. The lesion was pronounced on the dorsum of the body and was absent from the ventral surface (Fig. 1). The demarcation between lesions and normal skin was very clear-cut. Pigmented skin generally remained unaffected. Behavioural abnormalities were seen immediately on exposure to sunlight. These included restlessness, signs of photophobia, seeking shade and scratching or rubbing of the pruritic site. Other symptoms such as jaundice, mastitis and abortion in the 6th month of conception was observed in this cow. MAT showed that it was infected by *L. interrogans pomona*, *L. interrogans hardjo* and *L. interrogans icterohaemorrhagiae*. The antibody titre was 1 : 3200. Infected dairy cattle were treated with dihydrostreptomycin (12.5 mg/kg, IM) twice daily for 3 days and supportive therapy was administered. It recovered completely without any signs of PS after 4 months. The animal conceived after 13 months and labored successfully.

Discussion

Leptospirosis can occur as an acute and

Fig. 1: Photosensitization due to leptospirosis: the demarcation between lesions and normal skin is clear-cut

severe disease due to septicemia with evidence of endotoxemia such as haemorrhages, hepatitis and nephritis, as a subacute moderately severe disease with nephritis, hepatitis, agalactia and meningitis or as a chronic disease characterized by abortion, stillbirth and infertility. Acute, subacute and chronic leptospirosis are usually caused by *L. interrogans pomona* and *L. interrogans hardjo*. Acute leptospirosis caused by *L. interrogans pomona* is manifested by high fever, anorexia, petechiation of mucosa, depression and acute hemolytic anemia with haemoglobinuria, jaundice and pallor of the mucosa. Mastitis caused by leptospirosis has often been described in cattle, resulting from *L. interrogans pomona* and *L. interrogans hardjo*. Necrotic dermatitis, probably due to PS may develop in acute leptospirosis due to hepatic damage (Radostits *et al.*, 2000).

In veterinary clinical science, the term photosensitization generally refers to a syndrome, which resembles, but is distinct from sunburn. It results from exposure of certain photoactive compounds that are not normally present in a tissue, to light of an appropriate wavelength (Rowe, 1989). If PS substances (photodynamic agents) are present in sufficient concentration in the skin, dermatitis occurs when the unpigmented skin is exposed to sunlight (Radostits *et al.*, 2000). The phototoxic agent in hepatogenous PS is invariably phylloerythrin (PE), a metabolite of dietary chlorophyll produced by microbial action in the gastrointestinal tract. When biliary function is normal, systemically absorbed PE is cleared from the blood by the liver and excreted in the bile so efficiently that photosensitizing levels of PE are not attained in the dermal circulation (Rowe, 1989). When biliary secretion fails as a result of hepatitis or bile duct obstruction,

PE accumulates in the blood and may reach levels in the skin that make it sensitive to sunlight (Radostits *et al.*, 2000). Lesions of PS occur most frequently in white skinned (unpigmented) areas (Smith, 2002).

In conclusion despite the high percentage of leptospirosis noted, the incidence rate of PS on the dorsal site was rare.

Acknowledgement

The author thank Dr. Vand e Ussefi, J. Section of Bacteriology, Razi Institute of Karadj, Iran, for helping in laboratory diagnosis.

References

- 1- Cole, JR; Ellinghausen, HC and Rubin, HL (1976). Laboratory diagnosis of leptospirosis of domestic animals. Proc. US. Anim. Health Assoc., 83: 189-199.
- 2- Ellis, WA (1994). Leptospirosis as a cause of reproductive failure. Vet. Clin. North Am. Food Anim. Pract., 10: 463-478.
- 3- Radostitis, OM; Gay, CC; Blood, DC and Hinchcliff, KW (2000). *Veterinary medicine*. 9th. Edn., Philadelphia, W. B. Saunders Co., Ltd. Harcourt Publisher Limited. PP: 587-589, 971-986.
- 4- Rowe, LD (1989). Photosensitization problems in livestock. Vet. Clin. North Am. Food Anim. Pract., 5: 301-323.
- 5- Smith, BP (2002). *Large animal internal medicine*. 3rd. Edn., Philadelphia, Mosby. A Harcourt Health Sciences Co., PP: 1231-1232.
- 6- Talebkhan Garoussi, M; Famil Ghadakchi, H; Vand e Ussefi, J and Norozian, I (1997). Seroprevalence of leptospiral antibodies in dairy cattle herds and their employees in Mashhad suburb in Iran. In: *Proceeding of epidemiologie et sante animal*. 8th International Society of Veterinary Epidemiology and Economic. 8-11 July 1997, Paris, France, PP: 4121-4123.