Probable occurrence of black leg in a sucker dairy calf: the necessity of providing sufficient maternal antibody in endemic regions

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Abstract:

Black leg has been reported in a variety of animals, but is of the most importance in cattle and sheep. A 20 days old Holstein dairy calf was examined because of anorexia and lameness from 2 days ago. The calf was depressed, tachypneic, tachycardic, and had a body temperature of 38.5ºC. Both hind limbs proximal to the tarsal joint were markedly swollen, firm and painful. No crepitation was noted on palpation. The calf had bruxism, stiffness of gait and unwillingness to move. At necropsy, massive necrosis of thigh muscles which caused dark discolorated tissue with metallic sheen, large amount of thin sanguineous exuda and abundant gas bubbles were evident in the underlying tissues. Histopathologic examination revealed extensive degeneration and coagulative necrosis of muscle fibers and supported a diagnosis of black leg. No vaccination against *Clostridium chauvoei* was applied in the herd and the calf did not receive notable maternal antibody. Providing sufficient maternal antibody or early vaccination of the susceptible newborn calves should be considered in the endemic regions.

Case History

Black leg has been reported in a variety of animals, but is of the most importance in cattle and sheep (Sterne and Batty,1978). In cattle, the disease is a non traumatic endogenous infection produced by *Clostridium chauvoei* (Baldassi, 2005). This bacteria is a part of the normal bacterial soil flora (Mossawi Shoshtary et al., 2007) and clostridial myositis due to *C. chauvoei* is most common in pastured cattle between 9 and 24 months of age, but a range of 6-36 months of age has been suggested as the most susceptible (Jackson et al., 1995; Sterne and Batty, 1978). The only effective means of controlling black leg is by vaccination (Mossawi Shoshtary et al., 2007). Black leg in cattle has been recognized since 1938 in Iran and mostly affects cattle in enzootic farms (Ardehali and Darakhshan, 1975). Vaccination of calves Insufficient distance between two parts months of age is performed in the endemic regions (Mossawi Shoshtary et al., 2007).

Although some authors believe that calves as young as 6 weeks may be affected (Mossawi Shoshtary et al., 2007), to the best of our knowledge, there is only one previous report of black leg occurrence in calves under one month of age. This paper describes the probable occurrence of black leg in a 20 days old dairy calf which is the first report of black leg occurrence in a sucker dairy calf in Iran and shows that providing sufficient maternal antibody or early vaccination of susceptible individuals to protect the newborn calves should be considered in the endemic regions.

Clinical Presentations

In May 2010, A 20 days old Holstein dairy calf was presented to the Veterinary Teaching Hospital of Shiraz University, in the south of Iran, because of anorexia and lameness since two days ago previous. The calf was depressed, tachypneic (55 breaths/ minute), tachycardic (125 beats/minute), and had a body temperature of 38.5ºC. Stronger heart tone than normal was detectable by stethoscope and mucous membranes were pale.

Both hind limbs proximal to the tarsal joint were markedly swollen (about twice normal size), firm and painful on palpation. No crepitation was noted on palpation. The calf had bruxism, stiffness of gait in the hind legs and unwillingness to move. The case was housed in a group pen with older calves up to 6 months and had no history of injection at the affected sites. No wound was diagnosed in close examination of the skin of the hind legs and umbilical cord had no sign of infection.

Radiographic inspection of hind foot showed no defect. A CBC revealed leukocytosis (a total white cell count of 15.7 109/L), neutrophilia (10.7 109/L) and normal lymphocyte, monocytes and eosinophil counts. HCT was below the normal range (10%). No band cells were observed.

Treatment consisting of intravenous administration of fluids (Dextrose saline 5%, ghazi, Iran, 0.5 Liter), anti inflammatory agent (flunixin meglumine 5%, Razak, Iran, 2 mg/Kg.) and antibiotic (Cefazolin , Exir, Iran, 20 mg/Kg.) was not successful and the calf died about 48 hours after the onset of clinical signs.

Diagnostic Testing

Immediately following death, complete gross necropsy was performed. At necropsy, massive necrosis of thigh muscles of both hind legs which caused dark discolorated tissue with metallic sheen, large amount of thin sanguineous exuda and abundant gas bubbles in the underlying tissues were evident. Petechial hemorrhages were present on both epicard and endocardium. Samples of affected muscle were obtained for anaerobic culture and histopathologic examination.

Histopathologic examination of thigh skeletal muscle revealed extensive degeneration and coagulative necrosis of muscle fibers with severe hemorrhage. There was severe edema and small to large cavities due to emphysema between myofibers. Also, mild to moderate infiltration of neutrophils scattered between degenerated and necrotic myofibers was seen (Figure 1). Hemorrhagic necrotizing and emphysematous myositis which was seen in the histopathological sections supported a diagnosis of black leg.

Bacterial culture of the sampled tissues under anaerobic conditions showed no growth.

Assessments

Black leg cases in calves under one month have been reported rarely. To the best of our knowledge, there is only one previous report of black leg occurrence in a sucker calf, which has been reported by Sojka et al. (1992) in a 3 day-old calf. In cattle, the age range of 6-36 months has been noted as the most susceptible to black leg and the occurrence in the younger animals is sporadic (Jackson et al., 1995). Maternal antibodies against black leg can protect the calf for 3-6 months (Radostits et al., 2007) and calves at the age of 4-6 months are susceptible to black leg and usually receive the vaccine (Mossawi Shoshtary et al., 2007). In the mentioned case, no previous case of black leg had been diagnosed in the herd and no vaccination against *C. chauvoei* was applied. Therefore, the calves probably did not receive notable maternal antibody against *C. chauvoei* and were susceptible under 6 months of age.

Although anaerobic bacterial culture did not yield any growth, typical gross lesions at necropsy and histopathological results support the diagnosis of black leg in the mentioned case (Floyd, 1994; Hulland, 1993; Radostits et al., 2007). In black leg cases, because *C. chauvoei* is strictly anaerobic, isolation and identification of the organism from muscle lesions may be unsuccessful (Sojka et al., 1992). On the other hand, negative bacterial culture may be due to antibiotic administration to the calf.

Clostridial myositis due to *C. chauvoei* is most common in pastured cattle or affected cows have had a history of grazing (Jackson et al., 1995). But, in this case the herd had no history of grazing and the affected calf was fed milk only. Contamination of the equipment used for calf feeding with spores contain-

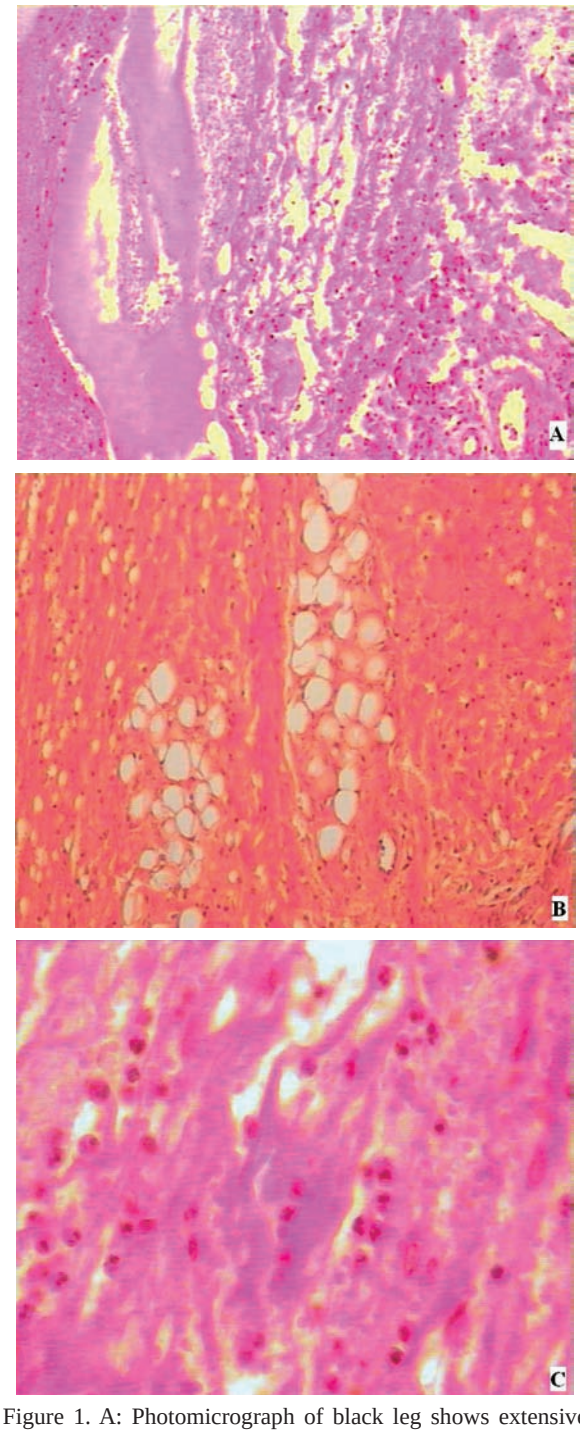

Figure 1. A: Photomicrograph of black leg shows extensive degeneration and coagulative necrosis of thigh muscle fibers with infiltration of neutrophils. Presence of marked edema in a large cavity is notable (H&E, X 180). B: Photomicrograph of black leg shows numerous small to large spaces or cavities between degenerated and necrotic myofibers (H&E, X 180). C: High power magnification of thigh muscle with black leg shows that neutrophils are infiltrated between degenerated and necrotic myofibers (H&E, X 720).

ing soil or manure has been proposed as the probable cause of the neonatal calves contamination (Sojka et al., 1992).

Most cases of black leg in cattle are due to *C. chauvoei* and rarely is the causative organism *Clostridium septicum* (Sterne and Batty, 1978). Some authors believe that *C. chauvoei* is the cause of true black leg in cattle and usually has endogenous origin (Jackson et al., 1995). In some regions with widespread use of *C. chauvoei* vaccine in the prevention of black leg, C. novyi may be diagnosed as the cause of some black leg cases (William, 1977). William (1977) believes that the lesions produced by *C. chauvoei* are recognizable from lesions produced by *C. septicum* and *C. novyi* by gross pathological findings. Although the lesions of *C. chauvoei* are dry and crepitant and a pale yellow fluid surrounded affected muscles which later become bloodstained, the lesions of *C. novyi* have obvious gelatinous edema of the subcutaneous and intramuscular connective tissues. However, in the 3 day-old affected calf which has been reported by Sojka et al., (1992), diffuse subcutaneous gelatinous edema was seen.

Although crepitation was not manifested in the clinical examination of the mentioned case, gas bubbles in deep muscular layers during necropsy and signs of emphysema in histopathologic slides were evident. In black leg affected sheep crepitation may be unnoticeable with palpation (Maxie and Jubb, 2007). According to our observations in the mentioned case, the crepitation may not be clearly noticeable in some cases of black leg in the calves.

In cattle, *C. chauvoei* is usually an endogenous infection. Latent spores of *C. chauvoei* may be found in many tissues and tissue damage such as trauma may create an opportunistic area of reduced oxygen tension or intramuscular hemorrhage that allows proliferation of bacteria (Glastonbury et al., 1988; Jackson et al., 1995). However, there was no history of trauma in the mentioned case.

Although in 1968 an extensive outbreak occurred among cattle flocks in the south part of Iran, black leg is endemic in this region (Ardehali and Darakhshan, 1975). An age range of 6-36 months has been suggested as the most susceptible to black leg (Jackson et al., 1995; Sterne and Batty,1978), however, this report shows that providing sufficient maternal antibody or early vaccination of susceptible individuals to protect the newborn calves should be considered in the endemic regions.

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References

1. Ardehali, M., Darakhshan, H. (1975) Isolation and characterization of *Clostridium chauvoei* strains isolated from cases of blackleg in cattle in Iran. Arch Razi Inst. 27: 37-41.
2. Baldassi, L. (2005) Clostridial toxins: potent poisons, potent medicines. J Venom Anim Toxins incl Trop Dis. 11: 391-411.
3. Floyd, J.G. (1994) Blackleg and other clostridial diseases in cattle. Alabama cooperative extension system, Document No: ANR-0888.
4. Glastonbury, J.R.W., Searson, J.E., Links, I.J., Tuckett, L.M. (1988) Clostridial myocarditis in lambs. Aust Vet J. 65, 208-9.
5. Hulland, T.J. (1993) Muscle and tendon. In: Pathology of Domestic Animals. Jubb, K.V.F., Kennedy, P.C., Pahner, N. (eds.). Vol. I, Academic Press, California, USA. p. 183-266.
6. Jackson, C.A., Rebhun, W.C., Mc Donough, P.L. (1995) Blackleg: a new perspective on an old disease. Compend Contin Edu Pract Vet. 17: 1299- 1306.
7. Maxie, M.G., Jubb, K.V.F. (2007) Jubb, Kennedy and Palmer's Pathology of Domestic Animals. (5^{th} ed.). Saunders-Elsevier, Philadelphia, USA.
8. Radostits, O.M., Gay, C.C., Hinchcliff, K.W., Constable, P.D. (2007) Veterinary Medicine: A Text-Book of the Diseases of Cattle, Horses, Sheep, Pigs and Goats." (10^{th} ed.). Saunders-Elsevier, Philadelphia, USA.
9. Sojka, J.E., Bowersock, T.L., Parker, J.E., Blevins, W.G., Irigoyen, L. (1992) *Clostridium chauvoei* myositis infection in a neonatal calf. J Vet Diagn Invest. 4: 201-203.
10. Mossawi Shoshtary, M., Pilehchian Langroudi, R., Abdolmohammadi, L., Jabbari, A. (2007) Preparation of concentrated blackleg vaccine. Arch Razi Inst. 62: 165-169.
11. Sterne, M., Batty, I. (1978) Clostridial infections. The Br Vet J. 137: 443-54.
12. William, B.M. (1977) Clostridial myositis in cattle: bacteriology and gross pathology. Vet Rec. 29: 90-91.

مجله طب دامی ایران، ۱۳۹۲، دوره ۷، شماره ۱، ۷۲-۶۹

وقوع احتمالی بیماری پاسیاه (black leg) در یک گوساله شیرخوار: ضرورت ایجاد ایمنی مادری مناسب در نوزادان در مناطق اندمیک

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چکیده

بیماری black leg در گونه‌های دامی متعددی گزارش شده است، اما بیشترین اهمیت را در گاو و گوسفند دارد. یک گوساله نژاد هلشتاین با سن بیست روز به علت شروع بی اشتهایی و لنگش از دو روز قبل مورد معاینه قرار گرفت. دام دارای دندان قروچه، عدم تمایل به حرکت، تاکی کاری، تاکی پنه و دمای بدن $38/5^{o}C$ بود. اندام‌های حرکتی خلفی در بالای مفصل تارس سفت، متورم، دردناک و در ملامسه فاقد حالت کریپتان بودند. در کالبدگشایی نکروز گسترده عضلات ناحیه ران که سبب رنگ تیره همراه جلای فلزی عضلات شده بود، مقدار زیاد ترشحات تیره و حباب‌های متعدد گاز در لایه‌های عمقی عضلات مشاهده شد. در بررسی هیستوپاتولوژیک مشاهده دژنرسانس و نکروز گسترده رشته‌های عضلانی احتمال ابتلای دام به بیماری black leg را تایید کرد. گله سابقه‌ای از واکسیناسیون بر علیه کلستریدیوم شوای نداشت و احتمالاً گوساله مقدار کافی آنتی بادی مادری دریافت نکرده بود. تامین مقدار کافی آنتی بادی مادری و یا واکسیناسیون زودهنگام گوساله‌ها در مناطق اندمیک باید مورد توجه قرار گیرد.

واژه‌های کلیدی: Black leg، گوساله شیرخوار، نژادشیری، ایمنی مادری، مناطق اندمیک

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