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Clinical Article

THERAPEUTIC MANAGEMENT OF PHOTOSENSITIZATION IN BUFFALOES DUE TO BERSEEM FEEDING

JAGPREET SINGH[1]* and RAVI SINGLA[2]
[1]Civil Veterinary Hospital Fateh Majri-147001, [2]Civil Veterinary Hospital Todarpur,
Block Samana, District Patiala, Punjab, India

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SUMMARY

Three buffaloes in a household were affected with photosensitization reaction due to ad lib feeding of lush green fodder of berseem. The main affected body parts were distal parts of the limbs, hind teats and tail. The most affected animal showed neutrohillic leucocytosis with mildshift to left, increased aspartate aminotransferase (AST), alanine transaminase (ALT), blood urea nitrogen (BUN), creatinine, bilirubin with decreased albumin and globulin concentration. The animals upon treatment with antibiotics, antihistaminics, non-steroidal anti-inflammatory drugs(NSAIDs), steroids and immunoboosters showed uneventful recovery.

Keywords: Berseem, Buffaloes, Photosensitization

Photosensitivity is an aberrant reaction of the body when exposed to the direct sunlight, owing to the abnormal presence of photodynamic pigments/compounds in the skin cells, cornea or mucus membranes (Mauldin and Peters-Kennedy, 2016). The portion of the skin devoid of the protective hairs, fleece or pigmentation is comparatively more susceptible to this untoward reaction. Upon being energized by the photons of the certain wavelength of sunlight, particularly in ultraviolet range of spectrum; the molecules get energized and when these return to their initial stage, the released energy transfers to the receptor molecules in skin and cause tissue injury either by formation of reactive oxygen intermediates or by changing the permeability of cell membranes. Thus, this reaction is typically a biophysical phenomenon. Photosensitization occurs mostly in cattle, sheep and horses worldwide, but its occurrence in buffaloes has reportedly been sporadic (Kumar and Patel, 2013; Choudhary *et al.*, 2013). The present article documents a case of berseem induced photosensitivity in three buffaloes.

The animals' owner requested the doctor for a home visit to check the animals as the animals were unable to be brought to the hospital. The owner complained of some kind of allergic reaction to all his three buffaloes about two days before. The animals were initially seen to be restless with rubbing and scratching all over the body especially all the limbs, perineum, teats and tail. The animals had previously been symptomatically treated by some local practitioner but there was no apparent improvement in their condition. On clinical examination, all the three animals were having high rectal temperatures (103.2 °F to 104.2 °F) andelevated respiration rates (19 to 22/min).One of the animals exhibited the severe form of lesions that included the longitudinal cracks on the medial side of both the distal forelimbs where from the skin had sloughed and serum exudation was seen (Fig.1), the findings of almost exact similarities were reported in a photosensitivity affected herd of Sahiwal cows by Thawait *et al.* (2013). In addition, the skin around fetlock and dew claws on both forelimbs and hindlimbs was hypertrophied and had bleeding cracks. The distal portion of the tail was thickened and hardened while two hind teats were inflamed and had crusted cracks (Fig. 2).

The other two animals were comparatively less affected and were mainly showing erythema on the skin between knee and fetlock on forelimbs and hock and fetlock on hind limbs and perineal area. Although the primary involvement of eyes and ears has been reported in buffaloes by Sharma (2007), however these parts were unaffected in the present case. All the animals showed decreased appetite, were reluctant to get up and were showing varying degrees of lameness. Upon being questioned about any recent change in managemental practices, the owner told that the animals were fed lush green berseem fodder, in an amount more than normal, before the illness.

Taking into account, the anamnesis, circumstantial evidences and clinical observations, it was presumed that the animals were suffering from the photosensitivity reaction due to berseem ingestion (Chen *et al.*, 2019; Thawait *et al.*, 2013). To figure out the extent of the damage, the blood samples for hematology and serum analysis were collected from the animal which was most affected. The hemato-biochemical report showed normal hemoglobin and neutrophillic leucocytosis with mild shift to left which is indicative of an ongoing inflammatory process in the body. The serum, biochemical analysis revealed increased AST, ALT, BUN, creatinine, bilirubin but decreased albumin and globulin (Table 1). The elevated AST, ALT levels are indicative of the hepatocellular damage,

*Corresponding author: jsarora2323@gmail.com

whereas, the increased total bilirubin implicates imminent icteric clinical symptoms. This compromised liver function was being manifested clinically as decreased appetite while physio-pathologically as decreased ability of body to get rid of photodynamic pigments. The increased creatinine and azotemia are suggestive of the renal damage due to phytodynamic pigments (Scott and Scott, 1993) particularly phylloerythrin. The similar findings have also been reported by Ananda *et al.* (2008); Hussain *et al.* (2013); Thawait *et al.* (2013) in such cases.

Table 1

Haemato-bioochemical parameters of the most affected buffalo before and after the treatment

Hematological parameter	Reference Value	Value before treatment	Value after treatment (2 weeks)
Hemoglobin (g/dl)	8.0-15.0	10.2	11.6
Total Leucocyte	4,000- 12,000	18,600	12,400
Neutrophil (%)	15.0-35.0	52.0	32.0
Lymphocyte (%)	62-65	48.0	68.0
AST (IU/L)	45-110	260	95
ALT (IU/L)	6.9-35	140	28
BUN (mg/dl)	7.8-25	38.0	23.0
Creatinine (mg/dl)	0.6-1.8	1.9	1.6
Bilirubin (mg/dl)	0.0-0.8	0.82	0.4
Albumin (g/dl)	2.8-3.9	2.64	3.21
Globulin (g/dl)	2.9-4.9	2.87	3.60

For treatment, owner was advised to restrict the berseem feeding and keep the animals away from direct sunlight with immediate effect. As three days had already been passed since the reaction started, the gastrointestinal evacuation by purgation using magnesium sulphate (Debnath *et al.*, 2010; Choudhary *et al.*, 2013) was not an option. However, the dilution and eventual excretion of the causative pigments was attempted by intravenous infusion of normal saline 6 to 8 liters and dextrose 5% @ 2 to 4 liters per animal (Sharma, 2007). Along with fluid therapy, antihistaminics (Chlorphrenamine maleate @10 mg/kg IM SID), NSAIDs (Meloxicam @ 0.5 mg/kg IM SID) and antibiotics (Procaine penicillin G, Penicillin G and Streptopenicillin @ 2.5 gm IM BID), inj.butaphosphan@ 3mg/kg IM, prednisolone @ 1mg/kg IM and B- complex 12 ml IM were prescribed for three days. As vitamin-C levels have been reported to decline due to photosensitivity induced hepatic damage (Hussain *et al.*, 2013), inj.ascorbic acid@12 mg/kg bw was also administered in the normal saline on day 1 and day 3 of the treatment in order to boost the immune system and hasten the skin recovery. In addition, the animals were given liquid hepatic stimulants containing yeast extracts, nicotinic acid and vitamin-B complex 60 ml PO BID per-orally, while a herbal antibacterial and antifungal spray was prescribed for topical treatment. The animals showed remarkable improvement within three days of the treatment as the exudative lesions started to heal and get dry (Fig. 3). There was decrease in redness and lameness. The appetite improved gradually. Despite restriction, one animal got exposed to the sunlight for a day and that resulted in the relapse of the symptoms, though in milder form. It was treated with inj.dexamethasone@ 30 mg/kg bw IM SID and inj.chlorphrenamine maleate @ 10mg/kg bw IM SID that reversed the symptoms on the second day itself, ultimately leading to an uneventful recovery in few weeks (Fig. 4).

The photosensitivity is broadly categorized in the three main forms. This reaction may result either from direct entry of the photocytotoxic compounds or their photoactive metabolites in the circulation either through ingestion or percutaneous absorption (Type-1/primary); congenital (type-2), whereby abnormal heme synthesis results in accumulation of photodynamic metabolites, including uroporphyrin, coproporphyrin, and protoporphyrin derivatives in the skin (Mauldin and Peters- Kennedy, 2016; Doyle and Gordon, 2008) or hepatogenous (Type-3), which is most common in animals (Mauldin and Peters-Kennedy, 2016) and is caused by accumulation of phytoporphyrin (also known as phylloerythrin) in dermal tissues (Kellerman and Coetzer, 1985) due to its impaired excretion. The present case was a case of the hepatogenous or type-3 photosensitivity reaction due to berseem (Thawait *et al.*, 2013; Chen *et al.*, 2019). Though berseem has been reported in a number of cases as a cause of photosensitivity reaction in animals yet the information regarding the exact pathogenesis involved is limited except for the attribution of the high selenium levels in the fodders like Lucerne or berseem (0.5-6.7 mg/kg DM) as reported by Arora *et al.* (1975). The increased ingestion of selenium has been reported to cause hepatic insults (Davis *et al.*, 2012) both in acute and chronic intakes. The acute ingestion has been reported to cause congestion and focal necrosis in liver, whereas hepatic cirrhosis results in the chronic cases (Subcommittee on selenium, 1983, James *et al.*, 1992). The resultant dysfunction leads to the accumulation of otherwise normally excreted phylloerythrin to potentially phototoxic level leading to hepatogenous photosensitive reaction. Thus, it is highly advised to the farmers to be cautious with the berseem feeding especially when a lush green fodder is being fed ad lib in the period when wheat straw is scarce and green fodder is readily available in the month of mid February and March in the northern region of our country.

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Fig. 1. Longitudinal cracks on the medial side distal forelimbs with sloughed off skin and serum exudation.

Fig. 3. Healing of the cracks and exudative lesions.

Fig. 2. The thickened and hardened distal portion of the tail (black arrow) with inflamed and crusted cracks on two hind teats (red arrows).

Fig. 4. Recovered buffaloes (black arrow pointing most affected animal).

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