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Successful management of Haemotoxic snake envenomation in a *Holstein friesian* crossbred heifer

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Abstract
A two years old Holstein Friesian crossbred heifer was presented with the history of acute swelling of left forelimb, lameness and in appetence after snake envenomation. Clinical examination revealed tachycardia, pale mucous membranes, swelling in the left elbow and knee region with pain on palpation. Fang marks were observed on the fetlock region of left forelimb. Haemato-biochemical analysis revealed Anaemia, thrombocytopenia and mild elevation of AST level. Electrocardiographic findings were normal. Twenty minutes whole blood clotting time was prolonged and the animal was treated with polyvalent snake venom antiserum (10ml) and intravenous fluids. Three doses of polyvalent snake antivenom were given at 6 hours interval after checking whole blood clotting time. Streptopenicillin and frusemide administered intramuscularly for 3 days and tetanus toxoid given intramuscularly on first day. Animal showed an uneventful recovery after treatment.

Keywords: Snake envenomation, whole blood clotting time, hemotoxic, snake venom antiserum

Introduction
Snake envenomation is a life-threatening emergency condition in livestock especially in tropical countries like India. There are about 216 species of snakes identifiable in India, of which 52 are known venomous (Bawaskar, 2004) [4]. The venomous snakes belong to four families namely elapidae, Viperidae, hydrophiidae, colubridae (Chugh, 1989) [5]. The incidence of snake envenomation in animals is more during summer months (Constable *et al*., 2017) [6]. Depending on type of snake bite the animals may be presented with the signs of cardio pulmonary dysfunction, blood coagulation defects, local tissue damage, ataxia etc (Ali, 2020) [2]. The presence of hemorrhagins in the venom of viper leads to endothelial cell damage, coagulation defect, increase vascular permeability and extravasation of fluid into tissues (Venkatesakumar, 2020) [16]. The present clinical report discussed a case of snake bite envenomation and its successful therapeutic management in a cross bred Holstein Friesian cow.

Materials and Methods
A two years old female Holstein Friesian cow was presented to the Large Animal Outpatient Medical unit of Veterinary Clinical Complex, Veterinary College and Research Institute, Namakkal with history of acute swelling of left forelimb, lameness and inappetence after snake envenomation.

The animal was dull and depressed with normal rectal temperature (38.8 ^{o}C), tachycardia (114 beats per minute), Tachypnea (40 per minute) and conjunctival mucous membrane was pale and moist. Fang mark (Fig.1) was noticed on the left fetlock region of forelimb. There was also swelling of left elbow and knee region (Fig.2) with pain on palpation and pitting on pressure. Haematobiochemical evaluation revealed anaemia (decreased haemoglobin, packed cell volume and red blood cells), thrombocytopenia and mild elevation of AST level (Table.1) Electrocardiography revealed tachycardia, Echocardiography was normal.

Table 1: Hemogram and clinical biochemistry values of snake bitten cow

Haematology		
1	Haemoglobin	4.8g/dl
2	Packed Cell Volume	17%
3	RBC	4.19 x 10^6/ µl
4	WBC	9.94x 10^3 / µl
5	Neutrophils	55%
6	Lymphocytes	37%
7	Monocytes	08%
8	Eosinophils	00%
9	Platelet	78 x 10^3/ µl
Serum biochemistry		
1	Aspartate Transaminase	414 U/L
2	Blood Urea Nitrogen	13mg/dl
3	Creatinine	1mg/dl

Twenty minutes whole blood clotting test: Two milliliters of blood was collected in a dry test tube without any anticoagulant and kept undisturbed for 20 minutes. Then, it was checked for clotting. The clotting was delayed for more than 20 minutes indicating that the 20 minutes whole blood clotting test (20 WBCT) was positive. The WBCT was checked three times at 6 hours interval.

Based on the history, clinical signs, haematological values and whole blood clotting time, the case was diagnosed as snake envenomation due to hemotoxic snake.

Results and Discussion

On first day, the cow was treated with 10ml polyvalent snake antivenom diluted with 300ml normal saline which was administered intravenously, Inj. Streptopenicillin @ 10mg/kg body weight, Inj. Frusemide @ 1mg/kg body weight and tetanus toxoid (2ml) administered intramuscularly. Whole blood clotting time was checked 6 hours after administration of first dose and WBCT was positive and another dose of polyvalent snake antivenom (10ml) diluted with 300ml normal saline was administered. One more dose of polyvalent snake antivenom (10 ml) was given at 6 hours interval after checking whole blood clotting time, after which blood clotted within 20 minutes. The animal was treated with Inj. Streptopenicillin, Inj. Frusemide on second and third day and on fourth day all symptoms such as swelling, oedema of the limb reduced (Fig.2) and feed intake improved and animal showed uneventful recovery. Snake venoms are complex mixture of proteins and peptides, consisting of both enzymatic and non-enzymatic compounds. Their venom also contains inorganic cations such as sodium, calcium, potassium, magnesium and small amounts of zinc, iron, cobalt, manganese and nickel (Arul, 2020) [3]. The other components are glycoproteins, lipids, and biogenic amines such as histamines, serotonin and neurotransmitters (catecholamines and acetylcholine) (Klaassen, 2008) [10]. Saw scaled viper bite caused local swelling, bleeding and coagulopathy (Gnanathasan *et al.*, 2012) [8]. Clinical signs of swelling and salivation at the bite site might be due to the enzymatic and non-enzymatic compound found in the snake venom (Turkar, 2016) and the swelling is attributed to hyaluronidase activity which act as a spreading factor and breaks internal glycoside bonds in certain acid mucopolysaccharides resulting in decreased connective tissue viscosity and allows other fractions of venom to penetrate the tissues (Sameer, 2020) [2]. And it also causes increased tissue permeability and the proteolytic enzymes destruct endothelium and basal membrane of the capillaries (cytotoxic effect); which results in the occurrence of oedema (Adukauskiene, 2011) [1]. Anaemia and venom induced thrombocytopenia as seen in the present case were observed often in animals with viper snake envenomation. Thrombocytopenia in viper envenomation might be due to vasculitis, sequestration of platelets in inflamed area, and consumption of platelets with disseminated intravascular coagulation (Segev *et al*., 2004) [13].

Using 20 mins WBCT we can diagnose snake envenomation as it is a simple bedside test of coagulopathy to rule out snake bite in animals (Sasikala, 2016) [12]. The 20 minutes whole blood clotting test was repeated at 6 hourly intervals to ensure the coagulation status and further dose of antivenom should be administered if blood clotting is delayed (Reid and Theakston, 1983; Gnanathasan *et al.*, 2012) [11, 8]. The tetanus toxoid was protecting the animal from tetanus spores that might have entered to site of bite through contaminated snake fangs (Shukla, 2009) [14].

Fig 1: Fang mark on the left fetlock region of forelimb

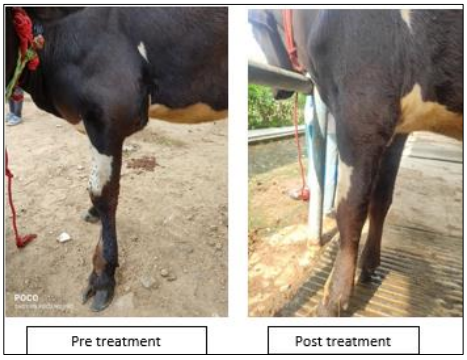

Fig 2: Cow with hemotoxic snake envenomation showing swelling of elbow and knee and reduction of swelling post treatment

Conclusion

Snake bite cases are difficult to diagnose in the field since most type of snake is either not known or unidentified. It is a life-threatening emergency needs rapid diagnosis and proper treatment immediately thereby can save the life of an animal and livelihood of farmer. In the present study, the cow was diagnosed as hemotoxic snake envenomation based on history, clinical signs, hematobiological values and whole blood clotting time. It was successfully treated with three doses of snake venom antiserum, streptopenicillin, furosemide and tetanus toxoid. Furosemide aids in reducing the oedema. Use of steroids in snake envenomation is controversial but dexamethasone has been proved to be effective against muscle damage due to its anti-inflammatory properties and so was able to prevent later manifestation of myotoxicity (Patrao-Neto *et al*, 2013).

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