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Honey Bee Sting (*Apis dorsata)*: Management, Treatment and Prevention in Domestic Bovines

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Abstract

This case study details the clinical management of a severe honeybee (*Apis dorsata*) attack on an eight-year-old Holstein Friesian crossbred cow at the Bargur Cattle Research Station, Tamil Nadu. The giant rock bee (*Apis dorsata*), is highly defensive and delivers venomous stings capable of inducing severe toxic and allergic reactions in animals. The incident occurred when a disturbed beehive triggered an aggressive swarm attack on a tethered cow. The animal sustained multiple stings and exhibited clinical signs including hyperthermia, tachycardia, tachypnoea, agitation and multiple cutaneous swelling (urticarial plaques) surrounding the several body parts, especially in head, neck and lateral side of the abdomen. Haematological analysis revealed hallmark signs of haemolytic anaemia: decreased haemoglobin concentration, packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC), along with elevated platelet counts and decreased white blood cells (WBC). Emergency treatment included mechanical removal of stingers, followed by administration of Atropine Sulphate, Chlorpheniramine Maleate (an antihistamine), and a broad-spectrum antibiotic combination of Strepto-Penicillin S with fluid therapy. This therapeutic approach targeted the toxic, allergic, and potential secondary bacterial complications associated with bee venom. The cow showed a positive response to treatment, with full clinical recovery observed. This case underscores the critical importance of prompt diagnosis and intervention in managing *Apis dorsata* envenomation. The potent haemolytic and inflammatory effects of its venom necessitate heightened awareness and rapid veterinary response to mitigate morbidity and mortality in affected livestock.

Keywords: Apitoxin, Anaphylaxis, Haematological changes, Antihistamine therapy.

Honeybees: Taxonomy, Social Behaviour, and Venom Toxicity

Honeybees belong to the order *Hymenoptera* and the family *Apidae*, which includes 11 groups of insects. These bees are social in nature and use their stingers for défense. Among the commonly known species, *Apis mellifera* and *Apis cerana* are found outside the tropics. *Apis dorsata*, also known as the rock bee or giant honeybee, is the most important species in tropical regions. This species is widespread across Southeast Asia and builds open nests on cliffs, tall trees, and even man-made structures such as water tanks and building ledges (Thomas *et al.,* 2009; Neupane *et al.,* 2013; Misra *et al.,* 2017; Roy *et al.,* 2011; Tan *et al.,* 1997). The giant honeybee is known for its strong defensive nature and aggressive behaviour when threatened. If disturbed, it uses its stinger as a weapon, which remains embedded in the target after a single sting, leading to the bee's death. Though honeybees do not usually sting unless provoked, their venom can pose serious health risks to humans and animals (Muhammad *et al.,* 2000). Honeybee venom, called apitoxin, is a complex substance with several bioactive components, including peptides, enzymes, and biologically active amines (Zhang *et al.,* 2018). A single sting can deliver around 0.1 mg of venom (Czarnetzki *et al.,* 1990). This venom can trigger toxic and allergic reactions in individuals, sometimes leading to severe consequences (Schmidt, 1995). *Apis dorsata*, the largest among honeybee species, are highly aggressive and capable of delivering severe stings to both animals and humans (Schmidt, 1995). These giant honeybees measure between 17-20 mm in length and closely resemble the European honeybee in coloration, with golden, black, and pale bands on the abdomen and a hairy thorax. Their forewing length ranges from 12.5-14.5 mm. Based on morphological characteristics, the attacking bees were confirmed as rock bees (*Apis dorsata*) (Hepburn and Radloff, 2011) (Fig 1).

Fig:1
A Giant Asian Honey Bee (*Apis Dorsata*)
found at the Stinging Site

This case report underscores the imperative for prompt diagnosis and intervention in the management of *Apis dorsata* envenomation. The venom's potent haemolytic and inflammatory characteristics necessitate heightened vigilance and an expedited veterinary response to mitigate morbidity and mortality in affected livestock.

CASE HISTORY AND OBSERVATIONS

An eight-year-old Holstein Friesian crossbred cow (third calving) was brought to the Bargur Cattle Research Station, Bargur, after being attacked by rock bees (*Apis dorsata*). The attack occurred when children disturbed a beehive by throwing stones while the cow was tied to the same tree, leaving the animal unable to escape. The owner witnessed the incident and immediately brought the cow for treatment. Clinical examination revealed numerous bee stingers embedded across the body (Fig. 2). The animal appeared restless, with several rock bees still hovering around it. Animal shows tachycardia (86-114 beats/min), tachypnoea (54-70 breaths /min), agitation and multiple cutaneous swelling (urticarial plaques) surrounding the several body parts, especially in head, neck and lateral side of the abdomen.

Fig:2
Holstein Friesian CrossBreed Cow with Swelling over the Stinging Sites allover the Body

Blood samples were collected from the external jugular vein of the affected animal for haematological analysis. The blood samples were analysed using TurboChem

Prime, Ever life CPC Diagnostics Pvt Ltd (India) and it was compared with the already available Holstein Frisian crossbred values. ((Joshi et al., 2018)

TREATMENT AND DISCUSSION

These giant honeybees exhibit a remarkable collective defence mechanism known as "shimmering," where individuals coordinate abdominal flipping in sequential waves to deter predators (Sajesh Vijayan *et al.,* 2022). The victimized cow's black coat colour may have attracted a greater number of bees, intensifying the attack. Honeybees release apitoxin upon stinging, which serves as a primary defence mechanism (Kumar and Parthiban, 2014). Apitoxin, also known as bee venom (BV), is secreted by specialized abdominal glands in worker bees and is crucial for colony defence (Zhang *et al.,* 2016). During a bee sting, venom is injected into the victim, with each sting delivering between 50 and 140 µg of venom (Moreno and Giralt, 2015). The physiological response in affected organisms can range from localized inflammation to systemic reactions, including immune and anticoagulant effects (Eze *et al.,* 2016; Cornara *et al.,* 2017). In animals, bee stings can cause a variety of symptoms, ranging from mild local reactions such as pain and swelling to severe systemic allergic responses, including urticarial rashes, angioedema, asthma, and even life-threatening anaphylactic shock (Kumar and Parthiban *2014*). Although bee venom has promising medicinal properties, its adverse effects can be unpredictable, leading to local inflammation, pruritus, swelling, pain, and in severe cases, anaphylaxis and neurological complications (Yang *et al.,* 2017).

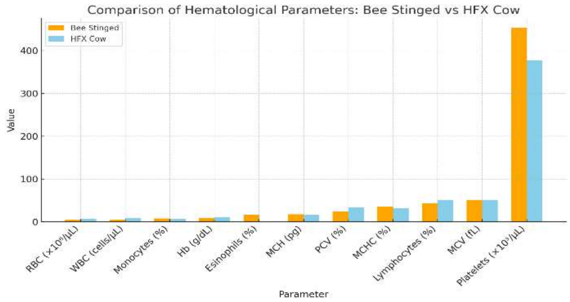
Bee venom has a strong lytic effect on red blood cells due to its ability to permeabilize cell membranes, leading to haemoglobin release and anaemia (Tosteson *et al.,* 1985). Melittin and phospholipase A_2 (PLA_2), two key components of bee venom, act synergistically to disrupt lipid membranes, resulting in cell lysis (Damianoglou *et al.,* 2010). This mechanism aligns with previous findings on bee venom toxicity.

The haemoglobin level was significantly lower than normal, consistent with the haemolytic effects of bee venom. Bee venom has a strong lytic effect on red blood cells due to its ability to permeabilize cell membranes, leading to haemoglobin release and anaemia (Tosteson *et al.,* 1985). Melittin and phospholipase A2 (PLA2), two key components of bee venom, act synergistically to disrupt lipid membranes, resulting in cell lysis (Damianoglou *et al.,* 2010). This mechanism aligns with previous findings on bee venom toxicity. Haematology revealed decreased values of blood indices in packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC). (Table 1). These declining trends indicate anaemia caused by haemolysis.

Parameters	**Bee Stinged HFX cow**	**HFX cow (Joshi et al., 2018)**
Hb (g/dL)	8.4	10.63 ± 0.23
PCV (%)	23.9	33.44 ±0.76
Platelets ($\times 10^3$ /µL)	453	378±36.11
MCV (fL)	50.5	51.18±0.34
MCH (pg)	17.6	16.13±0.15
MCHC (%)	34.9	31.66±0.25
RBC ($\times 10^6$ /µL)	4.72	6.55±0.144
WBC (cells/µL)	5.3	8.61±0.65
Lymphocytes (%)	43	50.60±3.70
Eosinophils (%)	17	0.77±0.09
Monocytes (%)	08	7.18±0.93

Table 1: Haematological values of bee stinged cow along with the normal reference range

Additionally, the platelet count was elevated, (453 x 10^3 µL; reference value 378±36.11 x 10^3 µL likely due to inflammatory responses triggered by bee venom exposure and discrete leukopenia noticed (5.3 x 10^6 µL; reference value 8.6±0.65 x 10^6 µL). (Graph:1)



Graph :1

Graph :1 Comparison of hematological Parameters of Bee Singed Versus Holstein Friesian Cross Cow.

The first step in treatment involved carefully removing the embedded stingers using forceps (Fig. 3). The animal was administered Atropine sulphate @ 0.5 mg/kg body weight intramuscularly to reduce excessive salivation and bronchial secretions. Additionally, Chlorpheniramine maleate (Anistamin, Intas Pharmaceuticals Ltd) was given @ 10 mL intramuscularly to relieve itching, pruritus, and anaphylactic reactions for three consecutive days. To prevent secondary bacterial infection, Strepto-Penicillin S (Dicrysticin-S, Zenex Animal Health India Pvt Ltd) was administered @ 2.5 g for three consecutive days. The cow was also supported with electrolyte therapy Viz Inf. Intalyte @ 1000 ml once at the time of sting removal. After the treatment, the animal showed significant improvement, and all symptoms, including swelling, subsided completely after 3 days. (Fig. 4).

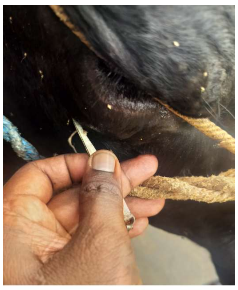


Fig:3
Removal of BeeStings using Forceps

Fig:4
Recovered Holstein Friesian CrossBreed Cow after the Treatment

Prompt removal of bee stringers is essential, as even a slight delay can allow more venom to enter the bloodstream (Visscher *et al.,* 1996). In this case to manage the toxic effects, Atropine sulphate and Chlorpheniramine maleate were administered to reduce excessive salivation, bronchial secretions, itching, pruritus, and anaphylactic reactions. Chlorpheniramine is a first-generation antihistamine that selectively inhibits histamine H1 receptors, thereby reducing vasodilation and decreasing capillary permeability (Gilman, 1985). The animal was also treated with Strepto-Penicillin S (Dicrysticin-S) for three days to prevent secondary bacterial infections at the sting sites. The animal showed significant improvement after the treatment, and all symptoms, including swelling, subsided completely. The animal showed uneventful recovery after treatment.

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Conflict of interest: None

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