

*Short Communication*

# DIAGNOSIS OF RARE CASES OF CUTANEOUS HISTOPLASMOSIS IN DROMEDARY CAMEL IN INDIA

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## ABSTRACT

The present investigation was aimed to diagnose the mycoflora associated with dermal mycoses infected camels in the Bikaner city and the nearby villages, Rajasthan. In this investigation 16 camels infected with dermal mycoses irrespective of sex and age were included. Out of 16 infected cases, two cases were found infected with cutaneous histoplasmosis caused by *Histoplasma capsulatum*. Cutaneous histoplasmosis appeared as small multiple nodular lesions, whitish to gray mainly found over the neck, axillaries and legs. In addition, alopecia, itching and emaciation were also noticed. The cutaneous histoplasmosis in both camel calves was confirmed by cultural and microscopic examination.

**Key words:** Histoplasmosis, mycosis, camel, skin

Camel is likely to be more prone to get fungal skin infections in comparison to bacterial skin infections. Among other fungi the *Histoplasma capsulatum* has been reported to cause various diseases in camelids (Al-Ani and Roberson, 2005). *Histoplasma capsulatum* is an environmental dimorphic fungus (Wheat *et al*, 2007). Gitao *et al* (1998) found high infection of dermatophilosis in the moist season in comparison to dry season in camels of Kenya, Sudan and Saudi Arabia. Mammals including wild, domestic animals and humans are the host of *Histoplasma capsulatum* which is a dimorphic fungus widely dispersed in the tropical or subtropical areas of the globe (Chermette and Guillot, 2010; Guillot *et al*, 2018). The dimorphism presented by these pathogens is considered one of the most relevant virulence factors in the pathogenesis of these fungi. The severity of the diseases relies on factors such as the immunity of the host and antigenicity of the pathogen. The single species *H. capsulatum* is supposed to include 3 distinct subspecies which do not share exactly the geographical distribution and which are responsible for variable clinical signs in different animal species and humans (Guillot *et al*, 2018; Brilhante *et al*, 2016).

*Histoplasma capsulatum* remains in a mycelial form at ambient temperatures and grows as yeast at body temperature in mammals. Although, the fungus that causes histoplasmosis can be found in temperate climates throughout the world. These fungi can cause disease even in immune-competent individuals. The establishment of these pathogens in the host directly depends on the conversion of the filamentous phase to the parasitic yeast phase (Nemecek *et al*, 2006). The case of cutaneous histoplasmosis in Indian dromedary camel is reported here.

## Materials and Methods

The present investigation was carried out to diagnose dermal mycoses in camels in the post rainy season. Skin scrapings were collected from the affected camels as per the standard practices without using anaesthesia.

## Animals

Sixteen camels (9 males and 7 females) showing any dermatological disorder were included in this study. These were screened at Veterinary Clinical Complex, CVAS, Rajasthan (University of Veterinary

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and Animal Sciences, Bikaner, Rajasthan, India and National Centre on Camel, Bikaner. These camels showed typical skin lesions and clinical signs like scab formation, pruritus and hair fall. The cases of dermal mycoses were confirmed by microscopic examination and culture examination of skin scrapings. The camels which were found positive for ectoparasite infestation were excluded from this study.

**Collection of samples:** Debris and/or faecal materials present over the clear skin lesions of camels were first removed with an alcohol wipe and then lesions were firmly scraped by using blunt scalpel, particularly at the advancing border and were collected in sterile vials.

**Direct microscopic examination:** The scrapings were placed on grease free glass slide with 2-3 drops of 20 per cent KOH and cover slips were placed. The samples were kept for 5 minutes over flame and examined microscopically after attaining normal temperature for the presence of sporing heads and conidia.

**Culture examination:** Samples were mixed with sabouraud's dextrose chloramphenicol broth and incubated for 24 hours. Thereafter, the samples were inoculated onto sabouraud's dextrose chloramphenicol agar (SDCA) plate and incubated at 25°C for 15 days. These plates were examined daily for the growth of the fungi. The resultant growth was examined for the colony morphology. Microscopic examination was carried out using lacto phenol cotton blue and/or calcoflour white stains using wet mount method (Halley and Standard, 1973). Fungal species were identified on the basis of colony morphology and microscopic characteristics (Colin *et al*, 2013).

**Haemato-biochemical examinations:** Haematological examination was performed as per the method described by Jain (1986) and biochemical analysis was carried out by the Vet Test Chemistry Analyser using standard kits supplied by Idexx laboratories.

## Results and Discussion

Cutaneous histoplasmosis was found in 2 male camel calves (Age < 1 year) out of 16 dermal mycoses (12.5%) infected camels.

The skin lesions appeared as small multiple nodular lesions, whitish to gray in colour associated with alopecia, itching, thickening of skin and emaciation. The lesions were most commonly found on nose, mouth, legs, neck, axilla, chest and abdomen (Fig 1). Similar findings due to cutaneous histoplasmosis in two years old domestic cat was

seen with no clinical signs of systemic involvements of gastrointestinal or respiratory system and no abnormality was noticed in complete blood count and serum biochemical profiles (Larsuprom *et al*, 2017).

Colonies of *Histoplasma capsulatum* on SDCA were flat, spreading, irregular white or buff-brown, suede-like to cottony in the front view of the plate (Fig 2) and appeared pale yellow-brown in reverse view. Morphological characters under the microscopic observed were single celled, typically large, tuberculated macroconidia on short branches, rounded, hyaline and undifferentiated conidiophores (Fig 3). Small microconidia, round to pear-shaped, were present either on short branches or on the sides of the hyphae. The morphological character of colony and microscopic findings were similar to *Histoplasma capsulatum* as described by Colin *et al* (2013). *Histoplasma capsulatum* shows thermal dimorphism which grows on living tissue and/or in the culture as a yeast-like fungus on body temperature and in environment as a mould at temperatures under 30°C.

Haemato-biochemical analysis revealed low haemoglobin concentration, PCV and TEC and high neutrophil count in affected camel calves (Table 1). Foutah *et al* (2012) also reported reduction of erythrocytic count, haemoglobin content, neutrophilia and lymphocytosis in camels infected with ringworm whereas Mathur *et al* (2011) found variations in most of the haematological parameters in dermatomycoses infected camels, but these were within the normal physiological range. Biochemical values of both infected camel calves were also found within the normal ranges.

*Histoplasma* is generally found in the soil of temperate and subtropical regions but some parts of the world are considered to be highly enzootic. Infection generally remains limited to the skin and subcutaneous lymph nodes but may also cause lesions in the lungs and gastrointestinal tract. The possible mode of transmission is inoculation, ingestion and inhalation are frequently reported in humid and hot altitude regions (Ameni, 2006). However, some cases of direct contact transmission have been reported between infected and healthy animals having wounds during mating (Al-Ani and Al Delaimi, 1986).

Cutaneous histoplasmosis was reported in some animal species and humans. *H. capsulatum* var. *farcinosum* causes epizootic lymphangitis in horses (Mahajan *et al*, 2017). Guillot *et al* (2018) reported *Histoplasma capsulatum* var. *duboisii* in Western and



**Fig 1.** Skin lesions of *Histoplasma capsulatum* on neck and mouth of affected camel calf.

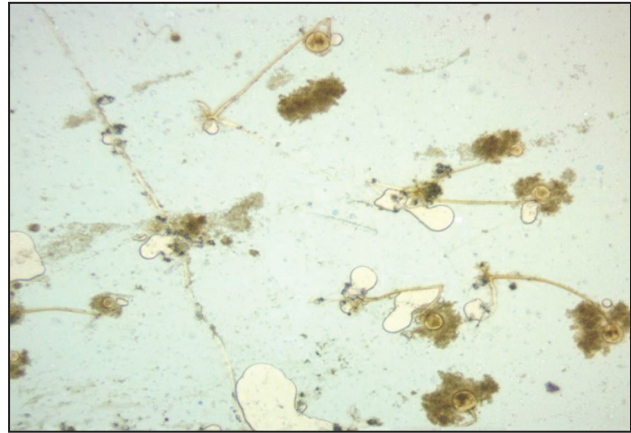


**Fig 2.** Photograph showing colony of *Histoplasma capsulatum* in front view of plate.

Central Africa which develops as large-sized yeasts with lymphadenopathy and dissemination to the skin and bones in primates. Macedo *et al* (2021) reported feline cutaneous histoplasmosis in the north-central region of Paul. Ameni (2006) recorded 18.8% prevalence of equine histoplasmosis (EH) in Ethiopia. *Histoplasma capsulatum* has been reported from dromedary camel to cause miliary necrosis of the lungs (Chandel and Kher, 1994). Young camels are supposed to be more susceptible to the fungal infections in comparison to the adults, that could be attributed to stronger immunity development in adult animals due to the diverse contacts with the fungus (Descamps *et al*, 2003; Moriello *et al*, 2003).

**Conflict of interest**

The authors declare no competing interests.



**Fig 3.** Microphotograph showing large, rounded, single-celled, capsulated macroconidia and small microconidia of *H. capsulatum* (Lactophenol cotton blue stainX100).

**Table 1.** Haemato-biochemical parameters of *Histoplasma capsulatum* infected camel calves.

Parameters	Mean value of infected camels (n=2)	Reference value of healthy camel Hozifa <i>et al</i> (2016); Islam <i>et al</i> (2019); Kant <i>et al</i> (2019)
Hb%	8.5	11-15
PCV%	22	25-38
TLC( $10^3 / \mu\text{l}$ )	11.5	8 - 13
TEC ( $10^6 / \mu\text{l}$ )	6.6	7.6-9.2
Differential leukocyte count (DLC) %	N%	61.5
	M%	2.5
	L%	38.5
	E%	2.5
	B%	0
Platelet count ( $\times 10^3 / \mu\text{l}$ )	338	230-360
Total protein (g/dl)	6.3	5.8- 10.5
Albumin (g/dl)	3.8	3.50-7.8
Globulin (g/dl)	2.5	2.8-2.2
ALKP (IU/l)	37.5	30-122
AST (IU/l)	34	20-80
ALT (IU/l)	25	9-30

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