

A clinical case: vitamin C-responsive dermatosis in a Holstein native cross bull calf

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Abstract: A case of vitamin C-responsive dermatosis was diagnosed in a 25-day-old Holstein native cross bull calf based on the dermatopathological findings, low plasma levels of ascorbic acid, and response to treatment on a dairy farm near Tehran, the capital of Iran. The calf showed signs of severe alopecia in both thighs and easy epilation of hairs, along with mild scaling around its thighs, flanks, and trunk. Dermatopathological analysis revealed mild orthokeratotic hyperkeratosis, mild acanthosis, congestion of the dermis, and follicular keratosis. The calf was treated with a single subcutaneous injection of 3 g of ascorbic acid. After 1 week, the hair loss ceased, and the hairs were growing again within 3 weeks after treatment; the condition was thus completely reversed.

Key words: Vitamin C-responsive dermatosis, dermatopathology, treatment, calf

1. Introduction

Vitamin C-responsive dermatosis is an uncommon cosmopolitan disorder (1).

It has been theorized that it may represent a temporary vitamin C (ascorbic acid) deficiency in growing calves. The disorder is seen in dairy calves 2 to 10 weeks of age, with no apparent sex predilection. Affected calves show moderate to severe scaling, alopecia, occasional crusts, and easy epilation of hairs beginning on the head or limbs. Pruritus and pain are absent and the extremities are usually erythematous and purpuric. Dermatopathological findings include orthokeratotic hyperkeratosis (thickening of the cornified layer without retained nuclei), curly hairs, vascular dilation and congestion, and periadnexal hemorrhage. Treatment with a single injection of 3 g of ascorbic acid results in immediate improvement and rapid recovery. Severely affected calves have widespread disease and may be depressed and grow slowly. Some deaths have been recorded (1-4). Diagnosis is based upon the dermatopathological findings and response to therapy (1,3).

A few reports of vitamin C-responsive dermatosis have been described in calves.

To the best of the authors' knowledge, this is the first report describing the clinical picture, dermatopathological findings, and successful treatment of a case of vitamin C-responsive dermatosis in a calf in Iran.

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2. Case history

In April 2010, a 25-day-old Holstein native cross bull calf was examined at a dairy farm near Tehran, the capital of Iran, due to severe symmetrical alopecia in the caudal part of its thighs (Figure 1). According to the owner, the condition began 7 days earlier. The calf had no history of illness before that. The animal had been born to a normal second-calf cow as a result of artificial insemination. The calf's diet included starter and cow milk. The physical examination revealed mild scaling around its thighs, flanks, and trunk. Furthermore, remainders of hairs around the alopecic areas were plucked easily and adherent crusts were also seen on the plucked hairs (Figure 2). The calf was not pruritic and was normal in other aspects.

According to these findings, the calf was suspected to have vitamin C deficiency, and for further study, a blood sample was collected for hematological analysis and evaluation of plasma levels of ascorbic acid. We also submitted tissue specimens for general culture and mold and yeast culture, along with parasitological examination.

A skin biopsy specimen was obtained after local infiltration anesthesia with a subcutaneous injection of 2 mL of 2% lidocaine hydrochloride. The specimen was fixed in 10% buffered formalin solution and, for microscopic examination, was sent to the pathology laboratory of the

Veterinary Teaching Hospital of Islamic Azad University, Science and Research Branch, Tehran, Iran.

For the prevention of focal dermatitis secondary to skin biopsy, the calf was given a topical spray of tetracycline for 3 days.

3. Results and discussion

The hematological evaluation was within normal limits.

The results of the yeast and mold cultures, along with the direct microscopic examination, were negative.

Dermatopathological analysis revealed mild orthokeratotic hyperkeratosis, mild acanthosis, congestion of the dermis, and follicular keratosis. Alopecic structures of the hair follicles were also seen (Figures 3–5).

The calf was treated with a single subcutaneous injection of 3 g of ascorbic acid, using the treatment described by Scott in 1981 (5). After 1 week, the hair loss had ceased, and the hairs were grown again within 3 weeks; the condition was thus completely reversed (Figure 6).

In this case, based on the clinical findings, low plasma levels of ascorbic acid and dermatopathological features that were typical of vitamin C-responsive dermatosis, the former diagnosis was confirmed.

The pathogenesis of vitamin C-responsive dermatosis is not known (2).

Ascorbic acid deficiency has been qualitatively related to mucosal barrier dysfunction, impaired resistance to infectious organisms, and the production of defective basement membrane collagen. Ascorbic acid is directly

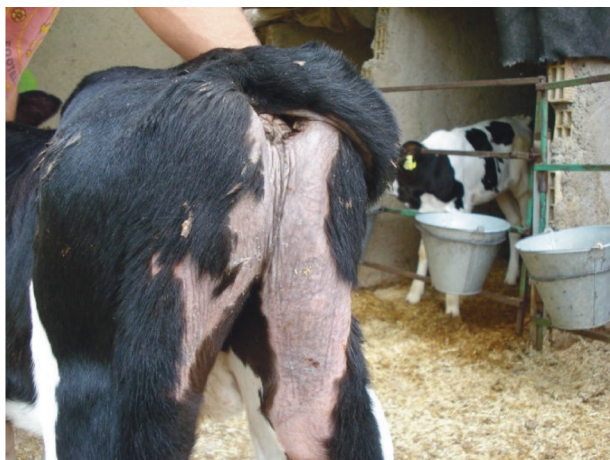


Figure 1. Alopecic areas in the caudal part of both thighs.



Figure 2. Remainers of hairs around the alopecic areas were plucked easily; crusts are seen.

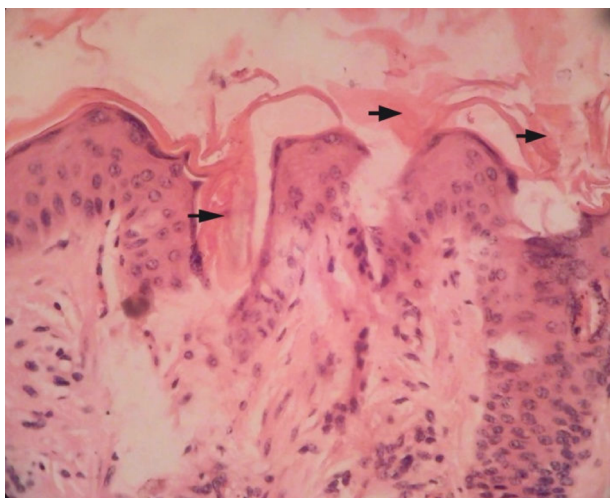


Figure 3. Orthokeratotic hyperkeratosis (arrow) in the epidermis (hematoxylin and eosin, 640×).

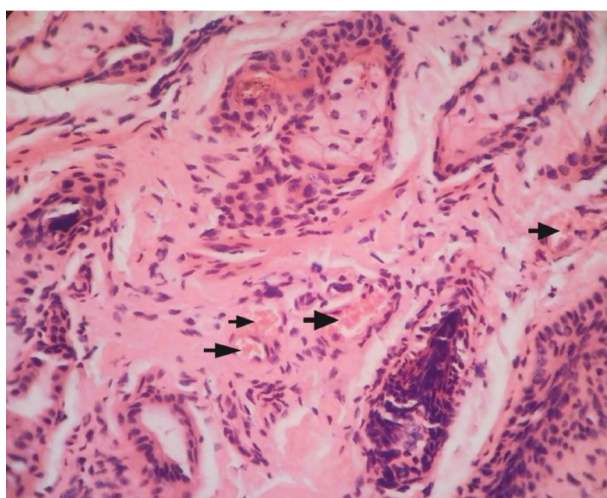


Figure 4. Congestion (arrow) in the dermis (hematoxylin and eosin, 640×).

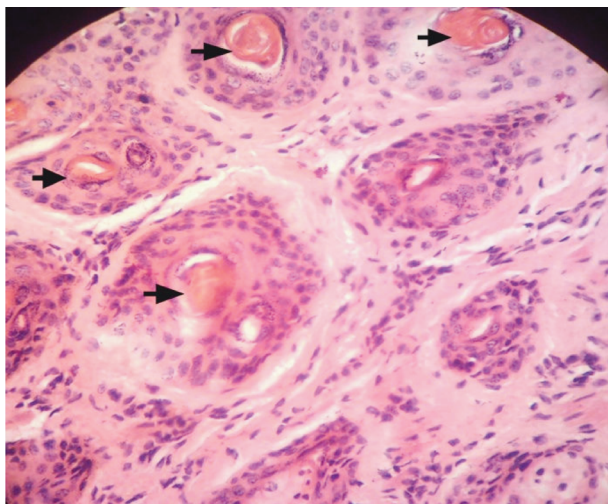


Figure 5. Follicular keratosis (arrow) in the dermis (hematoxylin and eosin, 640×).



Figure 6. Hairs were grown again within 3 weeks after treatment. The plasma levels of ascorbic acid were measured as low as 0.12 mg/dL (normal range: 0.24 to 0.38 mg/dL).

involved in the production of collagen (2,6,7). Cattle have a hepatic capability of ascorbic acid biosynthesis, using glucose as a precursor. Therefore, the National Research Council suggested that ascorbic acid was not essential in the feed formula for dairy cattle (8,9). It has been theorized that it may represent a temporary vitamin C (ascorbic acid) deficiency in growing calves; however, the blood levels of vitamin C begin to rise again at about 3 weeks of age.

A large reduction in the plasma vitamin C concentration was reported in calves stressed by housing conditions and in heat-stressed cows (3,7,8).

This syndrome must be differentiated from anagen defluxion (anagen effluvium). Various severe stressors, such as infectious diseases, metabolic diseases, and high fever, result in temporary growth defects in hair shafts. Apoptosis of the hair matrix keratinocytes, with or without dysplastic hair shafts, are histological features of the anagen defluxion (1,2).

In this case, the other causes of alopecia, such as dermatomycosis, were ruled out by negative mycotic culture and direct microscopic examination.

Biopsies offer the most valuable information in alopecic diseases if the clinical findings are not sufficient to pinpoint the disease (10).

The definitive diagnosis is based on the history, physical examination, plasma ascorbic acid concentration, and dermatopathological findings.

The results indicate that for the differential diagnosis of alopecia in calves, especially when the animal is not pruritic, aside from clinical features, biopsy offers the most valuable information. It is important to form a differential list before taking the biopsy. A thorough differential list will additionally help the pathologist to interpret the morphological findings (11).

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