

## Temporary hyperpigmentation as a complication of fixing the freestyle libre sensor in a cat - a case report

[Hiperpigmentação temporária como complicação da fixação do sensor FreeStyle Libre em um gato - relato de caso]

S.M. Castro<sup>1</sup> , H.J.M. Souza<sup>2</sup> , D. Alexander<sup>3</sup> , G.C. Cid<sup>4</sup> 

<sup>1</sup>Graduate, Universidade Federal de Uberlândia (UFU), Uberlândia, MG, Brasil

<sup>2</sup>Universidade Federal Rural do Rio de Janeiro (UFRRJ), Seropédica, RJ, Brasil

<sup>3</sup>Veterinarian, Centro Universitário Univeritas Veritas (Univeritas-RJ), Rio de Janeiro, RJ, Brasil

<sup>4</sup>Veterinarian, Universidade Federal Rural do Rio de Janeiro (UFRRJ), Seropédica, RJ, Brasil

### ABSTRACT

This report described temporary hyperpigmentation occurring in a cat after use of the FreeStyle® Libre sensor by applying three different adhesive glues. The device was continuously used as an aid for the treatment of diabetes mellitus. Histopathological examination revealed mild focal chronic active dermatitis. While the coat color change occurred due to inflammation and did not affect the device functioning, owners should be alerted to the possibility of this complication.

Keywords: diabetes mellitus, flash glucose monitoring system, ethyl cyanoacrylate, fabric glue

### RESUMO

*Este relato de caso descreveu a hiperpigmentação temporária que ocorreu em um gato após o uso do sensor FreeStyle® Libre, no qual foram aplicadas três colas adesivas diferentes. O dispositivo foi usado continuamente como auxiliar no tratamento do diabetes mellitus. O exame histopatológico revelou dermatite crônica ativa focal leve. Embora a mudança de cor da pelagem tenha ocorrido devido à inflamação e não tenha afetado o funcionamento do dispositivo, os proprietários devem ser alertados para a possibilidade dessa complicação.*

*Palavras-chave: diabetes mellitus, sistema flash de monitoramento da glicose, etil cianoacrilato, cola de tecido*

### INTRODUCTION

The FreeStyle® Libre (Abbott, São Paulo Brazil) is a system that allows for the measurement of interstitial glucose levels every minute to monitor diabetes mellitus. Complications inherent to the fixation of this device in cats include early dislocation and contact dermatitis (Shoelson *et al.*, 2021). The sensor contains adhesive chemicals (isobornyl acrylate and N, N-dimethylacrylamide), which can cause contact dermatitis in humans (Herman *et al.*, 2017). Techniques including skin fixation with non-absorbable thread, fabric glue, and adhesives covering the sensor have been used to prolong the functional life of this device (Del Baldo *et*

*al.*, 2021). Cyanoacrylates are liquid monomers that polymerize in an exothermic reaction upon contact with fluids or basic substances, forming a strong glue when applied to the skin (Henrique *et al.*, 2020). Hyperpigmentation and hypermelanosis are characterized by increased epidermal melanin levels (Coyner, 2019). This study described temporary hyperpigmentation occurring in a cat after use of the FreeStyle® Libre sensor by applying three different adhesive glues.

### CASUISTRY

A 10-year-old female, unneutered, domestic shorthair cat with phenotypic characteristics of the Siamese breed was treated at a cat-only clinic

and diagnosed with diabetes mellitus approximately 2 years before presentation. We opted for the continuous use of the FreeStyle<sup>®</sup> Libre system (Abbott, São Paulo, Brazil), which comprises a reusable reader device and a sensor that must be changed at a maximum of every 14 days. Approximately 48 sensors were placed, changing the placement of the device, and choosing the right or left lateral, cranial, or caudal thorax.

Trichotomy of the area of device fixation was performed for attachment. Initially, ethyl cyanoacrylate glue (Super Bonder<sup>®</sup>, Loctite, São Paulo, Brazil) was chosen as an additional form of fixation because of its low cost and easy accessibility and was used during the first 36 sensor placements. After removal, the skin showed areas of erythema, followed by

hyperpigmentation and the growth of dark-colored fur (Figure 1A).

The skin adhesive Vetbond<sup>®</sup> (3M, São Paulo, Brazil), composed of n-butyl cyanoacrylate, was the second adhesive chosen to aid in sensor fixation, and was used for eight sensor changes. Although it is a tissue-specific veterinary product, Vetbond<sup>®</sup> is expensive; therefore, its use has been discontinued. In addition, minimal skin reactions were observed after detachment (Figure 1B). Ethyl cyanoacrylate glue was used again, and after 2 months, a third change was performed using Ultra Hold<sup>®</sup> capillary adhesive (Walker Tape, São Paulo, Brazil) composed of acrylic glue, isopropanol, ethyl acetate, heptane, and toluene. The reaction was moderate after removal (Figure 1C).



Figure 1. (A) Hyperemic halo of a recently removed device that had been fixed with ethyl cyanoacrylate glue (red arrow). (B) Light-colored circle showing a minimal local reaction where the sensor was fixed with Vetbond<sup>®</sup> skin adhesive (blue arrow). (C) Light-colored circle showing a minimal local reaction where the sensor was fixed with UltraHold<sup>®</sup> capillary adhesive (yellow arrow). Source: Personal archive.

The FreeStyle<sup>®</sup> Libre system is continuously used in cats. In the present case, strong hyperpigmentation was observed as an adverse reaction to the sensor fixation. The coat darkened with the three types of fixation adhesives used and was more pronounced for ethyl

cyanoacrylate glue (Figure 2). After some time, the darkened fur returned to its original color.

Using a punch, a fragment of normal tissue and another with a change in color were collected. The sensor was fixed on this fragment using ethyl cyanoacrylate glue (Figure 3).

*Temporary hyperpigmentation...*

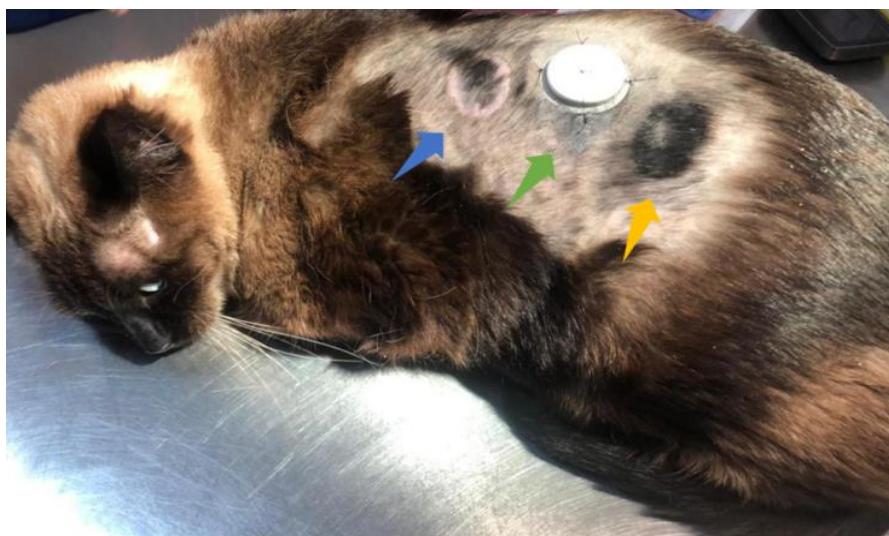


Figure 2. Hyperemic halo of a recently removed device that had been fixed with ethyl cyanoacrylate glue, day 0 (blue arrow). Sensor fixed to the animal with skin fixation points with non-absorbable thread, day 0 (green arrow). Area of hyperpigmentation in which the sensor was previously fixed, and the coat darkened in color, corresponding to the site where the sensor-fixing adhesive and ethyl cyanoacrylate glue were in contact with the skin, day 14 (yellow arrow). Source: Personal archive.

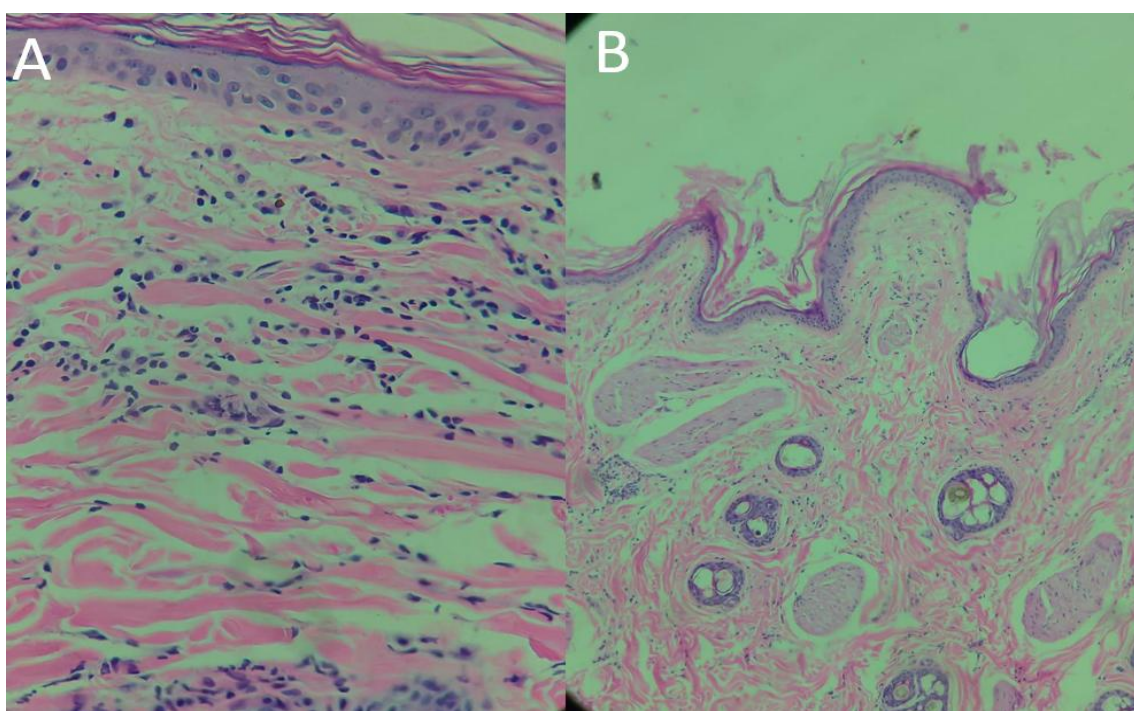


Figure 3. (A) Histological skin section taken from the pigmented region at the site of sensor fixation with ethyl cyanoacrylate glue. The skin shows an intact epithelial layer and foci of a mild inflammatory infiltrate with lymphocytes, plasma cells, mast cells, and neutrophils in the superficial dermis and mild acanthosis ( $\times 40$  objective). Mild and focal chronic active dermatitis is observed. (B) Histological section of intact skin without alterations taken from a non-pigmented region adjacent to the sensor fixation site ( $\times 5$  objective). Source: MV Gabriela Cid, CDVetRio.

## DISCUSSION

Isobornyl acrylate present in the adhesive used in the FreeStyle® Libre sensor was recently identified as a cause of allergic contact dermatitis in individuals with diabetes (Herman *et al.*, 2017). Contact dermatitis and other mild dermatological effects (erythema and crusts) are common complications associated with the use of the sensor in cats (Shoelson *et al.*, 2021).

The color locus in mammals is the tyrosinase gene, which encodes an enzyme involved in melanin synthesis. Cats have variants of this gene that cause the temperature-sensitive coloration of the extremities in the Burmese and Siamese breeds. In areas of the cat's body where the temperature is high, the coat color is white. Meanwhile, on the extremities of a cat's body, such as the paws, snout, and ears, where the temperature is lower, the coat color is dark (Yu *et al.*, 2019). This fact raises the hypothesis that hyperpigmentation after the use of the sensor occurred due to a variation in temperature caused by the contact reaction linked to a genetic predisposition. However, when cyanoacrylates meets the skin, they undergo an exothermic reaction; that is, heat is released. Therefore, the coat should be white (Henrique *et al.*, 2020).

Histopathological examination of the fragment treated with ethyl cyanoacrylate glue revealed an inflammatory infiltrate. Post-inflammatory hyperpigmentation results from melanin overproduction or abnormal melanin deposition in the epidermis or dermis (Lawrence and Al Aboud, 2022). Inflammatory mediators trigger hypertrophy and melanocyte activity, which increase melanin production in the epidermis and can lead to changes in skin color. In the deeper processes extending into the dermis, basal keratinocytes are damaged and release large amounts of melanin. However, the changes in the skin and coat pigmentation were temporary in the present case, suggesting that hyperpigmentation limited to the epidermis is more likely to resolve than dermal hyperpigmentation (Davis and Callender, 2010).

## CONCLUSIONS

The change in coat color at the sites where the sensor was attached was an intercurrent due to a chronic inflammatory reaction. It is important

that owners be aware of the potential coat color change after using the FreeStyle® Libre sensor. Despite being an aesthetic detail, this effect can be uncomfortable and result in dissatisfaction for some owners.

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