

Relationship of Hematological some Biochemical Indices and Thyroid Function with Cases of Hair Loss in Cats

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Abstract

The current study aimed to find out the relationship of hematological, some biochemical indices and thyroid function with cases of hair loss in cats. The collection of samples began from April to September 2022, samples were collected from 100 domestic cats (80 cats suffering from shedding and 20 healthy cats) with ages ranging from 6 months to 2 years. Blood samples were collected for CBC and serological tests (Albumin, Total protein, TSH, T3 and T4). The observed clinical signs included easy hair loss, causing hair loss in a limited or wide area, and the results also found that the skin condition is normal and there is no redness or any skin lesions, which confirms that the cause of hair loss is not infectious. The levels of total protein and albumin were significantly lower in diseased animals (51.45 ± 0.85), (23.1 ± 0.94) compared to healthy animals (62.5 ± 0.37), (28.82 ± 1.02), respectively. The results of the current study showed that the levels of TSH, T3 and T4 were significantly higher in animals suffering from hair loss (0.09 ± 0.0001), (58.2 ± 0.1), (2.8 ± 0.003) compared to healthy animals (0.05 ± 0.0001), (0.05 ± 0.0001), (46.2 ± 0.13), (2.2 ± 0.001), respectively, which indicates the presence of hyperthyroidism. The results of the current study showed that red blood cells, hemoglobin and packed cell volume (PCV, MCV and MCH) were significantly ($P \leq 0.05$) decreased in animals that suffered from hair loss (5.31 ± 0.01), (9.38 ± 0.1), (29.18 ± 0.3), (40.2 ± 0.21), (15.3 ± 0.16) compared with healthy animals, respectively, while white blood cells did not show any significant differences between the two groups.

Inconclusion, hematological results showed that there was a significant decrease in red blood cells, hemoglobin and packed cell volume, as well as MCV and MCH. There were relationship between protein levels and thyroid functions with hair loss in cats.

INTRODUCTION

Hair loss is a common problem in cats that can be caused by a variety of factors, including low protein and albumin density (Ferriani et al., 2022). Low density of these substances can lead to a range of health problems in cats, including skin and hair problems (Backlund et al., 2011).

Protein is an essential nutrient necessary for the proper functioning of the body, and it consists of long chains of amino acids, which are the building blocks of body tissues, including skin and hair (Watford & Wu, 2018). On the other hand, albumin is a type of protein found in the blood. It plays a vital role in maintaining fluid balance in the body and

helps transport nutrients and hormones throughout the body (Rosenoer et al., 2014).

Low density protein, or albumin, can have serious consequences for the health of cats. Low density protein can lead to a range of problems, including weight loss, muscle wasting, and skin and hair problems. Low density protein cats may also suffer from a weakened immune system, immunity, making them more susceptible to infections and diseases (Khasanah et al., 2015).

Hypothyroidism is the most common cause of non-inflammatory hair loss in pets. The pathophysiology of hypothyroidism usually involves thyroid atrophy or lymphocytic thyroiditis. Both conditions reduce the functional capacity of the thyroid gland, with acquired rather than congenital hypothyroidism being the most common presentation, with an increased representation of middle-aged to elderly pet patients (Frank, 2006). Patients with hypothyroidism of high-risk strains may present with clinical signs as early as two to three years of age (Feldman and Nelson, 2004).

Hypothyroidism itself is a non-itchy disease, however, hypothyroidism often accompanies secondary bacterial and/or fungal infections that are likely to induce itching. After diagnostic confirmation of hypothyroidism, treatment begins to supplement the affected animals with thyroid hormone. (Frank, 2006).

The current study aimed to find out the relationship of hematological, some biochemical indices and thyroid function with cases of hair loss in cats.

Materials and Methods:

The collection of samples began from April until September of 2022, when samples were collected from 100 (80 cats suffering from hair loss and 20 healthy cats and cats) at home, with ages ranging from 6 months to 2 years, as the animals were suffering from easy hair

pulling. Some of them suffered from obvious hair loss and voids in the hair.

Blood samples were collected from cats for CBC and serological investigations (Albumin, Total protein, TSH, T3, T4), which purchased from Linear company and these were done according to the company instructions. The blood samples were collected from the cephalic vein (Merrill, 2012).

Statistical analysis was done by using SPSS version 23.

Results and Discussion:

Proteins:

The levels of total protein and albumin were significantly lower in diseased animals (51.45 ± 0.85), (23.1 ± 0.94) compared to healthy animals (62.5 ± 0.37), (28.82 ± 1.02), respectively (Table 1).

Table 1. Total protein and albumin levels in healthy and animals with hair loss

Tests	Animals with hair loss	Control
Total protein g/l	51.45 ± 0.85 B	62.5 ± 0.37 A
Albumin g/l	23.1 ± 0.94 B	28.82 ± 1.02 A

Proteins, including albumin, play important roles in the structure and function of body tissues, including skin and hair. Albumin is a protein produced by the liver that plays a major role in maintaining fluid balance in the body (Toraqulova & Mamanova, 2022).

In cats, alopecia, or hair loss, can be caused by a variety of factors, including genetics, hormonal imbalances, infections, allergies, and stress (Watson, 1998). Proper nutrition, including adequate intake of proteins and other nutrients, is important for maintaining healthy skin and hair in cats (Shoveller & Atkinson, 2008).

The current study agreed with what was mentioned by Little (2011), where it was proven that the cat's failure to get enough protein in its diet can lead to a protein deficiency, which in turn may lead to hair loss and other health problems, in addition to that, Certain medical conditions, such as kidney disease, can cause blood albumin levels to drop in cats, which can also lead to hair loss.

Thyroid function:

The results of the current study showed that the levels of TSH, T3 and T4 were significantly higher in animals suffering from hair loss (0.09 ± 0.0001), (58.2 ± 0.1), (2.8 ± 0.003) compared to healthy animals (0.05 ± 0.0001), (0.05 ± 0.0001). (46.2 ± 0.13), (2.2 ± 0.001), respectively, which indicates the presence of hyperthyroidism (Table 2).

Table 2: The level of thyroid function in healthy and animals with hair loss

Tests	Animals with hair loss	Control
TSH ng/mL	0.09 ± 0.0001 A	0.05 ± 0.0001 B
T3 ng/mL	58.2 ± 0.1 A	46.2 ± 0.13 B
T4 µg/dL	2.8 ± 0.003 A	2.2 ± 0.001 B

The thyroid gland plays a vital role in metabolism, and an excess of thyroid hormone can cause a number of physiological changes in the body. Hair loss may be one of these changes, as an increased metabolism can lead to depletion of nutrients essential for healthy hair growth (Al Suhaimi & Khan, 2022).

Hyperthyroidism is a common endocrine disorder in cats that occurs when the thyroid gland produces too much thyroid hormones such as TSH, T3, and T4 (Crossley et al., 2017). This condition can cause a wide range of symptoms in cats, including weight loss,

increased appetite, increased thirst, increased urination, increased activity level, and hair thinning (Mata & Bhuller, 2022). In some cases, hyperthyroid cats may also suffer from Hair loss (Peterson, 2013, Khare et al., 2018), where these results agreed with the results of the current study, which proved that some cats were suffering from hair loss with an increase in thyroid hormones.

The results of the current study showed that red blood cells, hemoglobin and packed cell volume (PCV, MCV and MCH) were significantly ($P \leq 0.05$) decreased in animals that suffered from hair loss (5.31 ± 0.01), (9.38 ± 0.1), (29.18 ± 0.3).), (40.2 ± 0.21), (15.3 ± 0.16) compared with healthy animals, respectively, while white blood cells did not show any significant differences between the two groups (Table 3).

Table (3) Results of blood tests for healthy animals and animals suffering from hair loss

Tests	Animals with hair loss	Control
RBC $10^{12}/l$	5.31 ± 0.01 B	7.63 ± 0.03 A
HB g/dl	9.38 ± 0.1 B	12.5 ± 0.658 A
PCV%	29.18 ± 0.3 B	34.33 ± 0.208 A
MCV μm^3	40.2 ± 0.21 B	45.7 ± 0.14 A
MCH pg	15.3 ± 0.16 B	15.3 ± 1.22 A
WBCs $10^9/l$	10.1 ± 0.29 A	10.3 ± 0.42 A
Lymphocyte	32.48 ± 1.32 A	33.12 ± 0.85 A
Monocyte	2.6 ± 0.08 A	3.29 ± 0.7 A
Neutrophil	57.2 ± 0.37 A	58.63 ± 2.06 A
Eosinophil	6.15 ± 0.06 A	6.8 ± 0.86 A
Basophile	0.58 ± 0.04 A	0.57 ± 0.01 A

Low red blood cells and other associated tests could be an underlying condition that causes hair loss and a low red blood cell count and other tests. For example, some cats with hair loss may have a hormonal imbalance that causes hair loss and a low red blood cell count. The decrease in RBCs may be due to a condition such as anemia caused by blood loss or a deficiency of nutrients important for the production of RBCs such as zinc, iron, and B vitamins (Trost et al., 2006).

It is important to note that a low RBC count can have serious consequences for the health of cats, since RBCs are responsible for transporting oxygen to the tissues of the body (Hall & Hall, 2020).

The hair loss due to anemia observed in sick cats was similar to the results recorded by Alsaad et al., (2010, 2011) in cows and sheep respectively, where the researchers demonstrated that there is a close association between anemia and hair loss in ruminants. Zinc deficiency can lead to impairment of cell proliferation and protein synthesis, and consequently impaired production of blood cells (Payne, 1989), which may explain the results of the current study.

Conclusion:

Hematological results showed that there was a significant decrease in red blood cells, hemoglobin and packed cell volume, as well as MCV and MCH. There were relationship between protein levels and thyroid functions with hair loss in cats.

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