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Trichography in Dogs of a Canine Shelter, Ahmedabad, Gujarat (India)

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Abstract

The overall wellbeing of pet or stray dogs depend on healthcare and management practices adopted by owners or keepers at 'Canine Shelters'. Dogs suffer from a wide range of infectious and non-infectious conditions out of which, skin disorders are more commonly encountered in veterinary hospitals. A dog's skin is covered with fur or hairs which are examined for normal morphology and structural abnormalities using trichography. In the present study, trichography was carried out from hair samples of 30 dogs of a Canine Shelter in Ahmedabad, Gujarat. Normal trichogram having coronal surface scales as well as clear demarcation between cortex and medulla was observed in hair samples of all dogs. Five different medulla patterns were observed either throughout the shaft or at some areas. Three structural abnormalities (*viz.*, *Trichorhexis nodosa*, *Trichoptilosis* and *Trichomalacia)* were observed in hair samples. The present paper highlights interpretation of trichogram and its importance.

Keywords: Trichography, Trichogram, Abnormalities, Dog, Canine Shelter, Gujarat

Introduction

Pet-ownership is increasing at a rapid rate in urban and rural areas of India. Dog happens to be the most preferred pet animal in the world. Here, the knowledge level of owners regarding common healthcare and management practices in dogs is important (Bhadesiya and Raval, 2014). Nowadays, dog owners provide quality care and take precautions against canine health issues which can be due to increasing awareness associated with constant access to standard resources available on the websites. Dog owners also maintain regular contact with their veterinarians by use of communication media such as phone calls, e-mails, chatting applications etc. However, there are several factors which lead to abandonment of some pet dogs ultimately leaving them on streets or at shelters.

'Canine Shelters' are facilities designed and created to accommodate a few number of dogs depending on the availability of funds and co-operation from stakeholders. Many animal welfare trusts, non-government organizations (NGOs), self-motivated individuals etc. are establishing shelters in different

areas to provide indoor facilities and care to abandoned pets and critically ill stray dogs. Treatment of minor health issues in stray dogs and post-treatment rehabilitation into their territory is a common practice at a shelter. Shelter becomes a permanent home for dogs with untreatable health conditions. It is perceived that immunity and survival rate of indigenous or stray dog is higher as compared to pet dogs which could have been raised entirely inside homes throughout their life before facing unfortunate abandonment. Thus, it is a common scenario that Canine Shelters will have presence of both, well-known breeds and indigenous breeds of dogs.

Shelter owners/managers make dedicated efforts to develop all the necessary facilities for dogs including provision of required veterinary care. Disease-free status of Canine Shelters depend on hygienic practices, availability of staff, individual interests, funding (for construction, food, medicines etc.), support from stakeholders, veterinary services rendered by veterinarians (employed or consulting) and availability of laboratory diagnostic facilities in nearby areas. It is not necessary for a small shelter to have all types of advanced diagnostic facilities. Veterinarians working or consulting at Canine Shelters generally collect biomaterials (such as faeces, hairs, ectoparasites, blood etc.) and send them to nearby veterinary diagnostic laboratory or universities for examination. They can also determine schedules for screening of dogs from time-to-time.

With a similar vision, hair samples of dogs were collected by veterinarian at Canine Shelter, Saiyaji Maize Products, Ahmedabad. The present paper highlights results of the trichography.

Materials and Methods

Hair samples of 30 dogs were collected at the Canine Shelter, S M Products, Odhav, Ahmedabad, Gujarat (India) **[Figure-1]**.

Figure-1: Place of sample collection (Canine Shelter, Ahmedabad, Gujarat)

Samples belonged 16 male and 14 female dogs of six different breeds, *viz.*, Non-descript (n=24), Labrador Retriever (n=02), Dalmatian (n=01), German Shepherd dog (n=01), Saint Bernard dog (n=01) and Spitz (n=01) **[Figure-2]**.

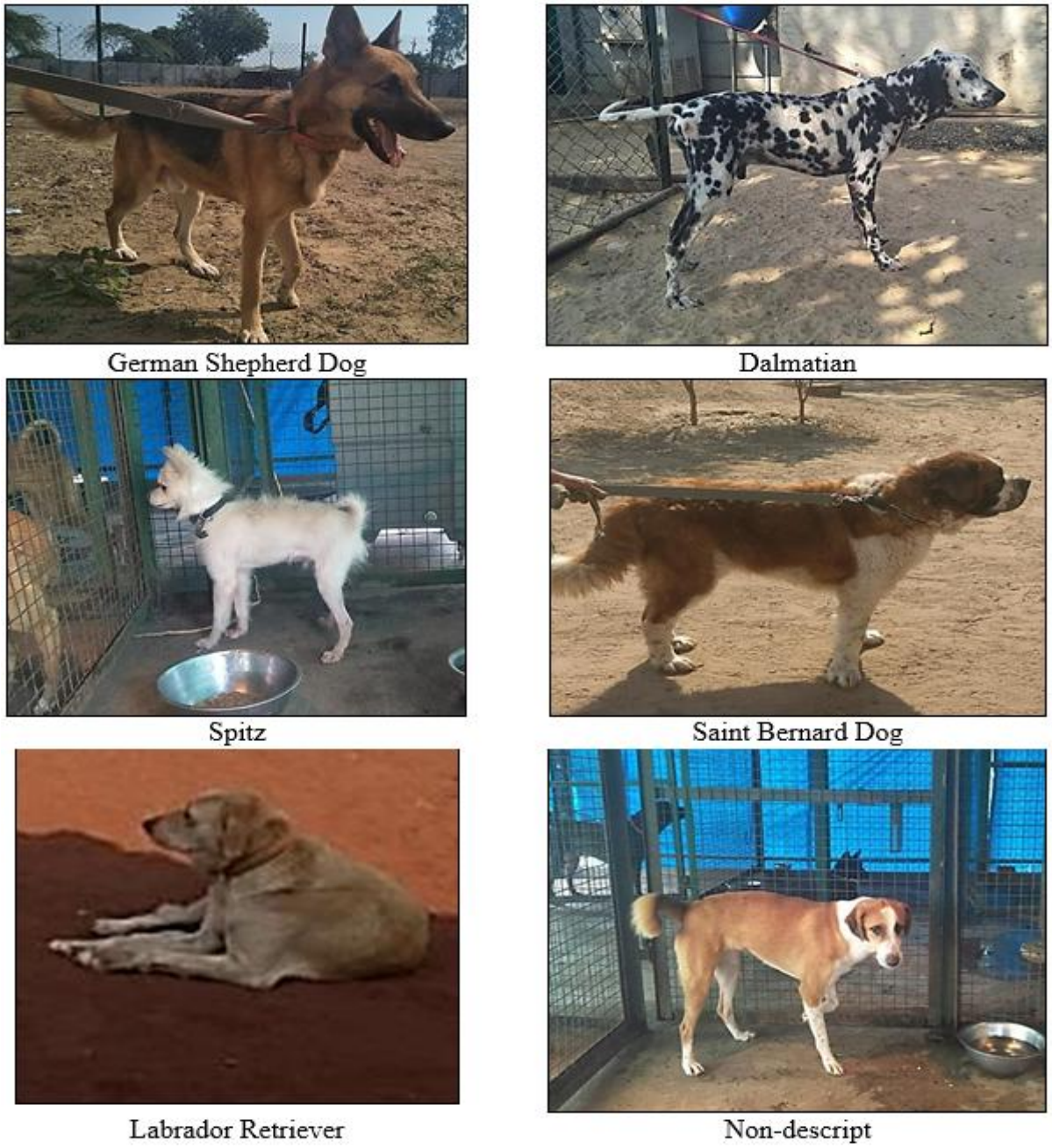

Figure-2: Breeds of dog documented in the study

Minimum 50 hair samples were collected from the neck region of each dog irrespective of age, breed and sex. Samples were examined during January-February, 2018 at the Postgraduate Institute of Veterinary Education & Research (PGIVER) functioning at Gandhinagar, Gujarat during the period.

Standard methods of sample collection and examination were used as per the suggestions made by Scott *et al.* (2000). Method can be summarized in 3 steps, *viz.*, [a] cleaning of hair samples; [b] observation under illuminated magnifier; and [c] observation of hair morphology and abnormalities using microscope (minimum 10 hairs/dog for microscopy).

Results and Discussion

The interpretation and results of trichography irrespective of age, breed & sex of dogs are shown in **Table-1**.

Table-1: Interpretation of trichography in dogs (N=30)

Sr. No.	Particulars	Interpretation & Result	
		Present/Visible	**Absent/Not-visible**
NORMAL TRICHOGRAM (GENREAL STRUCTURE OF HAIR)			
(A) Types of surface scales			
01	Coronal surface scales	**30 (100%)**	00 (00.00%)
-	*Simple coronal surface scales*	**28 (93.33%)**	02 (06.67%)
-	*Serrate coronal surface scales*	**02 (06.67%)**	28 (93.33%)
-	*Dentate coronal surface scales*	00 (00.00%)	30 (100%)
02	Imbricate surface scales	00 (00.00%)	30 (100%)
-	*Acuminate surface scales*	00 (00.00%)	30 (100%)
-	*Ovate surface scales*	00 (00.00%)	30 (100%)
-	*Elongate surface scales*	00 (00.00%)	30 (100%)
-	*Flattened surface scales*	00 (00.00%)	30 (100%)
-	*Crenate surface scales*	00 (00.00%)	30 (100%)
(B) Clear demarcation between cortex and medulla		**30 (100%)**	00 (00.00%)
(C) Types of medulla			
01	*Absent*	00 (00.00%)	30 (100%)
02	*Continuous in most of the areas*	**19 (63.33%)**	11 (36.37%)
03	*Discontinuous at some areas*	**02 (06.67%)**	28 (93.33%)
04	*Fragmental at some areas*	**01 (03.33%)**	29 (96.67%)
05	*Globular*	00 (00.00%)	30 (100%)
06	*Branched*	00 (00.00%)	30 (100%)
07	*Lattice in some areas*	**01 (03.33%)**	29 (96.67%)
08	*Aeroform*	00 (00.00%)	30 (100%)
09	*Ladder type in some areas*	**07(23.33%)**	23 (76.67%)
(D) Root			
01	Anagen root (Bulb)	**03 (10.00%)**	27 (90.00%)
02	Catagen root (Bulb)	00 (00.00%)	30 (100%)
03	Telogen root (Bulb)	**27 (90.00%)**	03 (10.00%)
STRUCTURAL ABNORMALITIES & OTHER FINDINGS			
01	*Trichorhexis nodosa*	**18 (60.00%)**	12 (40.00%)
02	*Pili torti*	00 (00.00%)	30 (100%)
03	*Trichomalacia*	**04 (13.33%)**	26 (86.67%)
04	*Trichoptilosis*	**21 (70.00%)**	09 (30.00%)
05	Mite or eggs of mite: *Demodex canis*	00 (00.00%)	30 (100%)
06	Mite or eggs of mite: *Sarcoptes scabiei* var. *canis*	00 (00.00%)	30 (100%)
07	Nits of lice	00 (00.00%)	30 (100%)
08	Exothrix	00 (00.00%)	30 (100%)
09	Endothrix	00 (00.00%)	30 (100%)
10	Others (e.g., keratosebaceous casts etc.)	00 (00.00%)	30 (100%)

(A) Normal Trichogram:

In the present study, coronal surface scales were observed in hair samples of all dogs (100.00%; 30/30). Simple coronal surface scales were more common (93.33%; 28/30) as compared do serrate coronal surface scales (06.67%; 02/30). Dentate coronal and imbricate types of surface scales were not observed in any hair sample.

Clear demarcation between cortex and medulla of hair was found in hair samples of all dogs (100.00%; 30/30). This finding is important because pigment deposition in cortex may affect clear visualization of medullary borders. Moreover, it is also possible that medulla of hair may cover the entire width of shaft leaving no scope for measurement of medullary index.

Microscopy also revealed five different types of medulla. A continuous medulla throughout the hair shaft was more common in dogs (63.33%; 19/30) as compared to ladder type (23.33%; 07/30), discontinuous (06.67%; 02/30), fragmental and lattice (03.33%; 01/30, each) at some areas of the hair shaft. Observations of the study suggest that medulla may show changes at different areas (mid-shaft, root, tip) of hair. Hence, a specific area of hair can be used to observe type of medulla for proper comparison between body regions and breeds. Observations on presence of various medullary patterns in different breeds of dogs have also been documented by Wandhare and Bhosale (2017).

Hair samples of 27 dogs (90.00%) were found to have telogen roots **[Figure-3]** while remaining 03 dogs (10.00%) showed hair samples with anagen roots. Limited literature is available on stages of hair cycle and their association with various factors (Diaz *et al.*, 2004). Therefore, the findings of this study should be limited to the study population of dog because hair samples were collected from only one region of the body.

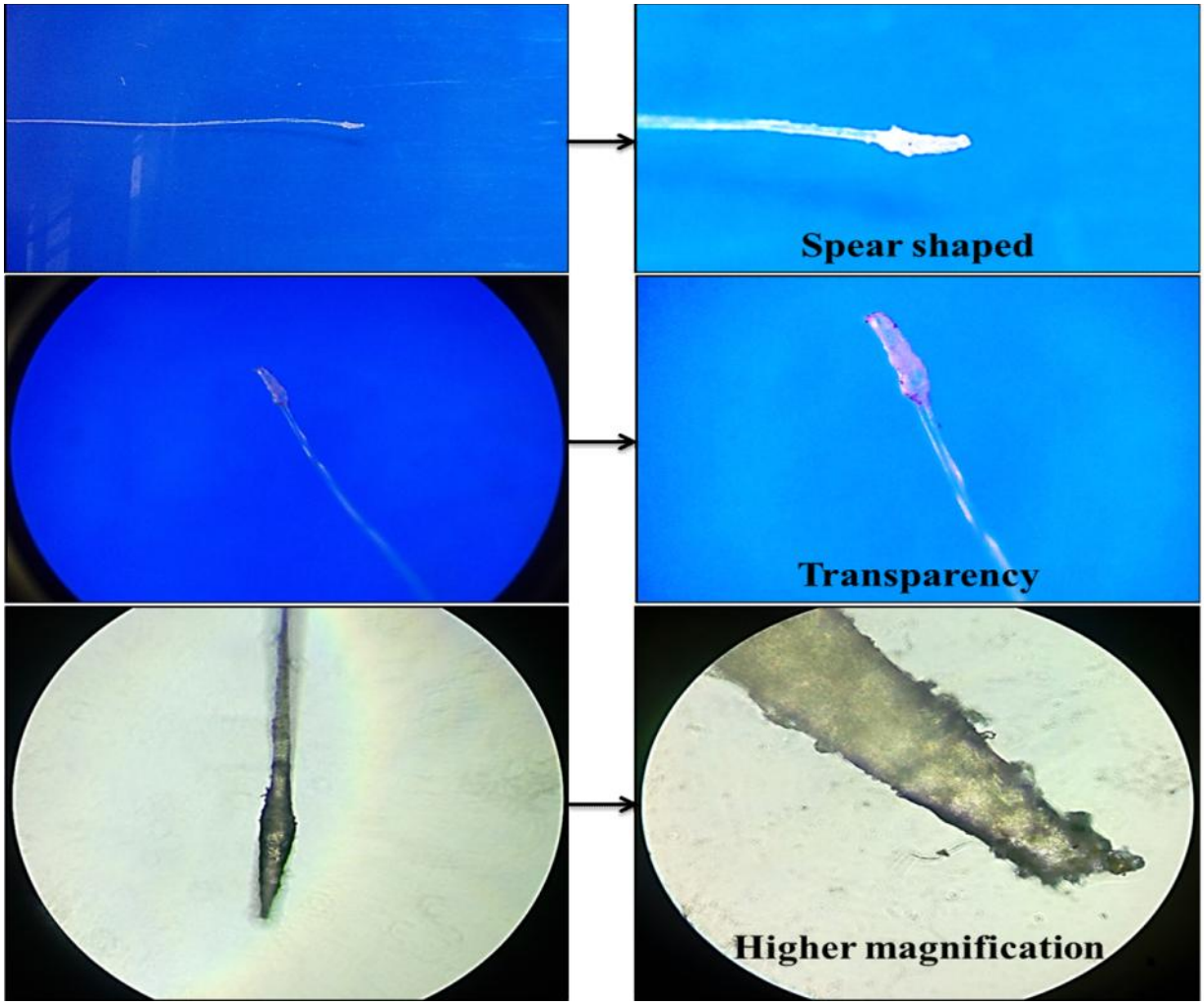

Figure-3: Root of hair – Telogen

The medullary index was recorded at a range of 0.36 to 0.54 in 24 dogs of Non-descript breed; 0.52 and 0.61 in two Labrador Retrievers; 0.53 in one Dalmatian; 0.56 in one German Shepherd dog; 0.57 in one Saint Bernard dog and 0.48 in one Spitz. Similar findings were documented by Wandhare and Bhosale (2017). Negi *et al.* (2017) also documented medullary index in dogs ranging from 0.542 to 0.75 while Kshirsagar *et al.* (2009) did not mention medullary index for dogs in their study.

Animals generally shed their hairs on regular basis which happen to be the reason behind use of hair sample as an evidence at a crime scene during veterinary forensic investigations (Wandhare and Bhosale, 2017). Trichogram obtained by trichography and understanding of animal hair morphology is important for such investigations (Verma and Joshi, 2012). Observations on types of scale pattern on surface of hair, cortex, type of medulla, measurement of diameter of hair and medullary index are important for forensics. Microscopic details and reference samples of standard hair mounts play vital role in species identification (Nishant *et al.*, 2017). Permanent mounts can be prepared from carefully processed hair samples. Such mounts can be used as reference for education, research, training and diagnostic assistance in future. In absence of mounts as reference material, detailed forensic studies can also be carried out by DNA analysis (Pilli *et al.*, 2014).

The above-mentioned findings of the trichogram are very important; however, detailed investigation on clinically healthy dogs in controlled situations should be conducted to establish proper guidelines. Studies can be conducted by collecting hair samples from different body regions of dogs belonging to a single breed, both genders and different age groups.

(B) Structural Abnormalities & Other Findings:

The skin coat of dogs have different types of hairs (fur hairs, single hair coat and dual hair coat etc.). This determines the quality and external appearance of dogs. Any insidious abnormalities of hair structure would cause dull and unattractive appearance of the coat.

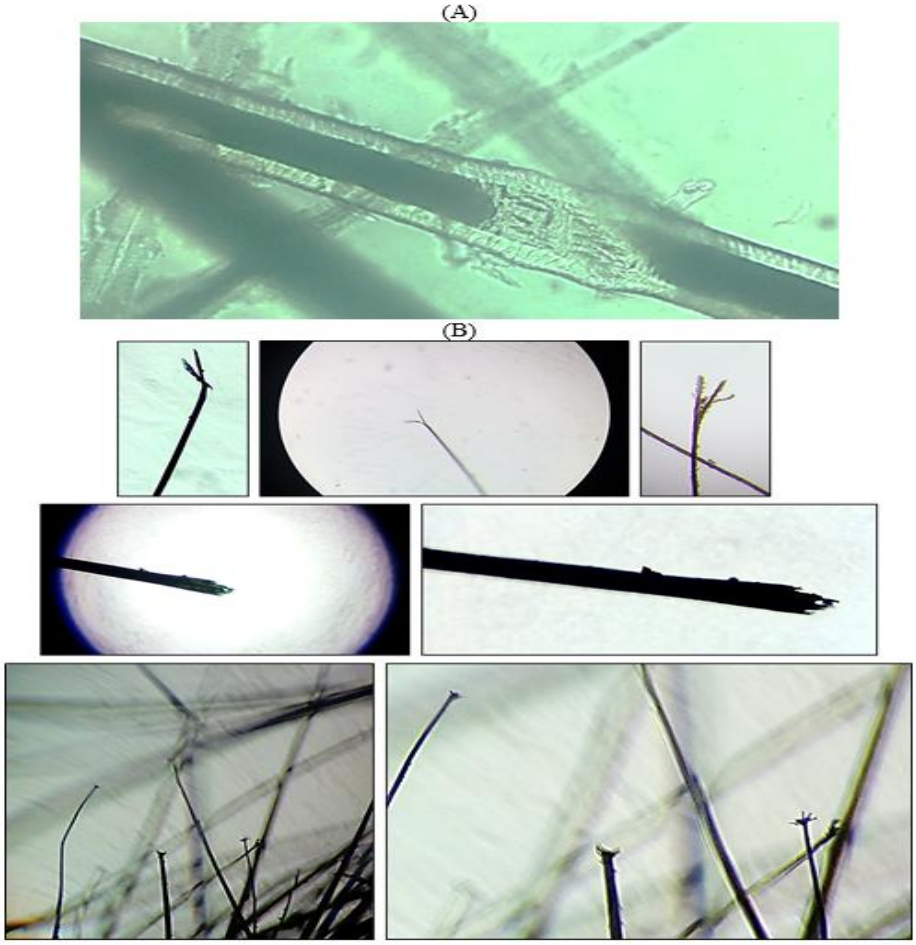

Figure-4: Hair abnormalities (A) *Trichomalacia* & (B) *Trichoptilosis*/Split ends

In the present study, hair samples were observed for presence of 10 different types of abnormalities. Only 3 types of abnormalities could be detected. *Trichoptilosis* was the most commonly found abnormality (70.00%; 21/30) followed by *Trichorhexis nodosa* (60.00%; 18/30) and *Trichomalacia* (13.33%; 04/30) **[Figure-4]**. Mite or eggs of mite, nits of lice, endothrix or exothrix and other abnormalities such as keratosebaceous casts and defluxions were not found in any hair sample. Literature suggests that mechanical stress factors such as moderate to intense pruritus, scratching, rubbing of body against objects, improper sampling, improper packaging and transport etc. can lead to abnormalities found in the study. Abnormalities in pigment deposition have been described to have relation with environmental factors, genetics, deficiencies etc. However, these type of observations were not recorded previously in veterinary institutes of Gujarat.

The observations recorded in the study indicate that Canine Shelter, S M Products, Odhav, Ahmedabad is providing proper 'coat care' facilities for the dogs. Based on the results of the study, advice was given with regards to [a] bathing the dogs by use of shampoos at regular intervals; [b] use of shampoo/conditioners exclusively developed for dogs and avoiding use of human soap/shampoos for bathing; [c] avoidance of excessive bathing, inadequate and short bathing intervals; [d] separation of healthy dogs from dogs with skin infections; [e] grooming by use of brush depending on type of breed to prevent damage to hairs; [f] regular use of supplements in diet to improve coat quality; [g] regular deworming, vaccination and control of ectoparasites; [h] avoidance of abrupt changes in diet causing food associated hypersensitivity and intense pruritus; and [i] regular laboratory examination for overall wellbeing of dogs.

Conclusion

Results of trichography using hair samples collected from neck region of 30 dogs at a Canine Shelter have been documented in this paper. Normal trichogram of dogs included coronal surface scales, different types of medulla and clear demarcation between hair cortex and medulla. *Trichorhexis nodosa*, *Trichoptilosis* and *Trichomalacia* were common structural abnormalities found in hairs. The baseline data generated through this study can be utilized to conduct large-scale investigations by collecting more hair samples from different body regions in different breeds of dogs. Trichography proved to be a quick, cost-effective and relatively easy-to-perform diagnostic technique to observe normal hair morphology and other abnormalities.

Conflict of Interest

Authors declare no conflict of interest with special regards to funding.

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Approval

Necessary permissions were received from Principal, PGIVER for examination of hair samples during the said period. The study did not involve any experimental trial on study population of dog.

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