

## Dogs' Shampoos for the Coat Care

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### Abstract

The majority of cosmetics for dogs are shampoos. These are used not only to wash the coat and improve its structural properties; but also as adjuvant treatment in various skin disease. The dogs' owners in Lithuania are beginning carefully to take care of their pet well-being, skin health and appearance of the coat. There are many cosmetic devices for this reason and the market is expanding by the addition of new products. So, the purpose of this work was to evaluate shampoos effects to dogs' hair for daily coat care. There were three dogs in the research work involved, and three shampoos for daily coat care for research work selected randomly: X1, X2 and X3. Some hair of each dog were used for analysis by scanning electron microscope FEI Quanta 200 FEG. There were taken hair photos of cross-section. Other hair was used to evaluate hair ratio of convolution. The maximum visible changes of hairs cross-section are seen in photos made after bathing of every dog with X3 shampoo. The ratio of convolution have increased in german jagdterriers breed case with all exploratory shampoos. Labrador retriever and german shepherd ridge's hair ratio of convolution reduced after bathing with all exploratory shampoos. After the research, there were established which exploratory shampoo is the most economical (X3), which is the most suitable for dogs' skin pH (X3). Also, the influence of shampoos' for hair surface, cross-section diameter and ratio of convolution was observed. In conclusion, the maximum visible changes were observed in photos after bathing with X3 shampoo, which was evaluated like the best by the dogs' owners.

**Keywords:** dog; coat care; ratio of convolution; shampoo.

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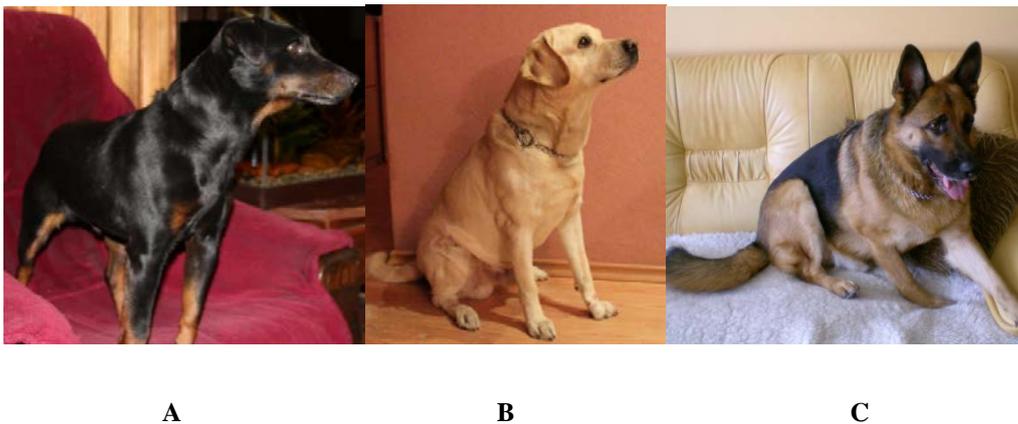
## 1. Introduction

Over the thousands of years during our animals were domesticated, they have become our companions, which we share our houses with. Living closely together with our pets, we place increased value on their appearance. The hair and skin of our pets has become more of our focus. The people want a companion who has a shiny hair coat, clean appearance and pleasant odor [1]. The most cosmetics for dogs are shampoos. These are used not only to wash the coat and improve its structural properties; but also as adjuvant treatment in various skin disease [2].

The dog owners in Lithuania are beginning carefully to take care of their pet well-being, skin health and appearance of the coat. There are many cosmetic devices for this reason and the market is expanding by the addition of new products. So, the purpose of this work was to evaluate shampoos effects to dog' hair for daily coat care.

## 2. Materials and methods

There were involved three dogs in the research work (Fig. 1.): german jagdterrier (6 years old), labrador retriever (6 years old), german shepherd (9 years old). All three dogs live inside.



**Figure 1:** Dogs involved in research: A) German jagdterrier; B) Labrador retriever; C) German shepherd

Research work was made with an agreement of the owner of each dog and by following the Republic of Lithuania law of animal care, storage and using [3] also the Republic of Lithuania law of animal welfare and protection [4].

There were selected three shampoos randomly for daily coat care for research work:

- X1 shampoo with camomile extract (250 ml – 2.20 €);
- X2 shampoo with nutlets of oranges and apricots (200 ml – 3.30 €);
- X3 aloe vera shampoo (300 ml – 11.00 €).

Shampoos viscosity was measured by rotary viscometer NDJ – 1, hydrogen ion concentration was measured by

pH meter-thermometer HD2305.0 in JSC „Ruvera“.

Dogs involved in research were bathed with each shampoo three times (once a week). There were one week break before starting to use following shampoo. Shedule of bathing is in the Table 1.

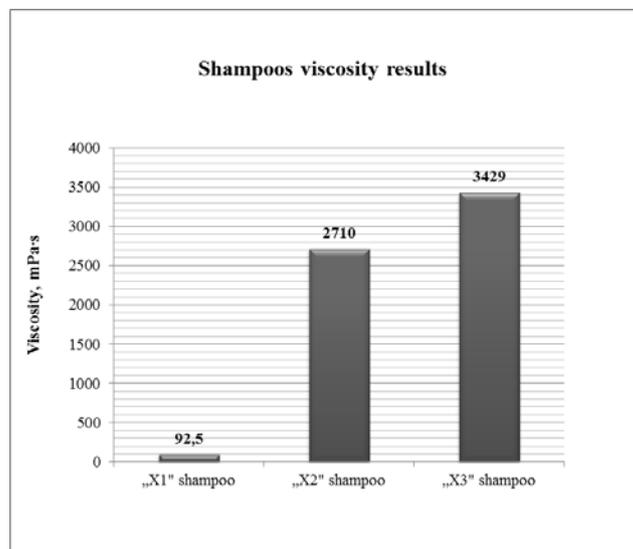
**Table 1:** Shedule of dogs bathing in 2015 year

Date	08-26	09-02	09-09	09-16	09-23	09-30	10-07	10-14	10-21	10-28	11-04
Bathing	X1 shampoo		break			X2 shampoo		break		X3 shampoo	

There were pulled 20 hair from every dog’s ridge and breast’s areas before and after bathing with each exploratory shampoo. Some hair was used for analysis by scanning electron microscope FEI Quanta 200 FEG. There were taken hair photos’ of cross-section. Other hair was used to evaluate hair’ ratio of convolution [5].

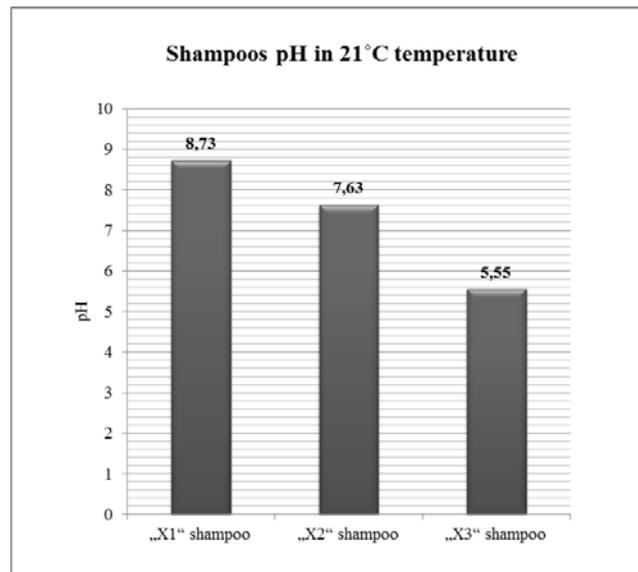
### 3. Results and Discussion

Shampoos viscosity are important for product economy. Low viscosity shampoos need more amount for bathing because they are liquid. Also shampoos should not be too viscous. In that case, it is hard to rub shampoo into the coat. X3 shampoo is the viscosiest (Fig. 2) also it is the most expensive of exploratory shampoos for daily coat care.



**Figure 2:** Shampoos viscosity results by rotary viscometer NDJ – 1 (p<0.001)

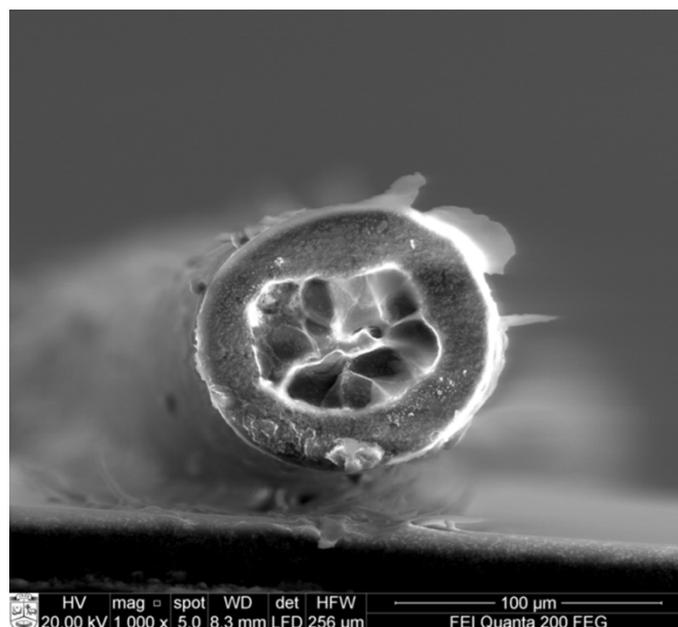
The health dogs skin pH 5.5–7.2 [6]. Shampoos should match this range. Only X3 shampoo is suitable for dogs’ skin. X1 and X2 shampoos are too alkaline (Fig. 3). It is important that hydrogen ion concentration of shampoo be optional for dog’s skin because it can cause dryness and irritation.



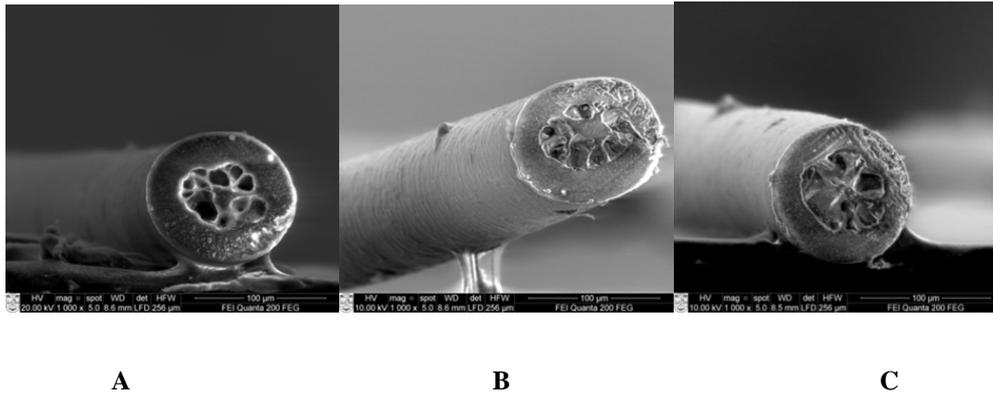
**Figure 3:** pH values of examined shampoos in 21°C temperature ( $p < 0.001$ )

All dogs' hair has become smoother, coat looked sleeker, shinier and light after bathing with exploratory shampoos. There is visible positive influence of all three shampoos in the photos of hairs cross-section: keratin flakes of hair surface became straighter. In the photos of hair cross-section before bathing is seen that keratin flakes are detached from hair surface. The maximum visible changes are seen in photos made after bathing with X3 shampoo.

There are ridge's hair cross-section photos of German jagdterrier before bathing displayed in the Fig. 4 and in the pictures after bathing presented in the Fig. 5.



**Figure 4:** Ridge's hair cross-section photo of German jagdterrier before bathing



**Figure 5:** Ridge’s hair cross-section photo of German jagdterrier after bathing with: A) X1 shampoo; B) X2 shampoo; C) X3 shampoo

As expected, the influence of shampoos for ridge’s and breast’s hair was different. It was believed that ridge’s hair is harder and tighter and after bathing they will be smoother and fluffier so shampoos have increased dogs ridge’s hair cross-section diameter. In most cases what happened: ridge’s hair cross-section diameter has increased after bathing with all exploratory shampoos for all three dogs, except labrador retriever ridge’s hairs cross-section diameter reduced after bathing with X1 and X2 shampoos. It may be influenced by specific characteristics of breed. There were expected to reduce breast’s hair cross-section diameter because breast’s hair is thinner and more flexible than ridge’s hair. For this reason, shampoos can remove dirt easier from the coat. Assumption has confirmed in most cases, all dogs breast’s hair cross-section diameter reduced after bathing with all exploratory shampoos, except german jagdterrier: hair cross-section diameter after bathing with X1 shampoo, when diameter increased. Ratio of convolution is the difference of straight and convoluted specimens expressed percentage by straight specimen length, according to authors in [7]. There were expected to increase ratio of convolution only of german jagdterrier ridge’s hair because coat of this breed liable to curl. Breast’s hair is less wavy and curly because it is thin and flexible, so their ratio of convolution reduced. All forecasts have proved in german jagdterriers breed case with all exploratory shampoos. German jagdterrier ridge’s and breast’s hair averages and reliability of ratio of convolution are shown in Table 2. Labrador retriever and german shepherd ridge’s hair ratio of convolution reduced after bathing with all exploratory shampoos, because their coat is thick, hair is resilient, not tend to be wavy or curly. However, breast’s hair ratio of convolution increased after bathing with X1 shampoo.

**Table 2:** German jagdterrier ridge’s and breast’s hair averages and reliability of ratio of convolution

Hair	Sample size	Ratio of convolution	
		Ridge area	Breast area
Before bathing	10	3.97% ±0.48 A	5.95% ±0.7 A
After bathing with X1 shampoo	10	5.38% ±0.46 B	5.09% ±0.64 A
After bathing with X2 shampoo	10	4.13% ±0.48	5.71% ±0.79 A
After bathing with X3 shampoo	10	5.06% ±0.64	2.79% ±0.65 B

A, B – averages with different letters in table columns statistically significant differences among themselves (p<0.05)

#### 4. Conclusions

It could be concluded, reviewing the results of this research: the most economical (the viscousest) of exploratory shampoos for daily coat care is the X3 shampoo; this shampoo is the most suitable of exploratory shampoos for dog's skin pH and was evaluated as the best by the dogs' owners. Shampoos for daily coat care increase dogs ridge's hair cross-section diameter (except labrador retriever ridge's hair after bathing with X1 and X2 shampoos) and reduce breast's hair cross-section diameter in many cases, but didn't influence hair ratio of convolution at the same time. It is evident, that all three of exploratory shampoos positively influenced keratin flakes of hair surface – it has become straighter. According the the collected data, several proposals may be submitted: before dog's bathing with a medical shampoo, fur coat of the desired place is recommended to be cropped or shaved in order to better access, and therapeutic effect of shampoo could be strengthened using skin liniments and sprays of the same purpose, simultaneously.

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