

**MACROSCOPIC LESION HEALING IN DOGS WITH ATOPIC DERMATITIS
FOLLOWING COCONUT OIL ADMINISTRATION**

**Kesembuhan Lesi Makroskopis Anjing Penderita Dermatitis Atopik Setelah
Pemberian Minyak Kelapa**

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How to cite: Setiawan A, Jayanti PD, Susari NNW, Sudimartini LM, Suartha IN. 2026. Macroscopic lesion healing in dogs with atopic dermatitis following coconut oil administration. *Bul. Vet. Udayana* 18(1): 324-336. DOI: <https://doi.org/10.24843/bulvet.2026.v18.i01.p31>

Abstract

Atopic dermatitis is a multifactorial disease associated with inflammatory and pruritic allergic conditions, with a genetic predisposition and immunoglobulin E (IgE) production against environmental allergens. To address this disease, the use of coconut oil as a herbal medicine may serve as an alternative therapy. This study aimed to evaluate changes in macroscopic skin lesions in dogs with atopic dermatitis following coconut oil administration. The study used five Balinese local breed dogs with atopic dermatitis aged three months. The dogs received coconut oil massage treatment once every three days for 33 days. The research procedure involved observing the progression of primary and secondary lesion healing, hair growth around the lesion area, and microscopic examination of the hair growth phase. The data were analyzed using nonparametric tests, followed by the Friedman test, Wilcoxon test, and regression analysis. The results of the Friedman, Wilcoxon, and regression tests showed significant healing after coconut oil application, with statistically significant differences ($P < 0.05$) in macroscopic observations. Overall, improvements in macroscopic lesions were observed in all

sample dogs, characterized by reduced pruritus, erythema, macules, papules, pustules, crusts, scabs, scaling, hyperpigmentation, and lichenification, as well as hair regrowth in areas affected by alopecia. In conclusion, coconut oil application is effective in improving the healing of macroscopic lesions in dogs with atopic dermatitis.

Keywords: atopic dermatitis, coconut oil, dog, macroscopic lesions

Abstrak

Dermatitis atopik merupakan penyakit multifaktorial yang dikaitkan dengan penyakit alergi inflamasi dan pruritus dengan kecenderungan genetik serta produksi imunoglobulin (IgE) terhadap alergen lingkungan. Untuk mengatasi penyakit tersebut, penggunaan obat herbal minyak kelapa dapat menjadi alternatif terapi. Penelitian ini bertujuan untuk mengetahui perubahan lesi makroskopis pada kulit anjing penderita dermatitis atopik setelah pemberian minyak kelapa. Penelitian ini menggunakan lima ekor anjing ras lokal Bali yang mengalami dermatitis atopik yang berumur tiga bulan. Anjing sampel diberikan perlakuan *massage* minyak kelapa yang dilakukan sekali dalam tiga hari selama 33 hari. Prosedur penelitian dilakukan dengan mengamati perkembangan kesembuhan lesi primer dan sekunder, tumbuhnya rambut sekitar area lesi, serta pemeriksaan fase pertumbuhan rambut di bawah mikroskop. Data kemudian diuji menggunakan nonparametrik test, dilanjutkan uji *Friedman*, uji *Wilcoxon*, dan uji regresi. Hasil uji *Friedman*, uji *Wilcoxon*, dan uji regresi didapatkan adanya kesembuhan setelah pemberian minyak kelapa pada anjing sampel dengan hasil berbeda nyata ($P < 0,05$) pada pengamatan makroskopis. Pada keseluruhan pengamatan terdapat perubahan yang baik terhadap lesi makroskopis anjing sampel, yang ditandai dengan berkurangnya pruritus, eritema, makula, papula, pustula, krusta, skuama, rontoknya *scale*, hilangnya hiperpigmentasi dan lichenifikasi, serta sudah terjadi pertumbuhan rambut pada daerah yang mengalami alopecia. Pemberian minyak kelapa efektif meningkatkan proses kesembuhan lesi makroskopis menuju kondisi yang baik pada anjing penderita dermatitis atopik.

Kata kunci: anjing, dermatitis atopik, minyak kelapa, lesi makroskopis

INTRODUCTION

Currently, many local dog owners pay insufficient attention to the health of their dogs. As a result, the dogs' conditions often appear concerning, such as malnutrition, and some suffer from skin disorders (Heparandita *et al.*, 2021). Skin disorders can cause skin inflammation or dermatitis, which is characterized by pruritus, hair loss, ulcerative lesions, and skin redness (Medleau and Hlinica, 2006).

Canine atopic dermatitis is a complex disease with multiple causes and is often associated with other pruritic conditions such as demodicosis, scabies, dermatophytosis, *Malassezia* infection, and food allergies (Hensel *et al.*, 2015). According to Gedon and Mueller (2018), atopic dermatitis is associated with inflammatory and pruritic allergic skin disease with a genetic predisposition, often linked to the production of immunoglobulin E (IgE) against environmental allergens. This condition is multifactorial and commonly occurs in dogs. Clinical signs include erythema, alopecia on the abdomen, limbs, and muzzle, as well as generalized alopecia (Goswami and Bortaki, 2012). Cases of atopic dermatitis are estimated to affect 15–30% of the dog population (Purwanti *et al.*, 2022).

Atopic dermatitis is progressive in nature without treatment or intervention, and early control is required to slow disease progression (Nuttall *et al.*, 2019). To date, standard therapeutic protocols for canine atopic dermatitis include the use of glucocorticoids, antihistamines, antibiotics, omega-6/omega-3 fatty acid supplements, allergen-specific immunotherapy

(hyposensitization), topical antipruritic agents, and their combinations (Cahyaniarta *et al.*, 2019; Goswami and Borkataki, 2012; Scott *et al.*, 2001). However, these medications may cause harmful side effects; for example, long-term use of antibiotics can lead to antibiotic resistance and other unintended adverse effects (Cahyaniarta *et al.*, 2019). In addition, the use of chemical drugs may produce residues that can contaminate the environment (Margaret *et al.*, 2013).

To reduce the adverse effects associated with chemical therapies, coconut oil may be used as an alternative treatment for atopic dermatitis. Coconut oil has been shown to possess several nutritional and therapeutic benefits. One of its components is unsaturated fatty acids, which can neutralize free radicals and help maintain immune system function. Furthermore, coconut oil exhibits important functional properties such as hypocholesterolemic, anti-obesity, anti-hepatostatic, antioxidant, anti-inflammatory, antimicrobial, antiviral, HIV (Human Immunodeficiency Virus) preventive activity, cardioprotective effects, and a high content of vitamin E, which helps moisturize hair and skin (Deen *et al.*, 2021).

Indicators of skin healing can be observed through lesion recovery and hair regrowth, which are attributed to the beneficial compounds contained in coconut oil. According to Jurchenko (2024), topical application of coconut oil on dogs with skin wounds can aid the healing process and help prevent inflammation and infection. Given the various benefits and components of coconut oil as an herbal remedy, and the lack of reports on its use in the treatment of atopic dermatitis, this study was conducted.

RESEARCH METHODS

Ethical Approval

All procedures involving animals in this study were approved by the Animal Ethics Committee of the Faculty of Veterinary Medicine, Udayana University, under Animal Ethical Approval Letter No. B/206/UN14.2.9/PT.01.4/2023.

Research Subjects

The subjects used in this study were five three-month-old Balinese local breed dogs diagnosed with atopic dermatitis, with day 0 (H-0; prior to treatment) designated as the control condition. The dogs selected for the study exhibited moderate lesion severity based on the lesion classification described by Cahyaniarta *et al.* (2019), in which affected dogs presented complex lesions with moderate severity, consisting of a combination of primary and secondary lesions. The lesion scoring system used during observations of the treated dogs throughout the study is presented in Table 1.

During the study, the dogs were housed at the Veterinary Teaching Hospital, Faculty of Veterinary Medicine, Udayana University, and kept in individual cages within a designated room that met animal welfare standards, including appropriate cage size, controlled lighting, optimal temperature and humidity, adequate ventilation, sufficient food and water supply, routine sanitation, and ethical approval in accordance with the principles of the 3Rs (replacement, reduction, and refinement).

Study Design

This study was an experimental study with descriptive qualitative analysis to observe changes before and after treatment. A single treatment was applied with twelve macroscopic lesion observations, with the first observation serving as the control without treatment. Based on sample size calculation according to Goh (2008), the use of five dogs with atopic dermatitis was considered sufficient for this study.

Research Variables

The independent variable was coconut oil. The dependent variable was changes in macroscopic lesions, with observed macroscopic parameters including lesion surface dryness, reduction in wound diameter, erythema of the skin surrounding the lesion, detachment of crusts, hair growth around the lesion area, and assessment of hair growth. The controlled variables in this study included dog age, breed, lesion severity, feed volume, animal husbandry conditions, skin absorption time, and the volume of coconut oil administered orally.

Data Collection Methods

Data collection was conducted by observing changes in macroscopic lesions in dogs before and after coconut oil massage treatment, starting from day 0 (prior to treatment) as the control and continuing every three days for 35 days as the treatment observations. The observed lesion changes included lesion surface dryness, reduction in lesion diameter, erythema of the surrounding skin, crust detachment, hair regrowth around the lesion area, and examination of the hair growth cycle.

Coconut Oil Preparation

The coconut oil used in this study was prepared by local farmers through a high-temperature heating process. The thermal method of coconut oil production began with grating the coconut meat, extracting coconut milk, and heating the coconut milk until all water evaporated, leaving oil and a residue known as *blondo*. The oil was then separated by decantation or filtration, and the remaining *blondo* was pressed to extract the absorbed oil.

Treatment Procedure

Five sample dogs received coconut oil massage treatment. Prior to application, the hair around the lesion area was combed to remove scales. Coconut oil was then applied to the dog's body, gently massaged into the skin, and left for 15 minutes to allow absorption by the skin. Afterward, the dogs were bathed using a surfactant-based soap, rinsed thoroughly, and dried. The massage treatment was performed once every three days for 35 days. In addition, coconut oil was administered orally by mixing it with the dogs' feed once daily at a dose of 5 mL. Before the study, all sample dogs were acclimatized to the research environment for seven days to allow physiological, psychological, and nutritional stabilization, as well as familiarization with the personnel. Every three days, the wound healing process of the skin was anatomically observed by assessing lesion surface dryness, reduction in lesion diameter, erythema of the surrounding skin, crust detachment, hair growth around the lesion area, and examination of the hair growth phase under a microscope. Macroscopic lesion changes were observed and recorded at three-day intervals for 33 days, specifically on days 0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, and 33.

Trichogram Examination

Hair examination was performed by collecting several intact hair strands from the area surrounding the lesion using a needle holder. The hairs were placed in the same orientation on a glass slide, a drop of baby oil was applied, and the sample was covered with a cover glass. The hair growth phase was then observed under a microscope at 100× magnification.

Data Analysis

The data obtained in this study were analyzed using nonparametric tests, followed by the Friedman test, Wilcoxon test, and regression analysis using SPSS software, and were described descriptively.

RESULTS AND DISCUSSION

Results

After 33 days of observation, the sample dogs showed a favorable healing process of macroscopic lesions. The data on lesion changes obtained during the study are presented in Table 2.

Statistical analysis using the Friedman test showed significant differences ($P < 0.05$) among the treatment days evaluated. This indicates differences in mean values across several observation days, leading to the conclusion that coconut oil administration affected the healing of macroscopic lesions in dogs with atopic dermatitis. The results of the Wilcoxon test also demonstrated significant differences ($P < 0.05$) among the treatment days. These findings indicate that coconut oil administration effectively enhanced the healing process of macroscopic lesions in dogs with atopic dermatitis, as illustrated in Graph 1.

Regression analysis revealed significant differences ($P < 0.05$) among the treatment days. The constant value was positive (5.279), indicating a direct relationship with coconut oil administration. This finding is further supported by the regression graph (Graph 2), which shows a healing process of macroscopic lesions as indicated by the downward linear trend. Based on the regression equation obtained ($y = 5.28 - 0.11x$), the estimated healing time for all sample dogs was approximately 48 days of coconut oil treatment to achieve complete healing of macroscopic lesions with a score of 0.

Coconut oil administration also had a clinical effect on hair growth around the lesion areas, which was confirmed by observations of the hair growth cycle. On day 18, hair regrowth had reached approximately 40%, as indicated by the anagen phase. Similarly, observations on day 33 showed further increases in hair growth around the lesions, reaching 64% in the anagen phase. The results of the hair examinations of the sample dogs are presented in Table 3.

Discussion

Based on observations of macroscopic lesions in the sample dogs from day 0 (control) to day 33 following coconut oil treatment, a favorable healing process was observed, as illustrated in Graph 1. On day 9, a decrease in lesion score to 3.6 was observed compared with the control dogs (before coconut oil administration), which had a score of 5.8. This reduction indicates a healing process of macroscopic lesions in several sample dogs. Macroscopic lesion healing assessment was based on observations of reduced alopecia area, characterized by a decrease in erythema size, reduction of macules and papules, detachment of crusts and scales, reduction of hyperpigmentation and lichenification, and the initiation of hair regrowth, as shown in Figure 1.

In contrast to day 9, macroscopic lesion observations on days 12 and 15 showed no further improvement in lesion healing. This was attributed to the presence of primary lesions in the form of pustules, which were not observed on the previous day (Figure 2). In addition, secondary lesions in the form of scales were also detected. Secondary lesions represent the progression or resolution of primary lesions and may indicate the presence of previous primary lesions. Bloom (2007) stated that secondary lesions are skin changes resulting from primary lesions or self-trauma, infection, or treatment (e.g., allergic skin disease, atopic dermatitis, and bacterial pyoderma). From day 18 to day 33, favorable changes were again observed, characterized by increased lesion healing, with several sample dogs no longer exhibiting primary or secondary lesions. These findings indicate that the use of coconut oil as an herbal treatment was effective in promoting the healing of macroscopic lesions in dogs with atopic dermatitis.

The observed abnormalities occurred only in some sample dogs. Specifically, in sample dog 1, lesions appeared on days 21 and 24 and resolved by day 27; in sample dog 2, lesions appeared on

days 12, 24, 27, and 30 and resolved by day 33; and in sample dog 4, lesions appeared only on day 33. These lesions were indicative of infection known as puppy pyoderma, which may be caused by bacterial infection, inflammation, allergy, scratching, local irritation, and other factors. Loeffler and Lloyd (2018) reported that superficial pyoderma is the most common type of pyoderma in dogs and involves bacterial invasion of the epidermis. Dogs with superficial pyoderma often present with papules, pustules, and epidermal collarettes, typically affecting the ventral abdomen and medial thighs, and are frequently associated with alopecia and varying degrees of pruritus. The occurrence of infection in this study was likely due to housing conditions, as some sample dogs damaged their cages, allowing them to roam, play, roll, and run over surfaces with uncertain microbial cleanliness. To address this issue, preventive measures were implemented, including reinforcing the cages with restraints and improving environmental hygiene.

Hair growth cycle examination revealed that hair samples from all five dogs had entered the growth (anagen) phase by day 18, reaching approximately 40%, and continued to increase to 64% by day 33, as presented in Table 3. These findings indicate that coconut oil administration was effective in promoting skin healing in dogs with atopic dermatitis. This healing effect may be attributed to the triglyceride components of lauric acid in coconut oil, which can easily penetrate the hair shaft and stimulate hair growth. When applied to infected areas, coconut oil forms a chemical barrier that protects the affected skin from dust, air, fungi, bacteria, and viral infections.

The purpose of trichogram examination is to provide information regarding cycle abnormalities, acquired hair shaft defects, genetic abnormalities (pigment disorders), and the presence of parasites or fungal infections. In this study, all hair growth phases were observed in the hair samples, as shown in Figure 3.

Additionally, several forms of damage to the hair tips and shafts were observed in all five hair samples, as shown in Figure 4. Negoită (2021) reported that alopecia resulting from self-induced scratching is commonly found in dogs with atopic dermatitis and scabies and consists of traumatic damage to the hair shaft caused by severe pruritus and chronic disease progression. Previous studies have indicated that mechanical stress factors such as moderate to severe pruritus, scratching, rubbing against objects, improper sampling techniques, improper packaging and transportation, and other factors may contribute to such abnormalities (Bhadesiya *et al.*, 2020).

Overall, most hair tips were found to be normal, characterized by tapered ends; however, some samples exhibited broken tips or trichoptilosis, resulting in complete loss of the hair tip. Hair with abruptly broken ends indicates external trauma due to licking, scratching, or other factors, often accompanied by structural changes or weakening of the hair shaft. However, a higher prevalence is required to support a definitive diagnosis. Furthermore, the lifestyle of the sample dogs, including playing, rolling, and running over various objects, may explain the observed changes in hair shafts and tips.

In conclusion, coconut oil administration was effective in promoting the healing of macroscopic lesions in dogs with atopic dermatitis. One month of coconut oil therapy resulted in clinical improvement, characterized by reduced pruritus, erythema, and other lesion types, as well as hair regrowth in areas affected by alopecia.

CONCLUSION AND SUGGESTIONS

Conclusion

Based on the results of this study, it can be concluded that coconut oil administration for 33 days was effective in enhancing the healing process of macroscopic lesions in dogs with atopic dermatitis.

Suggestions

Recommendations arising from this study include conducting further research with a larger sample size to validate the clinical observations using statistical analysis. It is also recommended that future studies employ a longer observation period to determine the duration required for the improvement of both primary and secondary lesions.

ACKNOWLEDGMENTS

The authors would like to express their gratitude to the Rector of Udayana University through the Institute for Research and Community Service (LPPM) for financial support provided by the DIPA PNBP of Udayana University for Fiscal Year 2023 under the Udayana Leading Research Grant awarded to I Nyoman Suartha, in accordance with the Research Assignment Agreement Letter No. B/1.46/UN14.4.A/PT.01.03/2023, dated May 2, 2023.

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Tables

Table 1. Lesion Scoring During the Healing Observation of Sample Dogs

Score	Primary Lesions	Secondary Lesions	Lesion distribution
0	No primary lesions observed	No secondary lesions	No lesion distribution
1	Erythema	Alopecia	Focal
2	Erythema, macule	Alopecia	Focal
3	Erythema, macule, papule,	Alopecia, scale	Focal
4	Erythema, macule, papule, pustule	Alopecia, scale	Focal
5	Erythema, macule, papule, pustule, nodule	Alopecia, scale, crust, skuama	Focal
6	Erythema, macule, papule, pustule, nodule	Alopecia, scale, crust, squama	Multifocal–locally extensive
7	Erythema, macule, papule, pustule, nodule	Alopecia, scale, crust, squama, lichenification, hyperpigmentation	Multifocal–locally extensive
8	Erythema, macule, papule, pustule, nodule	Alopecia, scale, crust, squama, ulcer, lichenification, hyperpigmentation	Multifocal–locally extensive
9	Erythema, macule, papule, pustule, nodule	Alopecia, scale, crust, squama, ulcer, lichenification, hyperpigmentation	Diffuse
10	Erythema, macule, papule, pustule, nodule	Alopecia, scale, crust, squama, ulcer, lichenification, hyperpigmentation	Diffuse

Table 2. Mean Macroscopic Lesion Scores Adapted from the Study

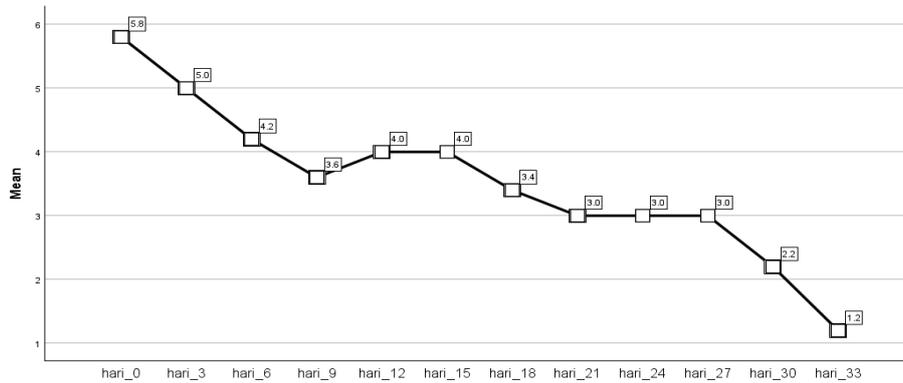
Hari	Perlakuan
0	5.80±1.095
3	5.00±2.000
6	4.20±1.789
9	3.60±1.949
12	4.00±1.871
15	4.00±2.449
18	3.40±2.074
21	3.00±1.000
24	3.00±1.414
27	3.00±1.000
30	2.20±1.483
33	1.20±1.483
Rata-rata	2.23±1.789

Table 3. Hair Growth Phase Examination of Sample Dogs

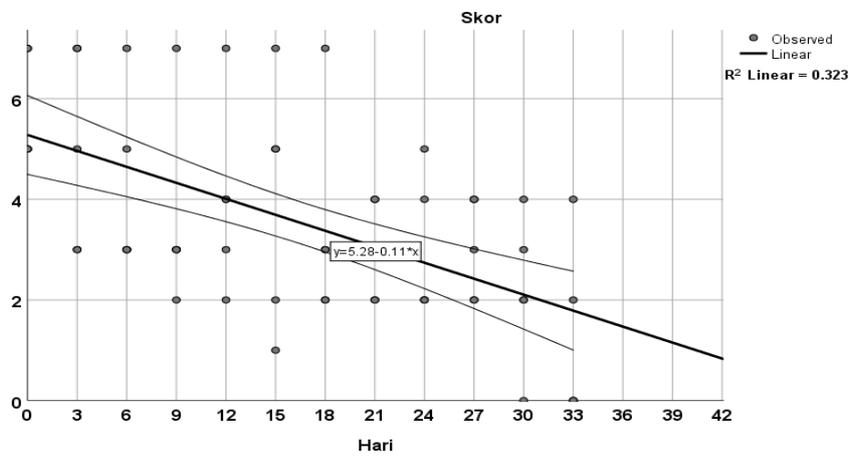
Day	Hair root	Hair Shaft	Hair Tip
18	40% anagen, 52% telogen	92% normal, 8% trauma	52% broken, 4% split ends
21	52% anagen, 32% telogen	96% normal, 4% trauma	64% broken, 4% split ends
24	56% anagen, 28% telogen	96% normal, 4% trauma	52% broken, 4% split ends
27	40% anagen, 28% telogen	100% normal	52% broken
30	60% anagen, 20% telogen	100% normal	68% broken
33	64% anagen, 28% telogen	100% normal	52% broken, 4% split ends

Notes: Trauma: partial indentation of the hair shaft caused by mechanical factors/scratching.; Broken: complete loss of a hair segment.; Split ends: longitudinal splitting of the hair shaft with varying patterns.

Graph



Graph 1. Results of the Wilcoxon test.



Graph 2. Results of the regression analysis.

Figures



Figure 1. Observation of lesions in sample dogs on day 0 and day 9. Notes: (1) Sample 1; (2) Sample 2; (3) Sample 3; (4) Sample 4; (5) Sample 5; (a) Day 0; (b) Day 9. (1a) Alopecia, erythema, macule, crust; (1b) hair regrowth, erythema, macule, papule; (2a) alopecia, erythema, macule; (2b) hair regrowth, papule, scale; (3a) alopecia, erythema, papule, scale, squama, lichenification; (3b) erythema, papule, macule, squama, scale, lichenification; (4a) alopecia, erythema, papule, crust; (4b) hair regrowth, erythema, macule; (5a) alopecia, macule, papule, squama, hyperpigmentation; (5b) hair regrowth, macule, papule.



Figure 2. Observation of lesions in sample dogs showing the presence of (A) papules and (B) pustules.

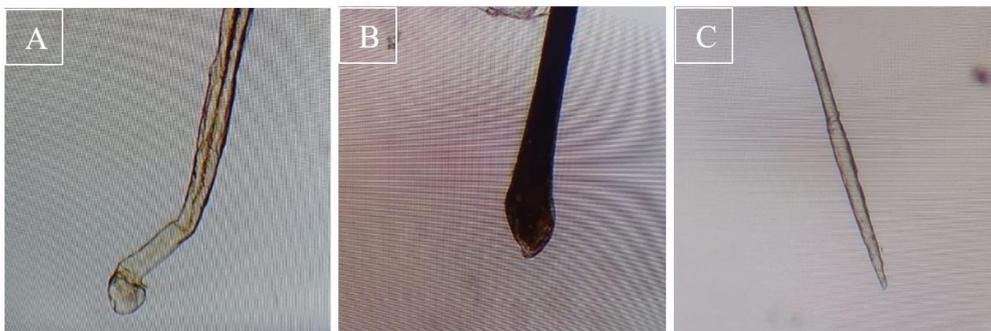


Figure 3. Observation of hair examination results in sample dogs, showing (A) anagen phase, (B) catagen phase, and (C) telogen phase (100× magnification).

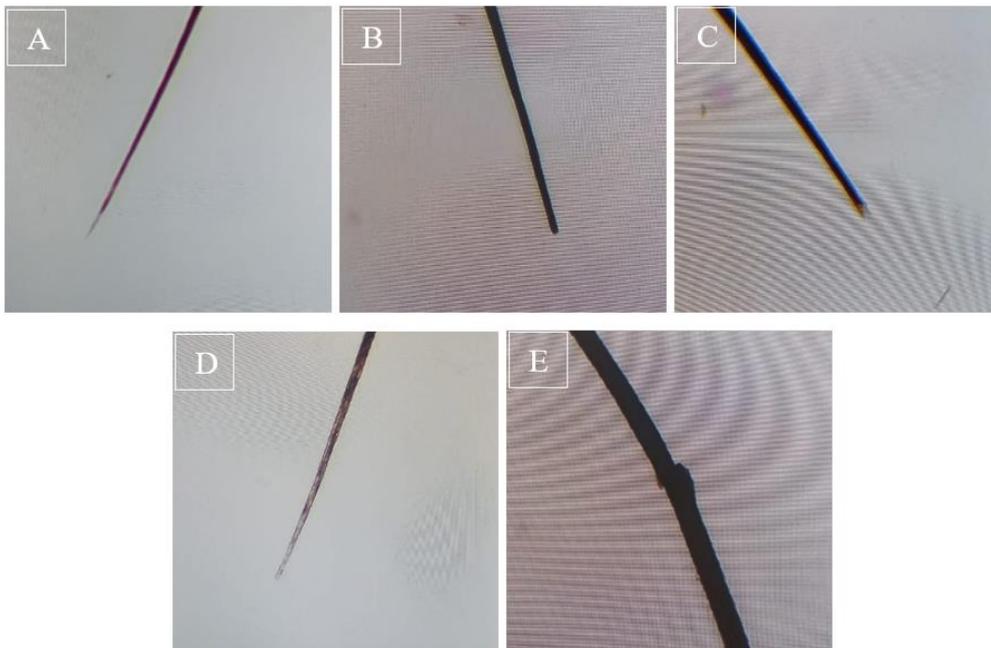


Figure 4. Results of hair sample examination in dogs, showing (A) pointed hair tip, (B) blunt hair tip, (C) trichoptilosis, (D) broken hair tip, and (E) hair shaft trauma (100× magnification).