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RESEARCH ARTICLE

# Clinicopathological evaluation of Autoimmune skin diseases in dogs

**Kothapalli Mounika[1], T. Devi[*], K. Nagarajan[2], B. Gowri[3] and S. Kavitha[4]**
[1]PG Scholar, Department of Veterinary Clinical Medicine, Madras Veterinary College, TANUVAS, Chennai- 600007
[2]Professor, Department of Veterinary Pathology, Madras Veterinary College, TANUVAS, Chennai- 600007
[3]Professor and Head, Department of Veterinary Medicine, VC&RI, Udumalpet, TANUVAS
[4]Professor and Head, Department of Veterinary Clinical Medicine, Madras Veterinary College, TANUVAS, Chennai- 600007

***Address for Correspondence**
*Dr. T. Devi, Assistant Professor, Dept. of Veterinary Public Health and Epidemiology, Madras veterinary College, Chennai -7;*
*E-mail: drdevi.t@gmail.com*

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## ABSTRACT

Autoimmune skin diseases in dogs are uncommon but clinically important disorders arising from immune-mediated injury to epidermal, vascular or melanocytic structures. The present study was undertaken to document the clinicopathological features of autoimmune skin diseases in dogs and to establish diagnostic patterns essential for accurate identification. A total of 2,811 dogs presented to the Madras Veterinary College Teaching Hospital, Chennai, were screened for a period of one year (2024-2025). Detailed diagnostic evaluation including clinical examination, dermatoscopy, cytology, haematology, serum biochemistry and histopathology was carried out in suspected cases. Twelve dogs (0.43%) were diagnosed with autoimmune skin diseases, comprising pemphigus foliaceus, pemphigus vulgaris, ear-tip vasculitis and vitiligo. Pemphigus foliaceus presented with crusts, scales and superficial erosions and subcorneal pustules in histopathology, whereas pemphigus vulgaris exhibited severe mucosal ulceration and acantholytic cells on cytology. Ear-tip vasculitis showed ischemic necrosis with fibrinoid vascular changes, while vitiligo was characterized by distinct depigmentation with loss of melanocytes. Dermatoscopic, cytological and histopathological findings supported clinical diagnosis. Haematological and biochemical alterations were mild and not clinically significant. The study highlights that comprehensive clinicopathological evaluation is essential for the early and reliable diagnosis of autoimmune dermatological disorders in dogs.

**Keywords:** Autoimmune diseases, clinicopathology, dog, pemphigus, vasculitis, vitiligo

## INTRODUCTION

Autoimmune skin diseases in dogs occur when immunological tolerance is lost, resulting in immune-mediated destruction of epidermal adhesion complexes, dermal vasculature or melanocytes. Although their overall prevalence in canine dermatology is low, these disorders often present with chronic, progressive skin lesions that mimic allergic, infectious or endocrine conditions. This diagnostic overlap contributes to delays in appropriate therapy. Pemphigus foliaceus (PF) and pemphigus vulgaris (PV) represent the major autoimmune blistering diseases in dogs, while immune-mediated vasculitis and vitiligo constitute important vascular and pigmentary autoimmune conditions. Early diagnosis requires a combination of clinical evaluation, dermatoscopy, cytology and histopathology. Detailed documentation of clinicopathological characteristics is particularly important in Indian veterinary settings, where published reports remain limited. The present study was conducted to establish the clinical and pathological features of autoimmune skin diseases observed in dogs presented to a tertiary referral center.

## MATERIALS AND METHODS

The study involved dogs presented to the Small Animal Dermatology Outpatient Unit of the Madras Veterinary College Teaching Hospital (Chennai, India) for a period of one year (2024-2025). All the enrolled dogs underwent a routine and thorough dermatological examination, including detailed anamnesis, assessment of lesion distribution, and characterization of primary and secondary skin lesions. Dogs exhibiting chronic, recurrent, or therapy-resistant lesions clinically suggestive of an underlying autoimmune etiology were selected for further diagnostic evaluation. Prior to definitive diagnosis, common infectious and parasitic causes of skin disease were rigorously excluded using standard diagnostic methods[2,3].

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Skin scrapings (deep and superficial) were collected and examined microscopically in potassium hydroxide (KOH) solution (10%) or mineral oil to exclude ectoparasites such as Demodex spp. and Sarcoptes spp[5] . Culture (aerobic bacterial culture and fungal culture, e.g., Dermatophyte Test Medium - DTM) was performed on samples from affected areas to rule out bacterial pyoderma and dermatophytosis[8]. The presence of Malassezia pachydermatis was assessed using tape cytology[5,6].

Dermatoscopic examination was performed on all selected lesions using a handheld digital dermatoscope (DermLite DL4) to document surface changes, including vascular patterns, scale, crusts, and follicular openings. This served visually to guide biopsy selection and document gross morphology[1]. Cytological samples were collected from lesions (e.g., vesicles, bullae, erosions, or pustules) for rapid assessment of the cellular profile. Direct Impression Smears were used for ulcerated or moist lesions. Tape Preparations (Acetate Tape Strips) applied directly to skin surfaces to lift debris and cells, primarily for evaluation of superficial inflammation and the presence of Malassezia or acantholytic cells[2,3,6,].

All cytological smears were stained using a Romanowsky-type stain (Diff-Quik) and examined under light microscopy to identify cellular patterns, inflammatory cell types (neutrophils, eosinophils, macrophages), and the presence of infectious agents or acantholytic cells (diagnostic for Pemphigus complex)[13,11]. Routine haematological and biochemical analyses were performed on venous blood samples collected from all dogs. Analyses were carried out using standard automated methods (e.g., automated cell counter for Complete Blood Count - CBC; automated chemistry analyzer for serum biochemistry profile)[14]. To assess systemic health, detect concurrent diseases, and identify hematological changes often associated with chronic inflammation or specific autoimmune diseases (e.g., non-regenerative anemia, leukocytosis, or alterations in globulin levels).

Skin biopsies were collected as the definitive diagnostic procedure. Representative biopsies (minimum of 3 samples per dog) were collected from active, untreated lesions (e.g., an intact blister, crust, or margin of an ulcer) under aseptic conditions using a 4-6 mm punch biopsy tool following local anesthesia (e.g., 2% Lidocaine)[6,7]. Specimens were immediately placed into 10% neutral buffered formalin (NBF) at a ratio of approximately 10:1 (formalin:tissue volume) for a minimum of 24 hours. The fixed tissues were then routinely processed (dehydrated in graded alcohol, cleared in xylene, and embedded in paraffin wax). Sections of 4-5μ thickness were cut using a rotary microtome, mounted on glass slides, and stained with Hematoxylin and Eosin (H & E) stain[7].

The final diagnosis of autoimmune skin disease (e.g., Pemphigus Foliaceus, Systemic Lupus Erythematosus etc.) was established by correlating three essential elements *viz.*, Specific distribution and morphology of lesions (e.g., bilateral symmetry, mucocutaneous involvement). Demonstration of relevant cells, such as acantholytic cells for Pemphigus, and identification of characteristic histopathological changes such as acantholysis (for Pemphigus) or interface dermatitis, ensuring that all infectious and parasitic etiologies had been excluded[1,2,3].

## RESULTS

A total of 2,811 dogs were screened during the study period of one year which twelve dogs (0.43%) were confirmed to have autoimmune skin diseases. Pemphigus vulgaris accounted for 41.66% (5/12) of cases, followed by pemphigus foliaceus accounting 33.33% (4/12), ear-tip vasculitis accounting 16.66% (2/12) and vitiligo accounting 8.33% (1/12). Dogs aged four to six years were most commonly affected, and males and females were equally represented. Clinically, pemphigus foliaceus presented with crusting, scaling and superficial erosions involving the face, ears and distal extremities (Fig 1). Dogs affected with pemphigus vulgaris exhibited deep mucocutaneous involvement with painful oral ulcers and gingival bleeding, with a positive Nikolsky sign indicating loss of intercellular adhesion within the epidermis. Ear-tip vasculitis was characterized by sharply demarcated ischemic necrosis and ulcerated margins of the ear tip (Table 1 and 2) (Fig 1). Across the 12 cases, autoimmune skin diseases in dogs predominantly exhibited mild to moderate severity with isolated instances of severe and extensive involvement. PF and PV were the most frequently encountered diseases.

**Table 1.** Clinical signs in Autoimmune skin diseases

| **Autoimmune Skin Diseases** | **Clinical Signs (with Percentage)** |
|---|---|
| Pemphigus Foliaceus | Pustules (25%), Erosions (50%), Crusts and Scales (75%) |
| Pemphigus Vulgaris | Oral Ulcers (80.0%), Erythematous scabs (20%), Gums Bleeding (60%) |
| Ear tip Vasculitis | Necrosed Ear Tip (50%), Debrided Wound (50%) |
| Vitiligo | Depigmentation (100.0%) |

**Table 2.** Severity score index

| Disease | No. of Cases | Score Range (Min–Max) | Severity Grade |
|---|---|---|---|
| Pemphigus foliaceus (PDAI) | 4 | 5 – 26 | Mild to Moderate–Severe |
| Pemphigus vulgaris (ODSS-PDAI) | 5 | 15 – >48.5 | Mild to Moderate–Severe |
| Ear tip vasculitis (Vasculitis severity score) | 2 | 5/20-14/20 | Mild to Severe |
| Vitiligo (VASI) | 1 | 6.75 | Moderate |


**Fig.1. Clinical signs of Autoimmune skin diseases in dogs. (a)** Skin and paw pad area - Erythema, ulceration, and deep ecchymoses into the subcutaneous tissue and paw margins; **(b)** Erosive and Ulcerative Nasal/Periocular Dermatitis - Markedly erythematous, swollen, eroded and ulcerated nasal planum; **(c)** Face - Erythema, crusting, erosion and ulceration on the Nasal planum, periocular and muzzle regions, and distal limb paw in Pemphigus foliaceus; **(d)** Severe necrotic, erosive and hemorrhagic crust on pinna – necrotic ear tip and debraded wound in ear tip - vasculitis; **(e)** Oral Cavity-Erythematous scab (arrow) and depigmentation over the lip lining and buccal mucosa - Pemphigus vulgaris; **(f)** Periorbital dermatitis - marked depigmentation, erythema and ulcerative cheilitis; **(g)** Crusting and Erosions around periocular area in a pemphigus foliaceus dog; **(h)** Paw - black and hyperkeratotic, with noticeable fine white scales/crusts, Pododermatitis - Pustules (arrow) on paw; **(i)** Severe gingivitis/mucositis - intensely erythematous and swollen mucosal surface with highly inflamed and small, bleeding spots or erosions.

Dermatoscopy revealed disease-specific patterns including erythematous backgrounds, ruptured pustules, white and yellow crusts, hemorrhagic dots, pigment loss and necrotic cores. Cytology demonstrated numerous acantholytic keratinocytes and non-degenerated neutrophils in pemphigus complex (Fig.3), degenerated neutrophils with erythrocyte extravasation in vasculitis, and melanin-laden keratinocytes without inflammation in vitiligo. Histopathology confirmed classical lesions: sub corneal pustules and acantholysis in PF, fibrinoid necrosis with perivascular inflammation in vasculitis, and melanocyte loss with pigmentary incontinence in vitiligo. Moderate neutrophilia and lymphocytosis. These alterations were within physiological limits and are consistent with inflammatory changes commonly reported in autoimmune skin diseases (Fig.2). Serum biochemistry remained largely stable, with occasional mild increases in total protein and ALT, suggesting limited systemic involvement.

The diagnosis of pemphigus foliaceus was established through the combined evaluation of cytology and confirmatory histopathology. Pemphigus vulgaris was primarily diagnosed based on the characteristic lesion distribution, further supported

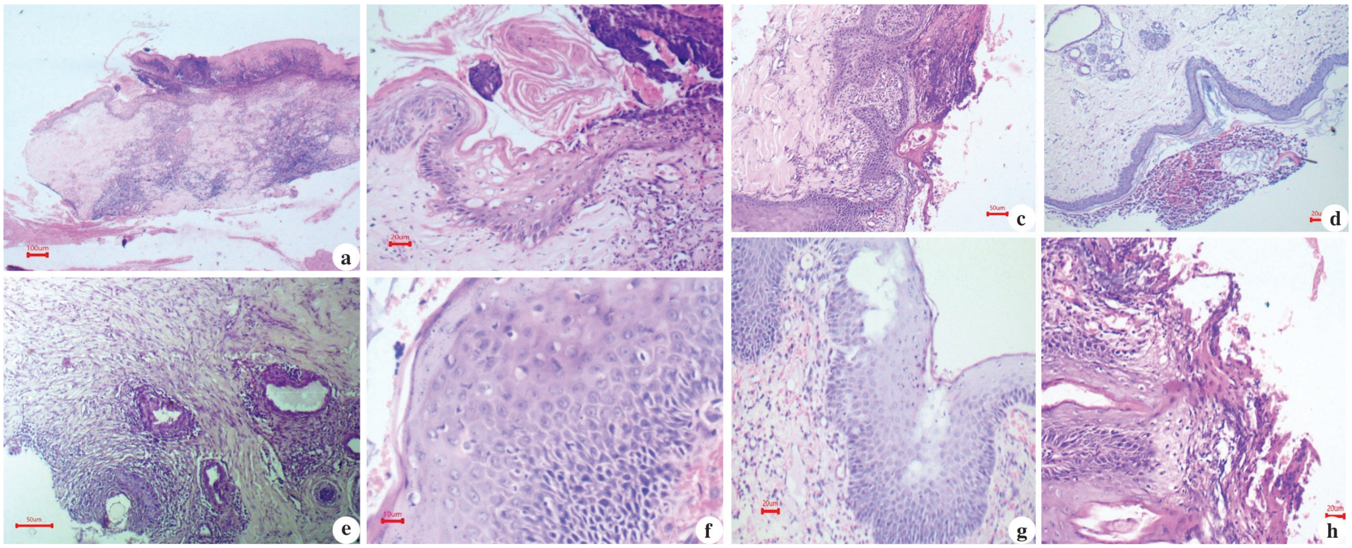

**Figure 2. Histopathology of Autoimmune skin diseases. (a**) Skin- Histopathology (HP)-Pemphigus foliaceus -Hyperkeratosis (Arrow) of stratum corneum and Granuloma formation in dermis H&E, 40x; **(b**) Skin – HP - Pemphigus foliaceus Pemphigus foliaceus –Lhasaapso-Hemorrhages(Arrow); Edema and ballooning degeneration of the dermis H&E, 200x; **(c**) Skin- HP- Pemphigus foliaceus- –Rajapalayam - Erosion and MNC infiltration H&E, 100x; **(d**) Skin- HP- Eartip Vasculitis - Ear tip vasculitis- ND-Granuloma formation with multinucleated gaint cells H&E,200x; **(e**) Skin- HP-Vitiligo-Lab- Vitiligo-Lab-Fibroblast proliferation and fibrosis H&E,100x; (**f**) Skin- HP-Pemphigus foliaceus – Beagle-Vacuolar degeneration(Arrow) of stratum spinosum and cell edema H&E,400x; (**g**) Skin- HP-Pemphigus foliaceus - Beagle- Cell edema, plasma cells, Mononuclear infiltration (MNC) infiltration, acantholysis,sub corneal pustule H&E, 100x; (**h**) Skin – HP- Pemphigus foliaceus - Beagle – Desquamation- Erosion with MNC Infiltration, H&E, 100X

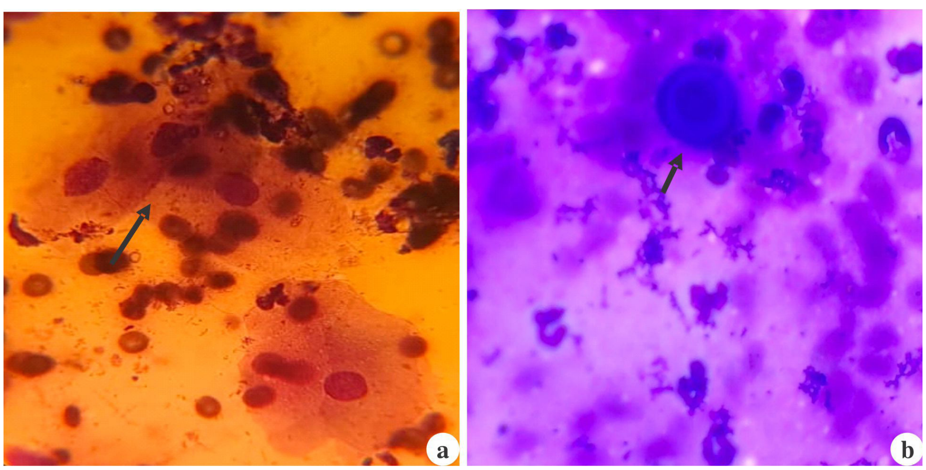

**Fig. 3. Cytology showing Acantholytic cells. (a)** Skin – Direct impression cytology - Acantholytic cells (Arrows) with non degenerative neutrophils Diff quik stain, 200x; (**b**) Skin – Direct impression cytology - Acantholytic cell (Arrow) along with neutrophils Diff quik stain, 1000x

by cytological identification of non-degenerate neutrophils and acantholytic keratinocytes (Fig.3). Vitiligo and ear-tip vasculitis were diagnosed on the basis of their distinct clinical presentation and lesion localization, with histopathological findings providing definitive confirmation.

## DISCUSSION

Autoimmune skin diseases in dogs arise from immune dysregulation in which autoantibodies target desmosomes, melanocytes or dermal vessels, leading to blistering disorders, depigmentation or vasculitis[4,8,10,13]. In this study, the clinicopathological patterns closely resembled classical descriptions of canine autoimmune dermatoses, with chronic, relapsing lesions and poor response to empirical antibiotics supporting an immune-mediated aetiology[2,5,8,11]. Pemphigus foliaceus exhibited characteristic crusts, scales and erosions, with dermatoscopic yellow-white crusts and inflamed surfaces reflecting subcorneal pustules and acantholysis[10]. Pemphigus vulgaris presented with deep mucocutaneous ulceration, gingival bleeding and Nikolsky positivity, consistent with suprabasal clefting and severe epithelial disruption[10,13]. Ear-tip vasculitis showed ischemic necrosis and purpuric lesions, and dermatoscopy demonstrated hemorrhagic dots and vascular injury patterns typical of immune-complex vasculopathies[1,4]. Vitiligo cases revealed sharply marginated depigmented patches with dermatoscopic loss of pigment network and perifollicular changes indicative of melanocyte destruction[1]. Cytology further supported these diagnoses by demonstrating acantholytic keratinocytes in pemphigus and degenerated neutrophils with erythrocyte extravasation in vasculitis[4,11]. Histopathology confirmed hallmark features including subcorneal pustules and acantholysis in PF, fibrinoid necrosis in vasculitis and melanocyte loss with pigmentary incontinence in vitiligo[12]. Overall, the integration of clinical lesions, dermatoscopy, cytology and histopathology provided a strong diagnostic framework consistent with established immunopathological mechanisms reported in veterinary dermatology[8,10,13]. Haematology showed mild inflammatory changes, notably neutrophilia and lymphocytosis, while serum biochemistry remained largely within normal limits except for increased total protein due to chronic inflammation[8,14]. Collectively, the clinical, dermatoscopic, cytological and histopathological features observed strongly align with classical immune-mediated mechanisms described in veterinary dermatology and confirm their diagnostic value in autoimmune skin diseases of dogs.

## CONCLUSION

The present study confirms that autoimmune skin diseases in dogs although uncommon exhibit distinct clinicopathological characteristics that permit reliable diagnosis. Pemphigus foliaceus and pemphigus vulgaris were the predominant autoimmune dermatoses encountered, followed by immune-mediated vasculitis and vitiligo. Dermatoscopy, cytology and histopathology played key roles in differentiating among disease categories, while haematology and biochemistry provided supportive information. The findings highlights the importance of comprehensive clinicopathological evaluation for early diagnosis and successful clinical management of autoimmune dermatological disorders in dogs.

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