

# DERMATOPATHOLOGY INFLAMMATORY PATTERNS

Rob Foster

[rfoster@uoguelph.ca](mailto:rfoster@uoguelph.ca)

[VetReproPath.com](http://VetReproPath.com)

UNIVERSITY  
of GUELPH

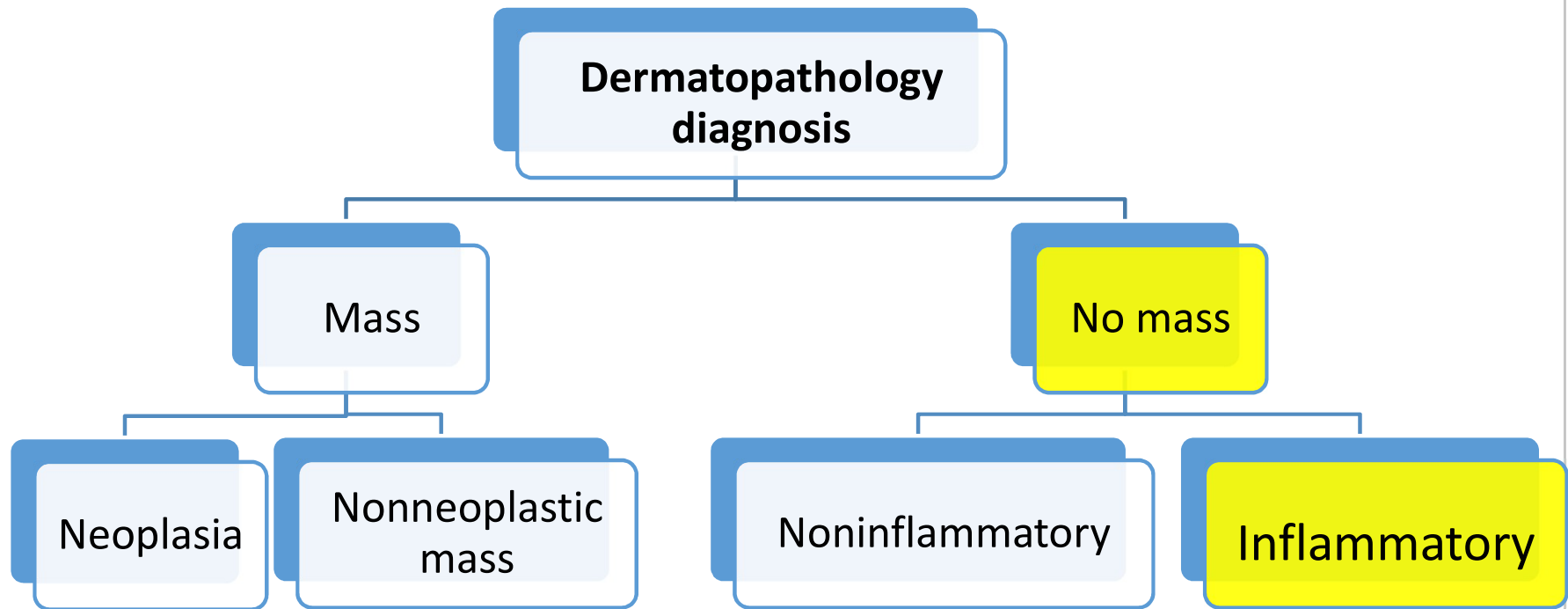
ONTARIO  
VETERINARY COLLEGE

DEPARTMENT OF PATHOBIOLOGY

## DERMATOLOGY - DERMATOPATHOLOGY

- Bewildering number of diseases.
- Incredible complexity.
- Pathogenetic pathways are legion.
  
- “It is a fact and a clinical conundrum that very different diseases can present with a similar clinical appearance.....” Ward J. Vet Dermatol 2014 25: 273-274
  
- ***Dermatology*** is based on breed, clinical distribution and lesion
- ***Dermatopathology*** uses a reductionalistic approach and is based on pathogenesis and ‘target’.

# DERMATOPATHOLOGY - GENERAL SCHEME



## DISEASES THAT ARE NOT MASSES

- **Noninflammatory diseases**
  - Follicle cycle (alopecia) disorders
    - eg seasonal cyclic alopecia
  - Collagen disorders
    - eg fibrosis, collagen dysplasias
  - Keratinisation disorders
    - eg Parakeratosis, Hyperkeratosis
- **Inflammatory diseases (Dermatitis plus)**
  - Pathogenesis based - Pattern Analysis System
    - 8 basic patterns
    - Common language
  - Danny Scott and Julie Yager adapted Ackerman's approach

# DERMATITIS: INFLAMMATION IN GENERAL

- **Fluidic (vascular) phase**

- The presence of fluid in an area of inflammation is based on:
  - Vascular and inflammatory mediators resulting in edema.
    - Vasoactive amines (histamine, serotonin, 5HO tryptamine).
    - Arachidonic acid metabolites – prostaglandin and leukotrienes.
    - Toll like receptor (innate) – Interleukin 1 receptor (adaptive) link
  - Vascular damage resulting in exudation of high protein fluid like fibrin.
    - Usually exotoxin or severe endotoxin.

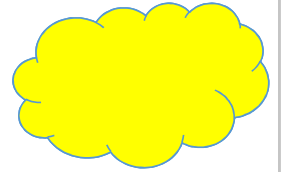
- **Cellular phase**

- The presence of cells in an area of inflammation is based on
  - Leukocyte emigration
    - Granulocytes emigrate based on intercellular adhesion molecules (ICAMs) and chemotaxis.
    - Lymphocytes migrate on intercellular adhesion molecules (ICAMs)
  - Local proliferation
    - Innate immune cells – histiocytic dendritic cells
    - Adaptive immune cells - lymphocytes

# DERMATITIS: TYPES OF INFLAMMATION

- Cell poor – fluidic (vascular dominates)
  - Erythroderma (vascular dilation), wheals (urticarial reaction)
- Neutrophilic
  - Bacteria, necrosis sometimes, Complement (C) 3a and C5a
- Eosinophilic
  - Eosinophil chemotactic factor, histamine, mast cell granules, some T-cells
- Lymphocytic
  - Antigen recognition – innate and especially adaptive immune response
- Plasmacytic
  - Adaptive B cell response – antibody production
- Histiocytic/dendritic cells
  - Antigen presenting cells and career macrophages
- Granulomatous
  - Foreign body and adaptive immune response
- Pyogranulomatous
  - Mixture of neutrophilic and histiocytic and/or granulomatous

# NORMAL SKIN



Julie Yager and  
YagerBest Histovet

# 1. PERIVASCULAR DERMATITIS (PVD)

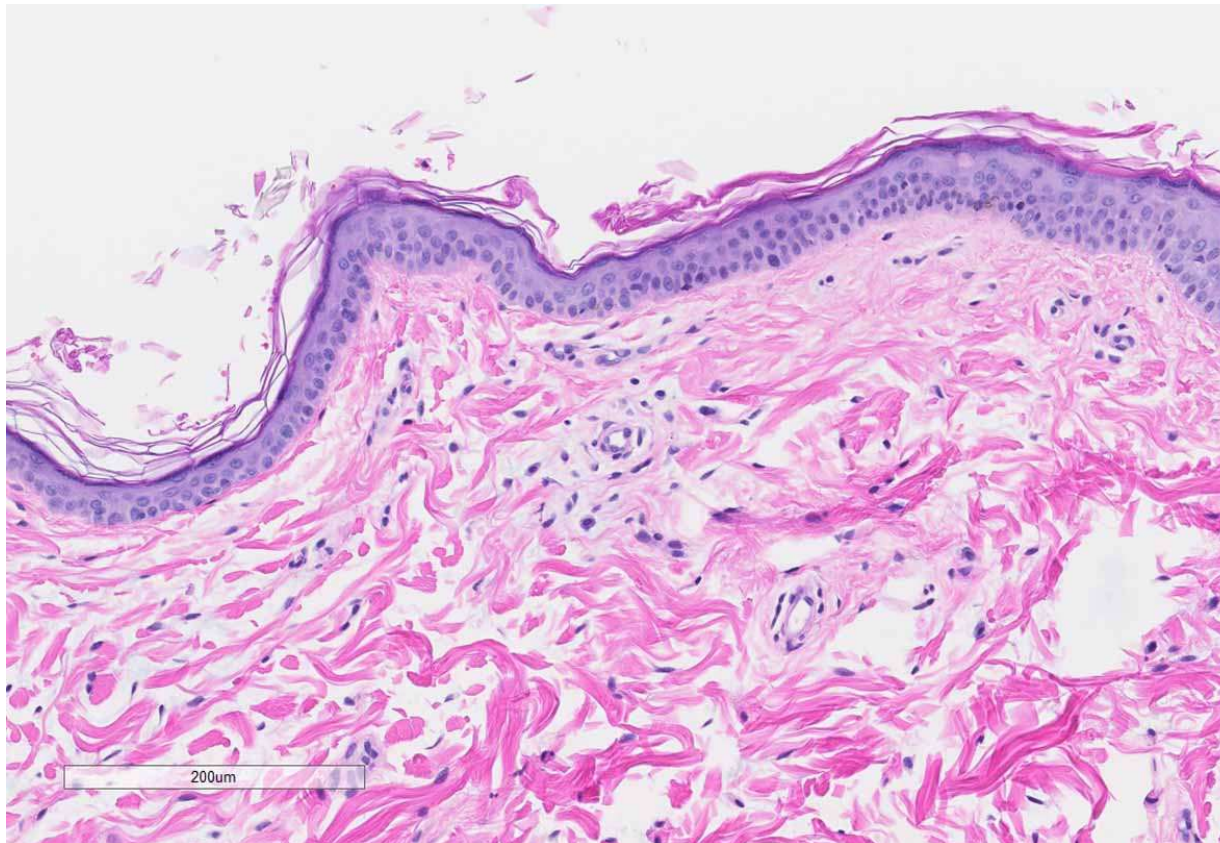
- Definition:
  - Stereotypical inflammatory reaction of skin
  - Inflammation where components are attracted to dermis or epidermis, affecting blood vessels (capillaries and post capillary venules) – which are the conduit for inflammation.
- Subtypes
  - Epidermis – hyperplastic or not
  - Dermis – superficial and or deep; see Inflammation in General
- Cause
  - Infectious (myriad)
  - Immunologic (Type 1 and IV hypersensitivity)
- Pathogenesis
  - Least specific
  - See Inflammation in General
- Lesions
  - What is expected in dermal inflammation



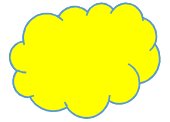
# PERIVASCULAR DERMATITIS PATTERN



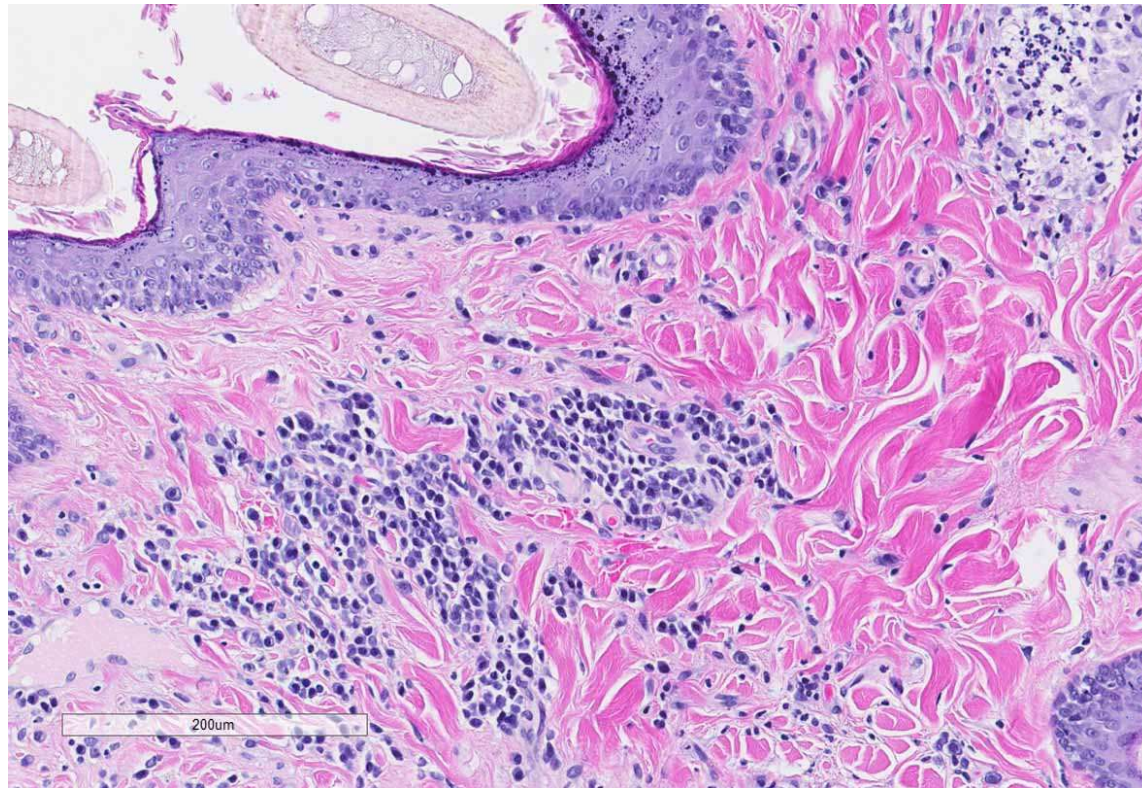
Superficial  
Cell Poor  
PVD  
Canine.  
Atopy



# PERIVASCULAR DERMATITIS PATTERN



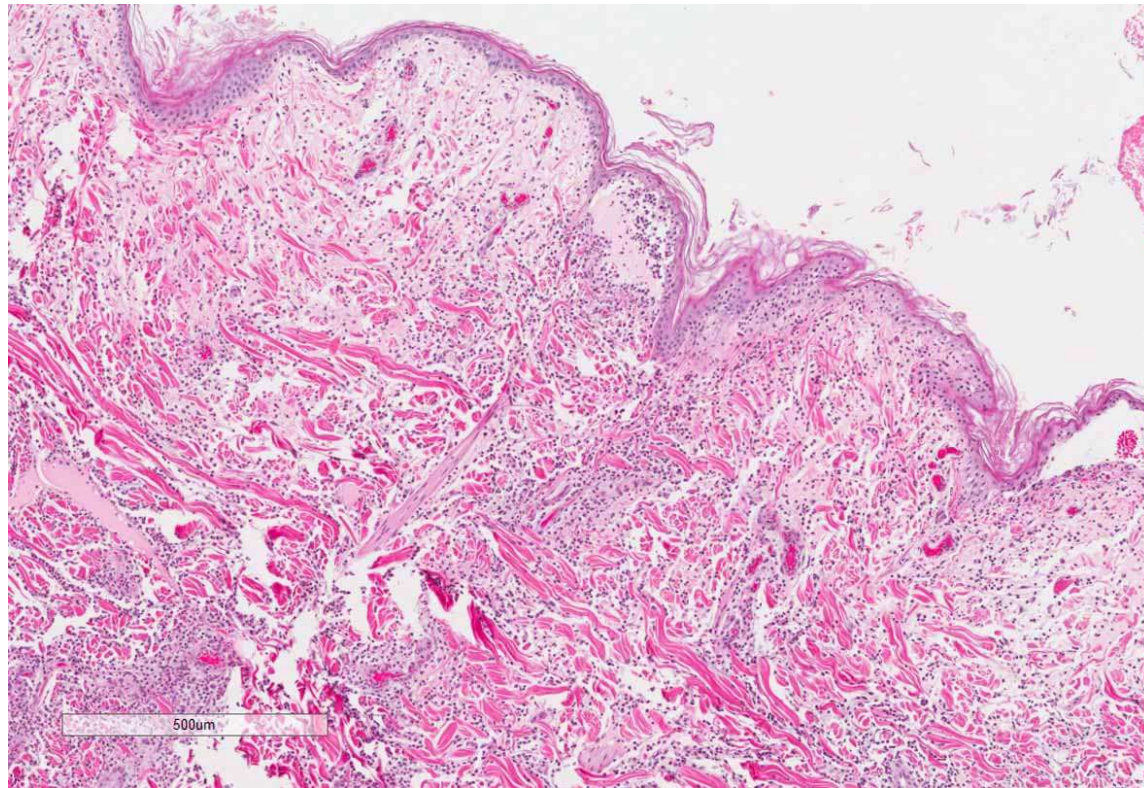
Superficial  
Plasma cell rich  
hyperplastic PVD  
Canine.  
Chronic pyoderma



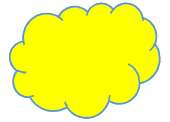
# PERIVASCULAR DERMATITIS PATTERN



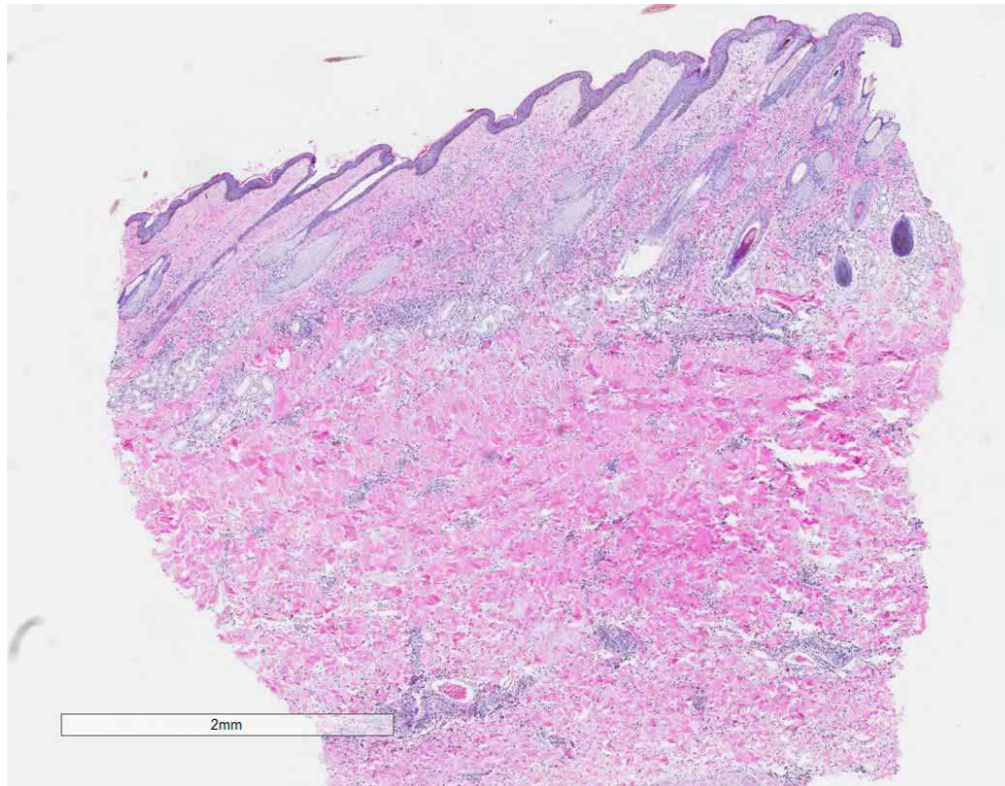
Superficial and  
Deep Severe  
Eosinophilic PVD.  
Canine.  
Canine eosinophilic  
dermatitis (Wells  
like syndrome)



# PERIVASCULAR DERMATITIS PATTERN



Superficial and  
deep  
Eosinophilic  
PVD.  
Equine.  
Hypersensitivity  
skin disease



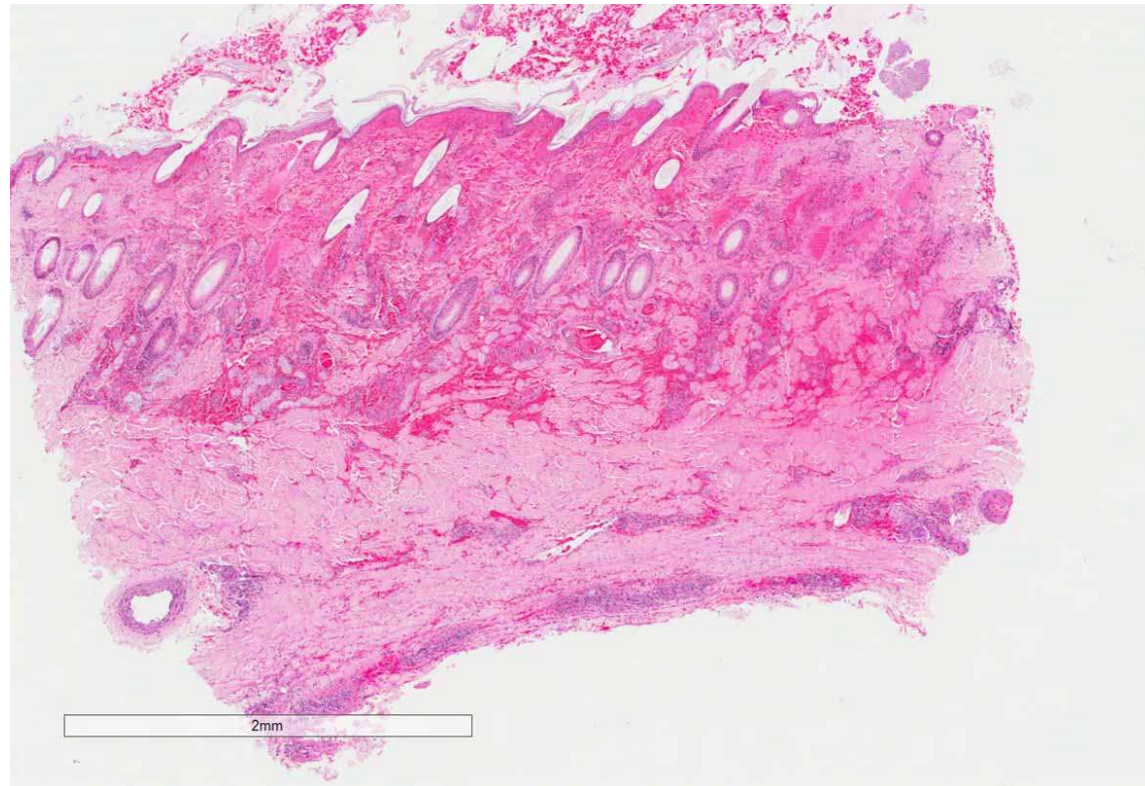
## 2. VASCULITIS

- Definition:
  - Inflammation targeting blood vessels, usually large, medium or small arteries/arterioles
- Subtypes
  - Small vessel, medium vessel and large vessel vasculitis
- Cause
  - Infectious (sepsis, RMSF, Ehrlichia)
  - Immunologic (Type III hypersensitivity reaction)
- Pathogenesis
  - Infectious
  - Immunologic
- Lesions
  - Dermal ischemia or infarcts – paws, ears, nose, anywhere

# VASCULITIS PATTERN



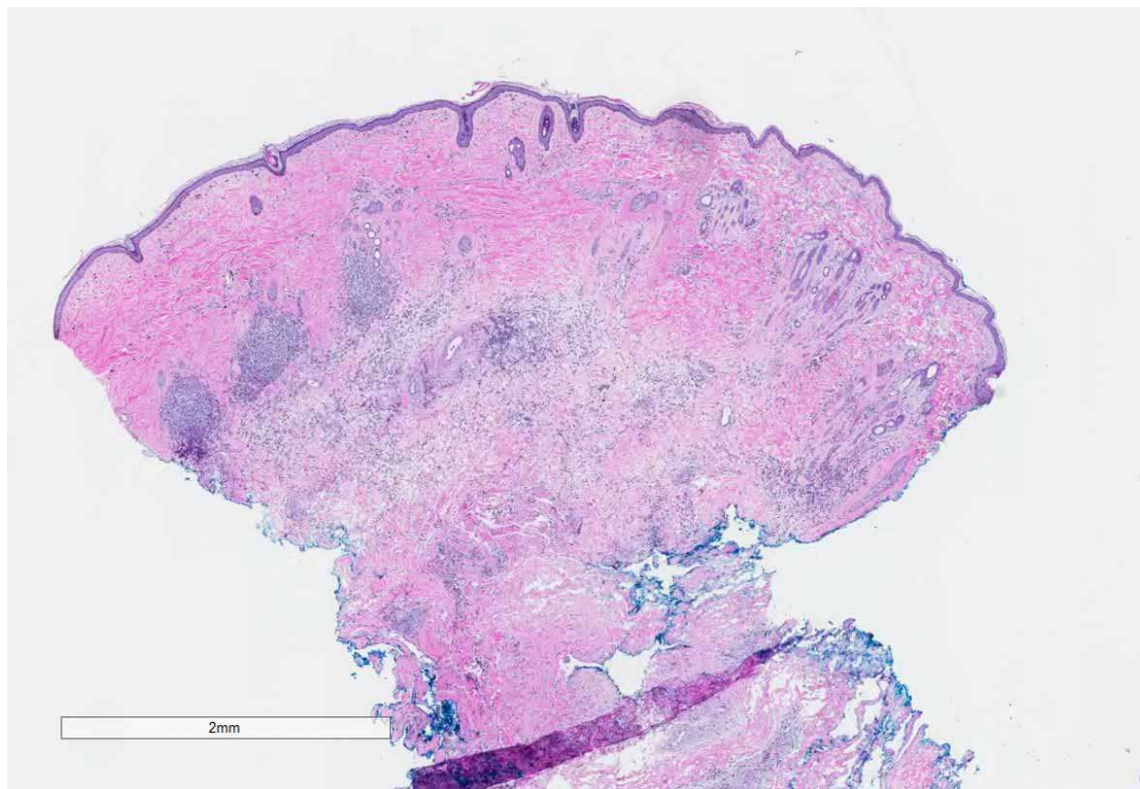
Fibrinoid vasculitis with  
infarct.  
Equine.  
Purpura hemorrhagica  
S. equi



# VASCULITIS PATTERN



Vasculitis /  
vasculopathy  
with ischemia.  
Canine.  
Vaccine induced



## 3. PANNICULITIS

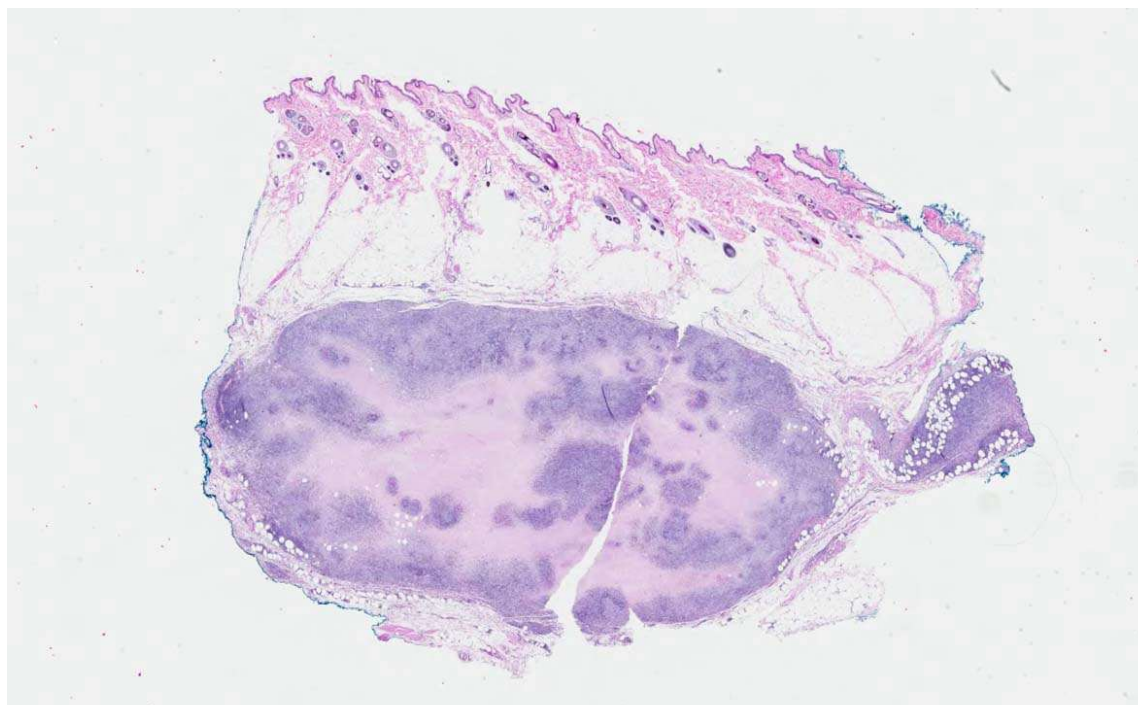
- Definition:
  - Inflammation targeting subcutaneous fat
- Subtypes
  - Interstitial
  - Septal
- Cause
  - Infectious (*Mycobacterium fortuitum*)
  - Immunologic (Type III hypersensitivity reaction)
- Pathogenesis
  - Infectious
  - Immunologic
  - Pancreatitis associated
- Lesions
  - Septal panniculitis – sepsis, sterile
  - Interstitial panniculitis – Inguinal panniculitis,



# PANNICULITIS PATTERN



Nodular  
Panniculitis.  
Canine.  
Vaccine reaction

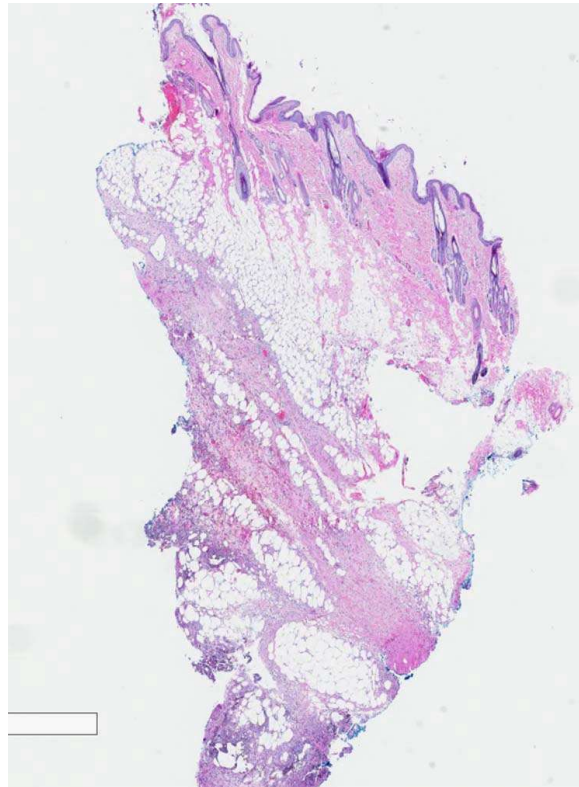


4mm

# PANNICULITIS PATTERN



Neutrophilic septal  
panniculitis.  
Canine.  
Necrotizing fasciitis



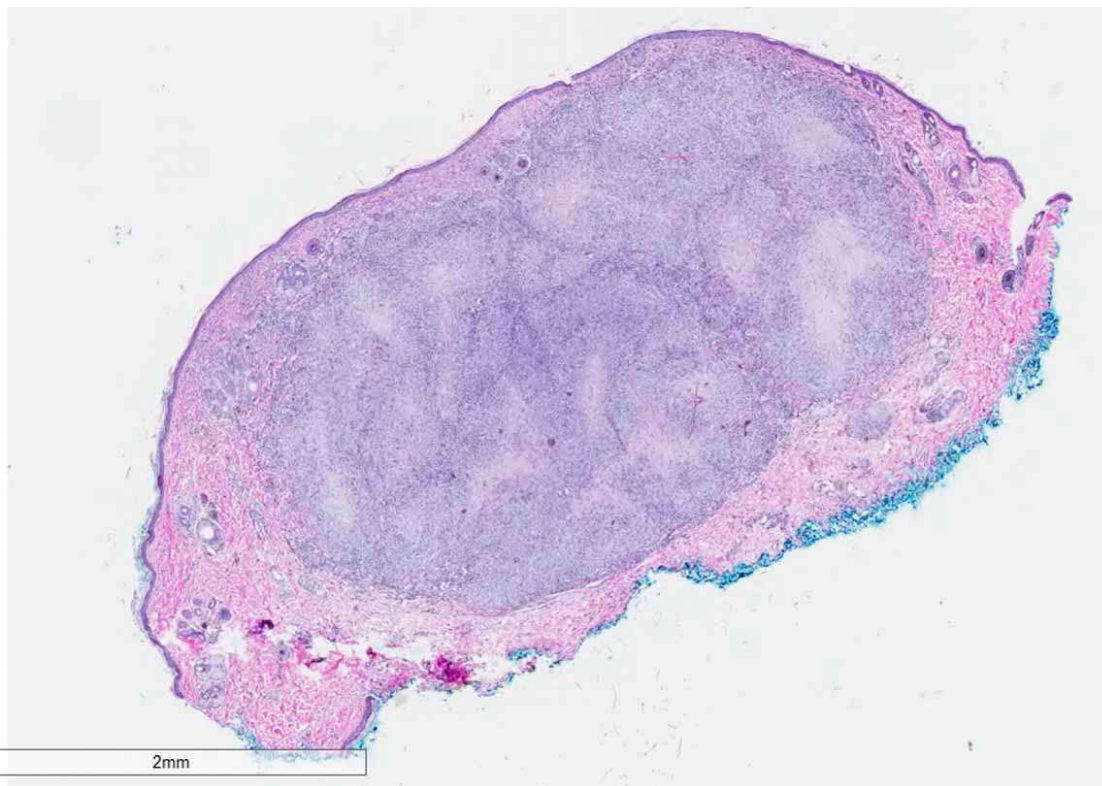
## 4. NODULAR TO DIFFUSE DERMATITIS

- Definition:
  - Inflammation of the dermis that is either in nodules or plaques, or extreme PVD
- Subtypes
  - See Inflammation in General
- Cause
  - Infectious (bacteria, fungi, protozoa)
  - Immunologic (Type IV hypersensitivity)
- Pathogenesis
  - Infectious
  - Immunologic
- Lesions
  - Wheals to nodules, single or multiple, or affecting whole areas.

# NODULAR – DIFFUSE PATTERN



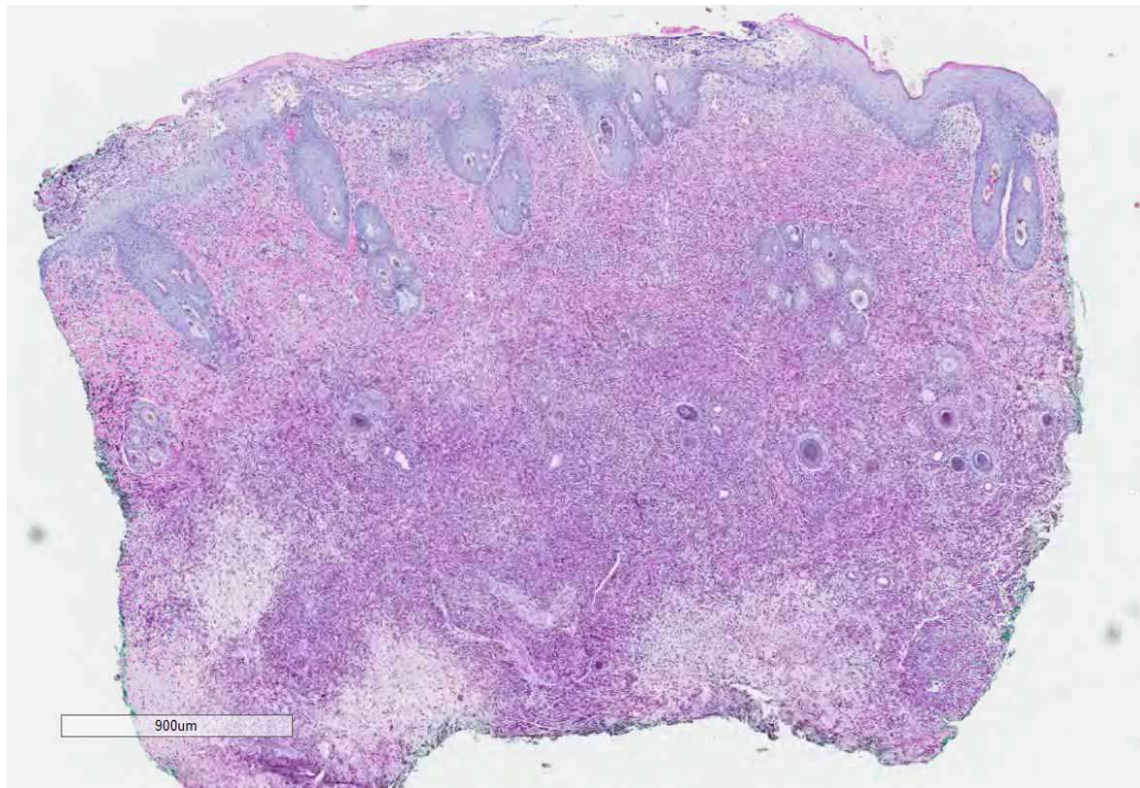
Nodular Dermatitis.  
Feline.  
Xanthoma.



# NODULAR – DIFFUSE PATTERN



Diffuse  
Dermatitis.  
Feline.  
Feline eosinophilic  
skin disease.



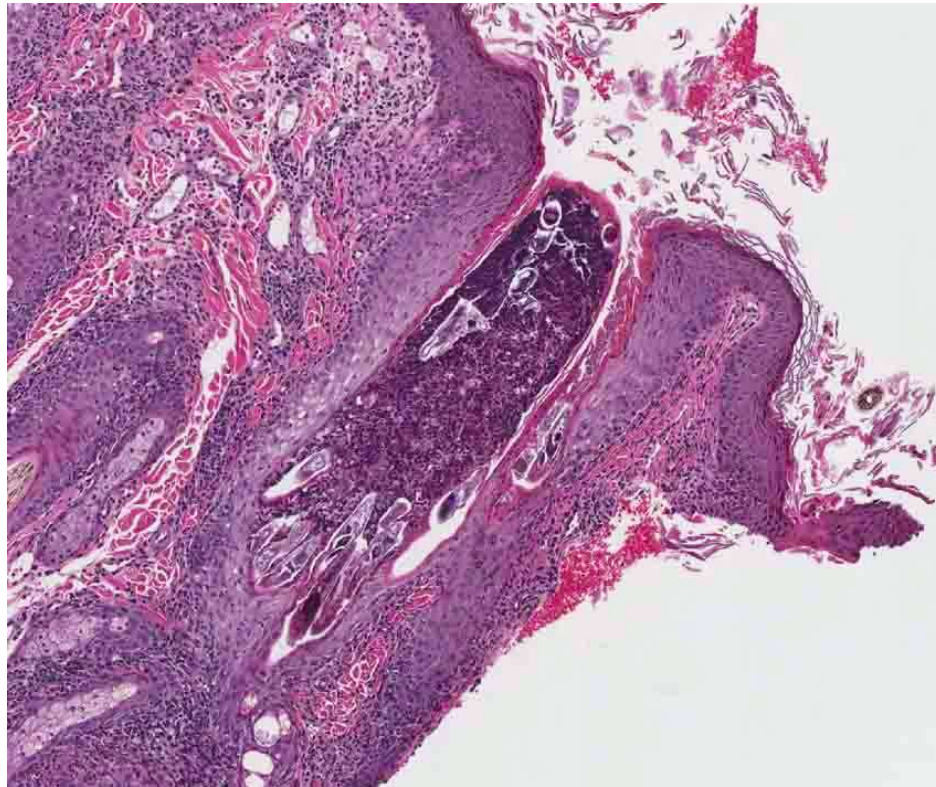
## 5. FOLLICULITIS, FURUNCULOSIS, SEBACEOUS ADENITIS

- Folliculitis
  - Luminal folliculitis
  - Mural folliculitis
    - Cytotoxic/Interface
    - Infiltrative
- Furunculosis
  - Luminal folliculitis gone extreme!
- Sebaceous adenitis
  - Direct targeting of sebaceous glands
  - Active
  - Endstage



## FOLLICULITIS – FURUNCULOSIS PATTERN

Luminal Folliculitis.  
Canine.  
Pustular demodicosis.

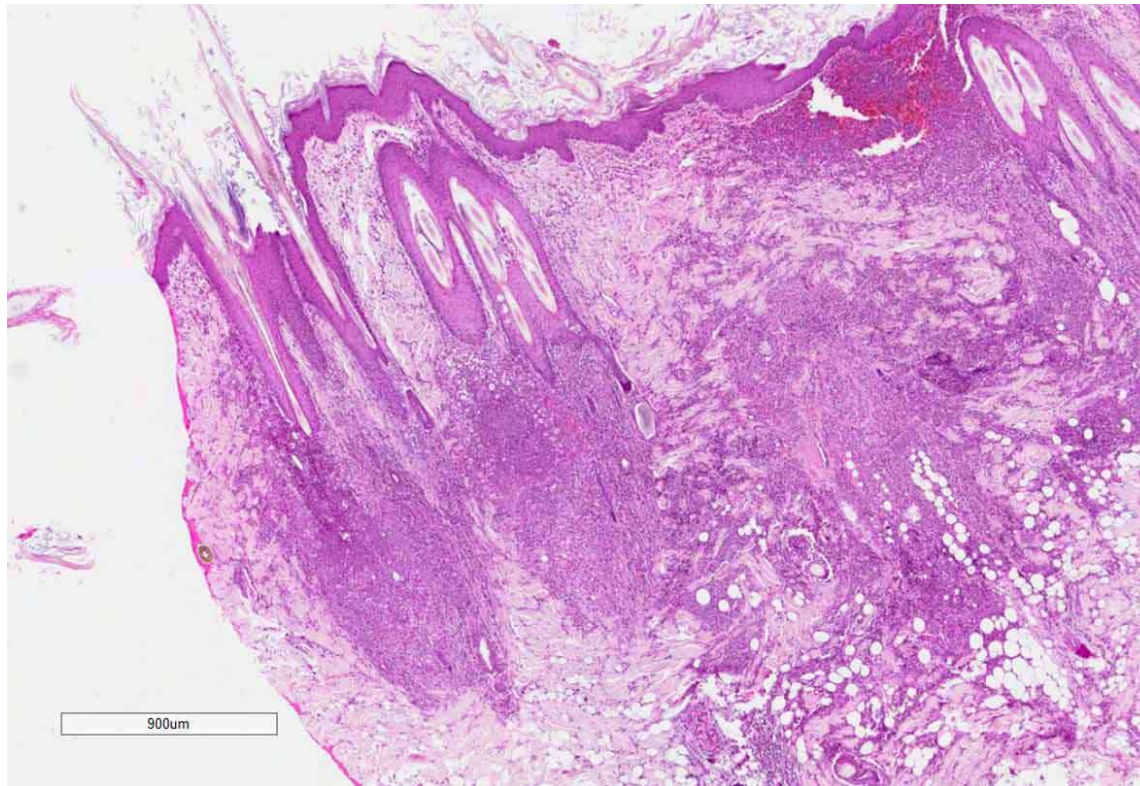


Julie Yager and  
YagerBest Histovet

## FOLLICULITIS – FURUNCULOSIS PATTERN



Neutrophilic  
Furunculosis.  
Canine.  
Dermatophytosis



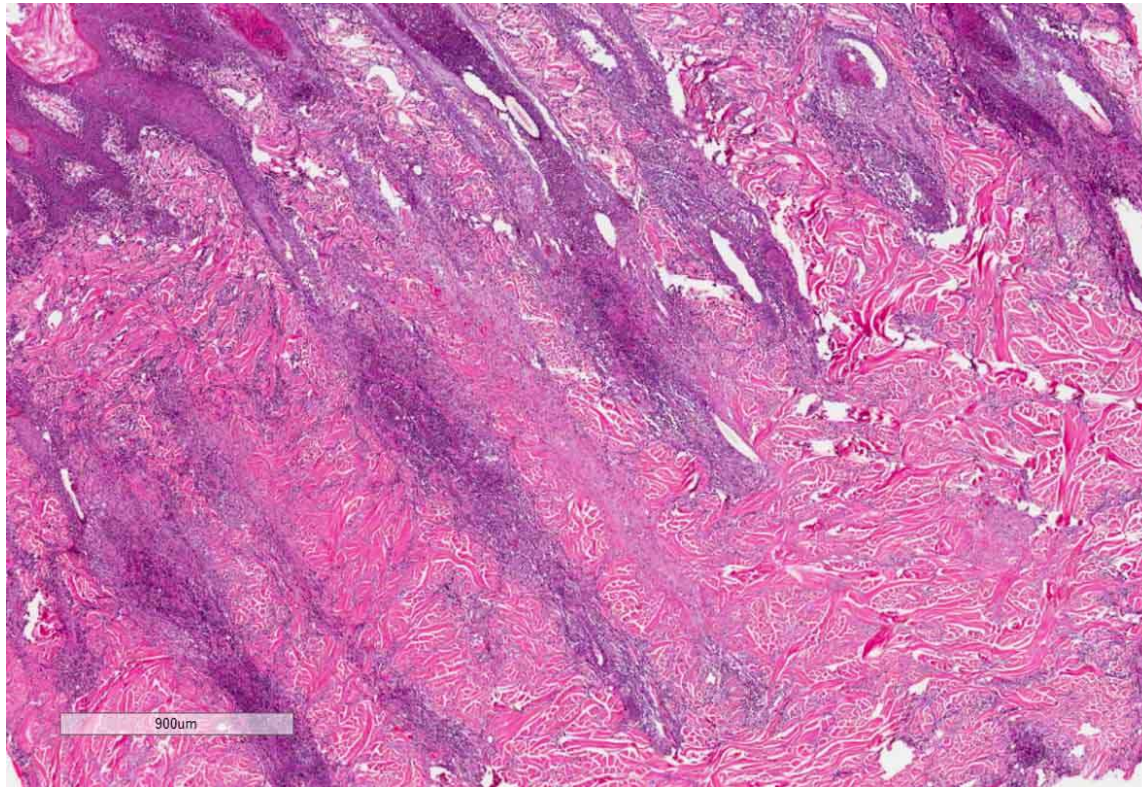
Julie Yager and  
YagerBest Histovet





## FOLLICULITIS – FURUNCULOSIS PATTERN

Mural Folliculitis.  
Canine.  
Cytotoxic/  
Necrotic

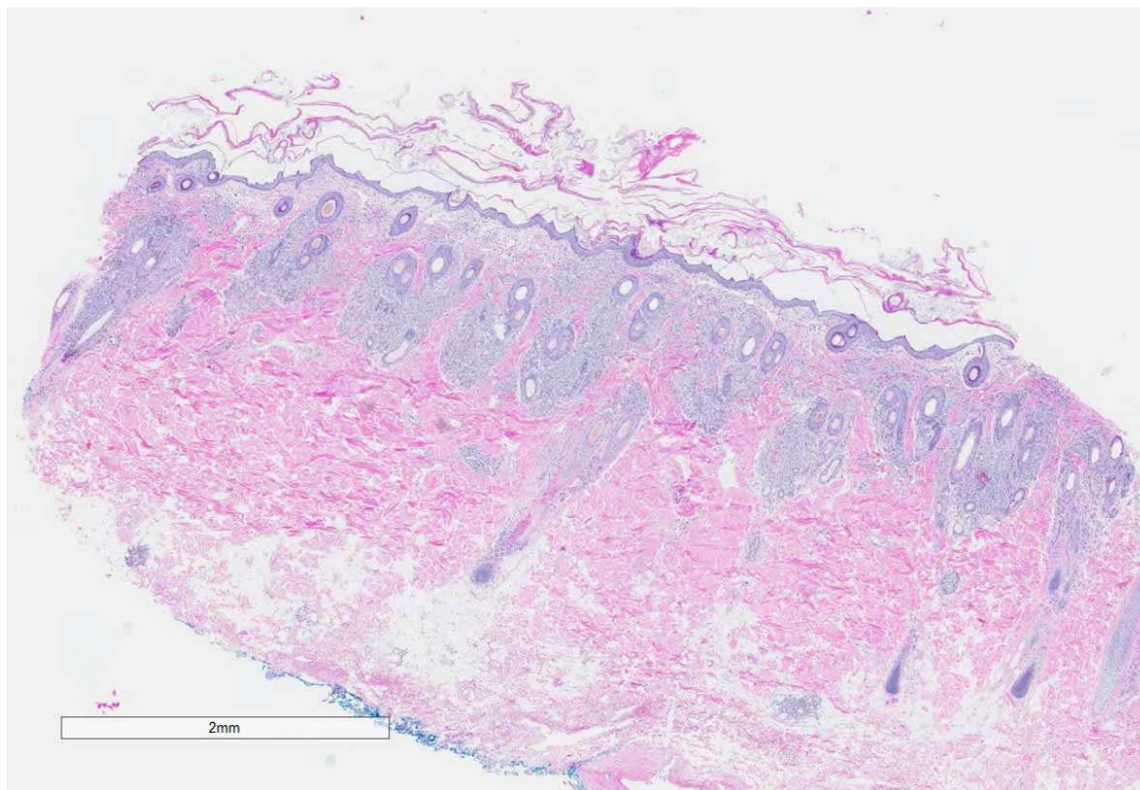


Dr Julie Yager and  
YagerBest Histovet

# FFSA: SEBACEOUS ADENITIS



Sebaceous  
Adenitis.  
Canine.



UNIVERSITY  
of GUELPH

  
**Marshfield Labs™**  
A division of Marshfield Clinic

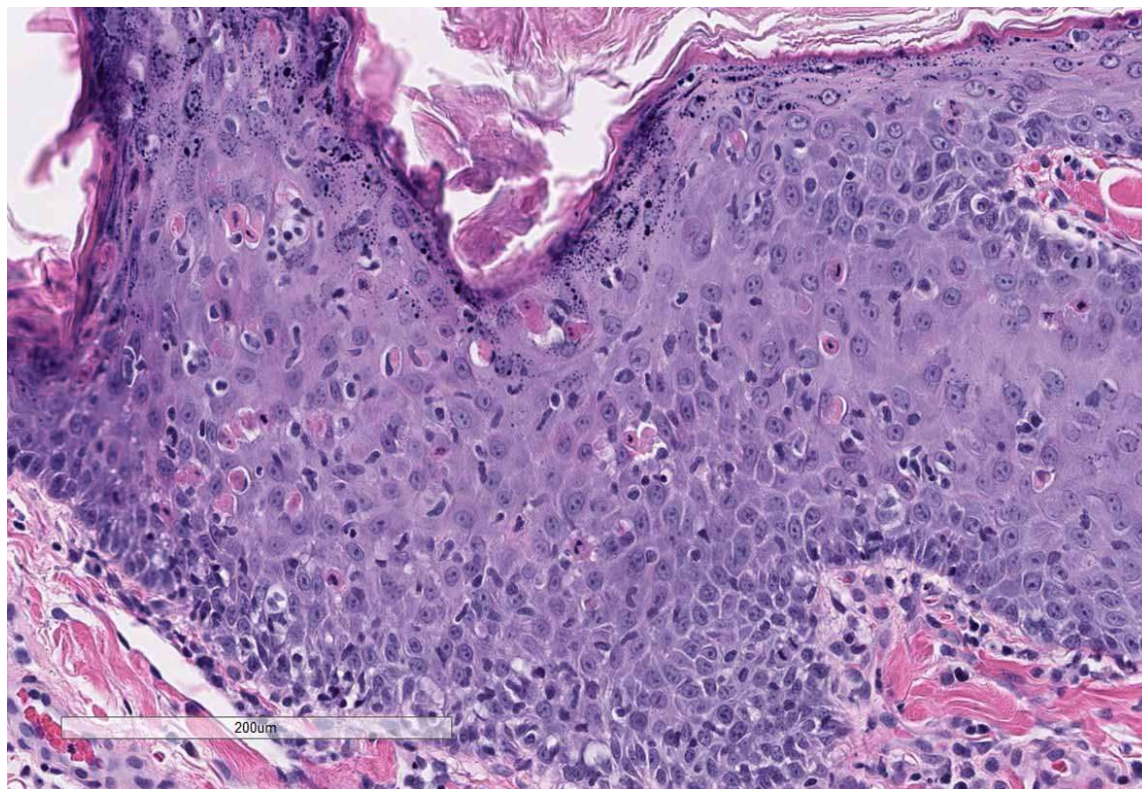
## 6. INTERFACE (CYTOTOXIC) DERMATITIS

- Definition: Death of keratinocytes, often single cell in type, based on targeting by immune mediated processes.
- Subtypes
  - Basal keratinocyte - Cutaneous lupus erythematosus
  - Transepidermal
    - Erythema multiforme like - single cell death.
    - Toxic epidermal necrosis – extensive necrosis.
    - +/- lichenoid band of cells in superficial dermis
- Cause
  - Infectious (viruses like herpesvirus)
  - Immunologic (Type IV hypersensitivity reaction)
- Pathogenesis
  - Infectious
  - Immunologic
- Lesions

# INTERFACE (CYTOTOXIC) PATTERN



Interface/cytotoxic.  
dermatitis  
Canine.  
Erythema  
multiforme like  
disease



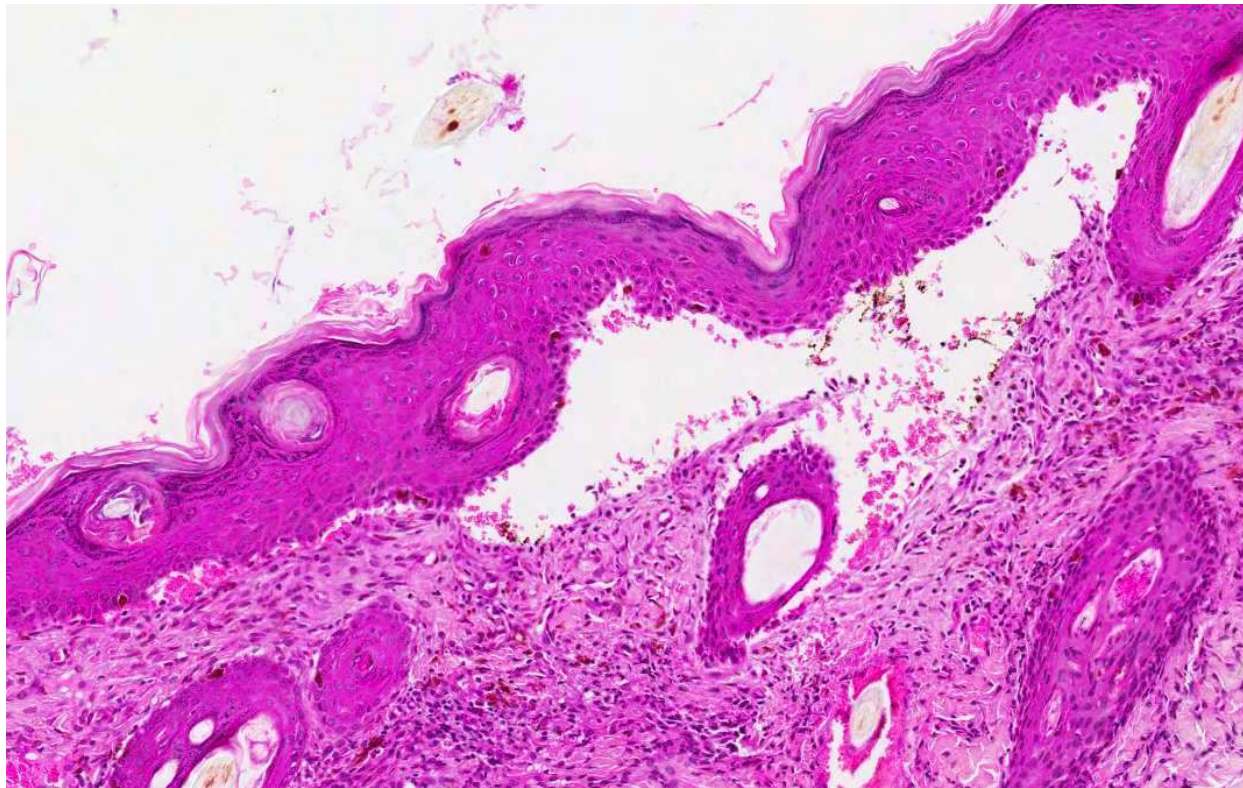
## 7. SUBEPIDERMAL AND 8. INTRAEPIDERMAL - VESICULAR AND PUSTULAR DERMATITIS

- Definition:
  - Inflammation resulting in the formation of vesicles or bulla, and / or pustules
  - Also called Vesicular and Pustular dermatitis
- Subepidermal vesiculopustular dermatitis
  - Autoimmune Subepidermal Blistering Diseases (AISBD)
- Intraepidermal vesiculopustular dermatitis
  - Suprabasal – Pemphigus vulgaris
  - Intraepidermal – Pemphigus foliaceus, superficial pyoderma, dermatophytosis
  - Subcorneal – subcorneal pustular dermatosis
  - Cause
    - Infectious (bacteria – superficial pyoderma, dermatophytosis)
    - Immunologic – autoimmune/immune mediated disease
- Pathogenesis
  - Hemidesmosome/Basement Membrane Zone is the target
  - Desmosome is the target
- Lesions
  - Vesicles and or pustules in locations depending on disease.

# SUBEPIDERMAL VESICULOPUSTULAR PATTERN



Subepidermal  
VP Dermatitis.  
Canine.  
AISBD.

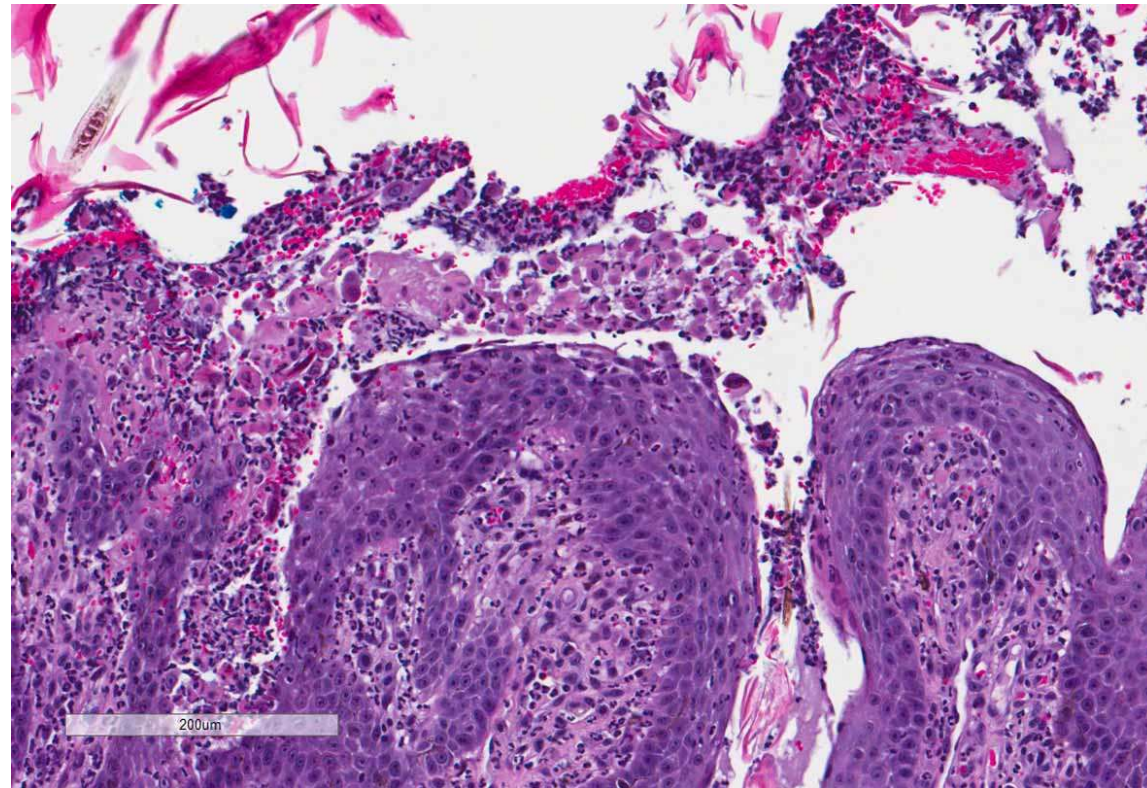


Julie Yager and  
YagerBest Histovet

# INTRAEPIDERMAL VESICULOPUSTULAR PATTERN



Intraepidermal  
Acantholytic VP  
Dermatitis.  
Feline.  
Pemphigus  
foliaceus



Julie Yager and  
YagerBest  
Histovet



## DERMATITIS PATTERNS

1. Perivascular dermatitis
2. Vasculitis
3. Panniculitis
4. Nodular to diffuse
5. Folliculitis, furunculosis, sebaceous adenitis
6. Interface / cytotoxic
7. Subepidermal vesiculopustular
8. Intraepidermal vesiculopustular



## SUMMARY

- Pattern analysis is about pathogenesis.
- Directs one to a shorter list of differential diagnoses.
- Tells you what is happening even if the specific diagnosis is unknown.
  
- Basic patterns allow management of skin disease even if specific disease is not known.

## ACKNOWLEDGEMENTS

- American College of Veterinary Dermatology
- Dr Julie Yager
  - YagerBest Histovet (now part of Antech Canada)
- International Society for Veterinary Dermatopathology
- University of Guelph
- Marshfield Clinical Laboratories