

PATHOLOGY OF THE SKIN AND APPENDAGES

This lecture will focus on the practicalities of taking skin biopsies and the principles of pattern analysis. This approach is to help both with the understanding of general principles of pathogenesis but also to assist in interpretation of histopathologist's reports on submitted skin biopsies which are common in practice.

Anatomy of the skin – review/ revise the different layers and anatomical compartments from earlier in the course. Remember for example:

- Skin from different anatomical sites has very different features
- Different species have different types of hair follicles
- The features of adnexal structures and specialised hairs
- The features of the hair growth cycle

SKIN BIOPSIES

Why take a biopsy?

- | | | |
|----|---------------------------|--|
| 1) | Inflammatory skin disease | <ul style="list-style-type: none">- make diagnosis- confirmation of diagnosis before starting therapy- rule out other conditions |
| 2) | Neoplasia | <ul style="list-style-type: none">- identify and confirm neoplasia cf. inflammatory lesion- confirm excision- prognosis- monitor progression or effect of therapy |

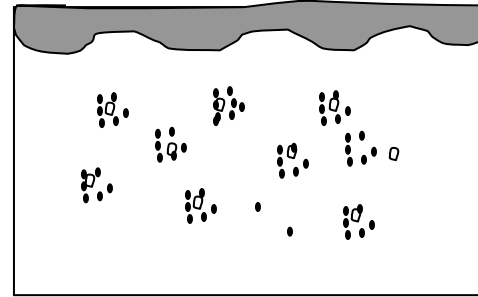
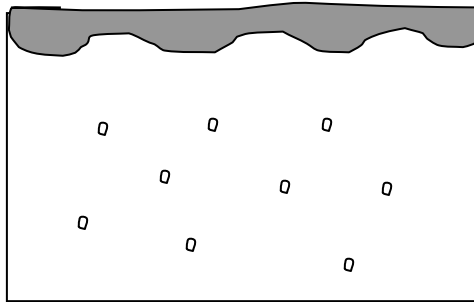
How to get the best results from a biopsy

- | | | |
|----|---------------------------|---|
| 1) | Provide a good history | <ul style="list-style-type: none">- age, sex, breed- description of lesions- distribution of lesions, a drawing/diagram may help- animal's response to lesions (pruritic, licking, chewing)- seasonality- concurrent systemic disease- treatment given- clinical differential diagnosis |
| 2) | Biopsy sites and fixation | <ul style="list-style-type: none">- ideally remove from treatment for 2-3 weeks prior to biopsy (not always possible clinically)- 6 mm punch biopsy, incision or excision biopsy- gently clip hair only, do not surgically prepare the skin- subcutaneous local anaesthetic- take multiple biopsies (3-5)- full thickness- do not crush with forceps- lesions at different stages, especially primary lesions- fix in 10 -20 x vol. of buffered formalin |

SKIN DISEASE – PATTERN ANALYSIS

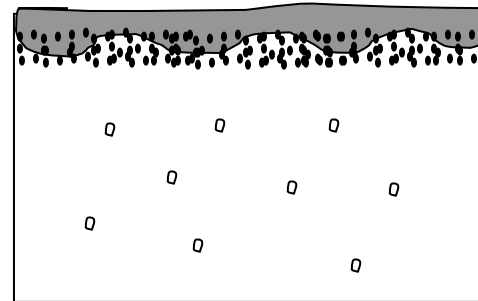
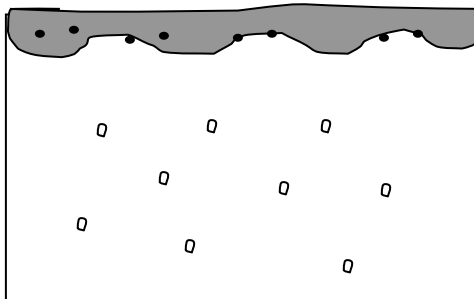
Pattern analysis is the way most histopathologists categorise the changes they see on skin biopsies – it is a MORPHOLOGICAL approach which can help in understanding common pathogenetic mechanisms in apparently different diseases. The following schematics are designed to illustrate the common 'patterns' encountered.

1. **PERIVASCULAR DERMATITIS** – this is a very common pattern but as a consequence is the least diagnostic.



Some good examples of diseases causing perivascular dermatitis:
Hypersensitivity reactions, Response to ectoparasites, Bacterial infections etc.

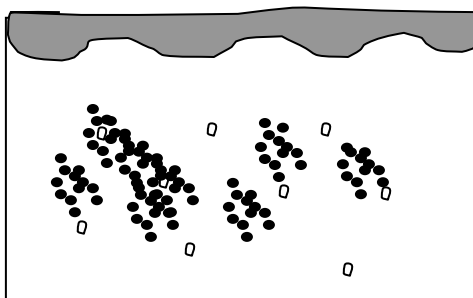
2. **INTERFACE DERMATITIS** – lesion targets the upper level of dermis/ dermo-epidermal junction/ lower levels of epidermis. There is hydropic degeneration and apoptosis of cells in the stratum basale. Interface dermatitis can be cell poor or cell-rich.



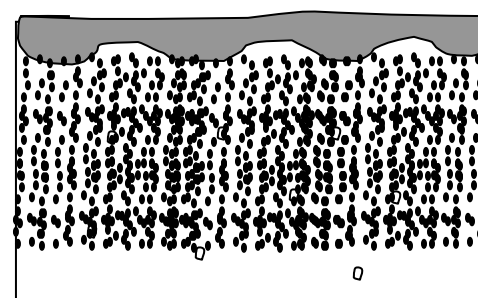
Some good examples of diseases causing perivascular dermatitis:
Drug eruptions, discoid and systemic lupus erythematosus, erythema multiforme

3. **VASCULITIS**
In contrast to perivascular dermatitis, here the reaction is targeted **AGAINST** the blood vessels themselves.

4. **NODULAR &/OR DIFFUSE DERMATITIS**
Can be nodular or the nodules can coalesce resulting in effacement of the normal dermal architecture



Nodular

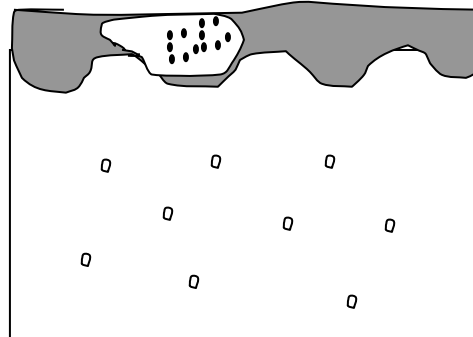


Coalescing/ diffuse

Examples:

INFLAMMATORY CELL TYPE INVOLVED	Examples
Neutrophil	Abscesses, cellulitis
Macrophage	Mycobacterial infections, Leishmaniasis, foreign body reactions
Neutrophils & macrophages (pyogranulomatous)	Fungal infections
Eosinophils	Eosinophilic granuloma complex
Lymphocytes	Vaccine reactions

5. INTRAEPIDERMAL VESICULAR &/OR PUSTULAR DERMATITIS



In general, these can form either by an extension of spongiosis, hydropic change, acantholysis or frictional cleavage.

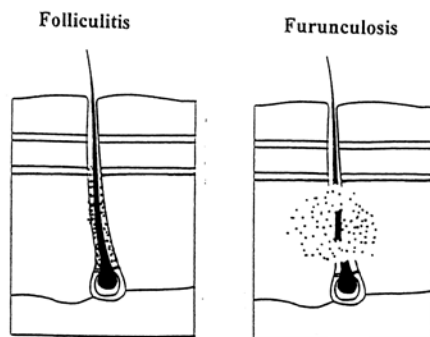
Nature of reaction	Examples
Neutrophil dominated	Superficial bacterial infection, Pemphigous foliaceus
Eosinophil dominated	Parasitic disease, allergic reactions
Minimal inflammation	Pemphigous vulgaris

6. SUBEPIDERMAL VESICULAR &/OR PUSTULAR DERMATITIS

RARE – the top of the bulla/ vesicle comprises the entire epidermis – example = bullous pemphigoid

7. TARGETTING OF HAIR FOLLICLES OR SEBACEOUS GLANDS

- **FOLLICULITIS and FURUNCULOSIS** – e.g. staphylococcal infection, demodicosis, dermatophytosis (ringworm)



- **SEBACEOUS ADENITIS** – sebaceous glands specifically targeted. In chronic cases, glands may be absent

8. PANNICULITIS

Subcutaneous adipose tissue is involved in the inflammatory reaction. Often in association with deep dermal inflammation. Most common type is pyogranulomatous e.g. associated with foreign body, vaccine reactions, deep fungal infections etc.

9. ATROPHIC DERMATOSIS

Atrophy of hair follicles and adnexal structures. Can also affect dermis and epidermis. Most important in this category are the endocrinopathies. Developmental disorders can also be associated with atrophic changes.

- Hair cycle abnormalities: prolonged telogen phase of the cycle
- Dysplasia: defect in the formation of the hair shaft

Typical features associated with endocrinopathies can include:

- Follicular atrophy
- Sebaceous gland atrophy
- Diffuse orthokeratotic hyperkeratosis
- Secondary bacterial infection

SOME IMPORTANT DEFINITIONS IN DERMATO-HISTOPATHOLOGY

Acantholysis - loss of cohesion between epidermal cells.

Acanthosis (epidermis) - increased thickness of stratum spinosum specifically; i.e. Thickening of non-cornified cells, often accompanied by rete peg formation.

Bulla – circumscribed fluid filled cavity either within or beneath the epidermis greater than 0.5 cm diameter

Crust - surface accumulation of keratin, serum and cellular debris (often pyknotic) ± bacteria.

Furunculosis - penetrating or perforating folliculitis resulting in hair follicle rupture.

Glabrous skin - non-hairy areas of skin, e.g. lips, peri-anal, footpads, ventral abdomen.

Hydropic degeneration (epidermis) - intracellular oedema leading to vacuolated cytoplasm. Usually focal in stratum basale or spinosum.

Hyperkeratosis (epidermis) - thickening of stratum corneum.

Orthokeratotic hyperkeratosis – thickened layer of keratin

Parakeratotic hyperkeratosis – nuclei of the keratinocytes are retained

Hyperpigmentation - excessive deposition of melanin in epidermal cells.

Lichenoid band - band of inflammatory cells just below epidermis.

Pigmentary incontinence - leakage of melanin granules from pigmented basal layer of epidermis into the underlying dermis; melanin often seen in macrophages in that zone (melanophages).

Pustule (micro-macro-) - space filled with proteinaceous fluid and inflammatory cells - neutrophils and possibly acantholytic cells, in or just below the epidermis.

Rete peg (epidermis) - cores or peg-like formations of hyperplastic epidermis projecting downwards into the dermis.

Seborrhoea - literally, abnormal flow of sebum. Used to indicate altered keratinization producing syndromes ranging from dandruff to pruritic inflammation with scaling and crusting.

Spongiosis (epidermis) - intercellular oedema leading to separation of cells or sponge-like appearance histologically.

Vesicle – see **Bulla** – but less than 0.5cm diameter