Skin Diseases of Exotic Pets

Edited by

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RCVS and European Specialist in Veterinary Dermatology
Rutland House Veterinary Hospital, St Helens UK

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Dedication

Richard, Sam and Matt XXX

List of Abbreviations

i.m. = intramuscular
i.v. = intravenous
p.o. = orally
s.c. = subcutaneous

sid = once a day
bid = twice a day
tid = three times a day

The authors and editor have striven to ensure that all drug dosages and usages are correct but that it is the responsibility of every individual veterinary surgeon to act within the laws governing medicine licensing and usage in their own country.

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SECTION ONE

Dermatology of Birds

Chapter 1

Structure and Function of Bird Skin

DESCRIPTION OF SKIN LAYERS

Avian skin is made up of two main layers (Figures 1.1 and 1.2):

- Epidermis.
- Dermis.

The overall thickness of the skin varies between different areas of the body. In areas that are feathered the skin may only be three or four layers thick (Figure 1.3). This compares with areas such as the feet where there is no feather covering, and the skin is many layers thick (Figure 1.4).

The outer layers of hard keratin structures such as the scales on the feet and spurs do not moult but instead gradually wear down. The outer surface of soft keratin structures such as the skin, comb and wattles slough the outer layer. This usually takes place at the same time as a feather moult (see p. 12). The exact pattern of feather loss will depend on the species and breed of bird.

EPIDERMIS

- Fewer layers than its mammalian counterpart.
- Lowest layer is the basal membrane.
- *Stratum germinativum* produces the cells which will mature and from the outer *stratum corneum*. Within the *stratum germinativum* it is possible to subdivide cells into three distinct layers:
  - *stratum basale* (just above the basal membrane).
  - *stratum intermedium* whose cells are larger than the basal layer, held together by desmosomes and polygonal in shape.
  - *stratum transitivum* where cells are well developed and show signs of keratinisation, although keratin granules within cells are not as obvious in avian skin when using light microscopy as they are in mammalian skin.
- S*tratum corneum* contains vacuolated and flattened cells which will become either hard or soft keratin – the soft keratin being sloughed and the hard keratin retained.

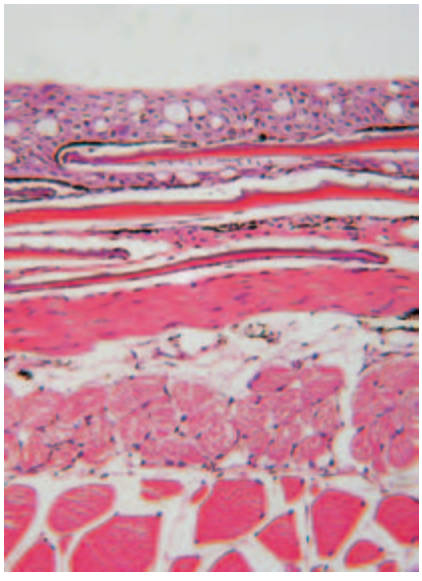

Fig. 1.1 Histopathological section through avian skin.

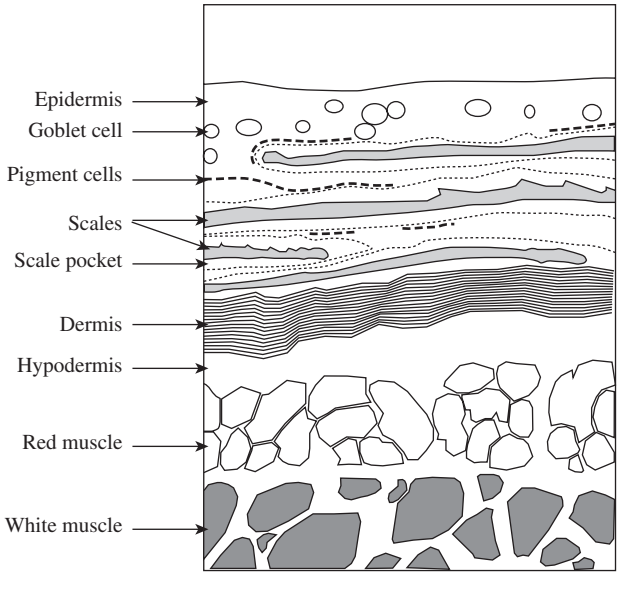

Fig. 1.2 Schematic diagram of Fig. 1.1.

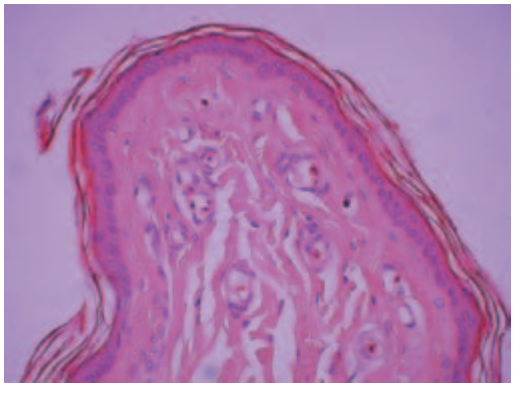

Fig. 1.3 Feathered skin from chicken. (Picture courtesy of C. Knott MRCVS)

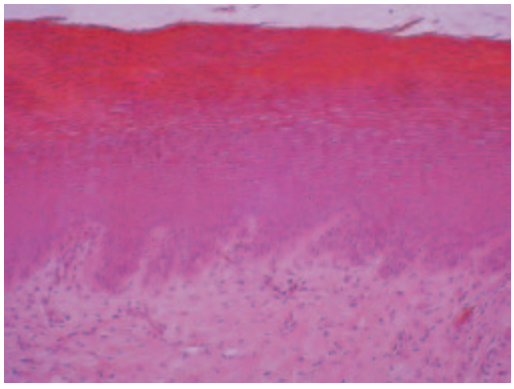

Fig. 1.4 Unfeathered skin from chicken leg. (Picture courtesy of C. Knott MRCVS)

DERMIS

- Divided into superficial and deep layers.
  - Deep dermis can be further described as compact or loose. The loose layer is the deepest and in addition to being attached to the underlying structures it contains apterial muscles and areas of fat.
- Throughout the dermis are elastin fibres which form tendons. These tendons are attached to the muscles of the feathers and are responsible for feather movement.

SUB-DERMAL STRUCTURES

- Beneath the dermis is elastic tissue and connective tissue, which allows both movement and attachment of underlying structures.

OTHER STRUCTURES

- There are no sweat glands in avian skin and therefore birds are prone to hyperthermia. The only areas where glands are found in avian skin are the uropygial (or preen) glands, the pericloacal glands (which secrete mucus) and the glands of the ear canal. However, as epidermal cells contain lipid material the skin itself can be described as a secretory organ.

SPECIALISED STRUCTURES

COMB

The tissue of the comb is extremely well supplied with blood vessels.
Anatomically the comb can be divided into:

- Base (where it attaches to the head).
- Body (the central part).
- Points (the dorsal projections).
- Blade (the posterior part).

Combs are not present in all species of bird but are commonly found in chickens.

WATTLE

The wattle is found under the jaw of many species of domestic poultry and is made up of:

- Thick epidermis.
- Dermis rich in blood vessels.
- Sinus capillaries.

FRONTAL PROCESS / SNOOD

This structure is found in turkeys dorsal to the nasal region. Due to the rich blood supply it can increase in length quite dramatically and is used as part of a courtship display.

CARUNCLES

These are the multiple skin protruberances which are found on the head and upper neck of the turkey.

CERE

The cere is found in some species at the base of the upper beak.

- It is made up of layers of keratinised epithelial cells.
- Colouration of the cere can be used to sex some species (especially budgerigars).
- Disease can cause alterations in the normal colour of the cere.
- The cere is well supplied with sensory nerve endings from the trigeminal nerve.

BROOD PATCH

This is an area in the breast region of some species (in both male and female birds). At this site the:

- Dermis is thickened.
- Dermis is highly vascularised.
- The feathering is looser than other parts of the body.
- When brooding, this area receives a large blood supply allowing heat to be transferred to the incubating eggs.

FEET

The skin of the feet usually does not have any feather covering, although feathers are present in some species.

In most species, the epidermis is thickened into scales to provide protection to the feet.

- **Scutes** are large scales, which in chickens are found on the anterior surface of the metatarsus and the dorsal surface of the toes.
- **Scutella** are smaller scutes found on the caudal surface of the metatarsus in chickens.
- **Reticula** are the smallest distinct scales.
- **Cancella** are minute scales found between the reticula.

CLAWS

Claws are of course present on the feet (Figure 1.5) but are also present on the wings of some species such as ostriches and rheas and are anatomically similar to the nails of cats and dogs.

Fig. 1.5 Claws of Barn Owl.

Fig. 1.6 Beak of a Hobby.

BEAK (Figure 1.6)

The upper and lower beaks consist of a bony structure covered in a keratinised, horny material known as the rhamphotheca.

- Rhamphotheca is the keratinised material equivalent to a thick stratum corneum which contains calcium phosphate and hydroxyapatite to give it strength.
- Dermis lies underneath the rhamphotheca. This is well vascularised and attached to the periosteum of underlying bone.
- A large number of sensory endings are present in the beak especially from the trigeminal nerve.

UROPYGIAL GLAND / SKIN SECRETIONS

The uropygial gland is a bilobed holocrine gland found at the base of the tail.

- It is not present in all birds (e.g. emus, some parrots and bustards do not posses a uropygial gland).
- Absence of this gland does not impair waterproofing of the feathers.
- The gland is made up of two lobes which open to outside via the uropygial duct. In most species this is a single slit, but there can be up to eight orifices. The papilla is not usually covered in feathers although a small number of down feathers can be found at the tip of the papilla (known as the uropygial circlet or tuft).
- The uropygial gland secretes a lipoid sebaceous material which is thought to be important in protecting and waterproofing feathers. It has also been suggested that these secretions may be a source of vitamin D precursors, which inhibit bacterial and fungal growth, maintain the moisture content of the skin and maintain the pliability of feathers.
- Preening is thought important in the distribution of these secretions through the feathers. Preening is also necessary for interlocking the barbules of the feathers and thus providing waterproofing.

- The cells of the epidermis also contain sebaceous material. Although avian skin does not contain glands which secrete sebaceous material the skin itself can act as a source of these secretions.

PATAGIA

These are flat, membrane-like structures which are found where the wings, neck, legs and tail join the body.

- They are always present irrespective of the position of the animal. Compare this with webs which are areas of skin that may be present when the wings or legs are in certain positions.
- Patagia are important as they are often areas affected by cutaneous ulcerative dermatitis.

FEATHERS

- There is a pattern to the arrangement of feathers such that feathers are arranged into tracts known as **pterylae**.
- The areas of skin between these feather tracts are known as **apteria**.
- Different species and breeds within species have particular feather tracts and names have been given to specific feather tracts in different areas of the body (See Lucas and Stettenheim (1972), for further information).

FEATHER TYPES

- **Natal down** is the initial feather covering and is made up of down feathers. This is usually present at the time of hatching after which the down feathers are pushed out by the juvenile feathers.
- **Juvenile feathers** have a normal feather appearance, although they are smaller and narrower than the adult feathers.
- **Feather sheath** covers the feathers as they grow from the feather follicle, these feathers are called pin feathers. This sheath should rupture and release the barbs.
- **Adult feathers** appear at the third moult and can then be divided into different types dependent on their structure, function and location on the bird.
  - Contour feathers are the predominant feather and are the main feathers present on the wings and body. They are present in feather tracts (**pterylae**), separated by featherless areas (**apteriae**).
  - Flight feathers of the wings are known as **remiges** and these can be divided into primary remiges (on the manus) and secondary on the antebrachium (Figure 1.7). Flight feathers of the tail are known as **rectrices** (Figure 1.8). Feathers that cover the bases of the remiges and rectrices are known as **coverts**.

Fig. 1.7 Flight feathers on the wing of a Grey Heron.

Fig. 1.8 Rectrices in a Barn Owl.

FEATHER STRUCTURE

The contour feather is described and other feather types are compared to this. Feathers are highly developed in comparison to hairs.

- Feathers grow from a follicle in the dermis (Figure 1.9). The feather follicle has many similarities to the mammalian hair follicle in its structure. At the point where the feather attaches to the follicle is a dermal papilla which projects up into the base of the feather from which the growing feather receives a blood and nerve supply.
- **Herbst's corpuscles** are found at the base of the follicle; these detect vibrations. Also at the base of the feather follicle is a smooth muscle which elevates the feathers to increase insulation.
- **Calamus** is the part of the feather that attaches to the follicle. In the growing feather the calamus contains mesoderm and an axial artery and vein. As the feather matures, this tissue and blood vessels degenerate so that the calamus becomes hollow. However, partitions, called **pulp caps**, remain within the calamus dividing it into sections. The dermal papilla of the follicle projects into the tip of the calamus known as the **inferior umbilicus**.

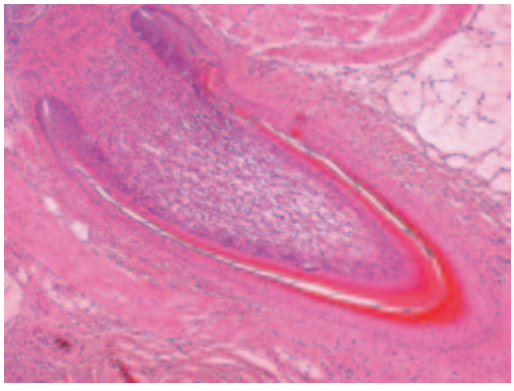

Fig. 1.9 Histopathology of a chicken feather follicle.

- **Rachis** is the main shaft of the feather. Where the rachis meets the calamus is a pulp cap known as the **superior umbilicus**. There may be a smaller feather attached to the superior umbilicus known as the **after feather**. On either side of the rachis are projections known as **barbs**, which themselves bear projections known as **barbules**. Most but not all of these barbules bear hooks known as **barbicels** which hold the barbs and barbules together. The combination of barbs and barbules on one side of the rachis is known as a **vane**.

Physical features of different feather types:

Down (plumules)	Fine feathers that do not have barbules on the barbs.
Filoplume	Found close to the follicle of each contour feather. They have a long shaft with a tuft of barbs or barbules at the distal end. The follicles of filoplumes are highly innervated.
Bristle	These feathers only have a few or no barbs and have a very stiff rachis. They are found at the base of the beak and around the eyes and are surrounded by sensory corpuscles.
Powder	These feathers shed fine granules of keratin which are important in waterproofing the feathers.
Semiplume	These feathers have a large rachis with a fluffy vane (Figure 1.10). They are present underneath the contour feathers and are important for insulation.

COLOURATION OF SKIN AND FEATHERS

The colour of the skin and feathers depends on the pigments that are deposited during development and the structure of the feather, as this controls the absorption and reflection of light.

Fig. 1.10 Semi-plume with prominent after feathers.

- **Melanocytes** produce brown, yellow and black melanin and are found in both feathers and the epidermis.
- **Carotenoids** and **xanthophils** produce red and yellow pigments and are obtained from the diet and deposited in the feather follicle and possibly in the secretions of the preen gland.
- Other pigments such as **porphyrins** and **schemochromes** also contribute to the final colour of the bird.
- **Uropygial gland pigments** can contribute to feather colour. Lipids from this gland can affect light reflection and give feathers an iridescent glow.

MOULTING

Moulting of feathers takes place in all species of bird. Most species will moult once a year, every year often after the breeding season. However, some species will not undergo an obvious moult but instead lose a small number of feathers throughout the year; other species will only undergo a moult every two years; other species can moult up to three times a year.

Moulting takes place when the growth of a new feather in the feather follicle forces out the older feather. Moulting will usually follow a distinct pattern of feather loss such that:

- Proximal primary feathers are lost first. Feather loss moves distally until around half of the primary feathers have been lost.
- Secondary feathers are then lost distally moving proximally.

- Body feathers are then lost.
- Tail feathers are lost initially from the midline, moving laterally.
- Powder feathers are shed continuously.

Depending on the frequency of moulting it is possible for a bird to be covered in feathers from several different moults. However, if a large number of feathers are lost at one time then it is possible for a bird to be flightless until the new feathers grow in, as occurs in many species of duck.

FACTORS INFLUENCING MOULTING

A number of factors are thought to influence the time of moulting and it is fair to assume that the timing of moulting will depend on the combination of these different factors.

- **Environmental factors** include photoperiod, temperature, nutrition, humidity, and stress.
- **Hormonal triggers** have tended to concentrate on thyroid hormones T_3 and T_4. T_4 stimulates growth of the feather papillae. New feather growth will cause shedding of old feathers and therefore an increase in T_4 is associated with feather loss. This compares with an increase in T_3 which tends to coincide with the growth of new feathers. Increases of other hormones such as catecholamines and prolactin have also been associated with moulting.

REFERENCES

Lucas, A.M. and Stettenheim, P.R. (1972) *Avian Anatomy – Integument. Parts I and II, Agriculture Handbook 362.* US Government Printing Office, Washington DC.

Chapter 2

Examination of Avian Skin and Diagnostic Tests

INTRODUCTION

Dermatological disease can present in a variety of fashions – abnormal feather growth, feather chewing or loss, inflammation of skin between the feathers, or beak or claw abnormalities.

The basic work up of any avian skin problem is exactly the same as that for a cat or dog. The importance of a detailed history and clinical examination cannot be over stressed. The main areas that should be examined are listed below.

HISTORY

Points that should be covered when taking a history from the owners include:

- Age and sex of bird.
- What is the main problem?
- Duration of problem?
- Number of birds kept / affected?
- Where was bird bought from?
- How long in owner's possession?
- What is the normal diet of the bird?
- Is the bird eating / drinking normally?
- Is the bird passing normal faeces?
- Any weight loss?
- How often does the bird moult / has a normal moult taken place?
- Is the bird chewing at feathers or affected areas?
- Type of enclosure bird is kept in (Figure 2.1) – inside or outside?
- If indoors, where is the bird kept?
- Is the bird left alone for long periods of time?

CLINICAL EXAMINATION

Points that should be covered when carrying out a clinical examination.

- Body condition.
- Areas affected.
- Condition of feathers / completed moult.

- General clinical examination.
- Dermatological examination.

Fig. 2.1 Is the bird kept inside or outside?

We will now examine the specific tests related to dermatological conditions which should be carried out.

FEATHER EXAMINATION

- *Feather abnormalities* may be obvious on a clinical examination of the bird or may be more subtle, and need microscopic evaluation. It is important to be aware of the normal microscopic appearance of the feather and calamus (Figures 2.2, 2.3). Although not all dermatological conditions will affect the feathers, abnormalities or damage to the feathers can be found in many conditions.
- *General appearance of the bird*: it is necessary to assess whether all of the feathers are the normal shape, size and colouration for that species; has a moult taken place and been completed; are feathers damaged? The distribution of lesions should also be noted. For example, if birds have lost feathers over the head, then feather plucking is unlikely to have been the cause.
- *Examination of individual feathers* can then take place. Depending on the condition this will involve examination of a fully grown feather or a pin feather. Feathers may be removed manually from a conscious bird or under sedation. The feather can be examined for the presence of ectoparasites, fret marks or chewed areas with a hand-held magnifier or examined microscopically. If carrying out microscopic examination it is better to cut the feather into sections if you wish to mount the feather.

PULP CYTOLOGY

The contents of the calamus are examined to try and demonstrate infection of the follicle.

- Firstly the skin around the chosen feather is prepared aseptically with chlorhexidine and the feather carefully plucked.

Fig. 2.2 Normal microscopic appearance of feather.

Fig. 2.3 Normal microscopic appearance of feather shaft.

- The calamus can then be cut from the rest of the feather and squashed between two glass slides. Alternatively the contents of the calamus can be removed with a sterile scalpel blade.
- Once smeared on a glass slide the material can be air dried and stained with Grams (for bacterial examination) or Diff Quick® (for cytological examination). It is possible to detect bacteria, inflammatory cells, inclusion bodies, yeasts and dermatophytes by this method.
- It is also possible to send the entire calamus to the laboratory for culture and sensitivity.

FEATHER DIGEST

Quill mites can be difficult to find on pulp examination.

- To improve mite identification the calamus can be placed into 10% potassium hydroxide, gently heated and then centrifuged, in this way mites can often be visualised more easily. Any mites that are present should be seen in microscopic examination of the sediment.

SAMPLING OF LESIONS FOR CULTURE AND SENSITIVITY

- All dermatological lesions can be sampled for bacterial culture and sensitivity.
- To avoid contamination it is preferable to take feather pluckings or biopsies of infected tissue rather than surface swabs. However, in conditions such as Cutaneous Ulcerative Disease where the affected tissue is easily sampled, swabbing the skin with a swab dipped in sterile saline can be used to detect surface bacteria and / or yeasts.

TAPE STRIP EXAMINATION

- This technique can be used to detect ectoparasites, yeast and bacterial infections. Care should be taken to differentiate pathogens from contaminants.
- Acetate tape is pressed on to the skin and then stained with Diff Quik®. Avian skin is much thinner than that of cats or dogs and therefore it is possible to damage the skin if too much pressure is applied.

IMPRESSION SMEARS

- Impression smears of moist lesions can be a quick way to detect surface flora. However, as for tape strips, they are also an ideal way of observing contaminants. They are a useful way of sampling lesions such as Cutaneous Ulcerative Disease.

BIOPSY

- A general anaesthetic is generally required.
- The skin should not be scrubbed prior to sampling, as this will remove surface cells and vital information.
- Avian skin is much thinner than cat and dog skin. This author prefers to use a scalpel blade rather than a biopsy punch in order to take longer sections of skin. If a biopsy punch is to be used, acetate tape placed over the biopsy site can maintain the structure of the sample and the surrounding tissue (Nett *et al*., 2003). Due to the anatomy of avian skin, and the network of tendons that runs through the skin, if a sample is removed without placing tape on the skin, then a large hole can result due to retraction of the surrounding tissue. It is important to take a section of abnormal tissue as well as some adjacent normal tissue.
- The skin should be placed on to card before being placed in formalin to prevent curling of the skin edges. It is preferable to include a feather follicle in the biopsy.

Fig. 2.4 Intradermal allergy testing in a bird.

INTRADERMAL SKIN TESTING

- Whether birds are affected by allergic skin disease or not is much debated. It is possible to carry out intradermal skin testing in larger birds, but even in species such as parrots the skin is very thin and a 27G needle is required – even so it takes a great deal of patience to avoid placing subcutaneous injections (Figure 2.4).
- Research by Columbini *et al*. (2000) has shown that histamine is not a good positive control in birds, codeine phosphate at a concentration of 1:100 000 w/v should be used instead.
- Interpretation can be difficult. Due to the thin nature of the skin the inflammatory response to an offending allergen is very mild and it can be very difficult to determine whether a positive reaction is present or not.

BLOOD SAMPLING

It is important to take blood samples as part of a complete clinical work up. Dermatological problem conditions such as liver or kidney disease can present as a bird which is feather plucking or chewing feathers over areas of pain, such as is seen in cases of gout.

- Blood samples can be obtained from different blood vessels depending on the species. In general up to 1% of body weight can be taken, which is not very much when dealing with a Budgerigar. Again, dependent on the species the individual may need to be anaesthetised before a sample can be taken.
- The right jugular is the vessel of choice using a 25G needle (Figure 2.5). The medial tarsal vein can be used in Galliformes and Anseriformes and the basilic vein can be used in raptors and Columbiformes (Figure 2.6). Some texts also describe using a toe nail clip to obtain blood from smaller birds but this should be avoided due to the difficulties in stemming blood flow and the poor blood samples that are obtained.

Fig. 2.5 Site for right jugular venepuncture.

Fig. 2.6 Site for basilic and ulna vein venepuncture.

- Due to the fragility of avian blood cells, a smear should be made at the time of sampling and sent to the laboratory along with the blood sample. Samples for haematology should usually be placed into EDTA and samples for biochemistry placed into heparin, although there are some species which require haematology samples to be placed in heparin. Communication with individual laboratories will determine how samples should be preserved.
- It may also be necessary to carry out specific tests such as lead or zinc levels, or hormone assays.

Some of the more common parameters that should be measured are given in Table 2.1.

Table 2.1 Some of the main biochemical parameters in blood sampling.

Parameter	Indications
Bile acids	Indicates liver function.
AST, Lactate dehydrogenase, Creatinine phosphokinase	Indicators of liver and muscle damage. AST found in liver and muscle whereas CPK is only found in muscle.
Uric acid	Kidney function.
Calcium and phosphorus	Kidney function, nutritional deficiency or hypocalcaemic syndrome of African Grey parrots.
Total proteins	Nutrition and liver function.

DIAGNOSTIC IMAGING

- Skin disease may be the presenting sign of a generalised problem. Radiography can be important to diagnose conditions such as aspergillosis and proventricular dilatation disease which can cause feather plucking.

SEXING / COELOSCOPY

- Endoscopic examination can reveal the sex of the bird (useful if dealing with a broody female with resultant feather problems) and abnormalities such as aspergillomas.

EXAMINATION OF GASTRO-INTESTINAL CONTENTS

- Crop washes can be used to examine the contents of the anterior and posterior gut. Washes or swabs can identify *Trichomonas* or *Candida* which can be present in birds which pull at feathers over the crop area.
- Examination of faecal smears can show normal and abnormal gut flora. Large numbers of Gram-negative bacteria or budding yeasts are considered significant and suggest a condition which requires treatment.
- Collection of faecal samples and direct examination or faecal flotation / sedimentation can be used to identify parasites. For example, nematodes such as *Ascaris platycerca* or intestinal fluke can present as birds which feather pluck.

ELECTRON MICROSCOPY OF FEATHER SECTIONS

- A slightly less common diagnostic technique is examination of feathers with an electron microscope. This can allow examination of the calamus to identify intraluminal mites, although the true significance of the presence of these mites is debatable.

REFERENCES

Columbini, S., Foil, C.S., Hosgood, G. and Tully, T.N. (2000) 'Intradermal skin testing in Hispaniolan parrots (*Amazona ventralis*)'. *Veterinary Dermatology* **11**:271–276.

Nett, C.S., Hodgin, E.C., Foil, C.S., *et al*. (2003) 'A modified biopsy technique to improve histopathological evaluation of avian skin'. *Veterinary Dermatology* **14**:147–151.

Chapter 3

Skin Diseases and Treatment of Caged Birds

ECTOPARASITES

MITES

The most important ectoparasites of caged birds are the mites. These can be divided into:

- Skin mites.
  - Burrowing mite – Cnemidocoptidae (*C. pilae*), Epidermoptidae.
  - Surface mite – Dermanyssidae (*D. gallinae*), Macronyssidae (*Ornithonyssus* spp.).
- Feather mites.
- Quill mites.

SKIN MITES

Burrowing mites – Cnemidocoptidae

Scaly beak / tassle foot mites (Cnemidocoptes spp.)

Cause and pathogenesis

Scaly beak is common in Budgerigars (*Melopsittacus undulatus*) where the cere is affected initially by the mite *Cnemidocoptes pilae* from the Cnemidocoptidae family. The mite principally infests the feather follicles and stratum corneum of the face and legs.

The mite usually infects juveniles shortly after hatching and remains latent until later life, however it may spread between adult birds. Its lifecycle lasts for three weeks, and is entirely spent on the host.

Clinical signs

This mite causes an increased volume of crusting, often honeycombed by small holes (Figures 3.1 and 3.2). A case in a Red-fronted Parakeet showed signs of general feather loss. Other forms of *Cnemidocoptes* spp. may cause hyperkeratotic lesions of the feet and legs in Passeriformes such as finches. Clinically, disease is thought to occur as a result of immunosuppression, inadequate nutrition (such as hypovitaminosis A) or concurrent infectious disease.