AVOIDING FEATHER DAMAGE IN HOSPITALISED BIRDS

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INTRODUCTION

The aim of this paper is to present common types of feather damage that occur in a hospital setting and present the methods we use to overcome some of these. It is not the intention of this paper to review the types of feathers, feather growth or moulting. For more information on these topics you are advised to consult previous AAVAC proceedings (Gartrell, 1999).

One of my first cases in practice was the successful treatment of a rosella with heavy metal poisoning but its tail feathers broke in the cages I had available. While I was congratulating myself on the successful resolution of the life threatening condition, the owners were disappointed in how their bird looked. While this may seem like a minor issue in companion animal medicine, in some species damage to the primary feathers may reduce reproductive success (Fitzpatrick, 1998; Barbosa et al., 2003). For racing pigeon flyers, maintaining feather plumage is essential for the sport performance of their birds. For falconry, good flight performance is again essential (Samour, 2006). In wild bird rehabilitation, loss or damage to feathers may result in prolonged rehabilitation periods, decreased fitness and reproductive success and increased mortality(Swaddle et al. 1996).

The flexibility, thermal insulation, pigment deposition during feather formation, waterproofing and structural quality of the feathers depend on adequate nutrition (Klasing, 1999; Schreiber et al., 2006). Dark melanistic feathers are more durable than non-melanistic feathers (Cooper, 2002). Stressors can influence the structural strength of feathers via the effects of corticosterone during the growth of the feather (DesRochers et al., 2009).

Maintenance of the feather depends on the combination of regular preening, and protective secretions produced by the epidermis (Menon and Menon, 1999) and uropygial gland (Sandilands et al., 2004; Versteegh et al., 2006; Reneerkens et al., 2008; Haribal et al., 2009). The role of powder down fragments in feather protection is suggested by the poor quality of the feathers of cockatoos with PBFD induced damage to the powder down (Cooper, 1994). However I was unable to find any direct studies of the powder down.

In this paper I will examine the following types of feather damage that can occur in hospital:

- Damage to primary feathers
- Feather matting from food and faeces
- Damage to feather structure from hands, topical agents and heat
- Stress moulting
- Loss of waterproofing in sea birds

Our group has developed and borrowed techniques to try to deal with these problems. They are mostly low-tech, simple fixes but I hope that these may be of some benefit to you and stimulate discussion of this often over looked area.

PRIMARY FEATHER DAMAGE

Damage to the primary feathers of the wing and tail (remiges and retrices) is a common complication of hospitalisation. This is particularly important in long tailed birds such as macaws, poultry (such as pheasants) raptors, some passerine birds and columbiformes.

Damage often occurs at prior areas of weakness in the feathers (such as stress bars) and is exacerbated by:

- poor handling of feathers;
- abrasive wiring on cage floors or walls;
- matting of feathers in faeces and urates; and
- adhesive bandage material.

Removal of primary feathers for surgical preparation is best avoided due to the high energetic cost of regrowing these feathers, the increased chance of damage to the growing feathers, and the extended period of hospitalisation required for wild patients. The primary feathers also insert directly into the periosteum of the appendicular skeleton (Cooper, 1994) and removal is painful.

Damaged primary feathers can be repaired by imping, which is the grafting of donor feathers onto the shaft of the damaged feather, and was developed in falconry. A good description of the technique of imping is given by Samour (2006). It is far preferable however to avoid damage in the first place.

Key factors in avoiding damage to the primary feathers are straightforward and include:

- Using absorbent towels rather than newspaper in cages
- Provide perches of adequate height to allow the tail feathers to sit off the ground
- Bandaging damaged wings to keep the primary feathers clear of the ground and the birds feet
- Use of non-adhesive bandaging materials
- Keeping the cage clean
- Gentle handling that takes account of the feathers natural position
- Cleaning blood and exudates from feathers post-operatively with warm water
- Using tail protectors

Tail protectors are simply a protective sheath that is placed around the tail and stapled to the shafts of the retrices. In the past we made tail protectors from old radiographic film but have moved to using simple plastic zip-lock bags. These are lighter, cheaper and still protective (plus the uni has shifted to digital radiography). In our practice these are routinely applied to most birds of prey and longer tailed parrots such as macaws.

FEATHER MATTING FROM FOOD AND FAECES

Spillage of food material or regurgitation onto the feathers of the face and neck can result in matted material accumulating around the commissures of the beak. In seabirds this can be enough to result

in loss of waterproofing as water tracks in under the damaged feathers and spreads out down the body. In companion birds, especially nectarivores and nestlings this matted food material can predispose to superficial Candidiasis (Gelis, 2006).

This kind of feather damage is best prevented by gentle washing of the facial feathers with warm water or a low pressure water jet (eg Dental water pick). Care must be taken not to simply rub the food material deeper into the feathers. Severely matted plaques must be plucked and the feathers allowed to re-grow.

At the other end of the bird, matting of the vent feathers occurs with diarrhoea, polyuria or any condition that alters the ejection of droppings cleanly from the vent. This occurs in obesity, cloacal prolapses, abdominal swelling for any reason or in birds that are recumbent. Superficial dermatitis of the vent margin is commonly seen in the intensive poultry industry, where it is known as vent gleet and has been associated with overcrowded and unhygienic conditions. Daily cleaning of the vent with warm water in patients that show vent matting can prevent the progression to vent gleet. In some severe cases, vent matting can result in faecal and urinary obstruction and can be fatal. If vent gleet has occurred then the feathers around the vent should be plucked and barrier creams used to prevent faecal and urate contamination of the dermatitis (Lumeij, 1994).

DAMAGE FROM HANDS, TOPICAL AGENTS AND HEAT

It is widely accepted that oily material can be transferred from hands of operators to bird's feathers. Some veterinarians will dust their hands with talcum powder before handling birds (Doneley et al., 2006). We recommend simply washing hands between patients as this has the dual purpose of minimising nosocomial infections as well as the transfer of sebaceous oils to a bird's plumage. We also use towels to wrap most birds as this minimises disruption to the feathers, and prevents transfer of material to the plumage. Our rule of one towel per bird does create a lot of washing, but a birds towel can be hung on the front if its cage and used until it becomes soiled.

Topical medications should be used sparingly in birds to prevent plumage contamination, particularly if they are oil based (Cooper, 1994). I advocate avoiding all spray based medications on the basis that they all leave a residue in the feathers that damage waterproofing and feather structure.

Surgical preparation for birds involves plucking a minimum sterile field and not removing primary feathers unless damaged. Surgical preparation solutions that contain detergents should be used sparingly, attempting to avoid contamination of the plumage where possible. We clean blood and exudates from feathers post-operatively with warm water.

Radiant heat sources can destroy the mechanical structure of feathers and result in loss of quality. These devices must be kept far enough away from the plumage so that they do not singe the feathers. We have seen penguins that have lost their waterproofing by over enthusiastic application of heat lamps and these birds have had to moult to recover.

STRESS MOULTING

There is an antipredator defence of many birds that involves the rapid loss of large amounts of feathers. This is particularly common in Columbiformes and poultry and can result in the wide-scale loss of contour feathers. This is disastrous in a racing pigeon and is guaranteed to result in a very grumpy client. For this reason, poultry should never be grabbed by the tail.

To prevent stress moulting occurring, the birds should be handled securely wrapped in towels or in a confident firm enclosing grip rather than a clutching one.

On an anecdotal note we have seen native wood pigeons (kereru - *Hemiphaga novaeseelandiae*) in New Zealand lose all their primary feathers one to two weeks after an intensely stressful event or hospitalisation. The exact cause and mechanism of this loss is still to be determined but has made us cautious in rapid release of these birds.

LOSS OF WATERPROOFING

Any veterinary care of wild seabirds, shorebirds and waterfowl must have the maintenance of waterproofing as a key outcome. In a recent case where we looked after 20 godwits with capture myopathy loss of waterproofing resulted in the deaths of several birds after release (Ward JM et al In prep).

Maintaining waterproofing in hospital can be challenging, especially when birds have undergone surgical procedures or bandaging is required. We have also seen several cases of mechanical feather damage from heat or over-washing resulting in loss of waterproofing (see earlier section). If the structure of the feathers is damaged the birds will need to moult and re-grow new feathers before waterproofing can be achieved.

Wherever possible we encourage the maintenance of waterproofing by the following:

- Providing bathing or swimming facilities for aquatic birds
- Handling birds with clean hands and towels
- Misting of birds which cannot be swum. This is particularly useful after feeding and handling as it encourages a bird to preen. Clean water only is used for misting.
- Removing spilled material (food, faeces, blood and exudates) from feathers as quickly as possible

In some instances, birds are sent to us from members of the public, or wildlife rehabilitators where the waterproofing is damaged by oil or other chemicals on the coat. Only in these cases will we progress to washing the birds. Bird washing is complicated by the fact that detergents strip from the feather the products secreted by the skin and uropygial gland. Further there is a loss of surface tension of the feathers complex structure resulting in immediate loss of waterproofing. As a result surgical scrubs containing detergents should be applied sparingly in birds.

The following detailed material on bird washing is taken directly from our Oiled Wildlife Response SOP (McConnell, 2009) that relates to cleaning feathers with oil contamination but can apply to any noxious topical agent that adheres to feathers and removes waterproofing. It can take a number of weeks for birds to fully restore the waterproofing abilities of their plumage.

Waterproofing is achieved by preening activities, whereby the bird repairs the plumage structure. Preening is encouraged by the presence of moving water; hence the sooner birds can remain permanently outdoors with access to water, the sooner they will regain their waterproofing. Note that contamination of plumage continues to be an issue through the rehabilitation phase. Potential avenues for contamination are from fish oil during feeding, from natural oils or hand creams via the handler, or from secretions via any wounds that the bird may have.

Cleaning:

The process of cleaning, rinsing and drying can be an exhausting experience for birds. Therefore it is important to conduct these steps in a professional and efficient manner to minimise stress. Plumage must be cleaned and rinsed thoroughly to remove all traces of oil and detergent without damaging feather structure. The cleaning phase culminates in birds entering the drying area and then postcleaning stabilisation area to regain strength before moving into the rehabilitation phase.

The detergent of choice varies depending on oil type. During the first day of cleaning you might like to trial a few different detergents to ascertain which performs the best under the circumstances. These tests are best conducted on sample feathers. Detergents trialed must:

- Be able to remove oil without damaging feathers or irritating skin or mucosal surfaces
- Be non-toxic
- Leave no residue

Tergo Birdwash® is the detergent stockpiled in regional response trailers and at Massey University for oiled wildlife response.

Water for washing and rinsing should be 40 – 41.5°C in temperature.

The use of 'hard water' during cleaning can extend the length of time it will take for individual birds to regain waterproofing due to deposits of conjugated detergent particles and calcium carbonate particles on the feathers. Softened water (30-50 mg calcium carbonate per litre) should be used for washing for optimal results. This is particularly important for those species which need to spend considerable lengths of time in the water.

Washing:

- Administer pre-cleaning warmed oral fluids before washing to mitigate dehydration. These fluids should be administered approximately 20 minutes before cleaning commences to avoid regurgitation during the cleaning process.
- Gentle, but firm handling of the bird by the 'holder' will minimise stress to the bird and allow the 'washer' to complete the wash process as effectively as possible. The 'holder' is fully responsible for monitoring the birds condition throughout the wash process and needs to ensure that the birds head remains above water. Generally the birds head should face slightly downwards to prevent water from entering nostrils and the tip of the beak should be held.
- If necessary, pre-treat tar patches with a minimal amount of warmed (39°C) methyl oleate or canola oil. Massage into tarred area until it softens. This usually takes 4 – 5 minutes. Precleaning agent must be rinsed or wiped off as soon as possible to avoid further damage to the feathers. Under no circumstances should a pre-cleaning agent be left on plumage for longer than 15 minutes.
- Select an appropriate sized tub for the individual bird. The tub should be deep enough to allow for the entire body (except the head) to be submerged, spacious enough to allow the person cleaning to move without undue restriction, while minimising the amount of water required.

- Select an appropriate detergent using as little as necessary to effectively clean, while minimising detergent residue to be rinsed.
- Set up three tubs ready with warm (40-41.5°C) softened water and detergent
- Clean the bird through a succession of tubs with decreasing concentrations of detergent– starting at 5% for the first few tubs, then 3%, then 1%. Move the bird between water changes as the tub water becomes oily.

General washing rules:

- Work against the grain for soft body feathers
- Work with the grain for primary and secondary feathers
- Do not rub feathers
- The washer should follow the systematic process outlined below to ensure all areas of the body are cleaned before the bird moves to the rinsing phase.

1. Starting with the chest – 'lift' the feathers against the grain to allow detergent penetration to the skin. Then move to the birds back and continue this action.
2. Attention then moves to the wings, where each primary and secondary feather is run between forefinger and thumb to ensure detergent penetration.
3. The side of the tub can be used to steady the bird while the opposite wing is extended.
4. Once most of the oil is removed from the body, the head is ready to be cleaned and at this point the handler swaps to the rear end of the bird, while the washer holds the tip of the beak.
5. The washer then uses a measuring jug to pour water over the head – a little water in the eyes/nares is not a problem. Alternate between pouring soapy water over the head and using a toothbrush to lift the feathers against the grain to allow penetration to the skin. Once soapy water runs clear, then fresh water is poured over the head until no further discolouration or detergent bubbles are seen. A check should now be made by running a cotton tip just below the eye. If there is any discolouration cleaning needs to continue on the head until all sign of pollutant is removed. Some washers find that a Waterpik® is useful to clean the face.
6. Once the head is clean check inside the mouth for oil and remove with a cotton tip.
7. The last part of the body to be washed is the neck – lower the bird as low as possible in the water and use the same technique as on the back and chest to wash the neck.
8. Now move the bird to the last soapy tub for a quick full body once over before it is ready for rinsing. Effective cleaning for a medium sized bird takes between 20 and 40 minutes.

Rinsing

As with the previous phase, water for rinsing should be 40 – 41.5°C in temperature and softened (test at 30-50 mg calcium carbonate per litre). The water supply for rinsing should however be pressurised allowing for both 275kPa and 400kPa sprays.

General notes about rinsing:

- Once washing is complete, rinsing needs to occur immediately.
- As with washing rinsing of soft feathers occurs by directing the spray of water against the grain of feather growth, but with the grain for primary and secondary feathers.
- Water will bead off feathers and down will fluff up as soon as detergent is rinsed

from them. Note: the handler's gloves will need rinsing after each section of the bird is complete to ensure that recontamination is not occurring.

- Gentle, but firm handling of the bird by the 'holder' will minimise stress to the bird and allow the 'rinser' to complete the wash process as effectively as possible. The bird's head should face slightly downwards to prevent water from entering nostrils.
- The 400KPa spray can be used for all parts of the body but the head where the 275KPa spray is used.
- Effective rinsing for a medium sized bird can take between 20 and 40 minutes.

Follow the steps below to ensure all traces of detergent are removed from the bird's plumage.

1. Start by rinsing the back and the top side of the wings, then turn the bird over to access the chest area and the underside of the wing. Feathers on the breast are the densest and need particular care.
2. Be particularly diligent around skin folds (between legs and body, and between wings and body).
3. Once the body has been rinsed, rinse the head by spraying against the grain while being very careful to ensure the spray does not hit the eye.
4. Now closely inspect under the plumage of the entire body for 'wet spots' and re-rinse these areas as necessary. Note – wet spots will be evident as patches of 'soggy' feathers and damp skin.
5. Once no further wet spots can be found, finish by re-rinsing the handling areas and the head.
6. The bird is then wrapped in a towel before being placed in a drying pen.

Cleaning Errors

From time to time the following problems may occur during cleaning:

- Aspiration of contaminated (by oil or detergent) water
- Aspiration of regurgitated food or fluids
- Hypothermia – the holder needs to watch for shivering.
- Exhaustion
- Plumage damage
- Asphyxiation
- Other injuries

It is the responsibility of the 'holder' to monitor the bird's condition and to halt the cleaning process if any problems are identified. If the cleaning process is stopped before completion the bird should proceed to solitary drying confinements and cleaning should resume only once the bird has re-stabilised (usually the following day).

Note that the loss of some soft feathers and down is normal during the cleaning process; down will re-grow in 2-3 days in areas where there are gaps in the plumage.

It is useful to have a white board in the cleaning room where notes about particular individuals can be written as observations are made. These notes should later be transferred to the birds individual record.

Drying

Birds will be exhausted as they exit the rinsing area. For this reason, special attention to the birds comfort should be afforded during drying. In particular thermoregulatory stress needs to be eliminated during this period and frequent surveillance should be undertaken to check for signs of heat stress (wings outstretched and/or panting indicate that birds are receiving too much heat / Shivering indicates that they are not receiving enough). Should these signs be noted, temperature should be moderated accordingly. Oral hydration may need to be administered during drying depending on time elapsed since last re-hydrated. Individual medical records should be consulted for notes on hydration routine.

Drying is largely a benign process whereby birds are held in drying pens with clean net bottoms and shade-cloth (or similar) covers. The drying room temperature is regulated between 25 - 30°C and heater-blowers or heat lamps are used to dry remaining water droplets from clean plumage by moving large volumes of moderately warm air. Ventilation is important during this phase to allow water vapour to escape and prevent the temperature from progressively increasing. The drying room should be quiet and darkened to ensure a restful environment for the birds and fresh drinking water should be provided.

Individuals may be dried in solitary pens or communally with others of the same species or compatible species. Care must be taken not to overcrowd communal pens. Indoor holding area density should allow 0.6 – 1.0 m2 per bird. Routine checks should be made of all birds for signs of heat stress. Heat supplies need to be adjusted accordingly.

References

Barbosa, A., S. Merino, et al. (2003). "Feather damage of long tails in Barn Swallows Hirundo rustica." *Ardea* **91**: 85-90.

Cooper, J. H., GJ (1994). Dermatology. Avian Medicine: Principles and Applications. B. H. Ritchie, GJ; Harrison, LR. Lake Worth, Florida, Wingers Publishing: 607-639.

DesRochers, D. W., J. M. Reed, et al. (2009). Exogenous and endogenous corticosterone alter feather quality. *Comparative Biochemistry and Physiology a-Molecular & Integrative Physiology* **152**: 46-52.

Doneley B, Harrison GJ, Lightfoot TL. 2006. Maximizing information from the physical examination. In: *Clinical Avian Medicine*. GL Harrison, TL Lightfoot (eds). Palm Beach, Florida, Spix Publishing. 1: 153-212

Fitzpatrick, S. (1998). Birds' tails as signalling devices: Markings, shape, length, and feather quality. *American Naturalist* **151**: 157-173.

Gartrell, B. (1999). A review of moulting and feather wear in birds. Association of Avian Veterinarians – Australian Committee, Noosa, Queensland. pp 77-87.

Doneley B, Harrison GJ, Lightfoot TL. 2006. Maximizing information from the physical examination. In: *Clinical Avian Medicine*. GL Harrison, TL Lightfoot (eds). Palm Beach, Florida, Spix

Publishing. 1: 153-212

Gelis, S. (2006). Evaluating and treating the gastrointestinal system. Clinical Avian Medicine. G. L. Harrison, T. Palm Beach, Florida, Spix Publishing. 1: 411-440.

Haribal, M., A. Dhondt, et al. (2009). Diversity in chemical compositions of preen gland secretions of tropical birds. *Biochemical Systematics and Ecology* **37**: 80-90.

Klasing, K. (1999). Comparative Avian Nutrition. Oxfordshire, UK, CAB International.

Lumeij JT. 1994. Gastroenterology. In: *Avian Medicine: Principles and Applications*. BH Ritchie; GJ Harrison, LR Harrison (eds). Lake Worth, Florida, Wingers Publishing:482-521

McConnell, H. (2009). Oiled Wildlife Response Standard Operating Protocol. New Zealand: 1-53.

Menon, G. K. and J. Menon (1999). Avian epidermal lipids: Functional considerations and relationship to feathering. Annual Meeting of the Society for Integrative and Comparative Biology, Denver, Colorado.

Reneerkens, J., M. A. Versteegh, et al. (2008). Seasonally chancing preen-wax composition: Red Knots' (Calidris canutus) flexible defence against feather-degrading bacteria? *Auk* **125**: 285-290.

Samour, J. (2006). Management of Raptors. Clinical Avian Medicine. G. L. Harrison, T. Palm Beach, Florida, Spix Publishing. 2: 915-956.

Sandilands, V., K. Powell, et al. (2004). Preen gland function in layer fowls: factors affecting preen oil fatty acid composition. British Poultry Science **45**: 109-115.

Schreiber, R. W., E. A. Schreiber, et al. (2006). Pattern of damage to albino Great Frigatebird flight feathers supports hypothesis of abrasion by airborne particles. *Condor* **108**: 736-741.

Swaddle, J. P., M. S. Witter, et al. (1996). Plumage condition affects flight performance in common starlings: Implications for developmental homeostasis, abrasion and moult. *Journal of Avian Biology* 27: 103-111.

Versteegh, M., J. Reneerkens, et al. (2006). Seasonal shifts in uropygial gland secretions in Red Knots: a flexible defence against feather-degrading bacteria? *Journal of Ornithology* **147**: 36-36.