FEATHER LOSS AND FEATHER DESTRUCTIVE BEHAVIOR IN PET BIRDS

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Abstract

Feather loss in psittacine birds is an extremely common and extremely frustrating clinical presentation. Causes include medical and non-medical causes of feather loss both with and without overt feather destructive behavior. Underlying causes are myriad and include inappropriate husbandry and housing; parasitic, viral and bacterial infections; metabolic and allergic diseases; and behavioral disorders. Prior to a diagnosis of a behavioral disorder, medical causes of feather loss must be excluded through a complete medical work-up including a comprehensive history, physical exam, and diagnostic testing as indicated by the history, signalment and clinical signs. This article focuses on some of the more common medical and non-medical causes of feather loss and feather destructive behavior as well as approaches to diagnosis and treatment. Copyright 2012 Published by Elsevier Inc.

Key words: feather destructive behavior; psittacine; behavioral disorder; feather-picking; avian behavior

Feather loss is one of the more common and frustrating reasons that avian patients are presented to veterinary hospitals. Several factors make the treatment of feather loss difficult. The initial problem lies in the relative scarcity of controlled studies related to the underlying causes of feather loss in companion avian species and the paucity of current veterinary medical knowledge regarding feather loss and feather destructive behavior (FDB). Although many medical and environmental conditions have been associated with FDB, few have been proven to be causal. Wherever possible, this article references applicable controlled studies, although they are few. Elsewhere, review articles and conference proceedings are referenced, with personal observations referred to as necessary.

The initial clinical dilemma facing the practitioner is determining if the feather loss is intrinsic or due to FDB. Pet birds are often left unserved for long periods of time, which limits the owner’s ability to observe FDB. Additionally, owners may be unable to distinguish normal preening behavior from overt feather destruction.

Although definitions vary, for the purposes of this article, intrinsic feather loss will refer to feather loss that is either not self-inflicted or is the result of normal preening of abnormal feathers. FDB will be defined as self-inflicted feather loss, damage, or destruction, regardless of etiology. If it can be determined that the feather loss is self-induced, the next step is determining if this FDB has a primary medical etiology, involves husbandry and/or nutritional issues, is psychogenic in origin, or, as is often the case, includes a combination of factors.

If environmental factors and medical conditions associated with feather loss and destruction can be reasonably ruled out, determining the underlying triggers and reinforcing factors that may perpetuate psychogenic FDB can be complicated and time-consuming. Limitations include the accuracy of the owner’s observations and his or her willingness to learn and commit to behavioral enrichment and modification techniques. This article will discuss the more common causes and risk factors associated with feather loss, both with and without FDB, as well as treatment options.

Missing or damaged feathers warrant a comprehensive review of husbandry, as well as a
medical workup and behavioral assessment (Fig. 1). The first step is a thorough anamnesis. Because of the need for extensive questioning regarding diet, husbandry, and behavior, a prepared questionnaire can be e-mailed or faxed to the owner before the office visit. By previewing a thought-provoking, problem-specific questionnaire, the owner should be able to present more thoughtful and accurate responses, and allow the practitioner time to review the information. Examples of these extensive questionnaires relating to abnormal feather problems affecting companion avian species have been published.1

The enclosure type (size, material), location (indoor, outdoor), and the presence or absence of cage mates or adjacent birds should be investigated. The current and previous diet, both what is offered and what is actually consumed, should be determined by the attending clinician. Unless an obvious reason for feather damage can be ascertained when taking the patient history (e.g., excessively small cage damaging the rectrices) and signalment (e.g., the characteristic “bald spot” of Lutino cockatiels), or while performing the physical examination (e.g., an obese budgerigar with alopecia over the breast), a medical workup is indicated. Generally, a complete blood count, plasma chemistry panel (including resting bile acids, cholesterol, and triglyceride levels), fecal cytology and wet mount examinations, and 2-view whole-body survey radiographs should be performed.

On physical examination, the condition of the skin, feathers, and feather shafts in areas with and without feather loss should be examined. Several excellent reviews are available that will help the practitioner in determining normalcy of companion avian species feather condition.2-4

**INTRINSIC FEATHER LOSS**

Non-medical Intrinsic Feather Loss

A commonly encountered risk factor for feather loss in the absence of either an underlying medical problem or FDB is an inappropriate environment. A small cage or poor cage layout can damage the primary flight feathers or the rectrices (Fig. 2). The bird may be removing the damaged feathers at an inappropriate rate, but removal of damaged feathers is normal preening behavior. This will rarely affect the secondary or covert feathers.

Toxins, both airborne (e.g., cigarette smoke, scented candles, perfume, air fresheners, hairspray) and topical (e.g., hand lotion, hand creams), have been implicated in FDB, though the association remains anecdotal. Owners should be encouraged to avoid the use of these products on or around their birds.

Low humidity levels and abnormal photoperiods can promote poor feather quality in pet birds; owners and veterinarians may mistake the patient’s unkempt feathers for FDB. In neonates, low humidity can lead to a failure of the feather sheath to soften, causing retention (Fig. 3).5 Adult birds housed in lower ambient humidity than required for that particular species may develop dry, flaky skin and overall poor feather quality, which may be mistaken for FDB.5-7 Photoperiod is essential to the regulation of circadian and circannual rhythms in birds; therefore, the artificial and usually static pho-

**FIGURE 1.** A common presentation of birds with FDB is a normally feathered head with a complete lack of feathers on the rest of the body.

**FIGURE 2.** Damage to the primary flight feathers and rectrices is common in birds kept in inappropriately small cages.
toperiod provided to pet birds may alter and often delay molts. Retention of feathers due to the delay in new feather formation can lead to a ragged, unkempt appearance which may be mistaken for FDB. Providing a seasonally appropriate variation in photoperiod, controlled access to the outdoors, and bathing, showering, and/or misting birds affected by this condition will often help to resolve the problem.

Medical Intrinsic Feather Loss

Many diseases can damage the feathers such that they are easily lost; these birds may be incorrectly labeled as “feather-pickers.” Chronic malnutrition can result in a variety of feather dystrophies. Less often, viral infections and parasitic mite infestations damage the feather follicle and shaft, weakening their attachment and allowing the feather to be readily shed.

Malnutrition

Nutritional feather disorders can be considered to be both environmentally and medically induced. Although malnutrition has long been associated with FDB, research into potential mechanisms is lacking. Birds in captivity, similar to those in the wild, do not self-select for dietary completeness. In addition, most captive birds are fed diets that are inherently nutritionally incomplete, and many of these diets further allow the birds to select favored foods. Consequently, this creates a situation in which malnutrition is endemic in captive psittacines both with and without FDB; clearly other factors are involved in the development of FDB.

The metabolic cost of growing, maintaining, and replacing feathers can be high; the process of molting involves the staggered replacement of up to 30% of the lean, dry body mass of a bird, of which 90% is protein. The basal metabolic rate of avian species can double during molting periods. Given these physiological costs, it is not surprising that nutritional status has a significant impact on feather health, and deficiencies may manifest as feather disorders. Birds undergoing molt have increased need for energy, amino nitrogen, and amino acids, in particular cysteine. Research studies have shown that food-deprived juvenile starlings have slower feather growth rates and sparrows fed diets deficient in sulfur-containing amino acids had delayed molts and a greater number of feather deformations when compared with birds fed nutritionally adequate diets. Deficiencies in certain sulfur-containing amino acids will create abnormalities of the rachis, abnormal persistence of the basal sheath, and misshapen vanes; lysine is essential for overall feather strength; and methionine deficiency has been associated with the formation of horizontal “stress lines” on feathers. However, it is important to note that in experiments where specific amino acid deficiencies were induced, birds did not develop FDB. Whether the removal of these abnormal feathers explains the observed link between FDB and malnutrition or a more direct link exists awaits further research.

Circovirus: Psittacine Beak and Feather Disease

Circoviruses are hardy, non-enveloped DNA viruses that are responsible for psittacine beak and feather disease (PBFD). PBFD is somewhat of a misnomer because the beak is rarely affected in non-Cacatua spp. However, the name PBFD has remained in common usage. PBFD primarily affects young birds; in one study 92% of infected cockatoos were under 3 years of age. African species such as the Psittacus spp. and lovebirds (Agapornis spp.) are considered highly susceptible to circovirus. Although rare, PBFD has been reported in several New World parrots (e.g., macaws [Ara spp.] and Amazon parrots [Amazona spp.]). The circovirus is shed in large amounts in feather and skin dander; although the exact mode of transmission remains unclear, inhalation and/or oral ingestion is suspected.

Feather dysplasia occurs via necrosis of the epidermal collar, basal epidermis, and feather pulp, and hemorrhage and necrosis within the feather pulp. The type and extent of feather lesions depend on the species of bird and the stage of molt when the bird begins to develop abnormalities.
Chicks affected during the initial stages of feather development demonstrate the most severe pathology associated with PBFD. Initial signs may include delayed molts or decreased powder-down production with a small number of dysplastic feathers; over time the number of affected feathers generally increases. Hemorrhage within or hyperkeratosis of the feather shaft, weak and easily broken feathers, pinching off of the feather base, abnormally pigmented feathers (particularly reddening of normally gray feathers in *Psittacus* spp.), or a combination of these feather dysplasias are commonly reported changes associated with this viral infection. In older juveniles, abnormal clinical signs often begin with necrosis and dystrophy of the powder-down and contour feathers; the lesions then spread to other tracts of contour feathers followed by similar lesions in all other feather types. Eventually, feather follicles become inactive and the bird will remain largely featherless.

Although the ban on importation of wild birds and the development of accurate testing has greatly decreased the incidence of circovirus infection in larger parrot species in the United States, lovebirds and budgerigars are still frequently affected and diagnosed with this disease. Some studies have found infection rates as high as 30% in lovebirds; the number is likely lower in budgerigars. Many, if not most, infected lovebirds will remain subclinical. Affected lovebirds are usually older juvenile to young adult birds; signs include an unthrifty appearance, delayed molts, and loss of feathers (Fig. 4). A unique manifestation occurs in budgerigars wherein the affected bird will exhibit normal feathering except for the presence of a "French molt" characterized by the absence of the primary and secondary wing feathers and often the rectrices as well. Breeders refer to these clinically affected budgerigars as "runners" or "creepers." It is important to remember that a polyomavirus infection (or a combined polyomavirus/circovirus infection) can result in the similar clinical signs in budgerigars as described above.

Diagnostic testing for PBFD is recommended for all susceptible birds before introduction to a collection regardless of the clinical condition of the bird during the initial examination. Polymerase chain reaction (PCR) analysis is considered the test of choice for avian circovirus. The most appropriate sample for testing is debatable, with some studies finding analysis of feather and cloacal samples more reliable than whole blood, especially in the case of subclinical birds, whereas other studies have found PCR analysis of blood to be more sensitive than that of feathers. If feather samples are submitted, the practitioner must be careful to avoid environmental cross-contamination and false-positive results because other birds infected with circovirus may be shedding copious amounts of virus. Laboratories have been shown to have different degrees of accuracy in diagnosing circoviral infection via PCR, and the practitioner is encouraged to contact their diagnostic laboratory to determine what internal controls have been established to ensure accurate test results. Veterinarians are also encouraged to remember that in the case of circovirus, as in all viral infections, a positive PCR result does not necessarily equal an active infection; positive circovirus PCR results should be verified by retesting after 90 days, during which quarantine is strongly recommended. Because circovirus is genetically diverse, PCR may not be able to detect all genotypes. Although there is much discussion regarding different "types" of avian circoviruses, it has been shown that many strains of circovirus exist with new strains still being discovered. Although some degree of host specificity likely exists it should be assumed that all susceptible psittacine species may be susceptible to any virus variant—another reason that owners should be encouraged to test and quarantine any new birds they want to add to their established avian collection.

**Polyomavirus**

Avian polyomavirus, a DNA virus with a worldwide distribution in which there are a large number of susceptible avian species, can, in budgerigars, be a cause of feather dystrophy and feather
loss in the absence of FDB. Polyomavirus infection is generally a disease of nestling birds. Nestlings and adult birds of most species are susceptible to infection; however, the vast majority of infected adult birds will seroconvert and clear the infection without demonstrable illness. Particular disease syndromes, and if clinical disease even develops at all, depend on multiple factors (e.g., species, co-infection with other disease agents such as circovirus, age at exposure). Certain species, such as macaws, conures (Aratinga and Pyrrhura spp.), Eclectus parrots (Eclectus roratus), budgerigars, lovebirds, ring-necked parakeets (Psittacula spp.), and caiques (Pionites spp.) seem to be most susceptible to polyomavirus infection. Feather lesions from polyomavirus are, in most cases, only clinically observed in budgerigars. Although not definitively proven, exposure to polyomavirus is suspected to occur primarily via inhalation.

Disease in budgerigars is unique compared with that in other bird species and can take many forms; although some budgies that survive polyoma infection will never develop overt clinical signs, others will develop French molt as previously discussed. English budgerigars are believed to be more resistant to infection compared with other lines of budgerigars. The development of feather lesions in surviving, infected nestling budgerigars follows a fairly predictable pattern: budgerigars under 2 weeks of age show a lack of powder-down on the head and neck; those 2 weeks to 1-month-old exhibit a lack of or incompletely developed flight feathers; and, after 25 days of age, feathers will begin to develop, although the tail and/or some flight feathers of some birds remain underdeveloped or absent.

PCR analysis of both whole blood and a combined choanal/cloacal swab is recommended for birds during quarantine in order to identify viremic and/or shedding birds. Because many birds survive and clear polyoma infections, positive results should be confirmed after 90 days.

Mites
Cnemidocoptes mite infestations are generally restricted to the cere (budgerigars; “scaly face”) or feet (canaries; “tassel-foot”), although feather loss in severe infestations involving the feather follicles have been reported. Feather mites can be found, nonpathogenically, in host-adapted species, though feather loss can occur in immunocompromised birds or in nonhost species. Quill mites (e.g., Syringophilus, Dermaglyphus) are generally not pathogenic, but can cause horizontal barring, hemorrhage, and fracture of feather shafts with subsequent feather loss. Most feather mites can be visualized directly or identified with tape preparations or skin scrapes. Quill mites can be identified with cytology and examination of feather shaft material from a growing feather. Mite infestations can be treated with fipronil, carbaryl, or avermectin drugs.

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Metabolic
Simply put, anything that produces pain or discomfort may predispose that individual to feather destruction; this feather loss may be diffuse or occur directly over the site of irritation. Renal disease has been associated with localized picking over the synsacrum. Septicemic alopecia is a condition of repeated rubbing and chewing of a particular area, often over the breast, in response to generalized fungal or bacterial infection. Hepatic disease, long known to be responsible for pigmentary changes and darkening of feathers, has often been associated with generalized feather plucking. Recently, pruritis in people with cholestatic disease was linked to the increased expression of an enzyme that forms the neuronal activator lysophosphatidic acid; the increased lysophosphatidic acid then activates itch.
fibers. Whether similar mechanisms can produce pruritis in birds with hepatic disease, potentially contributing to FDB, is unknown.

Hypothyroidism has also been linked to FDB, though in the single peer-reviewed case report that documented hypothyroidism through the use of a thyroid-stimulating hormone (TSH) assay, the bird showed diffuse feather loss but not FDB. Chickens with primary hypothyroidism as well as thyroidectomized birds show abnormal molts and plumage patterns but not FDB. Studies that investigated total T4 levels in birds exhibiting FDB have been inconclusive. TSH assays are considered superior to resting thyroid levels for diagnosis of avian hypothyroidism; this is especially true because birds have a resting total T4 level only one fifth to one tenth those reported in mammals. Although a TSH stimulation test has been validated for birds and normal values established for certain species, this test is not currently commercially available because of a lack of availability of bovine TSH. Attempting to diagnose or treat FDB by observing response to treatment with thyroid supplementation is unreliable. Overall, the role of thyroid disorders in FDB remains unclear.

Allergic and Inflammatory Disease
The roles of allergic and/or inflammatory diseases in FDB have also been investigated. A technique for intradermal skin testing in birds has been described, but was found by the authors to be unreliable. One small, prospective study using a paired biopsy technique that compared samples from affected and unaffected areas of the same patient failed to find any inflammatory cells in samples from either feather-picked or control birds, except in one sample from a nonpicked area of a feather-picking bird. A larger, retrospective, case-controlled study of feather-picking and self-mutilating birds using this paired biopsy technique found inflammatory changes consistent with a cutaneous delayed-type hypersensitivity reaction in both the affected and unaffected areas in slightly over half the samples. The authors felt that the balance of the samples represented “traumatic” skin disease that occurred in the absence of inflammation. In the study, lories, macaws, and Amazon parrots were more likely to have inflammatory skin disease, whereas cockatoos and African gray parrots were more likely to exhibit traumatic skin disease without inflammation.

Fungal or yeast allergy and/or dermatitis, specifically those cases involving Aspergillus spp., Malassezia spp., and Candida spp., have been considered as a possible cause of feather loss and FDB, though controlled studies are lacking (Fig. 5). Dermatitis and feather damage were reported in chickens from which C. albicans was identified and a fungus suspected to be Malassezia spp. was associated with pruritis and feather loss in a canary. In one study examining acetate tape preparations from birds with and without FDB, only 10% of the samples contained any yeast at all. None of the identified yeast were Malassezia spp. and only a very small percentage were identified as Candida spp. The numbers of yeast identified microscopically did not differ significantly between birds with and without FDB. Whether these findings indicate the limitations of the tape preparation technique or minimal involvement of fungal organisms in FDB required further scientific investigation. It is important to note that bacterial or fungal dermatitis may occur subsequent to self-mutilation. Treatment of the dermatitis is necessary, but addressing the underlying factors that predispose the bird to self-mutilation is critical.

Bacterial disease of the skin generally manifests as a folliculitis or a generalized dermatitis, both of which can create local inflammation, pruritis, and feather destruction. Lesions associated with bacterial dermatitis are often reddened and exudative with superficial crust formation and, in severe cases, necrosis extending into the dermis.

FIGURE 5. Malassezia dermatitis in a Psittacula parrot as confirmed by biopsy and histopathology.
Bacteria associated with these lesions are often Gram-positive cocci, commonly *Staphylococcus* spp. In cases of suspected fungal or bacterial dermatitis, an impression smear can assist in the interpretation of culture results; for example, should the cytology show a preponderance of Gram-positive cocci, growth of *Pseudomonas* spp. on culture is unlikely to be clinically significant. In both bacterial and fungal dermatoses, definitive diagnosis is obtained via biopsy and histology, because the presence of bacteria or yeast is not sufficient to prove causality; therefore, tissue invasion and an inflammatory reaction must be confirmed through histopathologic review of the affected tissue. In cases of suspected fungal infection, a portion of the biopsy sample can be frozen for culture and subsequently processed if indicated by the histopathology. Pending culture results, the cytological results can be used to determine the initial antimicrobial choice. Treatment involves long-term administration of antibiotics and/or antifungals; often treatment for 6 weeks or longer is required for successful resolution of the case.

**Avian Bornavirus**

Avian bornavirus (ABV), a single-stranded RNA virus in the family Mononegavirales, is the putative agent of proventricular dilation disease, a common infectious disease of many bird species. The virus has only recently been identified. In addition, a subclinical carrier state has been documented in cockatiels. Although a complete review of the emerging research of this virus is beyond the scope of this article, it is important to note that a link between ABV infection and FDB (as well as mutilation syndromes) has been postulated. Theoretically, because ABV is a neurotropic virus shown to induce peripheral neuritis, a link between ABV, peripheral pain, and FDB or self-mutilation may exist, but remains speculative at this time.

**Giardia**

*Giardia psittaci* are motile, flagellated protozoa with a worldwide distribution that are known to infect a wide variety of avian species, though they are most commonly documented in cockatiels. Although in most species clinical signs are limited to enteritis, a unique, though unproven, manifestation of *Giardia* infection in cockatiels is pruritis and a predisposition to feather plucking. *Giardia* is only intermittently shed, so repeated fecal examinations may be required for detection; fecal samples should be rapidly examined because the trophozoite form is very short lived once excreted. The use of warm saline solution and dilute Lugol’s solution as a contrast agent may increase the success of identifying the organism in infected bird feces. PCR analysis of feces and/or cloacal swabs is commercially available, though sensitivity and specificity are not documented for avian species. Transmission is fecal-oral, and the treatments of choice for this disease are metronidazole, fenbendazole, or ronidazole. Cockatiels may be sensitive to fenbendazole and it should be used cautiously, if at all, in this species.

**MUTILATION SYNDROMES**

Species-specific “syndromes” of self-trauma that may involve FDB have been reported. Although suspected links to infectious and/or metabolic conditions have been hypothesized, significant behavioral components must be considered. Controlled studies of these “syndromes” are lacking, and further identification of the unique disease entities within this classification awaits further research.

Cockatoos often present for severe self-mutilation involving the feathers, skin, and muscles of the breast or patagium. Chronic ulcerative dermatitis in lovebirds presents as severe self-trauma to the feathers and skin of the patagium, neck, and/or back (Fig. 7). A severe and often fatal self-mutilation, Quaker/monk parakeet (*Myciopsitta monachus*) mutilation syndrome, has been...
anecdotally reported for many years, though no etiology has been identified (Fig. 8).

Treatment of self-mutilation involves provision of a mechanical barrier via collaring or vesting, long-term antimicrobial therapy to treat and prevent secondary infections, and pain control. In some individuals, most often reported in cockatoos, the use of psychotropic medications may be helpful (see below). Unfortunately, treatment is often unrewarding and many of these birds are euthanized because of recurrent self-mutilation. Further research, including the submission of biopsy samples for histopathology by practitioners, may help elucidate the etiologies of these syndromes.

PSYCHOGENIC RISK FACTORS

If an environmental or medical basis for feather loss or FDB cannot be found, behavioral and/or psychological factors must be considered. It is important to remember that behaviorally induced feather destruction is not a diagnosis, per se, but a reflection of problems within the captive environment. For a list of specific proposed etiologies or contributing factors for behavioral FDB, and resources for client education, see Tables 1 and 2.

Some veterinarians and behaviorists consider FDB to be a stereotypical behavior disorder, similar to impulse control disorders such as trichotillomania in humans.64-66 Stereotypies are defined as those behaviors that are repetitive, performed out of their original context, and therefore serve no obvious purpose; these behaviors do nothing to reduce or ease the environmental situation on which they depend, but are simply an expression of that environment.67 These abnormal behaviors are typically observed in situations of conflict and/or frustration. Stereotypical behaviors are often abnormal expressions of normal behavior; the most common stereotypies seen in avian patients can be considered aberrations of typical behaviors: vocalization and flock communication (screaming behavior), reproduction and mate interaction (excessive masturbation and/or cockatoo prolapse syndrome), or grooming (FDB).

The fact that FDB is only observed in captive psittacines, and therefore is in some manner caused by captivity, indicates fundamental limitations in the environment of these animals.68 Frustratingly, many of the problems can be created by a “good” bird owner; for instance, the provision of a stable environment and abundant food, free from the normal costs and stressors that the bird would encounter in the wild. This becomes obvious should one compare the daily activities of a wild-living parrot and a pet parrot. Captive orange-winged Amazon parrots (Amazona amazonica) fed a pelleted diet spend only 30 to 72 minutes a day in feeding behaviors, whereas free-ranging Amazon parrots spend up to 4 to 6 hours a day foraging for food.69,70 This is to say nothing of the distance the parrot would travel to find that food; the mental acumen required to locate and avoid predators; the challenge of observing and reacting to changing environmental and weather patterns; and the mental flexibility required to navigate the myriad of interactions that occur in a flock of similarly intelli-

FIGURE 7. Chronic ulcerative dermatitis in a peach-faced lovebird exhibiting severe self-mutilation over the back and shoulders.

FIGURE 8. Severe self-mutilation in a Quaker parakeet.
gent individuals. Most pet parrots are housed in cages no larger than 5 to 10 times their own height and less than this in width. They are fed a bowl of easily accessible food that requires no thought to select or prepare. Our generally poor understanding of avian social structure leads to the “human flock” sending confusing and inconsistent signals, especially in terms of reproductive relationships. In addition, these birds are housed exclusively indoors with no need to adapt to their highly static environment. Given this situation, the similarity between the stereotypies seen in pet parrots and those observed in industrial farms and zoological institutions is not surprising.

It has been estimated that 1 of every 10 birds has some degree of psychogenic feather-picking behavior; FDB may be the most common disease presentation of companion psittacine species to veterinary hospitals.71 Counseling owners on the maintenance of the psychological well-being of their bird is as

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<th>TABLE 1. Factors associated with feather loss in psittacine birds</th>
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<td>Nonmedical feather destructive behavior</td>
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Plus signs are meant to indicate the suspected relative prevalence of each of these etiologies as seen in clinical practice, although no controlled studies exist that determine the actual contribution or prevalence of these etiologies in feather loss.
essential as discussing basic nutritional and husbandry requirements and should be an integral part of every “new bird” visit.

It is an accurate oversimplification to say that most behavioral FDB is related to a reductive environment over which the bird has little or no control. Experimentally, it has been shown that certain behavioral disorders, including FDB, may potentially be prevented, and when established, can possibly be reversed with environmental modification.\(^6\)\(^5\),\(^7\)\(^2\) Moreover, manipulation of the physical and mental environment that creates situations in which the bird is given the ability (and is required) to make decisions, is the first step to improve the patient’s living condition. This is often easier than most owners realize. A first step may be changing the location and furnishings of the cage, requiring the bird to accommodate to new surroundings. Weather permitting, owners should be encouraged to allow their birds controlled, supervised access to the outdoors. Here the bird can observe and react to novel stimuli, such as cloud movement, barometric pressure changes, traffic, wild birds, etc. Being outside also requires the bird to be vigilant for (hopefully nonexistent) predators, providing additional mental stimulation.

It has been shown that providing mentally stimulating challenges and tasks can provide relief from psychogenic FDB. This has been referred to as a “compelling occupation” for the bird; or “giving the bird a job.”\(^7\)\(^3\) Well-fed starlings were shown to prefer foraging for their food rather than eating out of bowls.\(^7\)\(^4\) Young Amazon parrots that were introduced to a combination of foraging activities such as sifting through nonfood items, along with environmental enrichments such as alternative perches, demonstrated improved feather condition.\(^7\)\(^2\) Foraging enrichment was shown to decrease psychogenic feather-picking in African gray parrots.\(^7\)\(^5\) However, it should be noted that the 2 previous studies used poor plumage condition as an indirect measure of FDB, which has not been validated as an experimental model.

Providing enrichment through foraging can be as simple as the provision of relatively complicated food items such as corn on the cob, pineapples, or pomegranates. Although a variety of complicated foraging toys have become commercially available, these items can easily be constructed by the bird owner. Owners can try paper bags, cardboard boxes, plastic water bottles, and other types of “food toys,” while being cautioned to provide these items to their birds under supervision to ensure that only the food is being consumed. Owners should also be informed of the resources currently available regarding captive foraging (see Table 2).

Additional enrichment techniques (“jobs”) include providing soft wooden perches for chewing, as well as magazines, phone books, or other “destroyable” objects that the bird will be disinclined to consume (Fig. 9). In addition to the destructive behaviors enjoyed by most parrots, cockatoos seem to enjoy unscrewing and solving items that are seen as “puzzles.”

One simple way to provide the bird with a “job” is training. Many birds, despite their intelligence, are not asked to perform any action more complicated than stepping onto a hand or a finger. Owners can begin by teaching the “come” and “stay” commands they use with other pets.\(^7\)\(^3\) Providing food and verbal rewards for performing a task requires the bird to focus and think. This also allows the bird and owner to bond in a way that does not

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<td>Inappropriate bond to owner</td>
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Please note that these are a sampling of the available online resources, with a significant and beneficial overlap in content. These are provided for the practitioner’s convenience and are not exhaustive.

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![FIGURE 9. One author’s bird spends hours per day chewing his perch symmetrically.](image)
involve rubbing and petting, consequently this will not be perceived by the bird as reproductive behavior.

Other treatments that have been used for behavioral FDB include avoidance devices such as Elizabethan collars and psychotropic medications. Collaring of birds to prevent behavioral FDB does nothing to change the underlying pathology and should be avoided except in cases of self-mutilation. Many birds do not readily tolerate collaring; commonly, initial responses by avian patients to collars include violent flailing, prolonged recumbency (“playing dead”), anorexia, and generalized anxiety (Fig. 10). In many veterinary hospitals, collaring an avian patient is an in-patient procedure. Owners are warned that multiple modifications may be required to find a functional, well-tolerated collar. If the bird does not immediately adapt to the collar, fluids and gavage feeding may be required. Midazolam (Versed; Roche Labs, Basel, Switzerland) dosed at 0.3 to 0.5 mg/kg is often administered before collar placement to facilitate acclimation. Although radiograph film has commonly been used to make collars, it is less durable than commercially available plastic collars. Available types of avian collars include molded plastic spherical and straight extenders, the latter often with grooves for the addition of Elizabethan-style collars (Fig. 11). Custom-made extenders can be designed from the inner cardboard support contained in rolls of flexible, cohesive bandaging; the cardboard is cut circumferentially to the

![FIGURE 10](image10.png) Sedated Dusky Pionus (*Pionus fuscus*) after the application of an e-collar. “Playing dead” is a common sequelae of application.

![FIGURE 11](image11.png) Types of commercially available avian collars include (from left to right) extenders, Elizabethan collars, and spherical collars.

![FIGURE 12](image12.png) The cardboard is cut to an appropriate height and wrapped with cohesive bandaging.

![FIGURE 13](image13.png) Note the padding goes beyond the edge of the cardboard to create tabs.
correct height, and then split vertically to allow it to be applied around the neck (Figs. 12-17). Before application, the cardboard is covered with layers of the cohesive bandaging material for padding; the bandaging material is left long, allowing overlap. These overlapping leaves are pressed together for closure and secured with strips of fabric tape.

Collars, regardless of type, must allow food to pass easily into the crop while still being snug enough to prevent the bird from getting its lower beak underneath the collar. The specific type of collaring used depends on the size of the bird, the area requiring protection, and what the bird will tolerate. A simple distraction may be enough to prevent mutilation in some birds; fabric “ponchos” or “vests,” a spherical collar, or an extender alone may suffice. Vests are fashioned from tubular stretch-net bandaging material with holes cut out for the wings (Figs. 18 and 19). If an Elizabethan collar is required, attention must be paid to orientation. When placed with the opening directed caudally, mobility is compromised and the birds may injure their wings on the collar edges. When placed with the opening directed cranially, the bird may be unable to eat and drink (Fig. 20). Note that the use of collars without extenders can produce abrasions on the cervical skin.

Multiple pharmacological agents have been advocated for use in behavioral disorders in birds, including FDB. Stereotypic and self-injurious behaviors have been shown to cause increased activity at opioid receptors; it is suspected that the release of endogenous opioids activates central dopaminergic systems, reinforcing the stereotypic behavior. Eventually, the behavior becomes gratifying in its own right, even when the initial stimulus is removed. Opioid blockade with receptor antagonists has been shown to be
Effective in treating self-injurious behavior in people, and as such has been advocated for treatment of FDB. Although controlled, peer-reviewed avian studies are lacking, in one small trial using the opioid antagonist naltrexone (prescribed at variable doses and durations), over three fourths of the birds appeared to respond to treatment. A naltrexone dose of 1.5 mg/kg twice a day orally has been advocated, but pharmacokinetic studies are lacking.

Antipsychotic drugs act as antagonists to dopaminergic D<sub>2</sub> receptors within the mesolimbic pathway causing a decrease in spontaneous movements, behavioral quieting, and, in people (and perhaps birds), a state of relative indifference to stressful situations termed ataraxia. Antipsychotics also have the ability to interrupt the endogenous opioid feedback cycle; of these drugs haloperidol has received the most attention in avian medicine. Haloperidol is used most often for self-mutilation, as opposed to FDB. Several studies have documented a decrease in injurious behaviors, especially in self-mutilating cockatoos, though side effects including sedation, depression, decreased appetite, and agitation were observed and considered severe enough in some cases to discontinue treatment. In addition, extra-pyramidal side effects, often noted in humans prescribed haloperidol, have been reported in birds. Doses from 0.01 to 2.0 mg/kg have been published, including both oral and injectable depot formulations, but none of the doses are based on controlled studies and frequent dose adjustments may be necessary. Although African gray parrots and Quaker parakeets have been documented to be at risk for disorientation and/or neuroses, caution should be used when dosing haloperidol in any species.

Serotonergic agents used for the treatment of FDB are generally one of two types; those having fairly specific affinity for presynaptic neurons, causing a selective blockade of the reuptake of serotonin in presynaptic neurons (selective serotonin reuptake inhibitors [SSRIs]), or the less selective tricyclic antidepressants (TCAs). TCAs inhibit the reuptake of not only serotonin but also, usually through the actions of their metabolites, norepinephrine, acetylcholine, and histamine. Of the TCAs, clomipramine is the most commonly used in veterinary medicine. It is a serotonin-norepinephrine reuptake...
inhibitor and has been used extensively in small animal medicine for behavioral disorders such as separation anxiety, urine marking, inappropriate barking, and destructive behavior. In psittacine birds, a small, nonblinded prospective study showed that only 2 of 11 cockatoos exhibiting either mutilation or FDB had a sustained, positive response to clomipramine.89 However, in a separate, double-blinded, placebo-controlled clinical trial, a statistically significant improvement in FDB was noted in cockatoos treated with clomipramine compared with those treated with a placebo.90 Side effects induced by clomipramine appear to be relatively mild, uncommon, and reversible with the withdrawal of the drug, though caution is indicated when it is combined with other drugs, especially antipsychotics, because clomipramine also acts as a dopaminergic antagonist.86,91

SSRIs used in psittacine behavioral medicine include fluoxetine and paroxetine. A small, open trial investigating the use of fluoxetine in feather picking birds showed an initial, positive response followed by relapse in 85% of the subjects.92 A description of the successful use of fluoxetine in a self-mutilating cockatiel has been reported.93 Paroxetine is a structurally similar SSRI with a comparable efficacy to fluoxetine and has been reported in other bird species.88,95-97 Wider-ranging, empiric doses have been published; however, a recent study in African gray parrots dosed at 2 mg/kg orally every 12 hours showed rapid elimination and poor bioavailability, implying this dose may be suboptimal.88,98

Psychogenic FDB is a multifactorial and complicated entity that is unlikely to respond to a single intervention or treatment. Even with a combination of approaches, success in resolving FDB may not be achieved. Owners should be reassured that increasing appropriate interaction and stimulation will result in improvement in the overall well-being of the bird, regardless of the degree of improvement in the FDB.

SUMMARY

Feather loss is a complicated, multifactorial, and frustrating clinical presentation that should be considered a clinical disease presentation and not a diagnosis. Underlying etiologies and associated risk factors may include medical, environmental, nutritional, and psychological components. A comprehensive history and medical workup are essential when approaching the bird with feather loss. If psychogenic FDB is involved, a variety of enrichment resources are available to create a more stimulating environment. The owner should be counseled on basic behavioral modification techniques and provided with resources to continue gaining information. A discussion of the environmental and psychological needs of pet birds is an essential but frequently overlooked part of all “new bird” visits.

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