

Emergency and Critical Care

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Fig 7.1 | This dyspneic female cockatiel was unresponsive to stimuli and had flexed claws. This bird died shortly after presentation.

Emergency Stabilization

Avian emergencies are typically more challenging than dog and cat emergencies.¹⁰ This is because birds tend to hide illness such that by the time they are brought in to be examined they are in an advanced state of debilitation. At this point, handling or other stress may be fatal. Some birds will have such grossly severe clinical signs that handling for examination is contraindicated (see the “Put It Down” List in Chapter 6, Maximizing Information From The Physical Examination). Such clinical signs include pronounced dyspnea (Fig 7.1), prolonged panting or gasping for air, inability to grasp with feet, weakness, inability to bite, closing the eyes during the examination (listlessness), lack of normal response to stimuli and incoordination (see Fig 7.3), marked abdominal swelling, frank blood in feces (Fig 7.2) and fluffed appearance. A lack of fecal material in the droppings (Fig 7.4) and anorexia, especially in smaller birds, can foreshadow impending death, which may be hastened by handling. For this reason, these clinical signs have been referred to as a “put it down” list.²¹ If such signs are noted during the examination, the bird should be released immediately back into its cage. Very critical patients, especially those that are dyspneic, often will benefit from oxygenation prior to handling. This is especially important with inhalation toxicosis or in cases of tracheal obstruction. The least stressful method of oxygen administration is to place the patient in a chamber connected to an oxygen source to create an environment of 40 to 50% oxygen concentration.³¹ When possible, the bird should remain in the carrier in which it is presented, and the carrier with the bird inside is placed into an oxygen chamber (Fig 7.5). The bird should remain in the chamber until it is stabilized. Oxygen toxicity from prolonged exposure has been recorded and should be avoided.



Fig 7.2 | Frank blood in the urine portion of the droppings is frequently an indication of renal disease. Mercury and lead toxicoses have been reported etiologies for hematuria. Blood from the cloacal mucosa may be confused with blood in the urine.

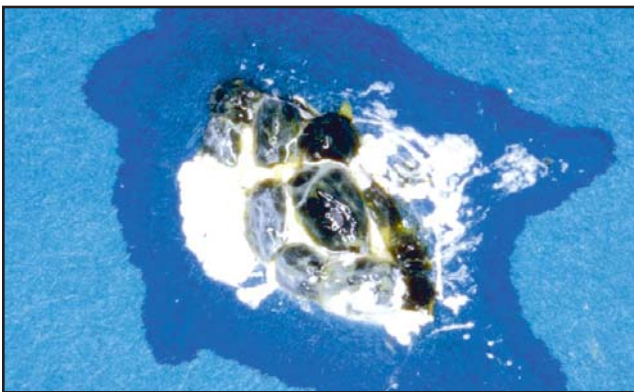


Fig 7.4 | Psittacine and passerine birds seldom pass pure urates and urine coated by mucous. Excessive fruit consumption, increased water consumption due to heat, or stress may produce such a dropping in an otherwise healthy bird. Passing such multiple droppings often indicates prolonged anorexia. Also note the yellow-colored bile pigment stain in the urates, indicating hepatic disease. All these indicate a grave prognosis.



Fig 7.3 | In an emergency situation with a dyspneic bird, minimal handling is required to avoid further stress. Placement of the bird into a container and then placing that container into a plastic bag will allow for direct delivery of oxygen.

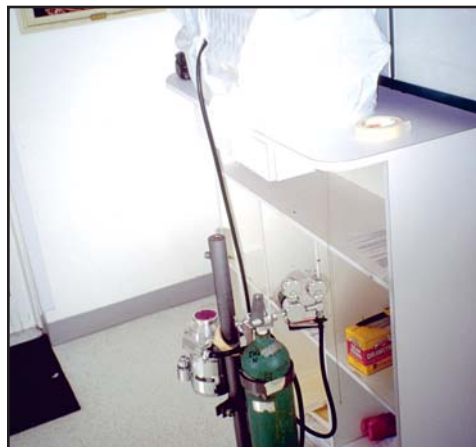


Fig 7.5 | Covering the cage of a dyspneic bird with a plastic bag and flushing with oxygen can be life saving.

In these critical cases it is best not to handle the patient immediately. Explain to the client possible differentials, prognosis and a plan of action. During this conversation, the client will have time to comprehend the severity of the bird's condition. Also, the owner may add information to the history that will alter the list of differential diagnoses, preliminary treatment or the prognosis. It is essential that the owner have a clear understanding of the prognosis and cost estimation before treatment is begun.

Once the owner has agreed to hospitalize the bird, a plan of action should be formulated. Severely ill birds may die from handling, and one must proceed in a step-wise fashion. One treatment or procedure is performed, and the bird is then placed back in its enclosure and allowed to recover prior to attempting the next diagnostic or therapeutic step.

AIR SAC TUBE PLACEMENT

In some cases, emergency placement of an air sac tube (**Fig 7.6a-c**) in the caudal thoracic or abdominal air sac is necessary. This should be done in cases of tracheal or syringeal obstruction. Clinical signs of upper respiratory obstruction include gasping for air, often with the neck extended (**see Fig 7.1**), and/or making "squeaking" sounds with each breath. Air sac tubes are not indicated for respiratory disease below the syrinx or for non-respiratory origins of dyspnea (ascites or organomegaly). For example, primary lung disorders, such as polytetrafluoroethylene (PTFE) toxicity, will not be improved by the placement of an air sac tube, since the air capillaries will still not be able to absorb and exchange oxygen. Abdominal air sac tube placement is contraindicated in lower respiratory conditions such as air sacculitis. These birds may present with whole-body movement during respiration and/or crackling sounds on lung auscultation.

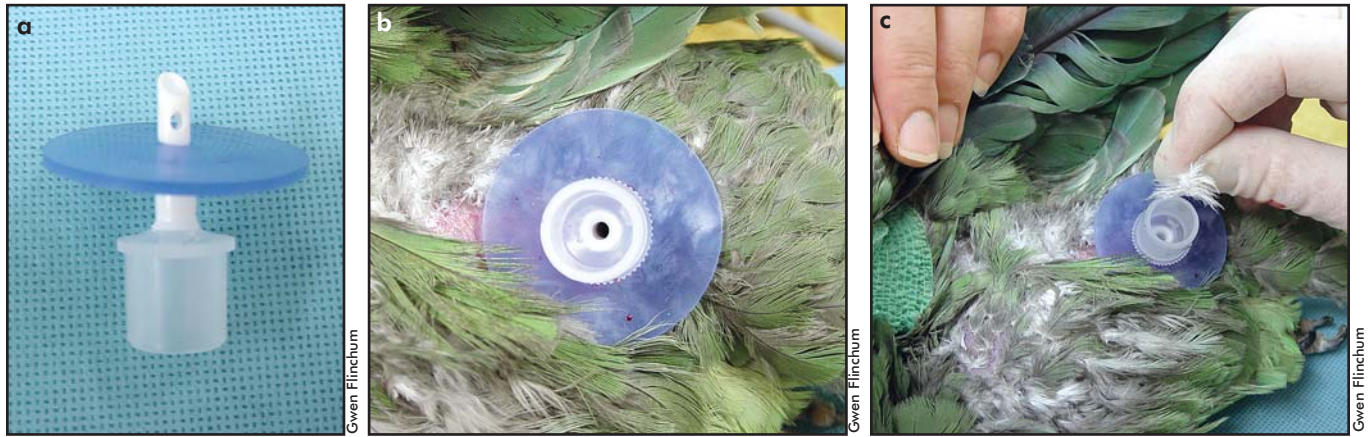


Fig 7.6 | Air sac tube. **a)** Non-cuffed tube^a and retention disk that is sutured to the skin. **b)** The tube inserted anterior to the leg (or in the left paralumbar fossa). **c)** A down feather plucked and used to detect airflow through the tube.

The approach to lacement of an air sac tube is similar to preparation for lateral laparoscopy (see Chapter 24, Diagnostic Value of Endoscopy and Biopsy). The patient is placed in right lateral recumbency with the dorsal leg pulled caudally. The caudal edge of the eighth (last) rib is palpated and the skin over this site is surgically prepped. A small skin incision is made behind the eighth rib. Using mosquito forceps, the muscle wall is bluntly dissected and the body wall is penetrated. A small tube is placed into the hole (Fig 7.6b). To check if the tube is properly seated, place a down feather over the tube opening. The feather should move with each breath (Fig 7.6c). Keep a tight hold on the feather so it is not sucked into the air sac. Care must be taken to avoid iatrogenic organ damage caused by pushing the tube in too far. The diameter of the tube should be the approximate diameter of the patient's trachea. Modified red rubber catheters work well for air sac tubes, as do endotracheal tubes for medium to larger birds. Avian air sac surgical catheters^a are ideal because there is a retention disc attached to the tube that makes suturing the tube to the skin easy and secure (see Tracheal Obstruction later in this chapter).

Supportive Care

SICK-BIRD ENCLOSURES

Sick birds are often hypothermic and should be placed in heated (brooder-type) enclosures^b (Fig 7.7) in a quiet environment (see Chapter 1, Clinical Practice). A temperature of 85° F (29° C) with 70% humidity is desirable for most sick birds. If brooders are not equipped with a humidity source, placing a small dish of water in the enclosure will often supply adequate humidity. A moist towel that is heated and placed on the bottom of a cage or incubator rapidly humidifies the environment, as indicated by the fogging of the acrylic cage front.



Fig 7.7 | A commercial incubator^b that allows regulation of temperature and humidity. Oxygen can be attached if needed.

FLUID THERAPY

Oral Administration

Oral administration is the ideal method of giving fluids. This method is more commonly used in mildly dehydrated birds or in conjunction with subcutaneous (SC) or intravenous (IV) therapy. Oral rehydration (30 ml/kg PO q 6-8 h) also may be used in larger birds (eg, waterfowl) that are difficult to restrain for parenteral fluid therapy.

Subcutaneous Administration

Subcutaneous fluid therapy is probably the most common method of administration, although administration in very critical patients must be done judiciously. With experience, warm fluids can be given over the dorsum in very depressed birds without restraint or altering of the bird's position within its incubator. Studies have shown that adding hyaluronidase^c to fluids (150 IU/L fluids) greatly facilitates the absorption of these fluids.¹⁷ Subcutaneous fluids are most commonly given in the intrascapular area, the flank, and the area over the pectoral muscles



Fig 7.8a | Materials needed for placement of an intravenous catheter in a bird: isotonic warm fluids, syringe and needle for administering flush, heparin flush (not pictured), plastic-coated intravenous catheter^{ff} (24-gauge pictured here), a catheter adapter set (extension), bandage scissors, cotton wool, porous tape, stretch fabric tape^z, flexible bandage material^{aa} (Note: needle and catheter sizes are based on medium to large psittacine patients).



Fig 7.8b | A butterfly catheter (24-gauge) and a much larger 22-gauge, three-quarter-inch catheter for larger birds are possible alternative indwelling catheters for birds.

or the axilla. Maintaining fluids on a heating pad or in an incubator, so they are available at the correct temperature for emergencies, is important. Warm fluids are both an adjuvant treatment for hypothermia and less painful on administration. However, as in mammals, a severely debilitated or dehydrated bird will not absorb SC fluids.

Intravenous Administration

Intravenous administration of fluids is necessary in cases of severe debilitation or severe hypovolemia. However, when dealing with critical cases in avian medicine, difficult decisions must often be made. For example, some patients may die from the stress of being restrained for injection or catheter placement. On the other hand, IV therapy may be imperative in saving a bird's life. Careful consideration must be given to the bird's history and physical condition. Intravenous hetastarch (10-15 ml/kg q 8 h for 1 to 4 treatments) is indicated for hypoproteinemic patients (total solids <2.0 g/dl).

Intravenous Catheter Placement

Intravenous catheterization facilitates fluid administration; however, catheterization can be challenging due to the small size of bird veins. Avian veins also are more subject to rapid hematoma formation than are mammalian veins. This is especially true with the basilic (wing) vein. Catheter placement may be more easily accomplished with the bird anesthetized, although the risk of anesthesia must be considered. Furthermore, catheter maintenance may be difficult, especially if the bird is prone to chew at the site. Elizabethan collars can be placed to prevent this, but often result in further stress to the patient.

Intravenous plastic-coated catheters (IVC) (Figs 7.8a,b) and the related plastic tubing and various rubber adapters — all derived from human pediatric medicine — have made catheter placement in small birds possible (Figs 7.9a-g). Anesthesia may be required for catheter placement and proper securing of the catheter and line. Once placed, the security of the adhesive materials incorporated into these devices, combined with the severe debilitation of the patients in which these catheters are utilized, makes additional restraint or mechanical barriers usually unnecessary.

With the advent of the use of hyaluronidase in subcutaneous fluids the IVC is seldom required. The multidose IV fluid technique also works on most cases in which subcutaneous fluids with hyaluronidase are inadequate. The disadvantage to bolus IV fluids is that they cause hypervolemia with subsequent polyuria; therefore, less fluid is retained than with a constant rate infusion IV drip. This drawback is minimized by the use of a syringe pump that will deliver as little as 1 cc of fluids over periods of up to 1 hour.

Other Fluid Therapy Methods

An alternative to IV catheterization is intraosseous (IO) catheterization of the distal ulna or proximal tibia. This method is very useful during the first 24 to 48 hours of initial hydration and shock therapy. It also is used to maintain hydration and IV access during prolonged procedures, such as complicated orthopedic repairs. In the latter case, the IO catheter can be placed after the patient is anesthetized, avoiding the pain and stress related to its placement. Insertion of IO catheters tends to be painful and often necessitates anesthesia for placement.

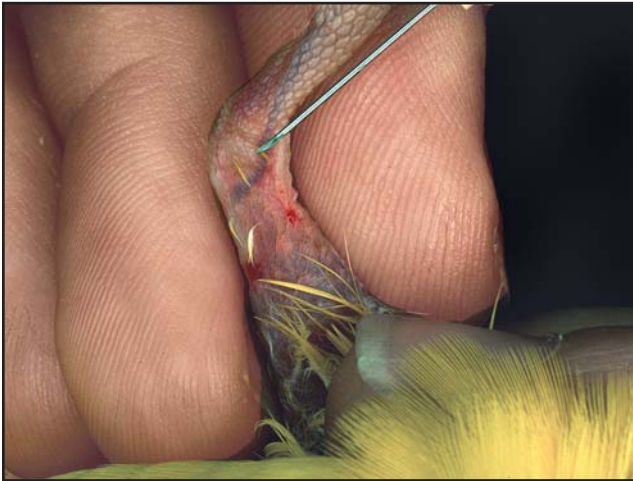


Fig 7.9a | Placing an indwelling catheter in the medial metatarsal vein on a lovebird's leg. The vein is occluded at the proximal tibial-tarsus.



Fig 7.9b | A 24-gauge catheter needle has entered the metatarsal vein. Note the entry site is just the distance of the catheter hub length proximal to the hock. This creates maximum catheter stability when the taping snugs the hub into the depression proximal to the tibioltarsus' distal condyles.



Fig 7.9c | The catheter is advanced to the hub. The hub is taped with a 3- to 4-mm-wide and a 4- to 5-cm-long piece of waterproof adhesive^{bb} tape in the fashion shown.



Fig 7.9d | A small tuft of cotton wool is wrapped around the leg.



Fig 7.9e | An extension with an injection port has been attached to the catheter and it is folded along the skin and covered with cotton wool.



Fig 7.9f | A layer of cohesive flexible bandage^{aa} is wrapped over the catheter, extension and injection port.



Fig 7.9g | The site is wrapped with stretch fabric tape. Fluids can now be administered by bolus as often as desired, or an IV pump can be attached and a continuous drip administered.



Fig 7.10 | An intraosseous needle and the insertion handle.

This may be too stressful for critically ill birds. An IO needle with a handle¹¹ (Fig 7.10) is available and makes catheter placement easier and more precise.

Rectal fluids also may be effective. Posturetal urine can be modified in the rectum after retrograde movement from the coprodeum and subsequently be reabsorbed. In an experimental study, four out of six pigeons were rectally infused with a hypotonic solution, which successfully maintained hydration.²³

PROTECTIVE DEVICES

Various traumas, postsurgical patients and cases of self-mutilation may require the placement of a mechanical barrier to prevent self-trauma. Some birds require little physical distraction (Fig 7.11a). Historically, circles of exposed radiographic film were designed to encircle the neck, forming a type of Elizabethan (E.) collar. Various types of padding used in conjunction with these collars creates a safe and effective barrier to self-mutilation.

Such devices have several drawbacks, however: they are time-consuming to custom make; one must ensure that the collar itself does not abrade or otherwise injure the bird; if the padding is not properly applied, the film's sharp edge may cause abrasions or lacerations circumscribing the cervical area; additionally, the collar must be designed such that the bird does not destroy it. Radiographic film is not very durable and is challenging to apply (Fig 7.11b).

Plastic disks are commercially available, but many are heavy and cumbersome (Fig 7.11c); birds may stumble and fall, have difficulty perching and/or accessing food and water (Fig 7.11d). These collars may become entrapped in the cage or on cage items. Almost all birds will go through a period of agitation in response to application of these "collars." Flapping in a circular, spastic manner for a prolonged period is not uncommon. Additional padding can be applied to avoid damage to the propatagium during these violent episodes;

however, this again adds additional weight to the collars and makes them more cumbersome.

Regardless of the material used, E. collars can be applied facing one of two directions. Applying them with the wide portion forward (cranial) allows for better balance and does not interfere with wing movement; however, it is more likely to impede eating and drinking, and the visual presence of the collar surrounding the bird's head often frightens the bird. If the collar is applied facing backward (with the wide end caudal), the bird can more readily access food and water and can see its surroundings without visual impairment; however, with the collar in this position, the wings cannot be extended for balance. In some cases, the collar must be left long enough to prevent the bird's access to its legs and feet. In these cases, the length of the collar is often significant and the bird will tend to trip on it as it attempts to ambulate.

Plastic disks that provide a neck ring of harder plastic or metal are available. These neck rings may break and some of these devices have a screw-type clamshell neck portion that is very difficult to apply without anesthesia.

Various custom-made, padded cervical collars have been utilized (Fig 7.11e). These are measured from the thoracic inlet — with the neck fully extended — to the mandible. A compressible material consisting of a rubber or plastic foam, such as a swimming pool float or the insulation used to encase refrigeration piping and covered with an elastic tape, has worked well in this author's (GJH) experience. Disposable baby diapers or similar human pads used to absorb urine and feces also can be shaped into lightweight, flexible neck collars (Figs 7.11f,g).

An additional device is a plastic "lego"-like, locking, ballooned out collar^f (Fig 7.11h). Care must be taken to avoid entrapping the bird's feathers in the device, preventing it from locking. If the bird falls or hits this device it may snap open and fall off.

Regardless of the protective device selected, a primary concern is that the application of the collar does not cause injury to the patient. Various combinations or devices and alternating applications may be necessary.

Removing the collar for a period of time each day so the bird may preen will decrease the stress to some birds during prolonged use of a collar.

The use of collars for feather-destructive behavior is seldom warranted, although their use in cases of self-mutilation can be life saving. This is where the clinical distinction between feather destruction and self-mutilation becomes critical.



Fig 7.11a | This cockatiel needed only the minor distraction of the decorative portion of a child's sock to discourage picking.



Fig 7.11b | A severe case of Amazon foot necrosis that occurred prior to the advent of newer treatment techniques. Such cases faced months of collaring. This collar was reinforced with a heavy-duty fabric tape used in the construction industry. Note that the bird managed to pull in the disk's edge and remove part of the tape. This collar also produced a weight burden for the bird.

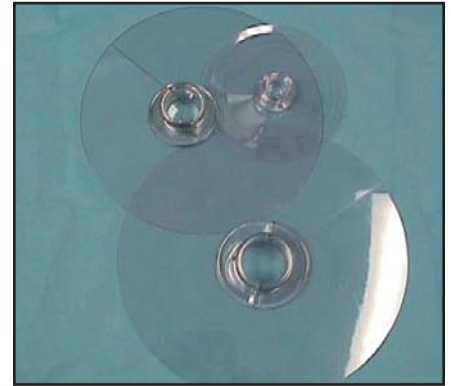


Fig 7.11c | Plastic circular disks use a plastic clamshell shape to envelop the neck. The sleeve comes in two parts and is joined by metal screws. Variations of this collar have a padded, rubber-like cervical edge and metal snaps.



Fig 7.11d | An Amazon is collared to prevent feather-destructive behavior. The bird's nutritional disorders, hormonal imbalances and behavior problems were not being addressed. The use of a collar without addressing the underlying problem is inhumane.



Fig 7.11e | A cervical brace-type protection device made from a padded material. While still requiring a period of adjustment, this variation seems superior to the extensive Elizabethan collar for comfort and rapid return to normal function.



Fig 7.11f | A section of black refrigeration pipe insulation that can be cut into various lengths to fit the cervical area and prevent mutilation. Elastic fiber tape makes a durable coating.



Fig 7.11g | Human diaper pads can be used as padding material that is taped to offer durability and attached for a custom-made cervical brace protective device.



Fig 7.11h | A plastic clamshell protective device with a soft bubble section shaped to prevent the bird from reaching its body. The manufacturer reports faster adaptation and a higher rate of comfort.

Birds that have E. collars applied should be kept in the hospital until they have acclimated to their presence. Some birds have an initial reaction of constant flipping and flailing. These birds should be placed in a padded but otherwise empty incubator and observed. The use of a medication such as medazolam prior to the application of an E. collar may aid in its acceptance. Acclimation here is defined as being able to move around a normal cage and access food and water. The collar may require modification or reinforcement, either to facilitate ambulation or to provide a more extensive barrier to self-mutilation. Chewing at the collar may persist to some degree throughout the period it is worn.

Applying a protective barrier to a bird without consideration for and treatment of the underlying etiology is both poor medicine and potentially cruel. If a less cumbersome device can be used, it should be applied.

ANTIBIOTIC THERAPY

The unnecessary use of antibiotics in veterinary medicine is a current concern. When practical, diagnostic testing should be done prior to the initiation of therapy. Minimally, confirmation of the need for antimicrobial therapy should be determined by response to treatment. Complete blood counts should be performed if collecting blood will not endanger the patient. Culture and sensitivity tests can identify infective organisms and the appropriate medication choices; however, it may take several days to get culture results, which is unacceptable for emergency therapy. Fecal, throat or crop Gram's stains can be done quickly, are relatively non-invasive and can be useful in making therapy decisions. Although indiscriminate use of antibiotics is discouraged, prophylactic use may be indicated on the basis of clinical signs and history for birds that cannot undergo further testing.

Antibiotics are commonly given intramuscularly (IM). Although this route is quick and effective, recently there has been concern about muscle necrosis and pain associated with IM administration. It has been suggested that medications be given SC, especially in smaller birds with less muscle mass. Controlled studies are needed to see if absorption from this location will provide adequate blood levels of antimicrobials.

Many critically ill or septicemic birds require IV injections. This requires repeated venipunctures or catheter placement. Disadvantages of IV injections include the possibility of extravasation, hematoma formation and stress to the patient.

ANTIFUNGAL THERAPY

Ideally, antifungal therapy is based on culture and sensitivity testing. This is almost never done in practice due to

the extended period of time involved, the lack of laboratory support for such studies and the lack of a wide-range of therapeutic choices. Gram's stain results, such as budding yeast or fungal hyphae, or confirmation of aspergillosis or other fungal infection through cytology or histopathology will help confirm a diagnosis. Antifungal medications also may be indicated during antibiotic therapy to decrease the risk of secondary yeast infections, especially in immunosuppressed birds. Birds with a history of malnutrition and chronic respiratory disease may benefit from prophylactic use of antifungal medications until a diagnosis can be made. Aspergillosis secondary to chronic vitamin A deficiency and subsequent squamous metaplasia may be an underlying problem in these birds. Among pet birds, Amazons (*Amazona* spp.),^{1,14} African grey parrots (*Psittacus erithacus*)^{1,25} and macaws (*Ara* spp.)⁶ appear to be especially susceptible to aspergillosis. Antifungal medications exhibit diversity in their mechanisms of action, toxicities and cost. An understanding of these properties will enable intelligent decisions as to which drug is appropriate for a particular situation.

MISCELLANEOUS MEDICATIONS

Corticosteroids

Corticosteroids have been widely debated due to the potential complications arising from their use.²⁶ These side effects include immunosuppression, adrenal suppression, delayed wound healing and gastrointestinal ulceration. Most of these side effects are seen following a prolonged course of administration of corticosteroids, although reports of potential glucocorticoid-induced adrenal suppression after topical use have been cited.

However, single doses of corticosteroids have been reported to improve the prognoses in cases of shock, trauma and toxicity³¹ without the occurrence of clinically observable adverse side effects. The use of corticosteroids is not recommended in birds that have had a history of immunosuppression or fungal disease. Dexamethasone sodium phosphate (2 mg/kg IM or IV once) is the preferred steroidal anti-inflammatory for birds.⁴ Prednisolone sodium succinate (0.5-1.0 mg/kg IM or IV once) has been reported to be most effective in cases of neurologic emergencies (see Stress in Chapter 19, Endocrine Considerations).

Glucose Therapy

Hypoglycemia may be present in cases of malnutrition or starvation, sepsis or hepatic dysfunction. This is seen most often in passerines, but seldom in psittacines and occasionally in raptors. Blood glucose levels can be determined on a laboratory panel, and levels will fall to below half of the normal for the species in hypoglycemic patients.⁵ Severe cases must be treated immediately, as

symptoms may include seizures, weakness and depression. Treatment includes IV administration of 25% dextrose (1-2 ml/kg slowly to effect), although dextrose alone should not be used in dehydrated patients.⁵ Oral solutions such as honey or Karo[®] syrup also can be used in birds that are not prone to aspiration. The underlying cause, if hypoglycemia, must be subsequently determined and corrected.

o,p'-DDD

Mitotane, or o,p'-DDD, is an adrenal-blocking drug that has been shown to inhibit stress-induced hypersecretions of corticosteroid, thus bolstering immunocompetency during stressful situations.¹³ Adrenal blockers also have been shown to arrest tumor growth and inhibit stress-induced tumor metastasis.¹¹ o,p'-DDD is used in cases of suspected immunosuppression and for neoplastic conditions. Its use should be avoided in cases of suspected pesticide toxicity.

ORAL NUTRITIONAL SUPPLEMENTS

Below are listed some of the oral nutritional supplements that can be gavage-fed to debilitated birds. Various hand-feeding formulas are on the market and, as a whole, are far superior to the homemade formulas used decades ago that contained monkey biscuits, peanut butter and ground seeds. Commercially available hand-feeding formulas for baby birds are often utilized in the treatment of sick and debilitated adult birds. The quantity that can be fed at one time to a sick bird is greatly reduced from that of baby birds. On the average, a baby parrot can accommodate 10% of its body weight per feeding due to the elasticity of the crop and its rapid emptying. Adult birds have a greatly decreased crop capacity, averaging 3% of their body weight. Additionally, sick birds are less tolerant of food in the crop and care must be taken to avoid regurgitation and/or aspiration.

A sick or debilitated bird should always have its hydration corrected prior to attempting to initiate oral gavage-feeding.

Some formulas that are used and the indications for these are summarized below. None of these formulas is indicated in the presence of ileus. Many ill birds are captive-raised and were hand-fed, and these patients may respond to hand-feeding techniques (Fig 7.12). This facilitates both feeding and medication administration.

Carbohydrate Supplement

A simple carbohydrate powder^r (fructose and malt dextran) can be mixed with water, Tyrode's solution^l or Normosol-R to make a non-viscous tube-feeding solution. This is useful for birds to resolve crop stasis because the



Fig 7.12 | Hand-feeding a sick bird using a warmed hand-feeding product may be attempted prior to tube-feeding. Hand-feeding will be more time-consuming but less stressful for the patient if accepted.

thin consistency of the carbohydrate supplement mixture is more digestible than regular hand-feeding formulas. It also is useful for hypoglycemic patients or those with primary liver disease. Another similar product^k is recommended for patients with primary hypoglycemia or for birds needing additional calories provided as highly digestible carbohydrates.

Following rehydration in sick birds, the liver needs adequate carbohydrates to carry out its functions, so carbohydrates are next in line as nutraceuticals for ill birds. Carbohydrates are generally followed by a more complex oral nutritional formula within 24 to 48 hours.

Carbohydrate Metabolic Detoxifier^h

Based on a rice protein concentrate, this product works as a metabolic detoxifier for the liver while also providing calories. This is useful in cases of chronic liver disease and when severe biliverdinuria is present. It is used for several days following the initial use of the carbohydrate-only formula. This is usually followed by the use of the hand-feeding formula or a sick-bird support formula.

Sick-bird Support Formulas

Medical and surgical patients are often undergoing pan-systemic debilitation. A product^l with simple proteins (isolated soy protein) and simple familiar fats (hi-oleic sunflower oil) is added to the carbohydrate supplementation listed above to further meet the bird's nutritional requirements. See the discussion on carbohydrates in Chapter 4, Nutritional Considerations for the raffinose values of soy.

Many surgical and medical patients have been fed a seed diet and need the additional nutritional support gained from the administration of a balanced formula.

The method of administration of the supplemental formula will depend on both the patient's condition and the experience of the person administering the food.

1. Hand-feeding can be an ideal way to supplement birds that revert to baby begging and feeding behavior when ill. However, the administration of a sufficient quantity of supplement at each feeding requires that the patient be strong enough to demonstrate an adequate feeding response, and that the person feeding be experienced enough to avoid causing aspiration of the material.
2. Gavage-feeding also requires experience. When gavage-feeding is performed, the experienced person will be capable of avoiding the following inherent dangers:
 - a) Mechanical damage to the oropharynx with the metal crop feeder
 - b) Damage to the beak with inappropriate use of oral speculums
 - c) Accidental tracheal gavage
 - d) Reflux of the formula from the crop into the oral cavity

(See Chapter 1, Clinical Practice).

Precautions: Feeding sick birds should not be attempted by inexperienced persons. Do not attempt to hand-feed birds that are not aggressively feeding. Do not use formulas that are too cold or too liquid. Feedings must be accomplished promptly to avoid appetite loss. Failure to heed these cautions could result in aspiration and death.

Hand-feeding Formula^d (Fig 7.13)

Although originally formulated for hand-feeding juvenile birds, these formulas have been ideal for nutritional support of malnourished birds or as a tube-feeding formula for sick birds. The average dose for psittacines is 30-60 ml/kg per day, divided and dosed q 6-8 h for an adult bird, in addition to parenteral fluid administration, assuming normal gastrointestinal motility.

TOTAL PARENTERAL NUTRITION (TPN)

Total parenteral alimentation is the IV administration of all essential nutrients. Indications for use include gastrointestinal stasis, severe head trauma that precludes oral alimentation, and malabsorption or maldigestion.³¹ Although parenteral alimentation has been described,^{9,30} it is not routinely utilized in avian medicine. There can be difficulties in placing and maintaining a catheter, and sepsis and bacteremia can occur if the catheter becomes contaminated. The constant monitoring of the electrolyte and acid/base blood values for adjustments to this formula is blood volume-prohibitive in pet birds.

Total parenteral nutrition given intraosseously (TPN/IO) was reported in 1995 and was tried experimentally on pigeons. Hyperglycemia and glucosuria were encoun-



Fig 7.13 | A formulated diet designed for hand-reared psittacines. The psyllium in this product^d cleans the digestive system, improves hydration and helps restore electrolytes while reducing toxins and cholesterol. This product delivers 1.5 Kcal/ml when reconstituted.

tered and resulted in the death of one bird. Another bird had complications at the site of administration. No further reports are currently available. Financial constraints may be an additional reason that parenteral nutrition is not being administered to avian patients. A recent e-mail (TPN January 9, 2003 xoticvet@shaw.ca on exotictim@yahoogroups.com) stated that the cost of having a pharmacist compound a TPN formula was \$100 Canadian for 300 ml, and the shelf life was very short (several days).

FREQUENTLY SEEN EMERGENCIES

Liver Failure/Malnutrition

Malnutrition is a major cause of liver disease in birds eating seed-only diets. This is due to the high fat and low nutrient content of seeds. As with many diseases in birds, no clinical signs may be apparent until the patient is in an advanced stage of decompensation. Clinical signs may include lethargy, inappetence, diarrhea with loose green feces and green or gold urates (Fig 7.14) (see Chapter 4, Nutritional Considerations, Section II). There may be no abnormalities on the serum chemistries of these patients, although elevations in either the hepatic enzymes or bile acids may be present.¹⁶ Hepatic disease with malnutrition as the underlying cause may present commonly as hepatic lipidosis, fibrosis and cirrhosis.

Routine dorsoventral and lateral radiographs can be helpful in identifying hepatomegaly or decreased liver size. Bag radiographs (see Figs 1.17a,b,c, 1.18a,b) are non-invasive and can be done by placing the bird in a paper bag for radiography. This technique is useful for



Fig 7.14 | Bilirubin in the urates, an indication of hepatopathy.



Fig 7.15 | Milk thistle[™] with a vegetable glycerin base is used as an oral supplement to aid hepatic regeneration.

screening for the presence of heavy metal densities, but not reliable for determination of hepatic size (see Chapter 1, Clinical Practice for information on bag radiographs).

Response to treatment for malnutrition-induced hepatic disease depends on the duration of the disease and the extent of organ dysfunction. Treatment includes par-enteral fluid administration, treatment of any concurrent infection and gavage-feeding with an appropriate formula. In one author's (GJH) practice, this is more specifically defined as the administration of subcutaneous fluids, and tube-feeding with sick-bird support formulas^{4,1}. If recovery is possible, a response to treatment should occur within 24 to 48 hours. In the presence of a leucocytosis, with or without hepatic enzyme or bile acid elevations, antimicrobials are routinely used by one author (TLL). These are empirically based on the CBC differential and fecal Gram's stain and may often include both antibiotic and antifungal agents.

Milk thistle (silymarin^{m,12,34,37}) has been shown to improve liver function and enhance regeneration of damaged liver cells (Fig 7.15).

Various other medications may be added to aid in hepatic function (see Chapter 15, Evaluating and Treating the Liver).

A diet change from seeds to a formulated diet is imperative in long-term successful treatment.

Egg Binding

Egg binding is common in lovebirds, budgerigars, cockatiels, eclectus parrots and older Amazon parrots (10 years or older) that are usually fed seed-based diets. Clinical signs include swollen abdomen, fluffed appearance and lethargy. Often, birds will act as if they are trying to defecate but cannot; therefore, the client concern

may be "constipation." A retained egg may be palpated in the abdomen, although care should be taken not to confuse a caudally displaced ventriculus for an egg during palpation of the sterno-pubic area. Radiographs are recommended to help identify soft-shelled eggs or double eggs, as well as secondary problems such as an enlarged liver shadow or coelomic fluid accumulation.

Treatment includes parenteral calcium supplementation (if the shell is soft), SC fluids and supplemental heat (see Chapter 5, Calcium Metabolism). Oxytocin (5 IU/kg IV or SC once) has been recommended to help in egg expulsion. It has been reported that oxytocin can have adverse side effects and should be used only if the uterovaginal sphincter is well dilated and the uterus is free of adhesions. However, since oxytocin is not the primary hormone of uterine contraction in birds, it is only partially effective, and the effect of exogenous administration is diminished. Both prostaglandin F-2 alpha and prostaglandin E are reported to be effective in cases of egg binding. Prostaglandin F-2 alpha is more readily available, although it also carries the concern of oviduct rupture if the utero-vaginal sphincter is not dilated. Prostaglandin E is used in human obstetrics. Egg extraction via the cloaca is the least invasive method and can be utilized in most cases (Fig 7.16). When dealing with soft-shelled eggs, eggs adhering to the oviduct or uterus, or cranially located eggshell fragments, laparotomy may be necessary. Collapsing the egg with a syringe and needle (implosion) may facilitate removal. When the egg cannot be visualized via the cloaca, this may be due to complications such as an impacted uterus or mummified egg. During egg extraction all shell material must be removed. If left in the uterus, shell fragments tend to migrate proximally, making retrieval very difficult. The use of delivery forceps, feeding needle, syringe, and cotton-tipped swab facilitates egg or egg fragment removal (Figs 7.17a-c). The collapsed egg can occasionally be



Fig 7.16 | An egg-bound bird with the eggshell adhered to the uterus. This is typical in birds with nutritional disorders.

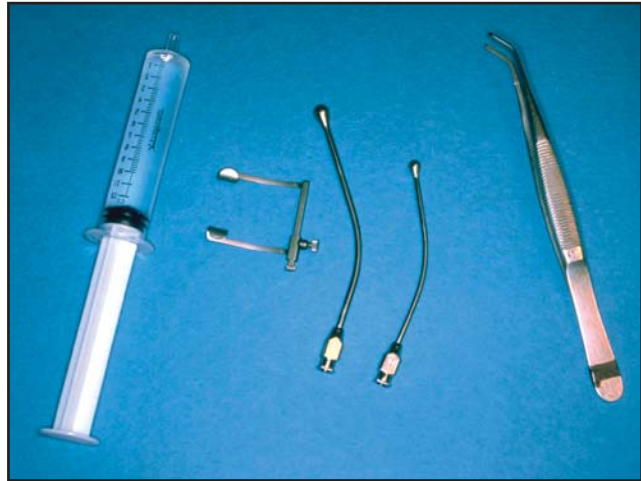


Fig 7.17a | Equipment pictured here may be useful in treating egg-bound birds; a syringe for flushing the uterus with normal saline, an ophthalmic speculum, metal feeding needles for flushing, and a curved-tip forceps for dilating the uterus and grasping the shell of a collapsed egg.



Fig 7.17b | Anesthetized female positioned over a towel to aid in proper cloacal inspection. The tail is perpendicular to the spine.



Fig 7.17c | A lateral view of the forceps dilating the cloaca and the feeding needle in place to puncture the egg, aspirate the contents or flush out shell fragments.



Fig 7.18 | Expressing a collapsed egg after it has been aspirated transabdominally.



Fig 7.19 | A retractor[®] makes cloacal examination much easier.

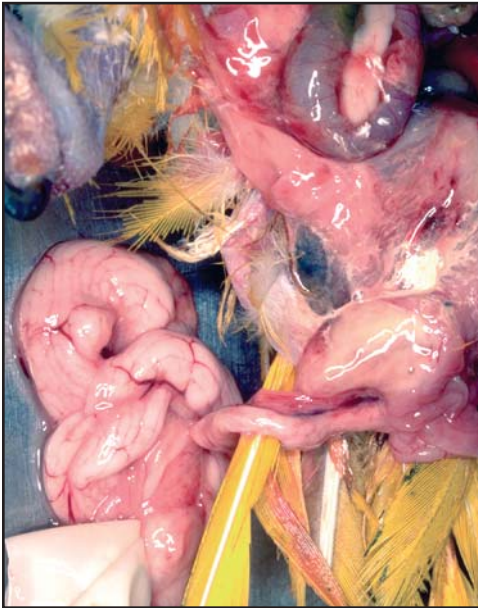


Fig 7.20 | A ruptured uterus allowed the egg to become retro-coelomic, causing death in this cockatoo.

removed intact (Fig 7.18). Use of a retractor^m (Fig 7.19) makes visualization much easier. (See Chapter 35, Surgical Resolution of Soft Tissue Disorders for more on retractor use. See Chapter 18, Evaluating and Treating the Reproductive System for forceps and procedures). Occasionally the uterus will rupture and the egg will be free within the coelomic cavity (Fig 7.20).

The rigid, semi-flexible^o (Fig 7.21) or flexible endoscope for egg delivery is useful. Warm saline/air flushing and insufflation with the endoscope can make visualization and subsequent egg particle removal much less stressful than blind forceps delivery. This is especially true for eggs that have migrated proximally and for retrieval of eggshell fragments. Once the egg has been removed and the bird is stabilized, a series of leuprolide acetate (500-1000 $\mu\text{g}/\text{kg}$ IM q 2 weeks, 3 times)^{3,38} or chorionic gonadotropin (HCG) (500 IU/kg IM on days 1, 3, 7, 14 and 21);²² injections have been recommended. One author (GJH) has found diet change from seeds to a formulated diet mandatory for full recovery and prevention of recurrence. Dexamethasone has empirically improved the response to HCG injections (see Chapter 18, Evaluating and Treating the Reproductive System for an excellent review).

Tracheal Obstruction

Tracheal obstruction is frequently seen in cockatiels subsequent to seed inhalation. In larger species of psittacines, tracheal obstruction is often due to the presence of tracheal granulomas or aspergillomas that impinge on the tracheal lumen. The history of these birds



Gwen Flinchum

Fig 7.21 | A semi-flexible endoscope for examining the salpingo-uterine area in an egg-bound bird.

often includes primarily a seed diet, with subsequent vitamin A deficiency. Clinical signs include open-mouthed breathing with a high-pitched squeaking noise emitted each time the bird breathes. The bird will often have a forward-leaning posture as it attempts to increase air intake (see Fig 7.1). Flexible and rigid endoscopes can be used for oral approaches to the larynx and trachea. A 1.2 mm x 20 cm semi-flexible endoscope^o (see Fig 7.21) is a valuable tool for visualizing and identifying the tracheal obstructions in birds under 100 g. Nebulization can be used to soften obstructive material. A needle can be placed through the trachea to prevent distal migration of the material. The bird is then held upside down and suction is applied until the obstruction is resolved. With cockatiels, a tom cat catheter can be utilized to provide a tube of appropriate diameter for aspiration of the material. A surgical approach to the thoracic inlet has been described and may be used to remove foreign material, but the surgical risk is significant.² A final option is to push the foreign body into one main-stem bronchus and into the lung, and follow up with aggressive antibiotic and antifungal therapy. Air sac tube placement (discussed earlier in this chapter) will likely be necessary for any attempted treatment. Without an air sac tube, the bird's respiration may be severely compromised by the presence of equipment in the trachea (see Chapter 24, Diagnostic Value of Endoscopy and Biopsy and the previous section of this chapter regarding air sac tube placement).

Vomiting and Regurgitation

Differentiation must be made between behavioral and pathologic regurgitation. Behavioral regurgitation is usually done in a controlled fashion and directed at an object in the cage or the owner. Pathologic regurgitation is not controlled and the patient will often sling its head as it regurgitates. Causes for regurgitation include toxicity, especially heavy metal, foreign body ingestion, bacterial, fungal or protozoal gastrointestinal infection, ingestion of oral irritants (ie, biting into a common houseplant of the *Pothos* sp.), goiter in budgerigars, rancid food ingestion, gastrointestinal obstruction, pancreatitis, renal

failure, hepatopathy, septicemia, dehydration, polydipsia, motion sickness and proventricular dilatation disease. Diagnostic tools include radiography (plain film and barium series), blood metal level tests, Gram's stains of fecal, crop or regurgitated material, and culture and sensitivity. Determining and correcting the underlying cause is necessary for long-term treatment. Initial therapy may include parenteral fluid administration, metoclopramide parenterally, crop flushing, frequent gavage-feeding of small amounts of a non-viscous formula.

Gastrointestinal Stasis

The most important aspect of resolving gastrointestinal stasis is to identify the underlying cause. Differential diagnoses include proventricular dilatation disease, bacterial or fungal crop infection, foreign body ingestion, septicemia, gastrointestinal obstruction, toxicity or other underlying disease. The first step in treatment of gastrointestinal stasis is to remove excessive material from the crop if present. A Gram's stain or culture and sensitivity of the flush contents will help yield a diagnosis if primary crop infection is present. Rehydration must be accomplished via parenteral fluids prior to initiating gavage feeding. Once this is accomplished and the crop is empty, the bird should be tube-fed small amounts of a dilute solution such as non-lactated multielectrolyte solution and 5% dextrose or carbohydrate substitute.^{jk} If obstruction is not suspected, gastrointestinal stimulants such as cisapride^o (0.5-1.5 mg/kg PO q 8 h) or metoclopramide (0.5 mg/kg IM q 8-12 h as needed) may improve motility. Although cisapride has been taken off the market in the United States, it is still available through compounding pharmacies. It also is important to note that metoclopramide has been shown to cause seizures in macaws at 0.5 mg/kg; however, when given at 0.1 mg/kg both PO and IM, no hyperexcitability or seizures have been noted by one author (TLL). As gastrointestinal motility improves, tube-feedings can be made more concentrated until normal consistency is tolerated (see Oral Nutritional Supplements in this chapter). Identification and treatment for the underlying cause of gastrointestinal stasis must be accomplished (see Chapter 14, Evaluating and Treating the Gastrointestinal System).

Blood in Droppings

It is important to note whether blood in the droppings originates from the urine, feces, reproductive tract or cloaca. Blood in the urine (see Fig 7.2) is a sign of kidney disease and is commonly caused by toxicity or tumors. Some birds will pass blood in the urine transiently after restraint. This vessel's fragility is not normal and, like occult blood in the feces, may be a sign of liver or gastrointestinal disease. A fecal test^l will identify blood versus artifact.*

(*Ed. Note: The authors have performed tests on 15 clinically normal boarding birds: no blood was grossly or microscopically noted in the stools and all were negative on the occult blood test. It has been stated that all birds' stools test positive for occult blood, however, we did not find this to be true. Positive blood on a fecal in a normal bird may be found when the diet includes meat products.)

Melena is the passage of black, tarry feces containing blood that has been acted upon by the digestive system. This is commonly seen in advanced liver disease, gastrointestinal ulceration and starvation. It also may be seen with gastric and hepatic adenocarcinoma and pancreatitis. Treatment should include treatment for the underlying cause, vitamin K₁ injections (0.2-2.5 mg/kg IM as needed) and parenteral fluid administration. Tube-feeding with barium sulfate suspension concentration (0.05 ml/g body weight PO as needed) provides a protective and anti-inflammatory coating to the gastrointestinal tract, assuming no perforation exists.

Hematochezia is the passage of frank blood in the feces. Causes include foreign body ingestion, reproductive disease, neoplasia, papillomas, cloacitis and gastroenteritis. The appearance of frank blood that is separate from the fecal portion and the urine portion when multiple droppings are examined is generally either reproductive or cloacal in origin. In South American psittacines, the presence of cloacal papillomatosis should be suspected and a cloacal examination done to rule out this disorder. Frank blood or hemoglobinuria may be seen in the urine in some cases of lead and other heavy metal toxicosis.

Cloacal Prolapse

Cloacal prolapse has been associated with behavior problems (see Chapter 3, Concepts in Behavior, Section III, Pubescent and Adult Psittacine Behavior), poor nutrition, neoplasia, papillomatosis, infection and reproductive complications. Prolapsed tissue should be inspected for necrosis or tears. Viable tissue can be gently replaced using a gloved finger or blunt swab lubricated with activated yeast gel^f. In this author's (GJH) experience, when there is severe tissue inflammation, the topical application of a dexamethasone-dimethyl sulfoxide (DMSO) solution (4 mg:10 ml) will help reduce swelling with no apparent clinical adverse effects; however, inflamed tissue in addition to DMSO may allow systemic uptake of these drugs causing potential adrenal suppression. Hyaluronidase also can be utilized to reduce tissue swelling. Its effect is assumed to last for several days, as has been documented in people (TLL).

Suture placement to reduce the cloacal opening has been described to maintain reduction of a prolapse; however,

if the underlying cause is not corrected, this will be only a temporary solution. In recalcitrant cases (ie, sexual behavior/masturbation), 2-0 nylon may be necessary, as smaller sutures will not hold. Care must be taken to avoid damage to the innervation of the vent. Do not place sutures directly within the vent lips. Do not inhibit defecation by having excessive restriction of cloacal outflow. Cloacal atony associated with these conditions has been reported to respond to cisapride.³⁹

Many birds with cloacal prolapse may present for foul-smelling diarrhea. A Gram's stain will often demonstrate overgrowth of clostridial organisms when this fetid diarrhea is present in association with cloacal prolapse and straining. Although the clostridial overgrowth is likely secondary to irritated cloacal mucosa and fecal retention, it still requires treatment when encountered. Gram-negative overgrowth also can occur, and a culture and sensitivity of stool would then be indicated.

More persistent or recurrent prolapses may require a cloacopexy. When the cloacal margins have been excessively stretched, surgical reduction may be necessary to reduce the diameter of the opening (see Chapter 35, Surgical Resolution of Soft Tissue Disorders).

The owner should be forewarned that there is danger of stricture and/or impediment to defecation or urination when a cloacopexy is performed, and unless underlying causes are addressed and corrected, the prolapse is likely to recur.

Uterine Prolapse

Uterine prolapse may occur as a sequel to egg binding or in conjunction with cloacal prolapse. Frequently, an egg will be visualized within the prolapsed tissue. Prolapsed tissue must be carefully flushed with sterile saline and examined for tears and necrotic areas. Treatment includes supplemental heat, warm SC fluid administration, parenteral calcium and broad-spectrum antibiotics. Secondary yeast infections are commonly seen in these cases, so antifungal medication also may be indicated. Once tissue has been debrided and inspected, it can be gently replaced using a gloved finger or sterile swab. However, the suspensory ligament has usually been damaged by the prolapse, and suturing the cloaca to hold the uterus as it involutes or performing a cloacal hysterectomy may be the best approach. Severely necrotic uterine tissue may require resection. Subsequent ovulation would, therefore, potentially allow intracoelomic follicle deposition and egg-yolk peritonitis in some species and individuals. Birds with uterine prolapses frequently have poor prognoses, since they are often malnourished and may have advanced liver disease or other underlying health problems.

Metal Toxicities

Toxicities are frequently seen in birds, especially in those that are allowed to roam freely in the house. Metal toxicity is common, with zinc toxicosis seen most often in the USA. Clinical signs may include general malaise, polyuria and diarrhea, and polydipsia with subsequent passive regurgitation of water. Neurologic signs are more common with lead toxicosis than with zinc toxicity. Radiographs can be helpful in identifying metal particles, however, metallic foreign bodies will not be seen in some zinc-toxic birds.³⁶ Conversely, not all ingested metal is toxic. Placing a bird in a paper bag for radiography facilitates screening for metal densities with minimal stress. Blood metal concentration tests⁸ are dependable for the diagnosis of metal toxicosis;³⁵ however, significant blood elevations of metal may not always occur in clinically ill birds.¹⁵ Furthermore, there is disagreement as to what constitutes accurate reference levels for metal toxicities.²⁸ Cases are best diagnosed and treated after careful consideration of history, clinical signs and test results.

Treatment for metal toxicity involves removal of the metal pieces from the gastrointestinal tract and/or chelation of metal ions in the bloodstream. Cathartics, such as lactulose or 1% psyllium in a hand-feeding formula,⁴ speed elimination of smaller metal pieces. Oils such as peanut butter are much less effective. Magnets are used in larger birds for removal of sizable iron pieces that have been galvanized with lead or zinc. For chelation therapy, the following drugs are commonly used:

1. Injectable edetate calcium disodium injection, USP[†], (CaEDTA) (35 mg/kg IM or IV q 12 h for 5 days, then repeat as needed) is an effective chelator. Its disadvantages include expense, pain at the injection site and potential nephrotoxicity (although this has not been documented in birds to date). The advantage of CaEDTA is that its parenteral formulation allows administration even in birds that are regurgitating.
2. Succimer (30 mg/kg PO q 12 h for 14 days) is an oral chelating compound that is safe and effective, especially for lead. It is usually made by a compounding pharmacy into a 25-mg/ml suspension.³⁶
3. D-penicillamine[‡] is the author's (GJH) drug of choice (55 mg/kg PO q 12 h for 1 to 2 weeks, off 1 week, then repeat as needed). It is an oral chelating compound that is safe and effective. However, it is available only as an oral medication, and therefore may not be used for the initial therapy if the patient is regurgitating. Also, it has been reported to cause regurgitation in some birds. Prolonged use may create a copper deficiency.
4. DMSA and dimercaprol.

Airborne Toxicities

Superheated, Non-stick Plastic Fume Toxicity

Superheated, non-stick plastic fume toxicity, or polytetrafluoroethylene (PTFE) gas poisoning, can be rapidly fatal. Clinical signs include severe dyspnea, weakness and coma. Treatment should include supplemental oxygen, SC fluids, aminophylline (10 mg/kg IV q 3 h, after initial dose, other doses can be given PO), dexamethasone sodium phosphate (0.8 mg/kg IV once), heparin (40-50 IU/kg IV once) and nebulization with heparin, lactated Ringer's solution and dexamethasone. The prognosis for severely affected birds is extremely poor (see Chapter 31, Implication of Toxic Substances in Clinical Disorders).

Air Fresheners

Clinical symptoms similar to PTFE toxicity have been observed in smaller birds (budgerigars, canaries) after exposure to plug-in or wick air fresheners. Treatment is the same as for PTFE toxicity.

Scented Candles

Sneezing and nasal discharge may occur after exposure to lighted, scented candles. Some scented candles contain wicks made with lead. When these are lit, the resulting odor can be poisonous to birds as well as humans.

Candy Cooking Flavoring

Flavorings such as peppermint and spearmint used in candy cooking while birds were present in the kitchen caused death in two budgies that were located 10 feet from the stove in an open cage (K. Marx, personal communication, 2003).

It is likely that other aerosolized agents may be toxic to birds. Limiting the exposure of psittacines to any aerosolized substance is a reasonable precaution.

General Recommendations for Toxicity

When toxicity is suspected, a complete anamnesis should be collected to determine the substance that is most likely responsible. If the bird is not regurgitating, activated charcoal solution^o can be given (10-20 ml/kg PO) to prevent or reduce toxin absorption in the gastrointestinal tract. Subcutaneous or IV fluid administration encourages the elimination of toxins through urination. If cholinergic toxicity is suspected, atropine (0.1-0.2 mg/kg IM or SQ q 4 h PRN) is indicated.

Poisoning by plants is infrequently seen; other references including human and veterinary poison control centers are recommended if such a case is encountered.

BEAK, NAIL AND FEATHER TRAUMA

The tip of the upper beak may be cracked without any blood or obvious displacement of the rostral fragment.

The bird may present for clinical signs such as decreased appetite, hesitancy to climb or failure to preen and history of a fall or other trauma. When digital pressure is applied to the rostral portion of beak, the distal damaged fragment may shift.

One method of correction is to use an electric grinding tool and hone off the fractured tip. If bleeding occurs, the practitioner may use the grinding stone's heat, or other cautery method, to cauterize the tip of the newly exposed beak. Soft foods may be used for a short period to encourage the bird to eat. It may be best to perform this procedure under a light plane of inhalation anesthesia. Damage to the beak tip is painful, and the anesthesia will prevent elevation of the bird's blood pressure and associated increase in bleeding.

Broken nails are a concern if they bleed excessively. Cutting off any remaining distal portion and cauterizing as discussed above is usually corrective. Similarly, applying flour as a first aid measure may be palliative until attended by a veterinarian. Telephone advice for this condition includes suggesting that the owner place flour in the bottom of a shoebox or other container and place the bird inside. This way, the bird's nail will come in contact with the flour without the increased blood pressure (and subsequent increased bleeding) that can occur with restraint.

Broken and bleeding feathers are handled similarly to the beak and nails. Distal fragments can be removed, and if still actively bleeding, place flour directly on and in the follicle. Ligating the proximal portion of the feather may be necessary. Caution must be used in advising clients to attempt chemical cautery at home. Inadequate restraint and insufficient application of hemostatic agents combined with the increased blood pressure generated by the restrained bird often result in prolonged and repeated bleeding episodes.

Cautery or pulling the broken feather is best avoided if possible. Pulling the feather may result in damage to the feather follicle's generative tissue, resulting in a crooked or cystic feather.

Excessive bleeding from any source should be investigated. Hepatic disease is frequently an underlying cause of coagulopathy.

More severe beak injuries are discussed in Chapter 14, Evaluating and Treating the Gastrointestinal System.

TRAUMA

Head Trauma

This is most often seen in free-flying birds encountering a ceiling fan or sliding glass doors. Cranial trauma may



Fig 7.22 | Micro-encapsulated ammonia solution™ for postsurgical or traumatic pain, burns and swelling. It is the author's (GJH) observation that the solution also aids in preventing bacterial overgrowth.

cause neurologic clinical signs. Prednisolone sodium succinate is a rapid-acting steroid that helps decrease central nervous system swelling. Dexamethasone sodium phosphate also can be given (2 mg/kg IM once). Head trauma cases should be placed in quiet, dark places with no heat. Minor cases usually recover within 24 to 48 hours.

Limb or Body Trauma, Bites, Lacerations

Non-penetrating traumas can be greatly aided by the use of a topical ammonia solution™ (Fig 7.22). This product reduces pain, swelling and the incidence of infection. (GJH)

In the case of fractures and deep penetrations, stabilization of the patient is the first priority. If there is no active or severe bleeding, warm, quiet and oxygenation may be the logically provided emergency care. While the bird is stabilizing in the warm, humidified oxygen chamber, the practitioner can be collecting information from the client that will aid in subsequent determination of the location and extent of the injuries, and in their treatment.

If significant active bleeding is present, this must be controlled. The application of direct pressure to the wound for several minutes may accomplish this. Remember that a bird's blood pressure can undergo a threefold increase in response to painful stimuli. Therefore, if the bleeding has stopped, it may be wise initially to refrain from exploring the injured area until the patient is stable (see earlier portion of this chapter). Repeated manipulation and restraint may cause the resumption of bleeding.

If bleeding persists, however, one or more of the following steps should be taken:

1. Application of a pressure wrap.
2. Radiosurgical cautery.
3. Application of ferric subsulfate.
4. The use of Yunnan Piao^x, a Chinese herb that also is an excellent hemostatic agent.²⁴ It can be used as a topical agent or mixed with a non-lactated multielectrolyte

solution and gavage-fed prior to surgery. This decreases blood loss in surgeries where excessive bleeding may occur (GBF).

5. Vitamin K₁ injection and evaluation for hepatopathy.

Once bleeding is controlled and the patient is stable, wounds should be debrided and cleaned. Any feathers that are sticking in the wound should be cut or removed. Wounds can be flushed with 50% dextrose for its bacteriocidal properties.¹⁹ Sterile saline also can be used. If there is dirt and dried blood caked in the wound, gentle cleaning with gauze and 0.5 to 1.0% povidone-iodine is helpful. In birds, many wounds will heal very well by second intention without sutures. Patients that pick at their wounds may require a collar.

BANDAGING

Modern gel-type dressings (Figs 7.23a-d) have made bandaging of bird injuries much easier and more successful. When combined with the improved properties of adhesive tapes (see Figs 7.9f,g), bandage removal has been made difficult to impossible for the bird and relatively easy for the veterinarian.

If needed, protective neck devices or collars can augment the bandage for additional safety. The bandages can usually be left on for 2 days. The hydroscopic or gel dressing can be reapplied at the time of bandage change.

Wounds that are deep, extensive or obviously contaminated require parenteral antibiotic administration as well as topical debridement. Puncture wounds, often from dog or cat bites, may appear minor but have a great potential for infection and septicemia.

Split Vent or Ruptured Pygostyle

This condition is commonly seen in malnourished cockatiels and other psittacines, and results from trauma to the region caudal to the vent during a fall (Fig 7.24). When the bird's tail feathers strike the floor, the skin and connective tissue surrounding the vent is stretched to the point of tearing. The skin in malnourished birds is not flexible and it tears easily. These wounds often have significant exposure of the subcutaneous tissue and muscle. Treatment includes debridement and flushing of the wound. Transecting the tail feathers so that they do not touch the floor as readily helps minimize repeated stretching trauma. The bird must be housed so that repeated trauma does not occur. If the wings were severely clipped, they should be allowed to grow out to allow some glide and decrease the severity of impact. Amazingly, these wounds may heal very well without sutures by second intention. In selected patients, suturing may be indicated. Critical to the long-term prevention of recurrence of this condition is changing the

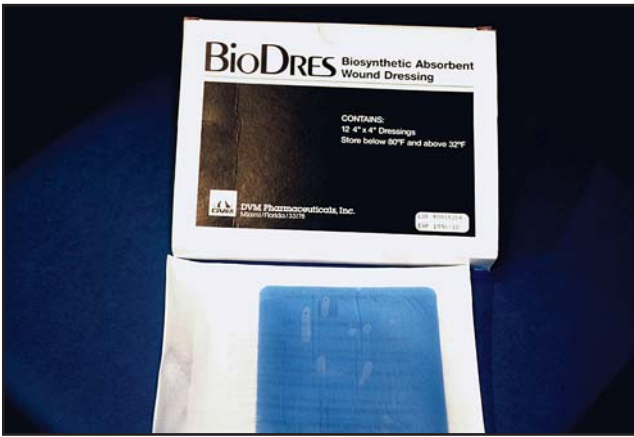


Fig 7.23a | An example of a gel dressing with a biosynthetic absorbent coating^{cc} that helps to maintain wound hydration. This type of dressing does not adhere to skin and is ideal for wounds without appreciable necrotic debris.

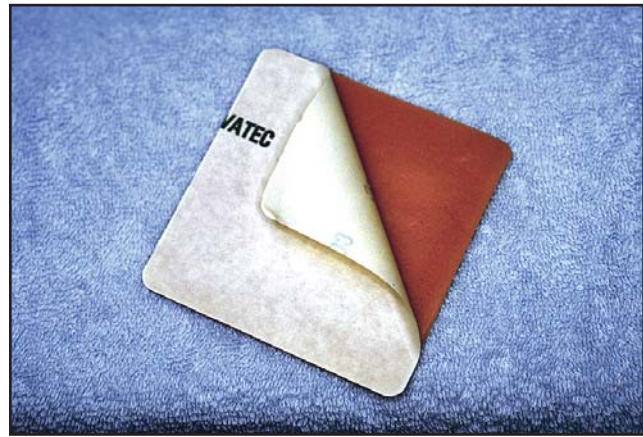


Fig 7.23b | A hydroactive dressing^{dd} is soft and spreads out as it absorbs serum from a wound and molds to the area. This “gel” is an excellent debriding agent and also forms a matrix in which cells can grow. If there is copious serum production, the bandage should be changed daily. To apply, the protective backing of the dressing is removed and the yellow-brown gel side is applied to the wound. A flexible bandage^{aa} is then applied over the dressing.



Fig 7.23c | A section of the gel dressing^{dd} has been cut into the desired shape and the protective backing is removed. The red necrotizing tissue of Amazon foot necrosis is readied for the bandage with the bird under anesthesia.



Fig 7.23d | The H-shaped dressing is placed on the plantar surface of the claw. The four legs of the H fold around the metatarsus and the third digit, covering all surfaces of the wound. A coating of a cohesive, flexible bandage^{aa} and an over-covering of elastic-cloth tape^e is applied as shown in Figs 7.9 f,g.

bird's diet to correct the malnutrition and obesity that were contributing factors.

ACUTE BLOOD LOSS AND ANEMIA

Acute blood loss is more rapidly life threatening in malnourished birds because they frequently have decreased liver function with associated coagulopathies. Severely anemic birds will appear pale on the skin covering the nares and feet, and have pale mucous membranes of the cloaca and oral cavity. Tachypnea and tachycardia also may be present.

As with other species, the administration of oxygen will increase the efficiency of the remaining red blood cells.



Fig 7.24 | A cockatiel with a split in the tissue just caudal to the cloaca's yellow feathers. This is a sign of a nutritional disorder that has diminished the skin's elasticity. Improvement of the bird's diet, preventing the bird from falling on hard surfaces and treatment as an open wound are indicated.

Transfusions are indicated when the packed cell volume (PCV) is below 20%. Homologous transfusions, from the same genus and species, yield the best result.^{7,8} Transfusion volume should be 10 to 20% of the patient's calculated blood volume.

Studies showed that using washed RBCs (no plasma) in conures the same genus as a donor was as efficacious as homologous transfusions (white-eyed conure to sun conure, sun conure to sun conure) for a single transfusion.⁸ In another study, however, cockatiels received Amazon blood (a heterologous transfusion), and these washed and labeled RBCs were short-lived.⁷

Other alternatives for blood transfusions have recently become available. Hemoglobin glutamer-200 (bovine) (Oxyglobin[®]) (30 ml/kg IV once) has been shown to be effective in the resolution of clinical signs in dogs, cats, sheep, rats, horses and a number of exotic animals.²⁷ Its use in avian medicine has been investigated,²⁰ although it is not labeled for use in birds. Hemoglobin glutamer-200 is expensive due to the lack of availability of small packaging, but it is potentially useful in treating avian anemia.

Hetastarch

Hetastarch (10-15 ml/kg IV q 8 h up to 4 treatments)^{4,20} is used primarily for intravascular volume restoration; however, it can be used in anemic patients when blood products are unavailable.²⁹

Erythropoietin^s

Erythropoietin^s (100 IU/kg SC 3 times per week until desired PCV is attained) has been reported to improve success in treating chronic anemia by stimulating erythrocyte production in some mammals.²⁹

Erythropoietin^s is a hormone that stimulates erythropoiesis in severely anemic patients. Avian erythropoietin, which is stimulated and released following hypoxia and suppressed by induced polycythemia, is structurally different than the mammalian type. Whether or not mammalian erythropoietin acts to stimulate RBC production in birds is not documented.

Interferon and F10

In the United Kingdom, preliminary results of clinical trials on circovirus-positive African greys with precipitous decreases in WBC and RBC counts show promise using interferon, F10^{cc}, and Oxyglobin[®] injections (M. Stanford, personal communication, 2003).

As with all critical conditions in birds, the stress of treatment must be considered prior to initiating intensive therapy. Birds with severe anemia have little oxygen

reserve, and treatment that causes stress with increased oxygen demand may prove fatal.

FRACTURES

In cases of fractured limbs, it is a priority to stabilize the patient before attempting fracture repair. Birds will die from stress, anesthesia, debilitation or septicemia rather than from the fractured limb. Topical analgesic[™] (Fig 7.23) helps reduce soft tissue swelling and pain. Analgesics such as butorphanol are indicated for systemic pain relief in fracture patients (see Chapter 8, Pain Management).

For emergency care of fractures, bandaging, and fracture repair see Chapter 34, Surgical Resolution of Orthopedic Disorders.

Products Mentioned in the Text

- a. 20 Fr Non-cuffed Tube with Retention Disk, Cook Veterinary Products, Bloomington, IN, USA, 1-800-777-222, custserv@cookaustr.com.au
- a1. Intraosseous Needle and Handle, Cook Veterinary Products, Bloomington, IN, USA, 1-800-777-222, custserv@cookaustr.com.au
- b. Animal Intensive Care Unit, Lyon Electric Company, Chula Vista, CA, USA, 619-585-9900, lyonelect@aol.com
- c. Tyrode's solution, Zoological Education Network, www.exoticdvm.com
- d. Juvenile Formula, Harrison's Bird Foods, Brentwood, TN, USA, 615-221-9919, www.harrisonsbirdfoods.com
- e. Wydase, Wyeth Laboratories Inc, Philadelphia, PA, USA, 1-800-934-5556, www.wyeth.com
- f. Spherical cervical collar, Gary Nelson, DVM, DRGHN@aol.com
- g. Epogen (epoetin alfa), Jansen C.lag. Agmen-Roche
- h. UltraClear Plus, UltraBalance Medical Foods, Gig Harbor, WA, USA, 1-800-843-9660, www.ultrabalance.com
- i. Ultrafuel, Twin Laboratories, Ronkonkoma, NY, USA
- j. Tyrode's powder to make solution, Zoological Education Network, 800-946-4782, www.exoticdvm.com
- k. Critical Care; Nutri-Support; Carbo-Boost, Lafeber Co, Cornell, IL, USA, 1-800-842-6445, www.Lafeber.com
- l. Recovery Formula, HBD International, 7108 Crossroads Blvd, Suite 325, Brentwood, TN 37027, customerservice@harrisonsbirdfoods.com, www.harrisonsbirdfoods.com
- m. Milk thistle, Zoological Education Network, www.exoticdvm.com
- n. Lone Star Medical Products, Inc, 713-796-0505, www.LSMP.com
- o. Karl Storz, 1-800-955-7832, www.karlstorzvet.com
- p. Propulsid, Janssen-Cilag, www.janssen-cilag.com. Must be obtained in the US from a compounding pharmacy
- q. Hemocult Fecal Test, SmithKline Diagnostics, San Jose, CA, USA
- r. Preparation H Gel, Whitehall-Robins Healthcare, Madison, NJ, USA
- s. Louisiana Veterinary Medical Diagnostic Laboratory, Baton Rouge, LA, USA, 1-504-346-3193
- t. Calcium versenate, 3M Pharm, Northridge, CA, USA 91324
- u. Cuprimine, Merck, www.Merck.com
- v. Toxiban, Vet-A-Mix, Shenandoah, IA, USA
- w. Penetran, Zoological Education Network, www.exoticdvm.com
- x. Mayway Corp, Oakland, CA, USA, 1-800-2-Mayway, www.mayway.com
- y. Oxyglobin, Biopure Corp, Cambridge, MA, USA
- z. Elastikon, Johnson & Johnson Medical, www.jnj.com/home.htm
- aa. Equi-flex, Burns Vet Supply Inc, Rockville Centre, NY 11590
- bb. Nex-care Waterproof adhesive tape, 3M Healthcare, St. Paul, MN, 55144-1000
- cc. BioDres, DVM Pharmaceuticals, Miami, FL, USA www.dvmpharmaceuticals.com/about_dvm.html
- dd. DuoDERM, ConvaTec, Bristol-Myers Squibb, PO Box 4000, Princeton, NJ 08543-4000, USA
- ee. F10, Health and Hygiene (Pty), Ltd, Sunninghill, South Africa, www.healthandhygiene.co.za/products-select.asp

References and Suggested Reading

- Bauck L: Mycoses. In Ritchie BW, Harrison GJ, Harrison LR (eds): Avian Medicine: Principles and Application. Brentwood, TN, HBD Int'l Inc, 1999, p 1001.
- Bennett A: Approach to the thoracic cavity of birds. Exotic DVM 1(3):71, 1999.
- Bowles H: Update of management of avian reproductive disease with leuprolide acetate. Proc Assoc Avian Vet, 2001, pp 7-10.
- Carpenter JW, Mashima TY, Rupiper DJ: Exotic Animal Formulary 2nd ed. Philadelphia, WB Saunders Co, 2001, pp 161, 221.
- Clippinger TL, Platt SR: Seizures. In Olsen GH, Orosz SE (eds): Manual of Avian Medicine, St. Louis, Mosby, 2000, p 173.
- Clubb SL: Psittacine pediatric husbandry and medicine. In Altman RB, Clubb SL, Dorrestein GM, Quesenberry KE, et al (eds): Avian Medicine and Surgery. Philadelphia, WB Saunders Co, 1997, p 94.
- Degernes LA, et al: Autologous, homologous homologous and heterologous heterologous red blood cell transfusions in cockatiels (*Nymphilus hollandicus*) J Avian Med Surg 13(1):2-9, 1999.
- Degernes LA, et al: Autologous, homologous homologous and heterologous heterologous red blood cell transfusions in conures of the genus *Aratinga*. J Avian Med Surg 12(1):10-14, 1999.
- Degernes LA: A preliminary report on IV TPN in birds. Proc Assoc Avian Vet, 1995, p 25.
- Degernes LA: Trauma medicine. In Ritchie BW, Harrison GJ, Harrison LR (eds): Avian Medicine: Principles and Application. Brentwood, TN, HBD Int'l Inc, 1999, p 42, Fig 7.
- Deguchi M, et al: Usefulness of metyrapone treatment to suppress cancer metastasis facilitated by surgical stress. Surgery 125(1):120, 1995.
- Duke JA, duCellier J, Beckstrom-Sternberg S: Western herbal medicine: Traditional materia medica. In Schoen AM, Wynn SG (eds): Complementary and Alternative Veterinary Medicine, St. Louis, Mosby, 1998, pp 323,351.12.
- Flinchum GB, Harrison GJ: Observations on the effect of adrenal-blocking drugs in terminally ill pet birds. Exotic DVM 2(3):71-75, 2000.
- Forbes NA: Respiratory problems. In Beynon PH, Forbes NA, Lawton MPC (eds): Manual of Psittacine Birds. British Small Anim Vet Assoc, 1996, p 152.
- Fudge AM, Speer B: Selected controversial topics in avian diagnostic testing. Sem Avian Exotic Pet Med 10(2):97-98, 2001.
- Fudge AM: Avian clinical pathology: Hematology and chemistry. In Altman RB, Clubb SL, Dorrestein GM, et al (eds): Avian Medicine and Surgery. Philadelphia, WB Saunders Co, 1997, p 149.
- Griffin C, Snelling LR: Use of hyaluronidase in avian subcutaneous fluids. Proc Assoc Avian Vet, 1998, pp 239-240.
- Harrison GJ, Ritchie BW: Making distinctions in the physical examination. In Ritchie BW, Harrison GJ, Harrison LR (eds): Avian Medicine: Principles and Application. Brentwood, TN, HBD Int'l Inc, 1999, p 151.
- Kelleher S: Wound and abscess management in rabbits. Exotic DVM 2(3):49-51, 2000.
- Lichtenberger M, et al: Administration of Oxyglobin and 6% hetastarch after acute blood loss in psittacine birds. Proc Assoc Avian Vet, 2001, p 15.
- Lightfoot TL: Avoiding disaster in the critical patient. Proc Assoc Avian Vet, 1998, pp 265-271.
- Lightfoot TL: Clinical use and preliminary data of chorionic gonadotropin administration in psittacines. Proc Assoc Avian Vet, 1996, pp 303-306.
- Lumeij JT, Ephoorti C: Theory and practice of rectal fluid therapy in birds. Proc Europ Com Assoc Avian Vet, London, 1997, p 101.
- McCluggage D: Holistic medicine in exotic species practice. In Schoen AM, Wynn SG (eds): Complementary and Alternative Veterinary Medicine, St. Louis, Mosby, 1998, pp 655,658.
- McMillan MC, Petrak ML: Aspergillosis in pet birds: A review of 45 cases. Proc Assoc Avian Vet, 1988, p 35.
- Orcutt C, Flinchum G: Contrasting views on corticosteroid use in birds. Exotic DVM 3(5):43, 2001.
- Orcutt C: Oxyglobin administration for the treatment of anemia in ferrets. Exotic DVM 2(3): 44-46, 2000.
- Osofsky A, et al: Determination of normal blood concentrations of lead, zinc, copper and iron in Hispaniolan Amazon parrots. J Avian Med Surg 15(1):31-36, 2001.
- Plumb DC: Veterinary Drug Handbook 3rd ed. Ames, Iowa State Univ Press, 1999, pp 284,376.
- Pollock C: Practical total parental nutrition. Proc Assoc Avian Vet, 1997, pp 263-276.
- Quesenberry KE, Hillyer EV: Supportive care and emergency therapy. In Ritchie BW, Harrison GJ, Harrison LR (eds): Avian Medicine: Principles and Application. Brentwood, TN, HBD Int'l Inc, 1999, pp 393,396.
- Romagnano A, et al: Treatment of a hyacinth macaw with zinc toxicity. J Avian Med Surg 9(3):185-189, 1995.
- Romagnano A: Avian obstetrics. Sem Avian Exotic Pet Med 5:180-188, 1996.
- Saller R, Meier R, Brignoli R: The use of silymarin in the treatment of liver disease. Drugs 61(14):2035-2063, 2001.
- Tully T, Hoefler H, VanSant F: Heavy metal toxicosis. J Avian Med Surg 11(2):115-118, 1997.
- VanSant F: Zinc and clinical disease in parrots. Proc Assoc Avian Vet, 1997, pp 387-391.
- Wellington K, Jarvis B: Silymarin: A review of its clinical properties in the management of hepatic disorders. Biodrugs 17(7):465-489, 2001.
- Zantop D: Using leuprolide acetate to manage common avian reproductive problems. Exotic DVM 2(3):70, 2000.
- Zantop D: Cisapride Use in birds. HBD's Avian Examiner - The 4-Year collection, 1998, p 35. Available online at avianmedicine.net.