



## **Parrot Preventive Medicine**

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### **Summary**

Preventative medicine is the best insurance for effective avian health maintenance and infectious disease prevention. Additionally, they require good management and husbandry. A complete preventative medicine program should include appropriate diagnostics as deemed necessary by the avian veterinarian. An effective preventative medicine program must also include strict quarantine, vaccination, disinfection, necropsy and histopathology.

Psittacine birds should have a yearly physical examination including a very thorough history. An adult psittacine bird should have systematic thorough physical examinations, commercially formulated bird food diet supplemented with fresh fruits and vegetables, and appropriate husbandry. The number of preventative medicine visits required yearly is determined by the avian veterinarian and depends on the birds medical, breeding, and reproductive history, as well as its species, age, and present condition.

Display, pet, and breeding birds alike need rigorous preventative medical care in order to lead healthy and productive lives in captivity. A complete preventative medicine program should include appropriate diagnostics as deemed necessary by the avian veterinarian; such as blood work, culture, radiography, and endoscopy. An effective preventative medicine program should also include strict quarantine, annual vaccination, and disinfection in the hope of achieving infectious disease prevention. Quarantine ideally within a separate building along with an extensive diagnostic work-up, is imperative for the safety of all psittacine collections, large or small ( $n > 1$ ). Necropsy and histopathology are the final safety nets of a thorough preventative medicine program. In reality, ante-mortem diagnostics are occasionally inconclusive. Often the post-mortem evaluation renders a diagnosis. This knowledge invariably helps the avian veterinarian, with future diagnostic, therapeutic, husbandry, and management decisions .

### **Description of a thorough Physical Examination**

A through physical examination should begin with observations and a visual examination of the patient from a distance. Look at the bird in his or her carrier or cage. Visually evaluate the bird, its cage setup, toys (wood and leather are highly recommended) hygiene, and ability to move about. Note whether the bird is bright, alert, responsive (BAR) and is able to vocalize. Check



its posture, perching stance, and feces before handling.

## **Observation and Visual Examination**

### **Notes on Adults and Juvenile**

Adults and juvenile birds should exhibit an upright posture with their wings symmetrically positioned on either side. They should also be BAR and breathing in a normal manner without obvious effort or stridor. The birds' vocalizations should be noted and any recent changes recorded. A change in vocalization could indicate pharyngitis, tracheitis, aspergillosis, partial tracheal obstruction, upper respiratory tract (URT) infection (URTI), lower respiratory tract (LRT) infection (LRTI), severe obesity, smoke or other toxic insult. When perching, birds should exhibit a firm bipedal grasp. Healthy birds should exhibit a consistent appetite and thirst pattern, and produce a three part dropping. Adult birds and their feces should be examined visually by the owner, curator, keeper, or bird breeder on a daily basis. Baby birds and their feces should be examined at each feeding by the handfeeder, daily by the nursery manager, and as often as possible by the avian veterinarian. A normal dropping contains a firm well formed dark green fecal portion, a white too off-white pasty looking urate portion, and a clear urine portion. Owners may state that their bird has loose feces, but they may have difficulty differentiating loose feces or diarrhea, from polyuria and hence polyuria from diarrhea. Diarrhea is defined as a loose or poorly formed fecal portion of the dropping. Diarrhea may occur for many reasons. These include bacterial, fungal, viral, or parasitic gastroenteritis, liver, kidney, or pancreatic disease, toxins, normal egg laying, egg yolk peritonitis, or stress. Polyuria can occur secondary to diabetes, psychogenic polydipsia, pellet or extruded commercial food induced polydipsia, neoplasia, nephritis, polyoma virus, toxicosis, gastroenteritis or stress. Feces can be colored depending on the bird's immediate past diet, e.g. brightly colored fruits or vegetables or colored pelleted bird food diets. Such changes would be considered innocuous. Very dark scant feces, however could indicate starvation, melena, or hematochezia. Voluminous feces from a bird on a commercial diet or undigested seed in the feces of a bird on a seed diet are indicative of malabsorption. Malabsorption can occur secondary to proventricular dilatation disease (PDD) or gastroenteritis due to bacteria such as megabacteriosis, mycobacteriosis, or fungus. Urates of abnormal color, such as red, yellow, green or brown could indicate liver disease. Causes of liver disease include chlamydiosis, hepatic lipidosis, or hemochromatosis. Toxins, viral diseases, artificial food coloration, and vitamin B supplementation, and gout can also cause abnormal urate coloration. Excessive urates of normal color could indicate impending egg laying, stress, toxicosis (e.g. lead or zinc), gout, dehydration, or nephritis. Normal wine (or burgundy) colored urine occurs in juvenile African grey and Amazon parrots handfed commercial formulas. Wine colored urine should be differentiated from true hematuria, which is most commonly seen in Amazon parrots with lead toxicity, but may occur in any bird secondary to severe nephritis or renal compromise. Hence, a



fluffed non-perching bird sitting back on its hocks on the bottom of the cage passing scant dark feces depicts the infamous "sick bird syndrome" (SBS). Such a bird is unable to regulate its body temperature, perch, or sit-up properly indicating illness and lethargy, and is most probably anorexic. The bird could have an infectious, metabolic, toxic, or nutritional disease, it could have neoplasia or have undergone trauma. There are many causes for this non-specific presentation, but all need to be addressed promptly.

### **Notes on Breeding Birds**

Breeding psittacine birds need to be examined before the breeding season, early in the day, and handled for as short a time as possible. This is imperative for successful aviculture. Breeding psittacines are particularly sensitive to physical intrusion, noise, and new human faces. Hence accomplish what is possible quickly within the aviary; take blood, treat minor lesions, etc. This does not preclude radiographs, endoscopy, or other "in-hospital" diagnostics, however timing, prioritization, and efficiency are imperative when working with breeding birds.

### **Notes on Baby Birds**

Baby cockatoos will sit and sleep balancing on their bellies; baby macaws will sit back on their hocks when awake and lie on their back or sides when asleep. If an appropriate feeding schedule is used, and managed correctly, baby bird crops should be empty between feedings. Crops should always however, without exception, be empty in the morning for the first feed of the day. A static, slow, or sour crop is the most common pediatric problem encountered in handfed baby birds and necessitates immediate intervention. Baby bird droppings should also have three distinct parts as described above for older birds. However their feces may normally be slightly looser due to their liquid formula diet. Babies should be weighed daily and exhibit a daily gain until weaning. During weaning a 10 to 20% weight loss is expected and acceptable.<sup>2</sup>

### **The Physical Examination**

The avian physical examination needs to be performed quickly and efficiently. The same protocol should be followed each time a physical examination is performed on a psittacine bird regardless of age. It is best to start with the structures of the birds head and work your way down its body in a consistent methodical fashion.

### **Head Region**

The head should be examined for overall symmetry, especially of the eyes, nares, cere, beak, and ears.<sup>5</sup> The head should be examined carefully and directly from the front of both the



unrestrained and the restrained bird.

Eyes should be clear and free of discharge. The margins of the lids should be symmetrical and the nictitating membrane functional. Ocular discharge could indicate a conjunctivitis, keratitis, corneal ulcers, a blocked lacrimal duct (if bubbles accompany the discharge), or if the discharge is very viscous poxvirus infection should be considered. A serosanguinous or frank blood discharge from the eyes during handling occasionally occurs in African grey parrots and the Major Mitchell's cockatoos among others. Although alarming, this stress response is temporary and innocuous. Birds have striated muscles in their iris allowing them to voluntarily constrict or dilate their pupils. Bright light however, should elicit pupil constriction. Ocular asymmetry could indicate past trauma, infection, or possibly a retrobulbar mass. Pituitary adenoma, an example of a retrobulbar mass, has been reported to cause exophthalmia in budgerigars and an Amazon parrot.<sup>18</sup>

The nares should be symmetrical, oval to round, and of appropriate size for the bird. They should also be free of discharge and organic debris which could eventually accumulate causing nasal rhinoliths. The cere should be smooth, dry, firm, and of uniform color. Cere and nare asymmetry could indicate a parasitic infection with knemidokoptes, a severe sinus infection, an allergic reaction to the environment, or insect bites. A browning of the cere, brown cere hypertrophy, is known to occur in budgerigars. This change may be from pink to brown in females and is of no consequence.<sup>1</sup> In males, a change from blue to brown is thought to be abnormal and associated with gonadal tumors, such as the sertoli cell tumor.<sup>1,4</sup> Moist matted feathers around the nares may indicate nasal discharge, but if these matted feathers progress further up to the crown and beyond, regurgitation should be considered. Further, moist feathers around the ears may indicate aural discharge or regurgitation in a bird that spits up and shakes its head.

Normally the keratin of the beak should be smooth and free of any cracks or deviations. An overgrown or flaky beak is indicative of poor nutrition or improper management. Hence, in addition to a balanced diet, captive psittacine birds need access to hard wood and leather toys to chew for proper and safe beak wear. Normal adult cockatoos and African grey parrots have powder down on their beaks. Psittacine beak and feather disease (PBFD) affects the powder down producing feathers resulting in shiny powderless beaks. This lack of down is extremely evident in species with black beaks, such as African greys and the larger cockatoo species. Beaks should also grow straight to attain proper occlusion. Asymmetry, malocclusion, or malalignment of the beak, could indicate developmental malformations (ex: scissor beak in macaws), or past trauma to a fully formed beak, grooves in the beak secondary to rhinitis, a deep seated bacterial or fungal beak infection, or beak necrosis secondary to PBFD.

The mouth, tongue, oropharynx and choana area are best examined with a small bright light



source. These areas should be free of debris, discharge, and abnormal growths and plaques. The oral mucosa is typically moist and pink. Various infections of the mouth can occur primarily, or secondary to trauma, and result in an oral discharge. Abnormal growths can be neoplastic. Adenocarcinoma is the most common tumor found in the avian oral cavity. The tongue should be firm, smooth, and dry. The oropharynx should be uniformly pigmented and moist. White plaques in the mouth can occur secondary to hypovitaminosis A resulting in squamous metaplasia, Candidiasis, Pox virus, Trichomoniasis, Capillariasis, mycobacteriosis, or neoplasia. The choana, the slit in the roof of the mouth, connects the nasal cavity to the opening of the bird's trachea, the glottis. Discharge from the choanal slit is therefore indicative of an URTI. The choanal papillae, bordering this slit should be pointed, uniformly aligned, and caudally directed. Blunted papillae are indicative of an active URTI, a previous URTI, permanent damage due to other previous infections such as Pox virus, or to chronic hypovitaminosis A.

The ear canals should be open and free of debris. Young macaws, such as Buffon's and the Blue throated, are prone to ear infections, which can occur secondary to pin point ear canal apertures. This is a common developmental abnormality in these species and is easily corrected if caught early. The ear canals are carefully stretched mechanically with a fine pair of hemostats, thus avoiding fluid and wax build up and subsequent infection (author's experience). When performed, culture and sensitivity commonly reveal a *Pseudomonas spp.* infection (author's experience). Further, the infraorbital sinus of the bird extends rostrally and caudally from the ear canal. Hence, an infraorbital sinusitis can also cause an ear infection.

### **Neck and Crop Region**

The neck should be palpated to evaluate the cervical esophagus, trachea, and crop, as well as the muscles of the neck. Hence the neck should be palpated to the point of the thoracic inlet, with care to avoid secondary aspiration when palpating the crop. In psittacine birds the right jugular vein is significantly larger than the left. Hence, it is the preferred site for venipuncture. The cervical esophagus and the crop should be smooth, relatively thin walled, free of lumps, swellings, fluid, and inspissated food or foreign bodies. The trachea and the crop can also be transilluminated and foreign bodies or parasites may be identifiable. A crop with a thickened wall and inspissated substance within is said to be doughy and typically empties slowly. This condition commonly occur secondary to candidiasis, especially in handfed baby birds. Other causes of slow crop emptying include various bacterial infections, too hot or too cold, too thick a handfeeding formula, too cold an environmental temperature for neonates, polyoma virus, PDD, and chlymadiosis among others.

### **Skin and Feathers**

Psittacine skin is thinner and more delicate than mammalian skin. It is slightly moist and



typically beige to pale pink in color.<sup>6</sup> The skin has extensive skeletal attachments, especially in the area of the wings and feet.<sup>6</sup> Dry, red, flaky skin indicates dehydration. The feathers should be carefully examined as a whole, and then individually. Examine the coverts, and contour; wing primary and secondary, as well as, the tail feathers. Describe any noted patterns of feather loss or feather abnormalities. Keep in mind that normal avian skin is incompletely covered by feathers (see Clinical Anatomy section).

Feather loss patterns, such as excessive molting, can be due to thyroid abnormalities or light cycle influences. Feather loss can also be due to PBFD, Polyoma virus, folliculitis, pulpitis, or dermatitis. Failure to molt can be due to thyroid abnormalities, light cycle influences, or PBFD. Feather picking can be due to behavioral or infectious causes; including parasitic (esp. giardiasis), bacterial, or fungal, musculoskeletal defects, fractures, trauma, pain, or poor nutrition leading to dry or flakey skin, barbering by mate or cage mates. Behavioral feather picking is common in African greys, cockatoos, and conures. Causes of behavioral feather picking include; loneliness, boredom, or a change of any kind. Self mutilation syndromes are more common in certain species. Moluccans are known for mid-keel feather, skin, and muscle mutilation. Lovebirds are known for the mutilation of their wing webs. Cockatiels are known for the overall mutilation of their feathers.

### **Heart and Lungs Region**

Examination of the avian cardiovascular system requires thorough auscultation. The heart is audible from the ventral and the dorsal aspects of the thoracic cavity. Normally a clear steady rhythm and a rate of greater than 200 bpm is expected (range 100 - 400). Primary cardiac disease is quite rare in birds, with the exception of congenital heart disease in babies. Baby birds with congenitally enlarged hearts have a post-cordial thrill palpable in their abdomen. In fact, in very severe cases, the abdomen can be seen beating at rest. Acquired cardiac disease is more common and the most common associated disease states are congestive heart failure, arteriosclerosis, and vegetative endocarditis. Congestive heart failure can be caused by hemochromatosis, polyoma virus, sarcocystosis, and chlamydiosis. Arteriosclerosis is caused by a high fat diet and complicated by mineralization. Vegetative endocarditis most commonly results from salpingitis, hepatitis, or pododermatitis. Heart murmurs can be auscultated when present, but the fast avian heart rate makes auscultation difficult. Evaluation of the cardiovascular system should be performed relatively early in the physical examination of a bird, since stress tends to increase the heart's rate. With the majority of psittacine birds however, auscultation will have to be performed after the patient is restrained. The author prefers to auscultate the heart after the head and neck regions are examined for conformity, start from the top and work your way down. With a few tame birds however, and with all baby birds, auscultation can be performed before restraint.

At rest the bird should be breathing normally with no evidence of stridor, abdominal breathing,



or tail bobbing. The latter clinical sign can be seen with both URT and LRT disease. Examination of the respiratory system also requires thorough auscultation. This evaluation should be performed immediately after the auscultation of the cardiovascular system. Auscultate both the ventral and the dorsal thorax, trachea, and the coelomic cavity airsacs. Normally no respiratory sounds are audible. Coelomic wheezes, clicks, and high pitched squeaks are associated with LRT disease, such as narrowing of the parabronchi. After auscultation of the respiratory system the bird should recover within a few minutes, hence its respiration rate and rhythm should return to normal. Prolonged respiratory recovery times generally reflect LRT disease.

### **Pectoral Muscle Mass**

The keel or pectoral musculature should be very carefully palpated as it gives the best indication of overall body condition in the adult bird. The pectoral musculature should be firm, with uniform muscle mass on each side of the keel bone rising almost to its most ventral edge (see Figure 1). Keel scoring is a tangible evaluation of the keel musculature and is particularly useful in the physical examination of a given bird from year to year. Based on the diagram in Figure 1, the normally muscled keel has score of 3. Each bird's pectoral musculature should also be screened for an identification chip with an appropriate chip reader. If a chip inactivates overtime and becomes unreadable, a new chip should be implanted. A radiograph can determine the presence of the inactive chip in the pectoral musculature. Asymmetry of the pectoral musculature, or atrophy of one side, is suggestive of unilateral wing disuse. Such atrophy can occur secondary to a wing fracture, sprain, or a boney or soft tissue neoplasia.

### **Thoracic Limbs**

Wing posture should first be examined at rest. Palpation of the thoracic limb and its girdle should then be performed. The larger ulna lies along the trailing edge of the wing and the radius lies along the leading edge. The allulae should be extended and palpated. The major and minor digits should also be examined. This should be followed by palpation of the joints, the propatagium, and the flight feathers. Both wings should be extended and flexed, examined for symmetry, and whether any fractures, other trauma, or neurological disease exists.

Note droopy wings (from shoulder or elbow joint) or overflexed wings (from over flexed carpi). Over flexed carpi or angel wing is common in larger heavy psittacine birds, such as Buffon's macaw. Encouraging the birds to flap their wings daily, while holding their feet, usually helps them to grow out of this suspected contracted tendon condition.

### **Pelvic Limbs**

Leg posture should first be examined at rest. Palpation of the pelvic limb and its girdle should



then be performed. The palpable bones of the leg consist of the femur, patella, tibiotarsus and fibula, tarsometatarsus, and the phalanges. The ventral surface of the digits should always be examined carefully for evidence of pododermatitis. The nails should be examined and their condition noted. Both legs should be extended and flexed, examined for symmetry, and whether any fractures, other trauma, or neurological disease exists.

Note if the bird is unable to perch, or has lameness or swelling of its legs, feet or toes. If a bird cannot perch rule out leg or foot sprains or fracture, other trauma including spinal cord or other CNS insult, boney neoplasia, ankylosed joints, arthritis, articular gout, renal neoplasia, pododermatitis, osteomyelitis, Amazon foot necrosis, infectious systemic disease, a band that is too tight, or generalized weakness due to a number of other causes. Lameness may indicate fracture or sprain, other trauma, eggbinding, kidney, gonadal or adrenal mass, or infectious causes (e.g. mycobacteriosis, osteomyelitis, etc. see above under "inability to perch"). Swollen legs, feet, or toes could indicate pododermatitis, due to excessively large, rough, or dowel perches, arthritis, foot lacerations, gout, hypovitaminosis A, a band that is too tight, fractures or other trauma.

### **Abdominal Region**

The abdominal region of the coelomic cavity should also be palpated. This area is normally flattened, exceptions to this rule include the ventriculus, which is normally palpable to the left of the mid-line in young psittacines, and transient eggs, which are palpable in the distal portion of the reproductive tract in cycling females. Eggbinding can also occur resulting in an abnormal palpable mass. The most common cause of eggbinding is hypocalcemia. An over-sized egg, soft-shelled egg or eggs, oophoritis/ salpingitis, mass or foreign body oviductal obstruction, malnutrition, chronic egg laying, musculoskeletal obstruction, lack of exercise, poor muscle tone, and stress induced or environmental causes such as severe temperature fluctuations (drastic changes in weather in the case of aviary birds housed outdoors) could also cause eggbinding. Coelomic cavity masses or an enlarged liver may also be palpable in this region, as is ascites.

### **Tail and Uropygial Gland**

The tail should be examined for posture. A normal tail lifts (flexed) during defecation and remains down (extended) and relaxed during perching. Young cockatiels, and those with a severe wing clip, may attempt to fly and then crash to the ground fracturing their pygostyle. Hence, the tail and therefore the pygostyle should always be visually examined and physically palpated.

Examine the bilobed uropygial, or preen gland, and its wick which is located on the dorsal surface of the tail base in some psittacine species.<sup>6</sup> Amazon parrots, hyacinth macaws, and



palm cockatoos do not have a uropygial gland. Its presence is inconsistent in many other psittacine birds. All budgerigars and African grey parrots however always have a uropygial gland. This gland is susceptible to infection secondary to blockage of a duct or the central papilla where the wick is located. If the gland is found to be asymmetric, hyperemic, or engorged on examination, then impaction, abscessation, tumor, or chronic dermatitis is suspect.<sup>21</sup> The most common tumors associated with the uropygial gland are adenomas, adenocarcinomas, and papillomas.<sup>21</sup>

### **Cloaca and Vent**

The vent should be examined for symmetry, integrity, hygiene and a neurologic exam should be performed on the cloacal lips. The cloaca should also be examined internally by circumferential eversion with a moistened cotton tip swab. The everted cloacal tissue is checked for lacerations, swellings, or cloacal papillomas. A simple vinegar test will reliably turn papillomas frosty white. The cloaca should also be palpated for the presence of cloacaliths, soft shelled eggs, or other physical abnormalities. A relatively common functional abnormality of the cloaca is cloacal prolapse. This syndrome is most common in male umbrella and moluccan cockatoos, and eggbound female birds of any species. The etiology in male birds is unknown, but hormonal changes are suspect.

### **Preventative Medicine as it Pertains to Infectious Disease Prevention: Quarantine, Vaccination, Disinfection, Necropsy and Histopathology**

In order to implement preventative medicine the avian veterinarian must first be aware of the importance of management and common sense in aviculture and pet bird husbandry. He or she must know the general principles of disease prevention which help limit the spread of infectious disease, thus aiding in its prevention. <sup>12</sup>

- The number of birds to be acquired must be considered in advance.
- The species of birds to be acquired must be considered in advance.
- Birds must be acquired from a reputable source.
- Strict quarantine must be followed at all times.
- Extensive testing is required at pre- and post-purchase examination.
- Proper management and nutrition must be implemented.
- Good hygiene and impeccable sanitation must be practiced routinely.

Infectious disease prevention is best achieved by following the principles mentioned above. Hence the avian veterinarian must first make sure that good management, husbandry, and hygiene practices are in place. Second, he or she must then implement proper quarantine, vaccination, disinfection, necropsy, and histopathology procedures. The latter two procedures are important because a complete preventative medicine program incorporates thorough post-



mortem evaluation.

Newly introduced birds should undergo strict quarantine in a separate designated quarantine building, where extensive testing, and a minimum quarantine period of 45 days is required. Quarantine is indeed one of the best methods of infectious disease control. When a separate building is unavailable an alternative plan must be instituted. Hence, regardless of the collection size, location, or value, a separate quarantine facility, even if it is a friend's bird free home, is truly imperative.

The "closed aviary concept" where strict quarantine procedures are practiced is a must in an effective preventative medicine program.<sup>22</sup> Traffic within the aviary should be managed and controlled, and new introductions must immediately be put into the separate quarantine building.<sup>22</sup> This building should be entered only by dedicated staff whom have no contact with other birds, or at the end of the day by general staff just before they leave the property. Further, before entering employees must gown, put on booties, masks, and gloves. The building should be self sufficient with its own caging, nets, towels, protective clothing, water source, bowls, and washing facilities. Nothing should ever leave the quarantine building to be re-introduced into the main collection as it may act as a fomite. The only exception should be garbage going directly off the property. Extensive testing for new introductions should include a CBC, serum chemistries, cloacal cultures, fecal float, fecal direct exam, fecal Gram stain and cytology, cloacal culture, polyoma virus swab DNA probe test, PBF/D whole blood DNA probe test, chlamydia serology, and barium contrast radiography to indirectly screen for PDD. Additional or alternative testing may be performed and is determined on a case by case basis, but the minimum data base needed for most adult psittacine birds is described above (e.g.: neonates and juveniles will need a crop culture).

Vaccination protocols are limited in avian medicine, because very few vaccines are available, safe, and effective in psittacine birds.<sup>14,16,17</sup> Presently two vaccines are labeled for use in pet birds; polyoma vaccine (avian polyoma virus vaccine, Bioimmune) and Pacheco's vaccine (Psittimmune PDV, Bioimmune), but only the polyoma vaccine is recommended for routine use and is USDA-registered.<sup>16,17</sup> The Pacheco's vaccine is recommended by certain avicultural veterinarians in the face of an outbreak with concurrent acyclovir treatment. A third vaccine, against *Chlamydia psittaci*, is presently in the preliminary stages of development.<sup>23</sup> A vaccine commonly used off label in aviary and zoological birds is the eastern equine encephalitis (EEE) virus vaccine formulated without tetanus toxoid (author, personal communication Drs. Lee Young and Scott Citino). The vaccine most commonly used is produced by Fort Dodge Animal Health, although whooping cranes have been successfully protected with an inactivated human EEE vaccine (government service division strain PE 6 WRAIR).<sup>11</sup> Several zoological collections in North Florida routinely vaccinate all species with the Fort Dodge Animal Health



EEE vaccine (author, personal communication Drs. Lee Young and Scott Citino).<sup>11</sup> It has been known for many years, through experience and serological studies, that neonatal, juvenile, and adult eclectus parrots are particularly susceptible to EEE and should be vaccinated yearly.<sup>15</sup> Although the author recommends, and performs, routine EEE vaccination of eclectus parrots in endemic areas, the reader is encouraged to recall that only the Bioimmune polyoma vaccine is officially recommended for routine use in pet and aviary birds. For more detailed information, the reader is encouraged to read the following papers, references 13, 14, 16, and 17, on avian polyoma virus and vaccine-

A disinfectant is defined as an agent that will destroy many disease causing microorganisms present on the surface of inanimate objects.<sup>15</sup> Disinfection and infectious disease prevention are both very important in an effective preventative medicine protocol because most disinfectants are inactivated by organic matter. Hence, it is imperative to first clean the area and objects in question removing all organic debris prior to application of the disinfectant.<sup>15</sup> The easier an object is to clean the more likely it can be adequately disinfected.<sup>15</sup> Wood is the perfect example of a difficult to clean object, hence, all wooden perches, nest boxes, and toys should be destroyed and replaced yearly, or immediately if an infectious disease is suspected. Enveloped viruses are the most easily inactivated and are susceptible to quaternary ammonia products.<sup>12</sup> Note that chlorhexidine has limited activity against some bacteria, especially *Pseudomonas spp.* and certain gram negative bacteria, and although it can kill some enveloped viruses, it can not be considered a reliable viricide. Nonenveloped viruses require phenolic compounds and sodium hypochlorite (bleach), or stabilized chlorine dioxide (Dent-A-Gene, Oxyfresh), for inactivation. Glutaraldehydes will inactivate most bacteria, including mycobacteria, many viruses, and chlamydia even in the presence of organic debris. Hence this product is particularly useful for endoscopy disinfection and sterilization. Overall the recommended disinfectants in avian establishments are bleach (at the dilution of 1 part bleach to 20 parts of water), quaternary ammonium products, glutaraldehyde-based products, and stabilized chlorine dioxide (Dent-A-Gene, Oxyfresh).<sup>12,15</sup>

## **Conclusion**

Preventative medicine is an ongoing interactive process which incorporates thorough routine veterinary visits as a method of data collection. The avian veterinarian must know the pet bird and/or the collection (large or small) intricately, and be aware of the importance of psittacine husbandry and management. He or she must then evaluate, diagnose, and treat the individual pet bird, as well as the entire collection. Hence, a systematic approach is not only important during an individual's physical examination, but also in the veterinary care of the entire collection. The necessity of diagnostic testing and therapeutic protocol are established based on the patient's history, the veterinarian's overall observations of the collection, and the physical



examination of the individual patient. Thus, pre-mortem tests are chosen on a case by case basis, but post-mortem examination is imperative and should be performed in all cases. Hence, necropsy and histopathology are also necessary for infectious disease prevention, as is quarantine, vaccination, and disinfection.

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