Avian Pediatrics

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Abstract: Psittacine incubation and pediatrics will be discussed and presented. Basic incubation facts, history, physical examination, and diagnostics of the pediatric patient will be described. Pediatric problems and diseases will be outlined and discussed. Husbandry will also be addressed. Kaytee handfeeding formulas, their preparation, and delivery methods will be reviewed in detail for individual psittacine species.

Introduction

Successful incubation and hatching requires intensive husbandry. Similarly, altricial psittacine chicks require intensive care from day 1. These neonates hatch with eyes closed, little to no down, are unable to thermoregulate, and need to be hand-fed on a scheduled basis. Thus, in addition to preventative and triage medicine, the avian veterinarian can help the aviculturist by evaluating the following processes: incubation, hatching, hand-feeding, neonatal development, and weaning.

Incubation

Natural incubation by captive psittacines is affected by many factors, which include the parents' health, diet, species, origin (wild caught or hand raised), experience, environment, and nest box design.[1,2,3,4] Broken eggs commonly result when birds are startled—especially among cockatoos, African greys, and macaws. Cracked eggs can lead to bacterial infections, and should be repaired topically with nail polish and incubated artificially.[1,2,3,4] Reduced breeding success has been reported with domestic hand-raised and inexperienced psittacine breeding pairs when compared with wild-caught parents or domestic parents raised with experienced birds.[1,2] However, as the numbers of domestically raised pairs increases, these reports may be disproven. Nest box parameters such as cleanliness, shape, depth, width, height, and degree of openness and the amount of lighting are important for breeding success. Hatchability of artificially incubated eggs pulled at day 1 is lower than those naturally incubated for a brief period (range: 7-14 days). Further, large psittacine eggs seem to be more tolerant of incubation from day 1 than the eggs of smaller psittacines.[4] However, large avicultural collections typically incubate eggs from day one to increase production. This dichotomy occurs because pulling the eggs at day 1 encourages the hen to lay again, thus increasing the number of eggs laid per clutch, as well as the number of clutches laid per year.

Eggs pulled need to be carefully identified. A number 2 pencil is safest for egg identification.

Successful artificial incubation is dependent upon several parameters including temperature, humidity, airflow in the incubator or hatcher, vibration, and egg rotation.[1,2,3,4] Egg rotation, or turning, is very important in artificial incubation. It is required to prevent embryo adhesion to the shell membranes.[2] Parents will rotate their eggs every 35 minutes to prevent such adhesions.[2] Inadequate turning in artificial incubation results in early dead in shell, malposition, or late dead in shell embryos. Good quality commercial incubators will turn eggs at different rates on various types of timed mechanical rollers with 10 turns per day being the average. A minimum of 5 turns per day, however, is required in machines where automatic turning is not an option.[2] A popular and reliable artificial incubator is the Grumbach ®, although many new and more automated models are available. Artificial incubators and hatchers should be cultured for bacteria and fungi several times a year, as well as DNA probe tested for polyoma virus and psittacine beak and feather disease virus. Units should also be cleaned and formalin gas sterilized yearly.

Incubation temperature and humidity vary for different psittacine species, but range from 98.9 - 99.3 °F (37.3 °C) and 30% - 45%, respectively. Digital hygrometers work best to monitor humidity. Incubation room temperature is ideally maintained at 73 -75° F (22.5° C) with a humidity of 43 - 48%.[2,4]
Psittacine embryos are best hatched at 99.5 ° F (37.5° C) with a hygrometer reading of 65% to 75%.

Artificially incubated eggs are candled to monitor development and should be moved to the bottom of the incubator, and no longer turned, once draw down has been noted, as this is when internal pipping begins (see below).[4] Some aviculturists will candle daily, but the majority candle weekly or bi-weekly.[2,3] Psittacine eggs are less tolerant of handling than poultry eggs.[1,2,3] However, candling, a necessary form of handling, is important in determining embryo fertility and viability. The critical periods of development for psittacines are the first few days of incubation and the time from internal pip until hatching.[2,4] During these times the embryo is most susceptible to adverse handling, and/or improper incubation parameters.[2,4] Incubation times vary for different psittacine species, and range from approximately 18 days in budgerigars to approximately 30 days in palm cockatoos.[1,2]

The first sign of fertility are blood vessels radiating uniformly from the embryo in a branching pattern around day 4 or 5 in some species, but can be seen as early as 3 days.[2,3,4] Eggs with clear yolks showing no signs of blood vessels or development by day 7 are infertile, or early dead in shell, and should be removed from the incubator (or nest). Mortality, during the first 7

days of natural incubation, may result from numerous factors and include failure of the parents and/or the artificial incubator, to properly incubate eggs, inbreeding or genetic abnormalities, egg-born infection, or contamination.[2,4] Some causes of early embryonic death during artificial incubation include improper handling, excess or insufficient temperature or humidity, excessive vibrations, improper egg turning or poor ventilation resulting in the build up of CO_2.[2,4] A healthy developing psittacine egg should lose between 11% to 16% (average 13%) of its water weight by diffusion during incubation (day 1 to external pip).[2] The aircell forms at the rounded end of the egg during this period of weight loss. If the humidity is too high however, the air cell will be small, and if it is too low then the air cell will be larger.[2] Washing of eggs, typically done in the poultry industry, is thought to be risky in psittacines, and is not recommended.

The normal psittacine embryo assumes the hatching position with its head below the air cell just before hatching.[2,3,4] Psittacine embryos have shorter and thicker necks than chicken embryos and do not normally tuck their heads under the right wing.[2,4] Instead, they barely tuck their head and typically lie it close to the right wing tip. Hatching occurs in stages (draw down, internal pip, external pip, emergence from the egg) and is the time of highest mortality in embryonic development.[2,4] Approximately 24 to 48 hours prior to internal pip the air cell expands and extends down, or draws down, one side of the egg occupying 20% to 30 % of its volume.[2,3,4] An increase in the level of CO2 then occurs because the gaseous exchange needs of the embryo are no longer met by the allantoic circulation. This build up of CO2 causes the *Muscularis complescus* (pipping or hatching muscle) of the neck to twitch.[2,4] This twitch causes the egg tooth, which is located rostrally on the tip of the maxilla, to penetrate the chorioallantoic membrane, i.e.: internal pipping. At this point the embryo becomes a chick, as it begins to breathe air within the aircell and utilizes its lungs. As the lungs begin to function, the right-to-left ventricular shunt in the heart closes, and in certain species a peeping sound may be heard from the egg.[2,4] At this time, turning of the egg should cease and it is placed on the bottom of the incubator. Twitching of the abdominal muscles, which occurs secondary to breathing, causes the exteriorized yolk sac to be drawn into the chick's abdomen. With subsequent breaths, the level of CO2 within the aircell rises. When CO2 reaches 10%, the pipping muscle again begins to twitch, causing the egg tooth to penetrate the shell; this is external pipping. The time between entering the air cell and external pipping ranges from 3 hours to 3 days, but is typically 24-48 hours for most psittacines.[2]

Malposition and inadequate moisture loss are among the most common causes of embryonic mortality prior to hatching.[2,3,4] Malpositions commonly occur secondary to elevated temperatures which also cause premature pipping.[2,3,4] Two of the most common psittacine malpositions are when the head is located at the small end of the egg or when the beak is

rotated away from the air cell. Eggs incubated below optimum temperatures develop slower and typically have increased problems with hatching. High humidity fosters the development of "wet chicks". These chicks drown at pipping, due to excessive albumin, and are often edematous.[2,4] Eggs exposed to low humidity may dry out, causing adherence of the shell membrane to the chick, preventing normal pipping.

All dead eggs should be necropsied by the avian veterinarian or aviculturist.[2,4] During the gross necropsy the embryo's general condition and position are assessed. Abnormal tissues and fluids are cultured and/or sent off for histopathology. The shell is examined for color, thickness, shape, and the presence or absence of stress lines.

Once hatched, neonatal chicks should be housed in incubators, such as the Animal Care Products ICU units ®.

All neonates should be started on a dilute commercial formula, such as, Kaytee Macaw Exact, for their first three days of life. This dilute formula (35 cc bottled water and 1 tbsp Kaytee Macaw Exact) is given every two hours of the first and second day, except during the night, when crops are allowed to empty. On day two neonates should get Bird Benebac ® (0.1cc) at their first feed. The third day feedings are every three hours.

By day four, neonates should be started on an undiluted formula mixture. The schedule of formula feedings after day three goes from 4 x a day, to 3 x, to 2 x, to 1 x, to weaning. Birds are gradually moved down based on their species and individual size. The amounts fed are based on body weight (BW) early on, later by species (see below). Hence, on day four, Kaytee Regular Exact is fed to all the white and pink/salmon colored cockatoos. The cockatoos are fed at 10% BW until three times a day when they are switched to 8% BW. Black cockatoos (palms and red- tailed cockatoos), the gang-gang cockatoo, thick-billed parrot, hyacinth macaw, green-winged macaw, and the slender-billed cockatoos are fed a special diet originally formulated for the palm cockatoo by Kaytee Products Inc.[5,] The hyacinth's are fed at 12% BW and the green-winged macaws at 11%, all the other birds in this group are fed at 10% BW. The rest of the macaw species and the golden conures, African greys, caiques, sun conures, eclectus parrots, and hawk-headed parrots do best on the Macaw Exact hand feeding formula. All these birds are fed at 10% BW, except for the Buffon's macaw which is fed at 12% of BW. Once the birds reach their twice-a-day feeding, they are no longer fed based on BW alone, but are gradually increased to a predetermined maximum for their species. For example, the maximum volume for sun conures is 25 cc, smaller cockatoos 35 cc, African greys 50cc, larger cockatoos 60 cc, mid-sized macaws 110 cc, and the hyacinth, Buffon's, and green-winged macaws are given 140 cc at each feed.

At two feedings a day the juvenile birds should be offered solid foods, such as Kaytee rainbow pellets, fruits and vegetables, and treat items such as pinenuts and almonds. Water bowls should be introduced when the birds are at one feeding a day. Once birds are drinking and eating on their own, they can be moved into outdoor flight or larger cages as the space and weather permits. There they can be trained to use a drinking Lixit ® before their water bowls are removed. Birds should always be weighed and monitored closely during the weaning process. Birds should never be force weaned. Instead, each should be treated as an individual and weaned at his own pace.

Pediatrics

History:

Note the parent's health and breeding history, the condition of the siblings, and any problems the chick may have had during incubation and hatching.[6,7] Evaluate diet, it's preparation, and the amount and frequency of feeding.[7,8] Determine whether the bird's crop is empty for each feed, especially the first feed of the day. Assess environment, housing, and substrate for cleanliness, safety, and warmth. Inquire as to the behavior of the chick, its feeding response, and the color, consistency, and volume of its feces, urine, and urates.

Physical Examination:

Physical examination of the chick entails evaluating available weight charts for daily gain, assessing overall appearance, proportions, and behavior. [7,8,9,10] In neonates, this exam should be performed in a warm room with pre-warmed hands. Knowledge of different species' growth rates, development, and behavioral characteristics is helpful. [10]

Psittacine neonates are altricial, hence nourishment, warmth (93-98° F), food, and a safe place must be provided. [6 ,7] Most abdominal organs can be seen through the neonate's skin. Neonates normally have a visible liver, duodenal loop, yolk sac, ventriculus, and lung. The lungs and heart should be auscultated. Assess body mass by palpation of elbows, toes, and hips, as keel muscle mass is a less reliable indicator of body weight in the very young.[6,7] Crops should be examined visually for size and color, and carefully palpated for thickness, tone, burns, punctures or the presence of foreign bodies. Crops should also be transilluminated to attempt to evaluate and describe their contents. Skin should be evaluated for color, texture, hydration, and the presence of subcutaneous fat. Normally, psittacine chicks should have beige-pink, warm, and supple skin. Dehydration causes a chick's skin to become dry, hyperemic, and tacky.[6,,7] In juveniles, feathers should be examined for stress marks, color bars or shade

changes, hemorrhage, or deformities of shafts and emerging feathers. The musculoskeletal system should be palpated and assessed for skeletal defects or trauma in chicks of all ages. Until weaning, cockatoo chicks sit back on their hocks and are balanced forward on their large abdomens, macaws prefer to lie down. Chicks normally have prominent abdomens, due to a food-filled crop, proventriculus, ventriculus, and small intestine. Beaks should be examined for malformations when the bird's mouth is closed. [6,,7,10,11] Pump pads should be examined for wounds and the feeding response elicited. Generally, a healthy baby bird should elicit a vigorous feeding response when stimulated at the beaks lateral commissures. The eyes and the periocular region should be examined for any abnormalities including lid defects, swelling, discharge, crusting, or blepharospasm. Normally a clear discharge is noted in the eyes when they are first opening, which typically occurs unilaterally. [6,7] Eyes begin to open on days 14 to 28 for macaws; 10 to 21 for cockatoos, 14 to 21 for Amazons.[7] Nares and ears should be examined for discharge and aperture size or absence.[7] The oral cavity should be examined for plaques, inflammation, or injuries.

Diagnostics:

Clinical Pathology Hematology and clinical chemistries should be performed by taking blood from the right jugular vein. As with adults, blood samples drawn should be less then 1% of the bird's BW. Toenail clips should be reserved for blood sexing only. Young chicks have lower PCV's and lower total proteins when compared to adults. (Palm EPH paper) Their albumin and uric acid values are lower and their ALP and CPK values are higher. [6,,7]

Microbiology Cloacal cultures, crop cultures, fecal cytology, and gram stains should be performed during routine examination. Normally, cloacal and crop flora is gram positive and consists of *Lactobacillus, Corynebacteria, Staphylococcus,* and non-hemolytic *Streptococcus.* Most gram negative and anaerobic bacteria are considered pathogenic, as are yeast. [7,8] Choanal cultures should be taken if upper respiratory tract disease is suspected or if choanal papillae are abnormally blunted.

Radiology The crop, proventriculus, and ventriculus are normally enlarged in neonatal and juvenille birds pre-weaning and the later two take up much of the abdominal cavity on radiographs. [6,7] Growth plates may be open, and the overall muscle mass is reduced.

Endoscopy Endoscopy, and surgery in general, are best performed on the fasted pediatric patient, since the proventriculus, ventriculus, and intestines are normally enlarged in unweaned birds. If the birds are kept warm and stable, anesthesia is quick. If feeding occurs soon after recovery then hypothermia, hypoglycemia, and hypocalcemia are easily avoidable, even in the neonate. Endoscopy is useful for foreign body retrieval, syrinx examination, surgical sexing,

and exploratory coelomic scoping.

Treatment:

Antimicrobials Antibiotic treatment should be based on culture and sensitivity.[6,7] The author feels strongly that all pediatric patients on antibiotics should automatically be put on antifungals. Lactobacillus supplementation is also highly recommended after antimicrobial treatment and at the beginning of life after hatch, typically day 2. Yeast infections in handfed birds should be treated with systemic antifungals in combination with nystatin for a minimum of 21 days. All, and especially refractory, yeast infections should be treated with acetic acid at least once, and with lactobacillus at the end of the treatment period.

Fluids In pediatrics, patient stabilization centers around temperature and re-hydration. So, heat up your fluids! Oral, SQ, and intravascular fluids (IV) are all warmed-up and given as needed. SQ fluids are the most frequently used, especially with the aid of hyaluronidase (1 ml/1 liter of fluid) (Wydase, Wyeth Lab. Inc., Philadelphia, PA) to hasten their absorption. In the severely dehydrated neonate, a jugular IV catheter is the preferred re-hydration route.

Common Pediatric Problems:

Unretracted Yolk Sac The yolk sac, a diverticulum of the small intestine, is normally internalized into the abdomen before hatching.[6,7] It is absorbed over the next few days providing the chick with nourishment and maternal antibodies. Retention of the yolk sac within the abdomen, another problem, commonly occurs secondary to *E. coli* omphalitis. Unretracted yolk sacs can also occur secondary to infections, but are typically a result of incubation problems, such as elevated incubation temperatures. Chicks with unretracted yolk sacs, and therefore an open umbilicus, should be placed on clean towels in the hatcher or the incubator, and their umbilicus swabbed with chlorahexidine scrub. Crop and cloacal cultures should be taken, as well as yolk sac cultures if the later is leaking, and the chicks should be placed on appropriate antibiotics and oral antifungals. Chicks should also be treated with fluids. If the yolk sac fails to become internalized in an environment of warmth and humidity over time, then surgery to mechanically internalize some or all of the yolk sac, if possible, and carefully ligate and remove the rest, may be necessary. Often removal is the only option and is necessary because externalized yolk sacs are susceptible to trauma and infection.

Stunting Stunting occurs most commonly in the first thirty days of life.[6,7] Affected birds have poor growth rates, low weight, an enlarged head relative to their body size, and abnormal feather growth including delayed emergence (on the body), misdirection (top of head), and feather stress lines.

Leg and Toe Deformities Splay leg is a common deformity in which one or both legs deviate

laterally. [6,7] Neonates can be packed in paper towels. Juveniles that splay on pellets may straighten up on towels or packed towels. Treatment options also include hobbling and possibly ostectomies in juveniles. Crooked, crossed, or forwardly directed toes can be corrected by splinting if caught early on, otherwise surgery may be indicated.

Constricted Toes Constricted toe syndrome, of unknown etiology, occurs most commonly in eclectus, macaws, and African grey parrots.[6,7] The lesion consists of an annular ring constriction usually on the last phalanx and most frequently affecting the outer toes, numbers one and four. Under isoflurane anesthesia and magnification, rule out cloth fibers as a cause. Next, debride the circumferential fibrotic annular band with fine forceps. Finally, put two full thickness longitudinal incisions, medially and laterally, through the constriction band, express accumulated serum, bandage, and monitor for swelling. Soak in warm dilute chlorohexadine solution and massage daily, then re-bandage. Chicks should be cloacal and crop cultured, and put on parenteral antibiotics and oral antifungals.

Beak Malformations The three most common beak malformations are lateral deviations of the maxilla (scissor beak), mandibular compression deformities of the mandible, and prognathism (pug beak).[6,7,10,11] The first two malformations are most common in macaws, while the third is most common in cockatoos. While the chicks are young and the beak pliable, physical therapy and trimming is indicated. After calcification, frequent trimming, acrylic implants, or extensions are often needed to correct the malformations.

Regurgitation During weaning, the crop normally shrinks in size. Hence, regurgitation of small amounts of food post-feeding signals the need to reduce the frequency of feedings and begin introducing solid foods such as pellets, fruits, and vegetables. [6,,7,8] Typically, as a bird grows feeding volumes are increased and the frequency of feeds decreased. Younger birds will regurgitate if overfed and this can lead to aspiration pneumonia. Repeated regurgitation in a chick which is too young to wean, or regurgitation of large volumes may indicate disease or mechanical blockage.[6,7,8] Rule out foreign bodies, crop or lower gastrointestinal fungal or bacterial infection, gout, or proventricular dilatation disease (PDD). Drugs, such as trimethoprim sulfa, doxycycline and nystatin can cause regurgitation, especially in macaw chicks. Chicks should be worked-up and started on antibiotics and antifungals as needed. Note that in cases of regurgitation antibiotics should be given parentally.

Esophageal or Pharyngeal Punctures Esophageal or pharyngeal punctures occur secondary to syringe or tube feeding. [6,7,8] They are most common in vigorously pumping birds, like macaws. Esophageal punctures usually occur mid-way between the pharynx and the thoracic inlet in the cranial most aspect of the crop. Pharyngeal punctures usually occur in the caudal aspect of the pharynx slightly caudal to the right of the glottis.[6] Emergency surgery is needed

to remove subcutaneously deposited food, create a drain, and begin flushing of the wound. The bird must be tube fed so food does not come in contact with the wound during healing. Chicks should be worked-up and started on antibiotics and antifungals as needed.

Crop Stasis Crop stasis is very common in neonate and juvenile birds.[6,7] Primary causes of crop stasis include infection, crop FB's (such as feeding tube or syringe tips), atony, burns, dehydration of food in the crop, hypothermia, cold or hot food and environment.[6,7] The most common primary cause of crop stasis is yeast or candidiasis.[6,7] Secondary causes include distal gut stasis due to ileus, intestinal intussusception, bacterial or fungal infection, sepsis, dilation, PDD, polyomavirus, GIT FB's, renal or hepatic failure.[6,7] Medical and mechanical management are typically needed for the treatment of crop stasis. Diagnostics as described above are very important, especially culture, crop and fecal cytology, and blood work. Further diagnostics, such as radiography, should be performed as needed without hesitation.

Fluids are key in the treatment of both crop and other GIT stasis cases.[6,7] Oral fluids rehydrate inspissated crop material and hasten its passage. SQ fluids are the treatment of choice for systemic rehydration. IV fluids are best in the severely dehydrated patient. In these cases, placement of a right jugular IV catheter is preferred. These IV catheters are safely maintained for days. If the crop is severely impacted, repeated flushing with warm saline may be needed to empty it. A crop bra is a simple form of mechanical management for the over stretched crop. The bras are made in-house of Vetrap (3M Vetrap, Animal Care Products, St. Paul, MN). In a severely over-stretched crop, reduction surgery may be necessary to facilitate emptying. Further, hypoproteinemia may occur secondary to severe chronic crop stasis. In these cases, whole blood transfusions and metoclopromide or cisapride may be indicated, as long as GI obstruction has been ruled out.

Chronic non-responsive crop stasis may involve mural candidiasis. These cases are best diagnosed with biopsy and require long-term systemic antifungal and antibiotic treatment and acetic acid gavage. Acetic acid acidifies the crop's contents and discourages yeast and bacterial growth. The most common clinical signs of crop stasis are a visibly oversized static crop and regurgitation. Although a manageable problem, crop stasis can be a fatal condition due to dehydration and sepsis and, therefore, demands immediate intervention.

Crop Burns Crop burns of the mucosa and skin occur secondary to feeding excessively hot food (> 110° F),[6,7] The burn must fistulate through before surgery is indicated and this may take several days to weeks.[6,7] During this time, the area should be kept clean, bloodwork should be drawn, and the bird should be put on parental antibiotics and antifungals, based on culture and sensitivities. At surgery, the area around the fistula should be debrided and the edges of the tissues separated and freshened. The wound should be closed in two layers—the

crop layer first followed by the skin layer,[6,7] Minor crop burns may resolve without fistulation and not require surgery.

Foreign Body Ingestion or Impaction Neonates and juveniles are curious and will ingest FB's, if available. If large and within the crop, FB's can be removed via retrograde palpation or carefully with hemostats.,[6,7] Smaller pieces, such as wood shavings, may pass through the crop and result in lower GI impactions. Emergency surgery is often indicated.

Less Common Pediatric Problems:

Rectal prolapse Secondary to hypermotility or infection, rectal prolapsed has been reported in macaws.[6] If the prolapsed tissues is fresh, the bird may be saved. Chicks should be worked-up and started on antibiotics and antifungals as needed. Emergency surgery is indicated.

Intestional intussusception Intestinal intussusceptions have been noted by the author in juvenile amazons, but could occur in any species. Chicks should be worked-up and started on antibiotics and antifungals. Emergency surgery is often indicated; however, patients usually do not survive

Hepatic Hematomas These are suspected to be secondary to rough handling/trauma or possibly dietary deficiencies. Most reports have been in macaws where the etiology is unknown.[6] Chicks should be worked-up, started on vitamin K1, and given transfusions as needed.

Hepatic Lipidosis Hepatic lipidosis occurs secondary to overfeeding or individual susceptibility primarily in handfed umbrella cockatoos, moluccan cockatoos, and blue-and-gold macaws, but it can occur in other birds.,[6,7]
Affected chicks have severely enlarged livers visible through the skin, enlarged abdomens, or are pale and dyspneic. These birds need to have their intake per-feeding reduced and their frequency of feedings increased immediately to help decrease their dyspnea. Their dietary fat content needs to be evaluated and possibly reduced, and they need to be worked-up and started on lactulose. Milk thistle may also be helpful.

Gout Gout, a clinical sign, occurs secondary to severe renal disease. In juvenile macaws, gout is thought to occur secondary to excess vitamin D_3 and calcium in the diet.[6,7] In cockatiels, a genetic predisposition is suspected.

Wine-colored urine Wine-colored urine normally occurs in juvenile African grey, amazon, and pionus parrots.[6,7] It may occur secondary to certain hand feeding formulas, and is most

obvious on white or light coiored towels.

Diseases in the Nursery:

Polyomavirus Polyomavirus is the most common viral disease encountered in psittacine nurseries.[7] It is highly contagious, has an estimated incubation period of two weeks, and is typically wide spread before detection. Most affected birds die within 24 to 48 hours. Hence, it is an acute rapidly fatal disease of hand-raised neonates. Two to 14 week old macaws, conures, eclectus and ring-necks are most commonly affected. If clinical signs appear at all, they consist of weakness, pallor, SQ hemorrhage, anorexia, dehydration, crop stasis, regurgitation, vomiting, and depression. Hemorrhage is noted at injection sites, plucked feathers bleed excessively, and petechial and ecchymotic hemorrhages appear on the skin. Survivors exhibit poor weight gain, polyuria, gut stasis, and abnormal feathering similar to that seen with psittacine beak and feather disease (PBFD). Asymptomatic infection keeps this virus in the psittacine population. A DNA polyoma cloacal swab test is available to identify actively shedding birds. Thus, the best method to manage polyoma virus is by vaccination with the killed polyoma vaccine manufactured by Biomune ®. The entire aviary and all the chicks in the nursery should be vaccinated. Strict nursery husbandry and a closed nursery policy (including showering in) should also be practiced.

Proventricular Dilatation Disease PDD is also an important viral disease of the pediatric patient. Affected birds range from 10 weeks to 17 years and the disease is ultimately fatal.[7] In the nursery, chicks may exhibit regurgitation, crop stasis, voluminous feces, weight loss, weakness, and neurologic signs, including head tremors. Biopsy of the ventriculus, the proventriculus, or the crop may be diagnostic. A closed nursery and impeccable husbandry are the best tools available to control this virus.

Psittacine Beak and Feather Disease Psittacine Beak and Feather Disease (PBFD) can occur in neonates, is highly contagious, and easily spread by feather dust and dander.[7] This viral disease is characterized by pterylodysplasia (abnormal feather growth) and is most often noted in fully feathered chicks. Feathers can be clubbed, have circumferential constrictions, and sheaths and blood feathers may be retained, etc. A DNA PBFD whole blood test is available to identify positive birds. Positive birds should be isolated and retested in 90 days as some may clear the virus. The disease course may be acute or chronic depending on the age and immuncompetence of the individual. The entire aviary should be tested for PBFD and positive adult birds should be immediately removed from the collection. Strict nursery husbandry and quarantine should be practiced and all chicks should be tested before leaving the nursery.

Poxvirus This virus problematic in neotropical collections where chicks remain in the nest for any length of time or where juveniles are housed outdoors.[7]

Bacterial Diseases Microbial alimentary infections are among the most common problems in psittacine chicks. They are typically diagnosed by cloacal and crop cultures, and Gram's stains. Gram negative bacteria or yeast infections are abnormal in psittacine chicks.[67] Some strains of *E coli*, *Klebsiella* spp., and *Enterobacter* spp. are thought to vary in pathogenicity and can be isolated from completely normal chicks.[67] Birds should be treated only if they exhibit clinical signs or if Gram negative bacteria or yeast are identified in large numbers.[67] Further, they should only be treated based on culture and sensitivity. As mentioned above, all pediatric patients put on antibiotics must be put on antifungals. In cases of regurgitation or stasis, antibiotics should be given SQ or IV until crop emptying or stasis improves. Microbial diseases of importance in the nursery include; *E coli* spp., *Klebsiella* spp., *Enterobacter* spp., *Pseudomonas* spp., *Salmonella* spp., and, *Candida* spp..

Chlamydia Chlamydiosis should be screened for in all cases of nursery mortality, especially if the collection contains budgerigars or cockatiels.[67] Unfortunately, diagnosis of chlamydia is difficult, and culture and isolation comprise the only definitive test. Chlamydia-positive birds must be treated with doxycycline for 45 days. The zoonotic potential of this disease must be discussed with the aviculturist and reported to the health department.

Conclusion

Incubation medicine and pediatrics are very tightly associated disciplines. Successful incubation with a smooth hatch makes for a healthy, viable neonate. A neonate that gets off to a good start has the best chance at becoming a thriving juvenile. The majority of pediatric problems are associated with husbandry and handfeeding. Nursery management and veterinary preventative medicine are both equally important in the production of healthy baby birds. Crop stasis is the most common pediatric problem seen, and if managed correctly, it need not be a fatal condition. Immediate intervention should include a thorough history, physical examination, medical and mechanical therapy, and blood work to help reverse this condition. Fluids (+/- whole blood) are critical in this reversal process, and lactobacillus and acetic acid may be helpful. Antibiotics and antifungals, although important, need to be used cautiously in baby birds. When used correctly, antimicrobials can halt infection and decrease the chance of sepsis. Along with dehydration, sepsis is the most common killer of pediatric patients.

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