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Initial Assessment and Treatment of Psittacine Paediatric Emergencies

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Introduction

Parrot chicks are altricial (i.e. when hatched their eyes and ears are closed; they are not feathered other than some down in some species; and are totally dependent on their parents (or rearer). Their growth rate is much slower than other altricial species (e.g. passerine birds) although they become endothermic much earlier than these other species (Groffen et al., 2008). They go through a rapid growth phase, during which their size and weight increases to a level above that of their adult weight, before falling and then plateauing at their fledging weight. During this time their eyes and ears open, their feathers grow, the bones and internal organs mature, and their social skills and learned behaviours are shaped. This is obviously a period of rapid change, where small changes can have a big impact on their health and development.

Common medical problems seen in parrot chicks include:

- Infectious diseases e.g. viral infections (Avian Polyomavirus, PBFD, and adenovirus); fungal infections (aspergillosis and candidiasis), and bacterial infections (e.g. omphalitis, enteritis, respiratory infections). Parasitic infections are uncommon in hand-reared birds, but can be present in birds reared in the nest by heavily parasitised parents; and
- Non-infectious diseases e.g. stunting, dehydration, chilling, aspiration pneumonia, regurgitation and vomiting, crop burns, yolk sac retention, and intestinal volvulus.

Added to the challenges presented by rapid growth and development of the chick is the frequent lack of awareness by the owner that a problem is even present, often compounded by a delay in seeking veterinary assistance. The result is that many chicks presented for health problems are often severely decompensated and are emergent cases.

This paper does not seek to address the ongoing diagnostic and therapeutic steps needed to resolve a clinical problem, but rather to present to clinicians a guide for the initial assessment and treatment of the emergent psittacine paediatric patient.

What are the challenges of a paediatric case?

There are unique challenges facing the clinician when dealing with a paediatric case. These include:

a. Their small body size means that there is:

- A large surface area to body mass ratio, sensitising them to temperature extremes (especially hypothermia):
- Difficulty in accessing blood vessels for the administration of fluids and medications and collecting blood samples:
- Small muscle mass, making intramuscular injections difficult to administer without causing significant bruising, pain, and discomfort.

b. A lack of white fat (for insulation) and brown fat (for thermogenesis) (Groffen et al., 2008) makes them reliant on their metabolism (Pearson, 1998) to maintain their body temperature. Although cockatiel chicks have been shown to develop endothermic responses as early as 1 week post-hatch, they are only capable of achieving 75% of the adult ability to maintain their body temperature until they fledge (Pearson, 1998). This means that:

- They require the frequent ingestion of a high-energy, easily digested food to maintain their metabolic rate;
- Their retention of body heat is hindered by the lack of insulation from feathers, contributing to potential hypothermia.

c. Their Immature physiology means that:

- The ability to invoke compensatory physiologic responses (e.g. vasoconstriction and vasodilation) is limited;
- The kidneys have poorly developed concentrating and filtering capacity, meaning that their fluid requirements may be two to three times that of an adult bird;
- The digestive tract has a rapid transit time and is easily 'stressed', leading to ileus;
- The respiratory tract is immature and the air sacs are compressed by the intestinal tract, giving a low respiratory reservoir; and
- The still-developing immune system is often unable to cope with primary or secondary pathogens.

d. Diagnostic testing can be limited by their size and age.

- Radiology is limited:
    - Coelomic radiography is difficult to interpret due to the loss of contrast without coelomic fat;
    - Evaluation of the skeletal system is difficult due to the decreased opacity of the bones and the open growth plates
- Haematologic and biochemical differences from adults can make diagnostic testing difficult. Compared to an adult of the same species, chicks generally have:
    - Lower haematocrit and higher white cell count;
    - Lower total protein and uric acid; and
    - Higher creatine kinase

Evaluating the sick chick on presentation

On initial presentation of the chick, a rapid but thorough evaluation needs to occur. This evaluation includes a history, physical examination, and finally diagnostic testing.

The history of the patient needs to include the species and age of the chick, whether it was artificially or naturally incubated, whether it is been parent-reared or hand-reared, and what the parents were been fed. If it is been hand-reared, the following information must be ascertained: from what age did the hand-rearing start; what is been fed; how is it been mixed; how often and how much is the chick fed; when it was last fed; and at what temperature the chick is been maintained. It is also important to know what the exposure of the chick to other birds/chicks is, and whether there have been any problem with them. It is useful if there are records accompanying the chick, but these are often not available.

The physical examination needs to include its body weight, its body condition (best evaluated by examination of the toes and elbows), its posture and conformation, its body colour and temperature, its hydration status, whether its crop has food in it, and an evaluation of its droppings.

If possible, a few drops of blood can be collected for a PCV, blood smear, total plasma protein, and blood glucose. Faecal and crop wash samples can be evaluated for bacterial and yeast overgrowth.

This evaluation, while not exhaustive, can be performed rapidly and an assessment made as to the chick's status using the four H's.

The four H's

Regardless of the underlying aetiology, the majority of problems with sick chicks can be associated with the "four H's": These have been developed by small animal emergency clinicians as an acronym for the assessment of paediatric patients (O'Dwyer, 2015). They are:

a. Hypovolaemia;
b. Hypoglycaemia;
c. Hypothermia; and
d. Hypoxaemia.

Other problems, such as beak abnormalities and angular limb deformities, rarely present as emergent conditions and will not be discussed further in this paper.

Hypovolaemia

Fluid requirements for paediatric patients are higher than those of adults. This is because of increased extracellular fluid requirement, higher body surface area, greater surface area: body weight ratio, lack of body fat, higher metabolic rate, decreased ability of immature kidneys to concentrate urine, and increased respiratory rate leading to greater insensible fluid losses (O'Dwyer, 2015).

Severe dehydration is common in chicks, usually associated with gastrointestinal dysfunction (vomiting, diarrhoea, and ileus) or decreased intake (poor husbandry, inappropriate or poorly mixed diet, refusal to eat). Respiratory loss due to panting when heat stressed can also lead to dehydration. Dehydration and hypovolaemia lead to decreased tissue perfusion and subsequent organ damage and even failure. As paediatric patients appear to lack the ability to compensate for mild hypovolaemia to increase tissue perfusion (increased heart rate and contractility, and increased vascular tone), they are extremely sensitive to the effects of dehydration.

Clinical signs include:

- Thickened mucoid saliva;
- Wrinkling of the skin;
- Enophthalmos;
- Decreased venous return (assessed by 'blanching' the basilic vein);
- Decreased urine output and thickened urates (although polyuria can be a contributing factor to dehydration); and
- Ileus, often reflected as crop stasis.

If any uncertainty is present, it is usually safe to assume the chick is dehydrated and act accordingly.

Crop stasis, if present, should be addressed by emptying the crop and assessing its contents for bacterial or yeast overgrowth. Failure to empty the crop in a sick chick may result in regurgitation and possible aspiration pneumonia. The chick should not be fed until warmed and its hydration status is corrected.

Fluid therapy requires the administration of warmed (30-35°C) isotonic fluids. These can be given IV, IO or SC, but if the SC route is chosen the chick should be normothermic, as hypothermia will add to the chick's reduced inability to peripherally vasodilate, slowing fluid absorption. IO catheters can be placed in the tibiotarsus or ulna, while IV catheters can be placed in the jugular, basilic or medial metatarsal veins. An initial fluid bolus of 3% - 4% of the chick's body weight can be given over 15 minutes, and repeated based on the chick's response. Ongoing fluid administration at 3mls/kg/hour can then be initiated (Lichtenberger, 2004). Care must be taken to avoid fluid overload (often seen as dyspnoea associated with non-cardiogenic pulmonary oedema). Once the chick is rehydrated and the gastrointestinal tract is functional the oral administration of adequate volumes of fluids can be expected to maintain a suitable fluid balance.

Hypoglycaemia

Hypoglycaemia often arises due to either poor feeding practices (inappropriate diet, infrequent feeding, diluted food, or insufficient volume of food) or severe systemic illness (particularly sepsis or those conditions leading to GI ileus or other GI dysfunction). When low dietary intake is combined with an immature gluconeogenic response and low body fat, the result can be severe hypoglycaemia. This in turn leads to neurological and cardiac disturbances (weakness, seizures, coma and death). In the early stages of hypoglycaemia, chicks may be constantly hungry, exhibited as excessive begging behaviour. Blood glucose levels below 8 mmol/L are suggestive of hypoglycaemia.
Chicks with severe hypoglycaemia should be treated with an IV/IO bolus of dextrose (250-500mg/kg (50% dextrose, 0.5-1ml/kg diluted 1:4) administered over five minutes. Repeat boluses can be given, based on response to treatment, and then once normoglycaemic the chick's IV/IO fluids can be supplemented with 5% dextrose until the chick is eating.

Less severe hypoglycaemia may be effectively dealt with by an early return to feeding or by feeding a more appropriate diet.

Hypothermia

- Hypothermia in chicks arises because of the effect of the following factors:
- Low reserves of white (insulating) fat;
- Large surface area to body mass ratio;
- Lack of feathers to insulate the body;
- Reduced ability to vasoconstrict or shiver; and
- Reduced activity (chicks are usually sleeping or eating).

When these factors are combined with inappropriate environmental temperatures or reduced food intake (decreased metabolic energy), the result can be profound hypothermia.

Hypothermic chicks are lethargic and poorly responsive to stimulus. Their limbs and bodies are cool to the touch. Peripheral vasoconstriction can be seen as a pallor to the skin. Left untreated cardiovascular function will be compromised, resulting in organ dysfunction and finally cardiac arrest.

Hypothermic chicks should be warmed before fluid resuscitation, but care should be taken to avoid excessive peripheral vasodilation and possible hypotension. Warming can be achieved with warmed air or heat lamps but the chick must for signs of hyperthermia (panting, hyperaemic skin, distress), especially if it is unable to move away from the source of the heat. Adequate humidity (50%-60%) must be provided to prevent desiccation as a result of the heat and worsening of the chick's hydration status.

Hypoxaemia

Hypoxaemia is common in chicks and can be associated with anaemia, the aspiration of hand rearing formula, infectious respiratory diseases (e.g. bacterial or fungal infections), or compression of the air sacs by distended loops of intestinal tract. Hypoxic chicks will have an increased respiratory rate and effort (mouth breathing, increased sternal lift and tail bobbing), and may have audible respiratory noises. Cyanosis can be seen, but is often difficult to appreciate. Pulse oximetry may be of benefit but, because of calibration difficulties with nucleated erythrocytes, trends, rather than absolute numbers, should be monitored.

Oxygen supplementation (via an anaesthetic induction chamber, flow-by oxygen or an intranasal oxygen line) should be administered when hypoxaemia is diagnosed or suspected Care must be taken to prevent oxidative tissue damage associated with 100% oxygen administered for prolonged periods (Jaensch et al., 2001). Antimicrobial therapy is often warranted e.g. a combination of amoxicillin-clavulanic acid, metronidazole and itraconazole.

Where to from here?

Once the sick chick has been stabilised the clinician can then move on to determining the underlying reason for the chick's illness. Common causes of illness in chicks have been mentioned earlier, but the diagnosis and treatment of these diseases can only be performed once the chick is stabilised. Careful evaluation and examination are paramount in diagnosing and treating paediatric problems.

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