TRIAGE: ASSESSMENT AND SUPPORT

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Increasing numbers of birds are being kept as pets, and owners want to receive high quality medical care for these pets. Treatment of hypovolemic shock and critical care monitoring in birds are complicated by small patient size, physiological diversity and lack of research and clinical data on their response to therapy. Despite these impediments, the same principles and techniques of monitoring used in domestic animals can be applied to the avian patient. The goal of this and the following companion articles is to provide an in-depth presentation on the principles and pathophysiology of shock, types of fluids, monitoring techniques, and shock resuscitation methods for use in birds. Principles of cardiopulmonary-cerebral resuscitation will also be discussed. Arterial blood pressure measurement is an important tool in the management of the critically ill bird. The message of clinical importance is that fixed fluid regimens (eg, lactated Ringers), fixed volumes (eg, mL/kg) and rules of thumb are in most instances outdated, inappropriate and often times inadequate. Appropriate fluid therapy, combined with frequent patient evaluation and periodic blood pressure monitoring techniques, can produce astounding and at times miraculous results.

Most birds do not show signs of illness in the early stages of disease. Often, birds with chronic disease present as an emergency because of their ability to mask clinical signs of the disease until the condition is severe. In virtually all cases, I advise the receptionist to recommend the bird be brought in for an exam. If the owner is concerned enough to call, then the bird is probably very sick and needs to be seen. While all signs reported by the client can be of concern, sitting at the bottom of the cage, bleeding, respiratory distress, regurgitation and anorexia are considered true emergencies. The client should be instructed to bring the bird in a cage, if possible, otherwise instructs the owner about suitable alternatives (eg, box, cat carrier). The water dish should be emptied but the cage should not be cleaned prior to traveling to the hospital.

Once the bird has arrived, it is ideal to have a trained receptionist call for an immediate triage by a nurse. Prompt, accurate treatment is vital to a favorable outcome. The nurse should assess the condition of the bird in a room. In cases of bleeding, seizing, head trauma and respiratory distress, the bird should be evaluated immediately by the veterinarian. If the bird is fluffed, weak or sitting at the bottom of the cage, they should be placed in a warmed incubator and oxygen is administered. The optimum temperatures for ill birds are 85 to 90°F (29–30°C).

PHYSICAL EXAMINATION

Initially the bird should be evaluated in its cage. Its posture, ability to ambulate and perch, respiratory status, interest in the environment, and fluffing of the feathers are assessed. The cage can be examined for discharges and vomit and sources of lead and zinc. Examine the feces (color, amount or blood), urates (normally is white to off white), and urine (an increase or change in color is abnormal) parts of the droppings. Following stress, birds frequently demonstrate polyuria.

Perform a complete physical exam as the condition of the bird allows. When handling a bird, it is best to work in a small room with low ceilings, closed window and no fans. Some birds, particularly finches and canaries, should be picked up in a darkened room. Prior to picking up the bird, you should determine if it is safe to restrain the bird. Weak birds and birds in respiratory distress could die during handling. Sudden death is no uncommon with restraint of obese budgies fed an inadequate diet. Efficiency is important when handling a bird. Setting up ahead of time for procedures to be performed will reduce the total restraint time. Proficiency in handling birds is an important factor in gaining client confidence. It is important to warn clients prior to picking up the bird what is going to happen. Most clients have never heard their bird scream or seen their bird struggle the way it does during restraint.

It may be better to postpone a complete physical exam in a weak bird or bird in respiratory distress. A quick one minute exam can be performed on a bird while taking the bird out of the cage and placing in the incubator. The head should be examined for oculonasal discharges and swellings. The oropharynx and choanal is examined for color mucous and presence of blunted papillae. The beak is examined for bleeding, symmetry, or fractures. Hydration is assessed by eyelid mobility, skin turgor, and dry mucous membranes.

The crop is palpated for presence of food or foreign bodies. Observation of refill time of the basilic (wing) vein will estimate perfusion status. Normal veins refill in 1 to 2 seconds after depression. The heart and lungs are ausculted. The respiratory rate and effort is evaluated. The pectoral muscle should be evaluated to judge the bird’s body condition. The abdomen is palpated for signs of masses or fluid distention. In normal birds, it is difficult to palpate abdominal organs. An increase in the distance between the caudal end of the sternum and the pubis can suggest abdominal organomegaly, neoplasia or ascites. The vent should be examined for matting, redness or swelling. The grasp reflex of the feet will help determine weakness. The bird is also weighed on a gram scale.

SHOCK IN THE AVIAN PATIENT

Shock is defined as poor tissue perfusion from either low blood flow or unevenly distributed flow. This results in an inadequate delivery of oxygen to the tissues. This definition applies to all species of animals. Recent studies done by the author on shock in birds, has provided in-depth knowledge of a birds response to hypovolemic shock. Fluid resuscitation of the patient in hypovolemic shock can be a challenge and the clinician should understand the basic pathophysiology of shock, principles of perfusion, have knowledge of the different types of fluid and blood pressure monitoring techniques.
Appropriate fluid therapy, combined with frequent patient evaluation and blood pressure monitoring, can produce favorable outcomes.

**Glucocorticoids**

The use of glucocorticoids in the treatment of shock is controversial. These drugs have been extensively investigated in the shock syndrome. The side effects of immunosuppression, increased risk of infection (i.e., aspergillosis, psittacosis), hyperglycemia, and gastric ulceration may outweigh their benefits. Their use in shock caused by hemorrhage and hypovolemia is not currently recommended.

**Sodium Bicarbonate**

The most important method of correction of severe metabolic acidosis is aimed at increasing the pH through increasing the extracellular fluid pH. Crystalloid fluids containing lactate, acetate, and gluconate (i.e., Plasma-Lyte, Normasol R, LRS) are considered an important means of increasing the alkalinity of the extracellular fluid. Correction of acidemia initially begins with correction of the patient’s perfusion and hydration status through the use of fluid therapy.

Blood gas parameters must be evaluated before considering the administration of sodium bicarbonate. Since this is rarely possible in the avian patient, use of sodium bicarbonate in shock is not recommended.

**HYPOVOLEMIC SHOCK**

Hypovolemic shock is caused by either an absolute or relative hypovolemia. Potential etiologies of absolute hypovolemia would be any cause of hemorrhage, including trauma, coagulopathy, gastrointestinal bleeding, surgical mishaps or a ruptured neoplasia. Examples of relative hypovolemia would include severe dehydration from gastrointestinal loss, or extensive loss of plasma as in a burn patient, or loss into a third-body space such as the coelomic cavity, uterus, or gastrointestinal tract.

The most common cause of hypovolemic shock is hemorrhage. When an animal begins hemorrhaging, there is a decrease in blood volume and decrease in venous return to the right side of the heart. This causes a decrease in return to the left side of the heart and therefore a decrease in cardiac output. With a substantial hypovolemia, blood pressure decreases below a mean arterial pressure of 60 mmHg or a systolic pressure of less than 90 mmHg. The carotid and aortic artery baroreceptors detect a decrease in stretch due to the decrease in cardiac output. This sends a neural signal to the vasomotor center in the medulla oblongata, which results in inhibition of vagal parasympathetic center and stimulation of the sympathetic center. This causes vasoconstriction of the veins and arterioles throughout the peripheral circulatory system and increases heart rate and strength of heart contraction. The humoral response is an increase in adrenal circulating catecholamines which in turn stimulates renin release via adrenergic receptors on cells of the juxtaglomerular apparatus (specialized smooth muscle cells in the afferent arterioles). Renin causes release of Angiotensin II, aldosterone, and antidiuretic hormone. There is a strong vasoconstriction and water retention, from their release causing an increase in extracellular fluid volume and an increase in blood pressure.

The pathophysiology of hemorrhagic shock is poorly understood in avian species. Acute blood loss of 30% to 40% of blood volume has been shown to result in 50% mortality (LD₅₀) in mammals. Blood loss is better tolerated in birds than in mammals. The LD₅₀ for acute blood loss in ducks has been shown in a recent study to be 60% of the total blood volume.

A recent hemorrhagic shock study in mallard ducks (*Anas platyrhynchos*) documented an increase in heart rate and decrease in blood pressure following acute blood loss. That study may show that birds have a baroreceptor response to shock similar to that seen in mammals.

Isotonic replacement fluids are administered according to the patient’s estimated dehydration, maintenance needs, and anticipated ongoing losses.

**Red Blood Cell Regeneration After Acute Blood Loss**

After acute blood loss, mammals are dependent on red blood cell (RBC) regeneration to maintain oxygen delivery to the tissues. In response to tissue hypoxia, erythropoietin stimulates RBC production by the bone marrow. Reticulocyte release from the bone marrow in mammals occurs rarely after 2 to 4 days and most commonly longer than 5 days after acute blood loss. Reticulocytosis, or polychromasia, is the hallmark of intensified erythropoiesis in mammals and birds, allowing classification of anemias into regenerative or nonregenerative types. A previous study done by the author, on acute blood loss in the duck documented an early regenerative response shown by presence of polychromasia starting at 12 hours after blood loss. The relatively short live span of the red blood cell (28–45 days) and presence of a nucleated red blood cell (RBC) may account for a birds’ ability to mount a very early regenerative response. The use of early supportive care with fluid therapy in avian shock may help bridge the gap for the first 24 hours, after which birds can mount their own RBC regenerative response.

**Fluid Selection**

Individual characteristics of available fluids influence the dose, type, and volume of fluid administered. Crystalloids solutions can be used together with colloids during the resuscitation phase. Crystalloids are the mainstay of the rehydration and maintenance phases of fluid therapy. The three basic groups (i.e., crystalloids, synthetic colloids, and hemoglobin-based oxygen carriers) of fluids will be discussed.

**Fluid Therapy – Birds**

Any sick, debilitated bird presenting for emergency care, should immediately be placed in a warm incubator (Temperature at 85–90°F [29.4–32.1°C]) with oxygen supplementation for 2 to 4 hours. When active external hemorrhage is present, this must be stopped.
immediately. Most birds benefit from the administration of warmed crystalloids at 3 mL/100 g BW IV, IO or SQ. Birds should be offered food and water during this time. When the bird appears stable (alert, responsive) and can be safely anesthetized with mask isoflurane or sevoflurane, diagnostics and treatment for hypovolemia and dehydration can be performed. Blood pressure monitoring using Doppler and an ECG can be used during these procedures.

The Doppler cuff can be placed on the distal humerus or femur and Doppler probe on the medial surface of the proximal ulna or tibiotarsus, respectively. The blood pressure of various avian species under isoflurane or sevoflurane anesthesia at the author’s clinic is 90 to 140 mmHg systolic. When blood pressures are below 90 mmHg systolic, birds are treated for hypovolemia as given below. Bolus administration of crystalloids (10 mL/kg) and colloids (HES or Oxyglobin® at 5 mL/kg) can be given IV or IO until blood pressure is greater than 90 mmHg systolic. In the author’s experience one or two bolus infusions are usually required. In severely dehydrated birds that are not eating, IV or IO catheters are placed for replacement of dehydration losses with crystalloids. Estimation of the fluid deficit is based on estimated dehydration and body weight:

$$\text{Estimated Dehydration (\%)} \times \text{Body Weight (g)} = \text{Fluid Deficit (mL)}$$

Daily maintenance fluid requirements (2 mL/kg/hr) are added to the fluid deficit volume.

References are available from the author upon request.