Medical Aspects of Captive Care and Husbandry of Native and Exotic Waterfowl in Australia

Danny Brown BVSc (Hons) BSc (Hons)[1]

Introduction

Native and exotic waterfowl are increasing in their popularity as avicultural topics. This is primarily due to relaxation of regulations in some states of Australia and in part due to increased regulations within suburban areas that limit the keeping of "traditional " poultry species. This group of birds in Australia comprises 27 species of waterfowl that may be kept. Some of these are highly specialised and are infrequently kept whilst the majority have husbandry needs within the ability of most novices. Waterfowl health is controlled to a large degree by their feeding and housing and this paper aims to outline the basic needs of this group and the most common husbandry related medical conditions.

Housing

Traditionally, native and exotic waterfowl housing has been on large open dams with natural vegetation and this has significantly limited many people from keeping this group of birds. Quite recently, it has been determined that many waterfowl species are more suitable for more restricted housing than previously thought. The basic needs of these birds are predator protection, clean feed and water facilities and suitable nest sites. The individual housing needs of each species are too numerous to mention here and I would suggest the book "A Guide to Pheasants and Waterfowl – Their Management , Care and Breeding" for further information.

Botulism

The predominant housing-related medical disorder likely to be encountered is botulism. Toxins produced by the bacteria *Clostridium botulinum* produce an uncommon but often devastating syndrome of paralysis and death. *Cl. Botulinum* produces thermolabile exotoxins. These are produced under conditions of decay of meat or vegetation. In waterfowl collections, ingestion of this toxin can occur under the following conditions :-

- Ingestion of maggots from decaying animal carcasses (e.g after rodent baiting program)
- Inundated vegetation as a result of increased water levels can decay under water and toxins are ingested whilst dabbling.
- Dried water bodies will trap dead plant material which is ingested whilst dabbling.

The toxins enter the body via the intestinal wall . They bind in an ascending fashion to all autonomic and somatic efferent nerves and block acetylcholine production. The result is an ascending flaccid paralysis of skeletal muscles with eventual respiratory failure. Treatment is at best supportive. Antibiotics have no significant influence on the overall outcome except in nstances where tracheal aspiration of food or water has occurred. Supportive care includes supplementary food (hand-rearing mix, Polyaid), activated charcoal, Psyllium husks (Metamucil) and SC/IV fluids. Vaccination with Type C botulinum vaccine has provided preventative benefits in large collections

[1] Nicklin Way Veterinary Surgery, Cnr Nicklin Way and Minkara St, Warana, QLD, 4575

with predictable seasonal problems. Definitive diagnosis can be made from mouse injection techniques from deep frozen (-20ºC) serum, liver or kidney samples or environmental extracts (water, mud).

Cestode Infections

Another housing related disorder is Cestode infection. Numerous species of cestodes are found naturally in Australian waterfowl and the majority are considered non-pathogenic. Under circumstances of concentrated housing some species may become a problem. Cestode infections in juvenile waterfowl is of particular concern. Most juvenile waterfowl are housed in heated brooders or pens that are either cleaned as needed or, if outdoors, moved around on the grass to access a clean substrate. Faecal buildup from these birds provides a perfect habitat for the growth of various maggot species. These feed avidly on duckling faeces (which contain cestode eggs) and grow quickly into flies. These flies are now ideal transport and reservoir hosts for the cestode species. Flies are in turn avidly consumed by juvenile and adult waterfowl and the life cycle is completed. The main problem is that a hygiene problem in one component of the collection can cause passive infection of the rest of the collection. Most adult ducks are not overly concerned by cestode populations until periods of stress such as breeding, drought or moulting. Clinically, birds show generalised ill-thrift and significant weight loss. Juvenile birds will have poor growth rates and fail to thrive despite adequate feeding. Treatment with anticestodal drugs and supportive care will save the majority of birds. Treatment is best administered directly to individual birds as in-water medication is difficult to use safely in waterfowl due to their heavy water consumptions. Praziquantel (Droncit, Virbac Tapewormer, Wormout Tabs) at 10 mg/kg is the treatment of choice.

Aspergillosis

Aspergillus sp. is a common environmental fungus that may cause disease as a result of increased exposure with poor housing. Damp , unhygienic conditions particularly in enclosed areas can result in inhalation of pathogenic levels of this fungus. Not all birds are equally susceptible to pathogenic infection and factors such as immune status, nutrition, age, genetic viability and natural habitat preferences seem to be important. Those birds at risk include young birds (particularly if crowded) , birds with other concurrent diseases (respiratory irritation, Vitamin A deficiency, undergoing antibiotic treatment), birds of poor genetic background (current Mandarin Duck (*Aix galericulata*) populations in Australia), and southern species kept in humid northern areas (New Zealand Scaup (*Aythya novaseelandiae*) in Qld). Aspergillosis is primarily a post mortem diagnosis. Clinically birds show weight loss, gurgling or wheezing respiration particularly with handling , or sudden death. Pre mortem radiographs and endoscopy will assist diagnosis. Some birds may have a heterophilia, anaemia and hypergammaglobulinaemia . Treatment is difficult and very unrewarding.

Early lesions may respond to I/V and nebulised Amphotericin B with concurrent flucytosine, ketoconazole, itraconazole or fluconazole. Chronic lesions have a very poor prognosis.
Air sac and dorsal lung lesions of *Aspergillus* fungus colonies can be visualised at post mortem.

Bumblefoot

Bumblefoot (pododermatitis) is seen commonly in a range of waterfowl species. It is primarily a disease caused by chronic or inappropriate wear of the foot pads on hard, rough surfaces. Different species have different susceptibilities to this problem depending on their general life style. Terrestrial species such as geese , wood ducks (*Chenonetta jubata*) and grass whistling ducks (*Dendrocygna eytoni*) are rarely affected. Aquatic species such as swans, water whistling ducks (*Dendrocygna arcuata*) and pochards (*Athya* spp.) are commonly affected when housed under less than ideal conditions. These species have not adapted to life on hard surfaces and, in addition, their more caudally positioned legs place additional weight bearing problems on their metatarsal pads. Floor surfaces considered inappropriate for waterfowl include concrete, paving, sharp gravel but even natural surfaces may become a problem when compacted or altered by continual use (e.g. high traffic areas along walkways or fence lines). Traumatic abrasion can also be seen in birds with

chronic damage associated with abnormal limb usage (e.g birds with perosis, angular limb deformities)

The result of constant trauma is initially seen as thinning of the plantar surface of the foot pads with eventual erosion and penetration of environmental bacteria (Staphlococcal infections are most common). Birds may be lame or non weight bearing in the early stages of the disease before infection becomes established. The associated joints may be visibly swollen and are painful with flexion. In later stages, the bird is usually seen to spend a proportion of the day sitting down. The foot may be significantly swollen with deep ulceration, necrosis, deep cellulitis and abscessation. Osteomyelitis and tenosynovitis are common sequelae.

In cases where swelling is moderate with no osteomyelitis evident, treatment generally aims at reducing inflammation and correction of the husbandry. Bandaging in early stages does not seem to influence outcome. During the treatment period, temporary housing on more appropriate floor substrates is beneficial and allows for easier daily access for medication. Suitable flooring includes soft rubber matting, carpet underlay, lawn or soft wood shavings. Be aware that this may need cleaning 2-3 times daily as faecal output in waterfowl is often exceptional. I have had good results using Dimethyl Sulphoxide once or twice daily (as Domoso roll-on or a 10: 1 mix of DMSO and Trivetrin injection).

In more severe cases, therapy is aimed at reducing inflammation, treating infection and debriding necrotic tissue to improve healing.

Antibacterials are best used based on culture and sensitivity but otherwise aiming for treatment of primarily gram positive organisms is useful. The appropriate antibiotics may also be incorporated into the DMSO mix. Surgical debridement of severe necrotic plugs and abscessation is important and may improve long term success. DMSO application in combination with daily iodine rinses will assist healing post surgically. Bandaging the foot is useful but may need to be replaced daily as waterfowl will rapidly soil any bandages applied. If multiple layers are applied with some form of water resistant material between then it may be feasible to replaced only the outer layers daily. During treatment most waterfowl will sit quietly if kept in a quiet, dark enclosure such as a large dog carry box. Bandaging techniques aimed at reducing constant foot pressure may not therefore be as critical in this group of birds. Vitamin A supplementation may assist healing in some birds.

Chronic cases or severe cases may result in enough damage to cause joint ankylosis and permanent lameness despite treatment. Recurrent problems are not uncommon if husbandry is not improved.

Feeding

The feeding of waterfowl species in Australia is decades behind the feeding strategies used in the United Kingdom and USA. Commercial diets specifically meeting the needs of native waterfowl are not available in this country and in many areas we do not even have the ability to borrow diets from commercial duck rations as these are rarely available.

Waterfowl kept in Australia fall into three broad categories with regards to their keeping requirements – Grazers, Omnivores and Specialists. The specialists include those highly carnivorous species such as musk ducks (*Biziura lobata*), and filter feeders such as Pink Eared Ducks (*Malacorynchus membranaceus*) and Australasian Shovellers (*Anas rhynchotis*).
Grazers and omnivores are the most commonly kept species groups. Natural diet preferences have a role to play in determining diets offered to captive birds but a lack of available choices means that many species may be offered diets that are at best a compromise. By nature of their natural diet, grazing species require a diet that is relatively higher in carbohydrates and lower in protein than non grazing species and vice versa. Some problems may arise when the different groups are housed together.

The feeding behaviour of some species may also make the task of providing feed in a hygienic manner more difficult. This is particularly evident with dabbling species. Many of the species being kept inhabit areas where food collection is time consuming and takes up a significant proportion of the day. Artificial diets and the techniques used to feed them may influence growth rates and feed utilisation. All of these factors make waterfowl susceptible to often unique disease problems related to the incorrect provision of those diets. The Australian climate may compound these problems.

Protein-induced Renal disease

As mentioned previously, grazing species have relatively lower protein requirements in their diets compared to dabbling or diving duck species. This does necessarily mean that their daily protein requirements are lower but that they are more likely to obtain protein in a significantly less concentrated form throughout the day.

When these species (e.g. Australian Shelduck (*Tadorna tadornoides*) , Black Swan (*Cygnus atratus*), Cape Barren Goose (*Cereopsis novaehollandiae*)) are fed with omnivorous species or accidentally gain access to higher protein diets, significant clinical disease has been observed. The usual scenario is not generally associated with routine food consumption but with excessive consumption following a period of starvation or consumption of very high protein content food (Turkey starter 44% protein) either through access to open food bins or by accidental supply of the incorrect diet by the keeper.

The initial clinical presentation of these birds is leg paralysis and reluctance to move. This may occur as little as 2-3 hours after consumption. This is presumed to be as a result of sciatic nerve compression secondary to renal swelling. Birds will become rapidly depressed and will initially pass copious amounts of urates with scant faeces. In more advanced cases birds are usually anuric or oliguric .Many birds will die of acute renal failure whilst others often die days to weeks later from chronic complications. If treatment is started within hours of the initial presentation, prognosis is fair to guarded. Treatment involves aggressive fluid therapy by oral, sc, iv or interosseous route as available. Further diuresis with furosemide may be of benefit. It is not known if antibiotics influence the outcome of treatment but they are used on the basis of preventing secondary complications with gut stasis and kidney damage. Obviously, potentially nephrotoxic drugs (enrofloxacin, aminoglycosides) should be avoided. I have safely used amoxycillin/ clavulanic acid in these situations. Supportive feeding is necessary but obviously high protein diets such as hand rearing mixes should be avoided. Commercial products such as Emeraid 1 and polyaid are useful, as are low protein baby foods. I have not been in a position to utilise haematology or biochemistry in these cases but would expect a profound hyperuricaemia associated with acute cessation of uric acid secretion in the face of excessive protein catabolism.

It is considered that in instances of acute renal failure with hyperuricaemia that mortality is associated primarily due to the cardiac effects of subsequent hyperkalaemia , not due to “uric acid toxicity”. Mean normal uric acid levels for a range of waterfowl species are 4.5 – 11.4 mg/dl. As this is almost always a peracute to acute presentation, initial haematological parameters may be non specific except to indicate acute dehydration. Radiography may indicate nephromegaly and increased radiodensity. The use of allopurinol to prevent hyperuricaemia is controversial as it has been found to have potentially induced hyperuricaemia in a clinical study in raptors. I have no experiences with regards to its use in waterfowl.

On post mortem, these birds generally show classical signs of acute renal failure with pronounced visceral gout of the pericardium, liver and air sacs. The kidneys are generally swollen and the renal parenchyma is packed with uric acid. In peracute cases, only swelling of the kidneys may be seen.

Tongue Impactions
A minor but not uncommon cause of concern in young and adult grazing waterfowl (swans, geese) is ventral tongue impaction. Lengths of ingested grass fibre become entangled and may form a dense ball under the base of the tongue. This is usually seen as a swelling of the submalar skin pocket. This may be a chronic condition if not identified by the owner. I have seen a 24 year old black swan which had swelling in this area for 22 years but the owner had not been concerned by it. It chronic cases, the skin may be significantly stretched and will need debulking of the excessive skin when the condition is corrected. Some skin pockets may be large enough that the tongue may fall into the cavity and therefore prevent feeding. Post surgically, an oesophageal feeding tube may be placed to allow for feeding without interfering with the integrity of the surgical site. In young birds, regular checks of each bird at feeding time will avoid problems. The fibre mass may be manually removed with forceps.

Prevention of this problem is dependent on providing young grazing waterfowl with grazing material of suitable length (no more than the length of the bill is a useful guide) and of suitable texture (avoid fibrous, dry material).

Angel Wing
This is a common nutritional disorder of growing waterfowl. As young waterfowl reach late pin feather stage, the primary feathers are seen as engorged blood quills. Under certain circumstances, if these blood quills develop at a rate that exceeds the rate of development of the support musculature, the wing tip will twist and rotate outwards under the forces of gravity. If allowed to remain in this position the deformation will be permanent and disfiguring. It may be unilateral or bilateral. In Australia it is most commonly seen in Cape Barren Geese (*Cereopsis novaehollandiae*), Black Swans (*Cygnus atratus*), and Egyptian Geese (*Alopochen aegyptiacus*) but other species may also be involved. Overall it is most commonly seen in slow growing larger species that are encouraged to grow rapidly by innapropriate feeding methods. This encourages developmental advancement of feather growth beyond the rate of musculoskeletal development. Inadequate exercise and over supply of food (ad lib access) are important in development of the condition. If encountered early, the condition may be reversible. Bandaging the wing tip in such a way that the wing tip is both supported and rotated slightly inwards will give good results. As this only occurs in birds with active blood quills, bandaging must not be too tight otherwise wing tip oedema will develop due to circulation interference. I prefer the initially wrap the wing tip lightly in cotton swabs or SoftBan to form a tubular cover over the sensitive blood quills. Over this, a self adherent bandage is wrapped in the same manner as a standard figure 8 bandage. This should be left in place for 5-7 days.

During this period the birds diet should be modified to provide suitable nutrition over an extended period ($1/5^{th}$ of daily needs 5 times per day) and to encourage exercise. If feed and water dishes are separated by a distance of at least 4-5 body lengths then birds will not be encouraged to sit beside the feeder and eat constantly as most waterfowl will need some water to wash down dry commercial mixes. Increasing the grazing access is also recommended. Some keepers suggest that running the young birds around the paddock daily also keeps them fit and reduces the incidence of angel wing and perosis.

Amputation of the wing tip is the only method of cosmetic repair in older birds. It is however an apparently non-painful condition and many birds will survive happily without any intervention.

Perosis
This is another common disorder of young waterfowl resulting in a medial luxation of the Achilles tendon and subsequent soft tissue and osteoarthritic changes within the affected hock. The hock is often swollen and the leg is non weight bearing. The aetiology of the condition is not entirely known. Similar nutritional situations to those encountered with angel wing may predispose to the condition if the end result is a rapidly growing bird with limited activity. This results in a heavy bird on an underdeveloped skeletal system. The nutritional components of the diet are also implicated with manganese deficiency (caused by calcium excess (calcium binds manganese)) and choline

deficiency (from all grain based diets) being the most common. Splinting the leg back into a normal position meets with poor success rates. A technique of surgical repair involving the suturing of the Achilles tendon sheath to the lateral periosteum and retinaculum of the trochlea groove gives moderate results. The problem appears to be preventable utilising feeding techniques as for Angel wing and using good quality commercial raising mixes.

Mycotoxicity

Mycotoxins are toxins produced by fungi. The habits and habitats of captive waterfowl are conducive to producing conditions under which moulds will commonly grow. The habit of "dabbling" in feed containers creates a situation where food sources are almost guaranteed to be wet at some stage in every 24 hour period. Food utensil hygiene problems may commonly lead to a buildup of mouldy feed that is accessible to the birds. This is a more common scenario than the usual situation of mould present in stored foods although this is still a possible contamination source. Intake of fungal toxins may occur acutely as a single large intake or chronically from constant feeding in unhygienic conditions. The time period from ingestion to clinical syndrome may therefore be extended and the source of toxin may be already eliminated when the syndrome is seen.

Different housing methods and different species appear to be more susceptible to mycotoxin effects. Apparently due to a simple concentration effect, aviary housed waterfowl are generally more prone than free range birds. Temperate species (New Zealand Scaup (*Athya novaezealandiae*) and New Zealand Shelduck (*Tadorna variegata*)) are considered more prone than other species when housed in tropical Australia.

Young birds are commonly effected in the brooder situation where ideal hygiene is very difficult to achieve. Ducklings are recorded to be acutely sensitive to mycotoxins. Different clinical syndromes are described depending on the age of exposure. At 1-2 weeks of age, ducklings may show signs of inappetence, ataxia, opisthotonous, siezures, reduced growth and subcutaneous haemmorhage of the feet and legs. At post mortem these birds are recorded as showing slightly enlarged, putty colored livers, pale and slightly swollen kidneys and petechiation of the kidney and pancreas. In birds over 3 weeks of age, the liver is firm and slightly shrunken and has a reticulated pattern, and hydropericardium , ascites and petechiation may be seen.

The typical syndrome in adult birds is either failure to thrive or sudden death. Birds are poor doers, grow slowly, and may be depressed and anorexic. Bleeding disorders with gastrointestinal bleeding and prolonged clotting times may be seen and may be difficult to distinguish from rodenticide toxicity. Mycotoxins can also induce immunosuppression by reducing alpha and beta globulins. This may allow for increased susceptibility to other disorders such as Aspergillosis.
Post mortem changes are mainly associated with the liver with a pale, large liver being common. This may also show significant fatty degeneration. Splenomegaly, pancreatic enlargement and reduced body fat are also seen.

Histopathology shows hepatic cell degeneration, bile duct hyperplasia and swollen proximal convoluted tubules.

Due to the fact that ante mortem diagnosis is difficult, treatment is often unrewarding as it is likely to be instituted late in the course of the disease. Treatment is purely supportive and aims to maintain body condition whilst liver repair is hopefully carried out. Antibiotics are of little benefit other than for prevention of secondary infections.

Sexing

A useful technique to know when working with waterfowl is vent sexing. The majority of species are relatively easy to sex with this technique with the exception of Cape Barren Geese (goslings), Magpie Geese (all ages), Blue Billed ducks (all ages) and Musk ducks (ducklings). With the use of this technique and other features such as plumage differences and vocalisation differences it should be totally unnecessary to surgically sex waterfowl as a routine sexing method.

Male waterfowl, like male ratites, have an erectile phallus. Even in recent hatchlings this is developed to a degree that it may be visualised without magnification. Most species can be sexed at one day old but I prefer to wait until 1-3 weeks of age. This avoids unnecessary stress on young birds and the potential for remnant yolk sac rupture in inexperienced hands.

Sexing early can allow for sex identification at pinioning (if this is carried out) as birds can be then be pinioned on one wing for females and the other wing for males.

The technique for all species and all ages is essentially similar with only the size of the patient changing. The appearance of the phallus varies with age and reproductive status. Generally it is a smooth "bean shoot" structure in juvenile and non-reproductive males and an ornate, ridged or spined organ in breeding males.

The technique for juvenile waterfowl is to hold the bird in one hand with the feet towards the handler and the thumb and forefinger resting around the vent. Gentle pressure is placed around the vent using the thumb and forefinger and the other hand is used to roll the vent edges out to expose the deeper mucous membranes. In the male, the small erectile organ is exposed with moderate pressure. The structure is absent in the female.

In adult birds the technique is similar except the vent is exposed by using the thumb and forefinger of both hands. This means that that the body must either be held by an assistant or, as I prefer, kneel down and support the birds body in your lap. If kneeling down, be aware that this brings the birds claws in close proximity to your chest. Whistling ducks and geese may scratch viciously so partly wrapping the bird in a towel may protect you.

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