Proceeding of the NAVC
North American Veterinary Conference
Jan. 8-12, 2005, Orlando, Florida

Reprinted in the IVIS website with the permission of the NAVC
http://www.ivis.org/
BACTERIAL DISEASE AND ANTIMICROBIAL THERAPY IN AVIAN SPECIES

Darrel K. Styles, MS, DVM
Exotic Bird Health Center
Texas A&M University, College Station, TX

The species characteristics of bacteria that can cause disease in avian species usually depend on the natural feeding habits and diets of that particular group of birds. For example, most psittacine birds are primarily granivores and their gut flora is predominantly Gram-positive. When bacterial disease is observed in parrots, it is usually Gram-negative in nature. Frugivores such as toucans have a greater proportion of Gram-negatives in their intestines and the composition of their gut flora is more complex. Carnivores like hawks may have entirely Gram-negative intestinal flora similar to the animals on which they prey. With these generalizations in mind, this paper will address a rational approach to bacterial disease and therapy in a variety of birds encountered in practice.

Diagnosis of bacterial infections is made by routine laboratory methods such as choanal culture for upper respiratory tract infections, cloacal culture for gastrointestinal tract infections, or tissue culture from biopsy/necropsy specimens. Standard laboratory procedures are implemented when analyzing avian bacterial cultures. However, some bacteria such as Chlamydiophila, Salmonella, Mycoplasma, and Mycobacterium require special procedures and the lab must be notified that these organisms are on the differential.

Psittacine birds are the most commonly encountered pet birds. A typical composition of the normal gut flora in adult parrots is about 80-100% Gram-positive bacteria with 0-25% E. coli. The Gram-positive bacteria found in the psittacine intestine consist of fecal Streptococcus, Staphylococcus, Lactobacillus, and Corynebacterium. Gram-negative bacteria are usually associated with disease in psittacines, but parrot species will vary in the amount of E. coli normally found in the intestines that is non-pathogenic. Neotropical species such as amazon parrots have little to no E. coli while it is not unusual in cockatoos and eclectus parrots to have up to about one quarter of the total flora composed of E. coli. This is also true for heavy frugivores like lorys. There is some controversy as to when the treatment of E. coli in parrots is necessary. Regardless of the species, if the bird is showing no clinical signs and the intestinal E. coli composition is not excessive, then treatment is not usually necessary. Naturally, if E. coli is found outside the gastrointestinal tract then it should be considered a pathogen, but a cloacal culture that reveals a small portion of E. coli usually does not warrant intervention. E. coli in parrot chicks and juveniles may have more serious implications. Again, if there is not an excessive amount of the bacteria and the chick is showing no clinical signs, then treatment may not be needed. High percentages of E. coli in the gut could possibly indicate poor hygiene in the nursery or food that is allowed to stand too long or is re-heated. If a bird is ill, regardless of the age or species, treatment of E. coli may be warranted. Even though the organism may not be the causative agent of the illness, it may exacerbate recovery and act as an opportunistic in the face of challenged immune system. This is especially true in chicks in nurseries where they are already at an immunological disadvantage.

The finding of other Enterbacteriaceae such as Proteus, Klebsiella, or Pseudomonas is cause for treatment. Isolating these organisms in large numbers of psittacine birds suggest for poor hygiene or sub-standard diets. However, Pseudomonas is a ubiquitous organism and can normally be found in both choanal and cloacal cultures in small amounts. Pseudomonas routinely is found in water supplies and can cause problems if it is present in high concentrations. Be wary of swamp-coolers that can aerosolize the bacteria or hoses that are allowed to sit for prolonged periods without flushing before water is dispensed. If small amounts of Pseudomonas are isolated from the choana or cloaca without the presence of clinical disease, then treating this organism is usually not necessary. However, when Pseudomonas is found outside the GI tract or choana/oropharynx, it can be a serious pathogen. In psittacine chicks, it is often associated with chronic sinusitis and usually related to an initial aspiration event.

Salmonella is always a pathogen in most avian species including parrots. Clinical signs are severe illness followed by acute death from septicemia. If an aviary is experiencing death from Salmonella, always suspect a rodent problem. The organism most commonly isolated is Salmonella typhimurium and is usually transmitted to the birds via rodent feces contamination. This can occur from rodents contaminating the food, rodents nesting in or around the aviary, or in nestboxes that were not cleaned.

Gram-positive organisms have also been associated with disease. Staphylococcus aureus can cause dermatitis (such as bumblefoot in raptors) and skin lesions in parrots. Occasionally, Gram-positive bacilli in the cloaca will produce a loose malodorous stool. This may be related to a pre-existing cloacal atony that permits overgrowth of the commensal bacilli. Occasionally, Clostridium may cause sporadic deaths in the aviary. If Clostridium is diagnosed, ensure that the water and food sources are not subject to contamination. Birds kept in proximity to large herbivores and ratites may be at higher risk.

Toucans and other frugivorous birds present a more complex population of gut flora. These birds may have gut flora consisting of Proteus, Klebsiella, and E. coli with only some measurable Gram-positive bacteria. These birds appear clinically normal and the organisms appear to be adapted to these species. A similar bacterial profile is seen with ground dwelling birds such as galliforms, anseriforms, and ratites. Again, the feeding habits of these species reflect what the routine intestinal flora may be. Treatment may be required if the bird is showing signs of clinical illness, and again it is often difficult initially determine if it is the bacteria or another disease causing the illness.

Raptors and other birds of prey including new and old world vultures will again demonstrate gut flora that is reflective of the diet. These birds are heavily weighted toward Gram-negative bacterial profile that is found in their prey and this is considered normal for those species.

Chlamydiophila psittaci or psittacosis, will be addressed elsewhere in this conference. However, C. psittaci is probably the most important of all avian bacterial diseases due to both its severity and zoonotic potential. C. psittaci infects virtually all known vertebrates and is particularly troublesome in cockatiel colonies where it seems to persist even post-treatment. Diagnosis is made by PCR or IFA and standard tetracycline therapies are still the accepted mode of treatment.
A particular bacterium of concern that is always a pathogen is Mycobacterium. There are at least two broad species of Mycobacteria found in birds, Mycobacterium avium and Mycobacterium genovense. Ante-mortem diagnosis of mycobacterial infections is difficult and is often made post-mortem. These bacteria are particularly troublesome in some species of aviculturally important birds. Brotogeris parrots such as gray-cheeked and canary-winged parakeets are highly susceptible and the disease where it can be quite debilitating. It almost appears that Mycobacteria are endemic in these species. Some species of Forpus parrots (parrotlets) also appear to be highly susceptible. Mycobacteria can be seen in other parrot species such as amazon parrots, but typically the finding is co-incidental rather than related to disease. Mycobacterial infections are especially troublesome for softbills and passerines. When birds are kept in mixed collections and fl**ights** (as in zoological displays), stocking densities are great, and the birds have access to the ground, then mycobacterial infections can be devastating. Treatment is available and a number of drug cocktails exist such as the older combinations of isoniazid and rifampicin, and the newer regimen of azithromycin and ethambutol. Treatment is a prolonged process of six months or greater and best results are obtained from individually dosing the birds. However, evaluating the efficacy of treatment is very difficult. Even after treatment and resolution of clinical signs, relapses are common. This disease is best managed by keeping the stocking density low and reducing stress in the collection.

Drug regimens will depend on the species and age of the birds and what bacterium is responsible for disease. For most adult birds, injectible drug therapy is far more effective and safer than relying on oral dosing. Oral dosing requires skill and there is always the possibility of aspiration. However, in pre-weaning birds that are still being hand-fed, oral medication is always preferable when appropriate. Drug therapy regimens for chicks will be discussed elsewhere in this conference, but if the bacterial infection is mild, it is better to use a milder antibiotic such as trimethoprim-sulfamethoxazole rather than enrofloxacin unless the severity of the infection warrants its use. Water based medication is not recommended unless pharmacokinetic studies have been performed to show that sufficient drug can be imbibed to provide the appropriate MIC.

We will now address some of the more commonly used antibiotics. Enrofloxacin is probably the most commonly used and over-used antimicrobial in avian medicine today. It is extremely potent with a broad spectrum of coverage. However, its use may not always be necessary for all bacterial infections. For example, its efficacy against C. psittaci infections is questionable. Also, in chicks and juveniles, it may retard growth eliminating beneficial bacteria along with the targeted pathogens. Enrofloxacin can be used as a water based therapy, but care must be taken to ensure that a sufficient concentration is imbibed to achieve the desired MIC. Direct oral dosing or injections are more reliable means of administration. Aminoglycosides have virtually been replaced by the fluoroquinolones. Amikacin is still occasionally used for Pseudomonas infections but exerts some nephrotoxicity, so caution must be used.

First generation cephalosporins are highly effective against Gram-negative infections. Drugs such as ceftaxime tend to preserve beneficial gut flora while ridding the birds of pathogens. However, administration by injection is the only acceptable means of use. These drugs are mild on the tissue and IM or subcutaneous administration are effective. Beta-lactams such piperacillin are still used, but they have a shorter shelf life and drugs such as ceftaxime have a broader spectrum of coverage.

Sulfa drugs such as trimethoprim-sulfamethoxazole are best administered orally and are really confined to treatment of chicks in the nursery. The use of these drugs will be addressed in the section on nursery management.