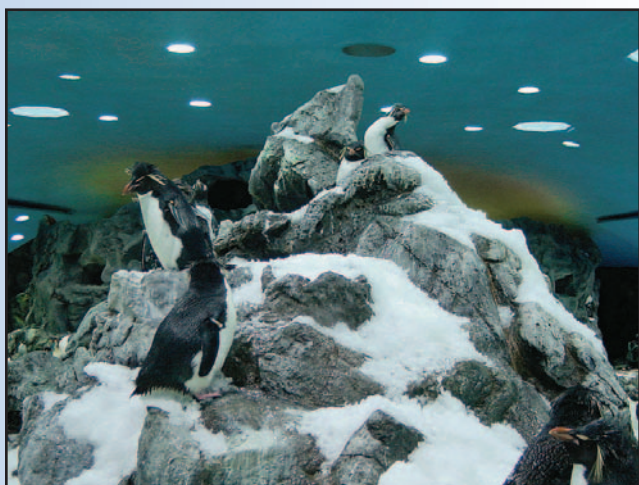


CHAPTER  
42

# Management of Zoo and Park Birds

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The role of the veterinary staff in a zoological setting involves the active promotion of animal health and well-being in addition to the treatment of overt diseases. It is uncommon for a zoo veterinarian to be involved strictly in avian medicine, although this may occur when a veterinarian is employed in a zoological garden that is a bird park. More commonly, an avian veterinarian will be consulted when problems with avian species are encountered in a mixed species zoologic collection.

## **The Purposes of a Zoo or Bird Park**

A zoological garden or bird park, whether private or open to the public, is a place where animals (birds) are exhibited. One of the most important concerns of the zoo is the appearance of the displayed animals. Zoos are constantly under pressure from animal rights activists. In many countries, including the USA, zoological gardens have legal requirements, including animal welfare rules and legislation, to which they must adhere.

Additional purposes or goals of zoologic parks include:

- Maintenance of the genetic pool of selected species.
- Geographically orienting management and exhibition of animals according to their natural distribution (eg, South American birds located contiguously).
- Gaining biologic and ecologic information regarding the applicable species.
- Performing specific research projects in areas of nutrition, behavior, genetics and disease.

## Routine Zoo Veterinary Work

The veterinarian’s work in a zoo involves adherence to strict protocols including meticulous record keeping. A thorough understanding of the concepts and challenges of aviculture is required. Management, husbandry and medical and surgical protocols must be developed and performed (Table 42.1).

## Medical Equipment

Zoo veterinary equipment for the avian collection does not differ significantly from that encountered in a normal exotic animal clinic (Table 42.2). Its availability will depend on budget and ease of outside sourcing. Housing for hospitalized birds is outlined in Table 42.3.

Depending on local veterinary support, the zoo veterinary clinic may need a full range of surgical and diagnostic tools including microbiology, hematology, blood

chemistry and cytology, histopathology, toxicology, virology and special tests, some which may be submitted to outside laboratories.

## The Importance of Biology and Taxonomy

Recent discoveries in zoology, field biology, morphology, ethology and DNA-based genetics need to be monitored and, where appropriate, implemented into the medical protocols. Understanding these issues allows the zoo veterinarian to form an idea about the correct husbandry conditions (eg, environment, temperature, diet) to provide. Taxonomy of a closely related species for which good medical information is available will be invaluable in the approach to any novel species.

**Table 42.1 | Recommended Veterinary Routines for Zoo and Park Birds**

- Daily
- Evaluate hospitalized patients
  - Review laboratory results received
  - Develop or alter treatment based on the above
  - Examine nursery birds, park exhibits and breeding birds, making appropriate notes, examining individuals, obtaining samples and retrieving birds for hospitalization as needed
  - Perform any required surgeries
- Weekly
- Interdepartmental meetings to review schedules and plans for routine procedures
- Monthly
- Routine deworming and fecal examinations
  - Vaccinations as appropriate
- Yearly
- Annual physical examination of every animal in the park; plan further testing, if warranted
  - Evaluate unsuccessful breeding pairs

**Table 42.2 | Recommended Medical Equipment for Zoo and Park Birds**

- Endoscopy
- Both rigid (standard avian) and flexible (larger bird) endoscopes of various diameters
- Surgery
- Standard surgical equipment and facilities for exotics
- Anesthesia
- A portable anesthesia machine for larger patients such as ratites
- Radiology
- A portable x-ray machine is often needed in a zoo
- Ultrasound
- A portable ultrasound machine equipped with various sized probes
- Cages, hospital cages and aviaries
- A variety of enclosures for various avian patients is desirable (see Table 42.3)

**Table 42.3 | Recommended Cages for Different Avian Patients**

Avian Patient	Recommended Cage
Critically ill birds	They need a warmed cage, ideally an Intensive Care Unit (ICU). This applies to any avian patient in critical condition. The hospital cage should be connected to an O <sub>2</sub> delivery system, with the temperature and humidity controlled.
Potential infectious patients	A zoo must have a special area for animals that may carry an infectious disease. This area should be separate from the quarantine for incoming birds.
Psittacines	See Chapter 7, Emergency and Critical Care.
Birds of prey (diurnal and nocturnal)	See Chapter 40, Management of Raptors.
Cranes, storks and flamingos	Although these animals have totally different feeding habits, they have similar hospital needs. Flooring must provide adequate traction. Hard rubber mats are ideal since they can be disinfected. Flamingos must be housed with access to the water and food blend that they consume via filtration through their beaks.
Small passerines	Some species may be very shy and easily stressed, so English-style cages (with 3 solid walls) are preferred.
Ratites	See Chapter 41, Management of Captive Ratites.
Penguins and auks	Penguins belong to the Order Sphenisciformes. There are 17 living species of penguins, divided into 6 genera. All penguin species live in the southern hemisphere. The term “auk” includes species of the Alcidae family, 21 species in the world, which include the guillemot, or murre ( <i>Uria aalge</i> ), razorbill ( <i>Alca torda</i> ) and puffin ( <i>Fratercula artica</i> ). Penguin and auk species require species-specific environments, but they all need to swim, preferably in a relatively cold saltwater pool. If a zoo includes penguins and/or auks among its species, an appropriate area should be built for quarantine and hospitalization room(s). An ideal room for nursing these aquatic birds meets the following requirements: <ol style="list-style-type: none"> <li>1. A saltwater pool within easy access of the birds.</li> <li>2. Environmental air and water temperatures cooled to 0° C (32° F).</li> <li>3. Water and air filtration systems (to decrease the potential for aspergillosis).</li> </ol>
Anseriformes	See Chapter 36, Management of Waterfowl.
Galliformes	See Chapter 38, Management of Galliformes.
Columbiformes	Pigeons and doves, like the two preceding groups, vary in size, husbandry and dietary requirements. For short-term nursing, they can be kept in cages similar to ones for psittacines or birds of prey. Some of the shyest of the species (ie, the large crowned pigeons [ <i>Goura spp.</i> ]) should be kept in a very quiet environment (see Chapter 37, Management of Racing Pigeons).



**Fig 42.1** | Cooperation with the gardeners helps achieve pleasant looking cages, while avoiding toxic plants.



**Fig 42.2** | Some bird species, such as these rockhopper penguins (*Eudyptes crestatus*), have extreme temperature and humidity requirements.

## The Importance of Teamwork

A common problem encountered during setup of a new exhibit or refurbishing an existing one is the lack of team work. Often the architects, biologists, curators, keepers and veterinarians have different perspectives on what the ideal exhibit should be for a given species, but all these points of view must be collated before the building or refurbishing work begins. The basic issues of an exhibit design should be addressed in the preplanning phase. Once the building work has started, it is often impossible or too expensive to make changes.

Experienced, committed keepers understand the behavior and personalities of the animals. They know the daily cleaning and feeding routines and can offer important suggestions about materials best suited for furniture, fencing, drainage and access to aviaries. Keepers who work with aggressive birds (eg, ratites and large cranes) can be helpful in developing solutions for their safe transport from the exhibit to holding areas.

The veterinarians and gardeners, or horticultural department if there is one, are involved in the selection and control of the vegetation to be planted, thereby eliminating the use of toxic plant species inside the exhibit (Fig 42.1).

Additionally, keepers' suggestions are invaluable when planning service areas and pest control.

## HOUSING

Housing is one of the most important aspects of keeping birds in a zoo. In an up-to-date setting, animals must not only be healthy but also be exhibited in the most "natural" environment possible.

### Temperature and Humidity

Most commonly kept zoo and park birds do well in the

average temperate climate, but exceptions do exist. Most tropical birds, especially smaller ones, need temperature-controlled housing for winter, in addition to warm spots, even during summer nights. There also are birds that need some accessible areas away from extreme heat to thrive during the summer months (Fig 42.2). Some of these species are easily identified (eg, penguins, snowy owls, gyrfalcons). Bird species that are represented in different climates by multiple subspecies, such as the peregrine falcon (*Falco peregrinus*) or the osprey (*Pandion haliaetus*), offer special challenges. It is better to obtain a local subspecies in order to avoid stress due to inappropriate climate.

### Light Cycles

Most bird species are highly dependent on photoperiod for their reproductive cycle, but other physiological issues (eg, molting) also are light-cycle dependent. This is important for birds originating from the extreme northern or southern latitudes and must be taken into consideration when designing an exhibit for these species.

### Flooring

Flooring is of primary importance in a birdhouse (Figs 42.3-42.5). When approaching bird management, the avian veterinarian must keep in mind two important things:

- Avian species have evolved with multiple anatomic and functional variations of the feet (eg, webbing, talons, feet for wading), which require the appropriate caging materials in captivity.
- Birds are bipedal; therefore, damage to one foot places 100% of the weight-bearing load on the remaining contralateral foot. For all but the smaller species, this increased load and decreased mobility can quickly lead to affliction of the plantar surface of the remaining foot.



**Fig 42.3** | Natural flooring and a proper diet promote healthy feet, as in these demoiselle cranes (*Grus [Anthropoides] virgo*).



**Fig 42.5** | Aquatic species, such as these little blue penguins (*Eudyptula minor*), need a proper pool to allow swimming and prevent foot problems.

## Roofing

Some non-flying species (eg, ratites) do not need a roof. Also, some birds have limited ability to fly because they have been pinioned or their wings are regularly trimmed. This often applies to ducks, geese, swans, flamingos and sometimes cranes and storks. When a roof is designed, several factors are taken into consideration.

It is important to know if the birds will or will not be on exhibit. If so, the roof will have to be both effective and have a natural look. “Invisible” nets are available and work well in these cases. Because some species may bite and chew on the roof, this should be considered when selecting roofing material.

Another factor is the ability of a species to climb and become trapped in a mesh roof. Roofing for birds of prey and other birds that might become trapped in mesh can be made with wooden lathing strips, 2 cm thick and 10 cm wide. The strips are arranged horizontally, 5 cm apart, allowing resting birds to see the sky and receive fresh air, rain and snow, if advisable; when the birds are flying, this roof will appear as a solid wall



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**Fig 42.4** | Natural displays should include the different plants that occur in a bird's natural habitat. Marsh owl (*Asio capensis*) shown.

and the birds will not fly into it (Figs 42.6a,b).

## Vegetation

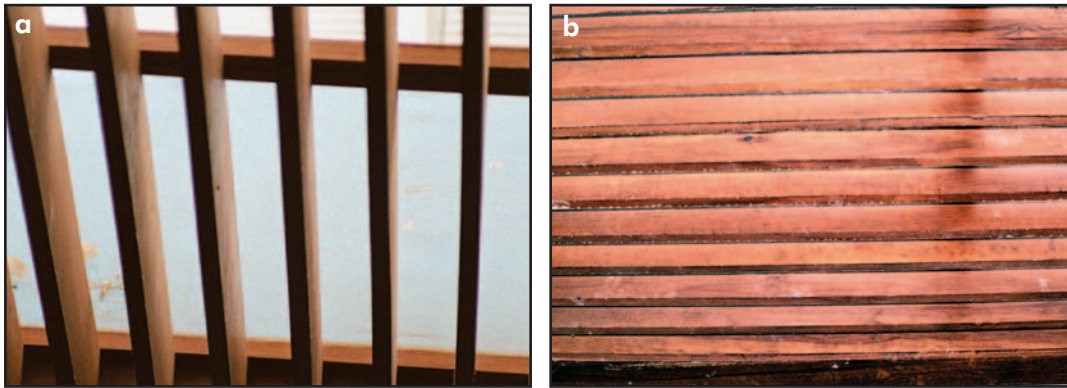
Most bird species like plants and branches in their aviaries for hiding, perching and nesting, but not all trees are appropriate for planting. Normally, large zoos employ botanists or experienced gardeners who can help veterinarians and curators select local plants suitable for installation in large aviaries or exhibits.

## Perches

Perches, whether provided alone or in conjunction with planted trees, must offer a good base for both rest and exercise. Ideally, perches should provide a variety of textures, diameters and elasticities. When perches are made of a variety of different materials, sizes and shapes, they will provide the birds' feet with exercise, equal weight distribution and natural nail trimming (Figs 42.7a-c).

## Food and Water Delivery Systems

In most bird collections, food and water are provided twice daily. During the summer and year long in warm climates, food and water easily become polluted by bacteria, fungi and protozoa and can be the source of serious health problems. Feeding schedules and equipment must be adjusted according to the type of food (eg, seeds, dry, wet, fish, live food) used for the different bird species. In general, hygiene is the most important issue. Food and water bowls must be changed daily, and good cleaning and disinfection procedures are necessary to avoid spreading pathogens from one enclosure to another.



**Figs 42.6 a,b** | A properly designed roof for flying birds (ie, birds of prey) will appear to the birds as open air or solid, depending on perspective.



**Fig 42.7** | A selection of branches and other natural perches to exercise the feet is a must in exhibits for wild species. **a)** Great grey owl (*Strix nebulosa*). **b)** Red-tailed black cockatoo (*Calyptorhynchus banksii*). **c)** A variety of branches in an aviary.

In some facilities, water is delivered through an automatic watering system. The system's pipes must be checked on a regular basis for hydrophilic bacteria, especially *Pseudomonas* sp. Cleaning and disinfecting the pipes should take place on a regular basis. Natural exhibits with a lake or waterfall as the main source of the birds' water intake should have a high-quality filtration system. Weekly bacteriologic and chemical tests (eg, nitrogen and chlorine) should be performed using one of the available commercial kits. Using a dipping media<sup>a</sup> for urine bacteriology allows identification of type and number of bacteria in the water.

## Nests

For many species, nests are necessary for reproduction and may be a stimulus for breeding activity. Although some exceptions do occur (eg, macaw and cockatiel), most psittacines will not breed without a nest box.

Searching for a nest site and building a nest can play important roles in mating behavior and breeding suc-

cess. Less commonly, species like king penguins (*Aptenodytes patagonica*) do not build nests but incubate their single-egg clutches on their feet, which are covered by a skin fold. Even these birds need to be provided with an adequate breeding area where they are protected against weather and feel safe from actual or perceived threats, such as predators.

Choosing the best nest sites and adequate nest shapes for different types of birds falls to the biologists and curators, but the veterinarian's medical input should be included in the decision-making process (Figs 42.8, 42.9).

## Nest Hygiene

Depending on the species, nests can easily become dirty with excrement from the offspring. Parasites and bacteria proliferate in this organic medium. Consequently, selection of bedding material is important. In general, bedding material should be clean and free of pathogens. Inadequate bedding material has been reported as a cause of aspergillosis in neonatal parrots and other avian



**Fig 42.8** | Nest sites should meet species-specific needs. A diamond dove (*Geopelia cuneata*) is shown.



**Fig 42.10** | A nest box for lorikeets, built using wire mesh for the floor, allows the liquid feces to drop and ensures better ventilation.

species. Ectoparasites can be avoided by adding 5% carbaryl powder to the bedding material at the beginning of the breeding season. Bedding material should be routinely tested for bacterial and fungal contamination. Toxic substances also can cause problems in this respect. Wood shavings, widely used as nest bedding, must exclude the presence of paints, resins and wood preservatives.

The condition of the bedding material must be monitored during the breeding season. This should be undertaken in cooperation with the curator or animal keeper in order to not disturb the breeding pair. In some species, like lorikeets and lorikeets that feed on a liquid-based diet resulting in voluminous stools, it may be necessary to change or add new bedding material during egg incubation or while the young are still in the nest. For these birds, a specially designed nest box has proven to be effective against pollution. Instead of a wooden floor, the nest box is built using wire mesh, allowing the liquid feces to drop through and ensuring better ventilation (Fig 42.10).

Cleaning and disinfecting the nest after the breeding season should be carried out carefully. Wooden nest boxes may require replacement. Natural trunks should



**Fig 42.9** | Empty trunks can be used as nests for selected species. Shown is a palm trunk nest provided to Pesquet's parrots (*Psittirichas fulgidus*).

be cleaned as carefully as possible, and appropriate disinfecting solutions, which allow the birds to use the nesting site again, should be used. In species like the gentoo penguin (*Pygoscelis papua*), which uses stones for nesting, the stones should be removed and carefully cleaned after the breeding season. Permanent nesting sites, eg, caves for puffins (*Fratercula arctica*) or other cave-breeding species, must be designed for ease of cleaning and disinfecting. The design of a nest should be a compromise between the natural breeding behavior of the species, its specific hygiene requirements and the captive situation (Figs 42.11a,b).

### Controlling the Nest Site

Nests should be designed in a way that allows evaluation of parents, eggs and chicks (Fig 42.12). In case of irregularities in the behavior of the parents, evaluating and/or removing the offspring may be necessary.

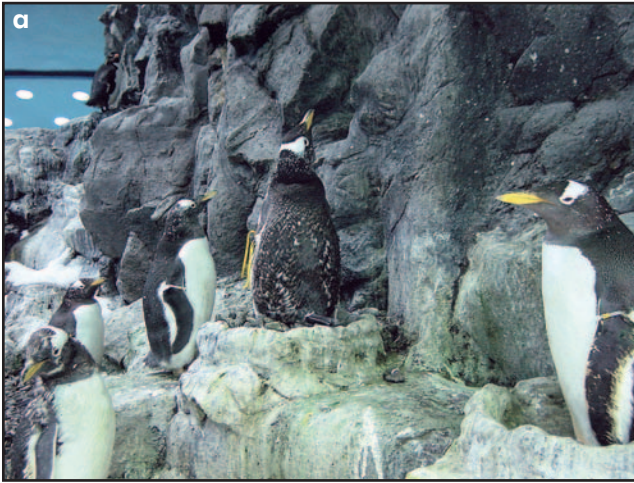
### Risks to the Offspring

Leaving the nest for the first time after weaning is a risky situation for young birds, and fractures or other traumatic injuries can occur. Therefore, nests should be designed to minimize the risk of fledglings flying into wire mesh or other dangerous structures of the cage. To help prevent such accidents, tree branches can be placed in front of the nest a few days before fledging.

## DISEASES

### Identification of Sick Animals

Routine controls include daily rounds during which all the aviaries and exhibits are inspected, and, if war-



**Figs 42.11 a,b** | In an exhibit housing cave nesters and bird species that build nests using stones, special attention to the hygiene involved in such an exhibit is required. Shown are gentoo penguins (*Pygoscelis papua*) on a nest and a pair of Humboldt penguins (*Spheniscus humboldti*) in the cave nest.



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**Fig 42.12** | Nests should be designed in a way that allows control of parents, eggs and chicks. A great grey owl (*Strix nebulosa*) with a 1-day-old chick is shown.

ranted, samples are collected for laboratory evaluation (see Table 42.4).

### Species-specific Diseases

Viral diseases tend to be more species-specific than bacterial or fungal diseases. In parrots, one might see psittacine circovirus, avian polyomavirus or Pacheco's disease. Other viral diseases that are specific to selected bird groups and encountered in zoo settings are avian poxvirus infections and herpesvirus infections (HV).

Some HV may be extremely dangerous for flocks of sensitive species. HV are generally pathogenic for a single group of birds, but other bird families, even those not very taxonomically close, may sometimes be susceptible. For example, pigeon herpesvirus causes disease in pigeons, Arctic falcons and sometimes in owls. Typically, herpesvirus infections cause neoplastic, hemorrhagic or necrotic lesions. A group of these diseases causes necrotic hepatitis in falcons, eagles, owls, cranes, storks and pigeons.

When an outbreak of disease occurs in a zoo, bird movement should be limited.

### Multi-species Diseases

Most bacterial and viral infections potentially are transmittable through many avian species and orders. In this respect, an extremely strict routine for disinfection of selected areas in the zoo (eg, food preparation, chick hand-rearing station, quarantine and, of course, the hospital) is important. A good strategy for avoiding bacterial resistance to disinfectants is to rotate the use of three to four different disinfectants; at selected times, a fogger for disinfecting the most unreachable spots also can be used.

It is extremely important to know the most common interspecific diseases in order to rate the risk of cross-species transmission in case of an outbreak. Bacterial examples are *Mycobacterium avium*, *Yersinia pseudotuberculosis*, *Salmonella* spp., *Pasteurella multocida*, *Chlamydophila psittaci*, *Erysipelothrix rhusiopathiae* and *Listeria monocytogenes*.

Paramyxovirus-1 (PMV-1) is distributed worldwide, and all bird species are considered susceptible to PMV-1. Influenza A viruses have been recovered from several different bird orders, including species very common in zoos and bird parks, such as Anseriformes, Galliformes, Falconiformes, Psittaciformes, Sphenisciformes and Gruiformes. It also has been recovered from some mammals.

### Introduced Diseases

The introduction of new animals may lead to the introduction of unexpected diseases. The chance of introducing a disease through ectoparasites or other pests traveling with the crates, cages or boxes of newly arrived animals also must be considered; hence, it is important to institute strict quarantine measures and thorough disinfection (if

**Table 42.4 | Routine “On-site” Check for Park and Zoo Birds**

1. Behavior  
Look for any behavioral changes (the bird is quieter, sleeps, is nervous, turns away from the partner).
2. Physical posture  
The bird sits hunched over.  
The bird sleeps standing on both feet (healthy birds usually sleep on one foot).  
The bird wags tail (indicates respiratory diseases or egg retention).  
The bird favors its extremities (one or both wings are hanging down slightly; the bird obviously tries not to strain one of its feet).
3. Plumage  
At the first stage of a disease, birds quite often ruffle a few neck or head feathers (which also may be just a threatening posture).
4. Eyes  
At the very beginning of a disease, the animal’s eyes are slightly—very slightly—closed. You will have to take a very close look. At the same time, the eyes are no longer shining. Seriously ill birds may have the eyes completely closed.
5. Stool  
Pay attention to the quantity, color and consistency. Increased or reduced stool quantity may indicate a disorder.  
Also feces’ color and consistency should be monitored.
6. Ingestion of food and water  
Is the ingestion of food and water normal? Does the bird eat or drink more or less than usual?

not destruction) of crates, cages or boxes used for the importation of animals.

## Zoonosis

The incidence of diseases acquired by humans from birds is low (Table 42.5). The most frequent diseases of concern are usually chlamydiosis and salmonellosis. Quarantine and strict hygiene measures are the only effective methods for avoiding bird-to-human transmission of diseases. Most zoonoses are transmitted via the fecal/oral route. Birds in contact with visitors should be tested on a regular basis for potential zoonoses, and results must be archived to prove negative test results in case of a new occurrence. Positive birds should be removed from visitor contact for security reasons and treated or euthanized as appropriate.

## QUARANTINE

Quarantine guidelines have been established by the American Zoo and Aquarium Association ([www.aza.org](http://www.aza.org)) and should be adapted to each situation. Quarantine measures include all birds that are newcomers to the collection (and those that return after being on loan to another facility or from a different exhibit). All newcomers are subjected to a minimum 6 weeks’ quarantine

period. Multiple quarantine rooms of varied sizes should be available for this purpose. All quarantine rooms should have separate, low-pressure ventilation systems. After a short, 2- to 4-day period of adaptation, each bird is subjected to a thorough medical examination, which includes the procedures listed in Table 42.6.

Birds may be integrated into the collection after the quarantine period in the absence of any detectable disease or infection. Special attention should be paid to behavior and feeding of new animals in the first weeks of quarantine. Food and water should be supplied in a manner equivalent to the animals’ former feeding conditions at the original facility. Changes to the food and feeding schedule should be made gradually to avoid stress to the birds. A separate keeper for the quarantined birds is preferred to avoid disease transmission. Separate clothes, boots and hand and shoe disinfection baths are critical.

## COMMON SENSE NUTRITION

Working in a zoo presents the veterinarian with a variety of different species, often with very unusual or specialized diets. In most circumstances, specific commercial diets are not readily available. Hence, it is important to work jointly with other professionals such as zoologists, biologists and nutritionists in an effort to customize the most appropriate diet for a given species.

In addition to the foods manufactured specifically for psittacines, diets are also commercially available for mynah birds, canaries, small finches, pigeons, thrushes, cranes, emus, flamingos, game birds, ostriches, waterfowl, aquatic ducks and toucans. Other diets are often used according to “local traditions,” “avicultural myths” and keepers’ experiences, which may or may not be ideal. For best results, a veterinarian should work with a nutritionist in developing a feeding plan.

Imitation of natural nutrition can be very successful, but this may not always be possible or desirable for the following reasons:

- Some or all diet components are not available.
- Nutritional requirements in captivity are different from those in the wild.
- Some foods cannot be digested in the absence of other unknown or unavailable items.
- Birds do not recognize the offered diet as food.

If a diet for birds has to be revised, especially in cases of birds for which little accurate data are available or when birds have been fed for a long time on an alternate diet, discretion is needed. Generally speaking, if a bird flock has been fed a locally developed diet for a prolonged period, it can be assumed that the diet and general management were reasonable if the birds maintain good



**Table 42.5 | Zoonotic Diseases Potentially Present in a Bird Park**

Disease	Etiology
<b>Bacterial</b>	
Campylobacteriosis	<i>Campylobacter jejuni</i>
Colibacillosis	<i>Escherichia coli</i>
Erysipeloid	<i>Erysipelothrix rhusiopathiae</i>
Listeriosis	<i>Listeria monocytogenes</i>
Miscellaneous bacterial infections	<i>Klebsiella</i> spp., <i>Pseudomonas</i> spp., <i>Vibrio</i> spp.
Pasteurellosis	<i>Pasteurella</i> spp.
Psittacosis	<i>Chlamydophila psittaci</i>
Salmonellosis	<i>Salmonella typhimurium</i>
Tuberculosis	<i>Mycobacterium avium</i> , <i>M. genavense</i>
Yersiniosis	<i>Yersinia pseudotuberculosis</i>
<b>Mycotic</b>	
Aspergillosis	<i>Aspergillus fumigatus</i>
Cryptococcosis	<i>Cryptococcus neoformans</i>
Dermatophytosis	<i>Trichophyton gallinae</i> , <i>Microsporum gypseum</i>
Histoplasmosis	<i>Histoplasma capsulatum</i>
<b>Viral</b>	
Influenza A	Orthomyxovirus type A
Newcastle disease	Avian Paramyxovirus type 1
West Nile virus	Flavivirus

physical condition. Normal laboratory examination results, successful reproduction, good quality feathering and a normal physical examination would warrant a gradual and cautious approach to dietary alterations (see Chapter 4, Nutritional Considerations).

## BEHAVIORAL CONSIDERATIONS

In zoo and bird park collections, particular attention should be given to the choice of animals occupying neighboring cages due to potential incompatibility among species or individuals and aggressive or challenging behavior during the breeding season. This is particularly true for some parrot species, such as the hawk-headed parrot (*Derophtus accipitrinus*), which seems to be affected by the presence of other pairs of the same species. Male macaws (*Ara* spp.) are protective of their partners during the breeding season, and a neighboring male of the same species may affect the mating behavior of the pair and create a stressful situation that can compromise breeding success; males are more occupied with challenging each other than with breeding.

On the other hand, parrot families such as white cockatoos (*Cacatua* spp.) appear to benefit from the presence of conspecific birds. If they are housed to allow visual and vocal contact, they will display and call to each other, and this situation might contribute to breeding success.

Sound knowledge of the natural behavior of the species is helpful when choosing the most suitable species to be neighbors. Sometimes it is only a question of common

**Table 42.6 | Recommended Medical Check-up for Birds in Quarantine**

- Bacteriological analysis (cloacal, choanal, tracheal)
- Mycological analysis (cloacal, choanal, tracheal)
- Parasitological analyses (endo- and ectoparasites)
- Checking for viral infections, (eg, circovirus and polyomavirus in the case of parrots and Newcastle disease for all birds)
- Checking for *Chlamydophila* (test for antigens and antibodies)
- Hematological and blood chemistry analysis
- Other tests, depending on the species

sense when choosing neighboring birds so that one of the species is not stressed, especially in a zoo collection where birds and their natural predators are maintained. An incorrect choice can create a stressful situation for the animals and will lead, at best, to the abnormal appearance and behavior of the animals. In most circumstances, a stressed bird will soon become a sick bird as well.

## MIXED SPECIES EXHIBITS

The idea of keeping different species in a mixed exhibit is common in zoos. The major challenge is to weigh the benefits and risks that a mixed exhibit can offer. It is easy, practical and economically more convenient to use one enclosure to display different species. Further, a mixed exhibit can be more attractive and educational for visitors, and a combined species exhibit can have a positive effect on the physical and mental behavior of the animals. From an educational point of view, most zoos prefer that animals belonging to the same geographical area be shown in the same mixed exhibit.

Despite these advantages, the negative points of a mixed-species exhibit are the risk of aggression among the animals and competition for position, space and food in the exhibit itself. It is important to be knowledgeable regarding the natural environment and behavior of the species to be combined and even more important to know the temperament of the individual animal in a mixed-species exhibit.

To successfully develop a mixed-species exhibit, specific guidelines should be followed:

- Avoid combining animals that occupy the same ecological niche because they will compete for space and food. Try to use all the space of the enclosure, combining terrestrial species with arboreal and/or aquatic species.
- Primates are always problematic to combine in mixed-species exhibits due to their inquisitive nature and the fact that they are often aggressively territorial in captivity. Nevertheless, there are examples of birds successfully exhibited with primates. Golden lion tamarins

(*Leontopithecus rosalia*), screech owls (*Otus* spp.) and red-capped cardinals (*Paroaria* spp.) have successfully been housed together.

- Avoid housing closely related species together in order to prevent the risk of hybridization.
- Provide an abundance of items the animals may compete for: perches and branches of different sizes, feeding points, nesting areas and shadows. For example, when keeping multiple hummingbirds together, a bird can be harassed by its cage mates when there are insufficient feeders (although occasional mock fights are normal behavior in hummingbirds).
- Provide the animals with the option of hiding from others, when necessary, by offering visual barriers such as plants and rocks.
- Avoid combining species that can be antagonistic in nature.
- Combine animals of different sizes when working with animals occupying the same niche. Large species have a tendency to accept the presence of small animals. Nevertheless, the smaller species may challenge the larger if the species is of a particularly aggressive or protective nature. Aggressive species can be combined with others only in a very large exhibit.

Combining birds of different sizes requires additional consideration. For example, very small nocturnal birds of prey (eg, *Athene* spp., *Glaucidium* spp.) can be housed with some waterfowl, but particular care should be taken when combining toucans (*Ramphastidae*) with passerines or other small birds like doves, to avoid predation. Cranes, waterfowl, ibises and storks are often displayed together. Some parrots also may be kept together in walk-through aviaries. Several lory (*Loriidae*) species are commonly housed together in an aviary exhibit.

For birds that have the same or similar diets, or the diet of one species represents part of the diet of another, adequate distribution of food can be accomplished by providing feeding sites accessible to only one of the species (eg, flying vs non-flying species) or providing the birds with additional feeding sites.

Some examples of successful mixed-species exhibits include:

- Bali mynah (*Leucopsar rothschildi*) with Asian glossy starling (*Aplonis panayensis*), Prevost's squirrel (*Callosciurus prevostii*) and mouse deer (*Tragulus* spp.)
- Bali mynah with chevrotain (*Tragulus napu*)
- Goffin's cockatoo (*Cacatua goffini*) and Eleonora's cockatoo (*Cacatua g. eleonora*) with bettongs (*Bettongia penicillata*)
- Emu (*Dromaius novaehollandiae*) and cassowary (*Casuarius* spp.) with red kangaroo (*Macropus rufus*) and dama wallaby (*Macropus eugenii*)
- Crowned crane (*Balearica* spp.), marabou stork (*Leptoptilos crumeniferus*), storks (*Ciconia* spp.) and ostrich (*Struthio camelus*) with giraffe (*Giraffa camelopardis*) and antelope (*Tragelaphus* spp. and *Gazella* spp.)
- Yellow weaver (*Ploceus subaureus*), black-winged bishop (*Euplectes bordaceus*), golden-breasted starling (*Cosmopsarus regius*) and speckled pigeon (*Columba guinea*) with dik-dik (*Madoqua dirkii*).

## WORKING (SHOW) BIRDS

Most zoo parks and some zoos have bird shows and/or walk-through aviaries, putting both visitors and birds into direct contact. The potential risk of bird-to-human and human-to-bird disease transmission has been addressed.

The training and working schedules of show birds are readily accepted by some animals that benefit both mentally and physically from this activity, but other birds may be stressed by this routine. This work-derived stress will influence the birds' immune systems and make them more susceptible to both infectious and non-infectious diseases. In this respect, good teamwork with trainers is important in identifying subtle changes before they become problems.

Generally speaking, show birds are individually examined two to four times per year. This examination includes a discussion with the trainers and careful inspection of the resting area where the birds live. Tests for major viral diseases are performed when a new bird is introduced to the group and then repeated as needed (see "Quarantine"). Birds are regularly screened for parasites, especially if they are free-flying animals. Blood tests, including CBC and basic biochemistries, are performed annually. Tests for chlamydiosis and other bacterial diseases are performed at least twice a year, especially when direct contact with visitors occurs. Finally, a fecal screening for the presence of acid-fast bacteria is performed annually on free-flying animals.

## COMMON ACCIDENTS AND ESCAPES

Zoo birds are exposed to some of the same risks as pet and aviary birds, such as poisoning, foreign body ingestion and aggression by cage mates. Situations may be unique to zoo settings.

Aggression can be inflicted by a conspecific bird or by a cage mate belonging to a different species (Fig 42.13) (see "Mixed-species Exhibits"). In the case of trauma, therapy follows emergency protocols.

When a bird escapes and flies into a dangerous animal's exhibit, it will probably be killed. If the predator is not



**Fig 42.13** | A conspecific bird can inflict injury due to aggression. A bite wound on the wing of a Humboldt penguin (*Spheniscus humboldti*) is shown.

dangerous to humans (eg, small felids or canids), the bird can be netted and removed. In any other case, measures should be taken to anesthetize the predator and avoid further escape of the bird by putting a net in front of the hiding place before attempting to rescue it or being ready with a water hose to soak the bird's feathers to prevent further escape.

## VETERINARIANS AND BIRD CONSERVATION

It is believed that a natural rate for extinction is about one species every 100 years. But since 1800, more than 100 bird species have become extinct, which is 50 times higher than the natural rate. Zoo veterinarians must become more involved in bird conservation programs, to prevent disease and other factors from contributing to species extinction (Fig 42.14).

Veterinarians' contributions to conservation programs can also include clinical care for individuals of highly endangered species (the highest standard veterinary care



**Fig 42.14** | Spix macaws (*Cyanopsitta spixii*) are the most emblematic endangered parrot species.

must be provided) and the design and implementation of breeding and release programs.

Domestically bred birds must be fully evaluated for diseases prior to becoming part of a reintroduction program. A health check for psittacines might include the following: physical examination, complete blood count analysis, fecal parasitology, cloacal and choanal cultures, radiographs and endoscopy (biopsy) as well as testing for avian influenza, circovirus, paramyxovirus, herpesvirus, *Chlamydophila*, adenovirus and avian tuberculosis.

The veterinarian may lend his or her expertise to the release program and subsequent monitoring and handling of the subject birds.

### Product Mentioned in the Text

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