Medical And Non-medical Management Of A Mixed Species Penguin Collection in A Closed Environment

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Abstract

Penguins are becoming increasingly popular in zoos and bird-parks. These animals are particularly challenging for the keeping institution, since their special needs are not easily met and specific facilities have to be designed. The institution where the authors work keeps four penguin species, maintained in two different exhibits. Each exhibit has different air and water temperatures and a different light cycle. Birds are fed, managed and checked medically according to the species-specific needs. This paper gives a survey on the medical and non-medical aspects of penguins in captivity.

Non-medical Issues

- **Systematics**: penguins belong to the family *Spheniscidae*, the only one in the order *Sphenisciformes*. There are 17 living species of penguins, divided in 6 genera. All the penguin species live in the southern hemisphere.

- **Housed Species:** the Loro Parque's Penguinarium hosts four different penguin species: King penguin (*Aptenodytes patagonicus*), Gentoo penguin (*Pygoscelis papua*), Rockhopper penguin (*Eudyptes chrysocome*) and Humboldt penguin (*Spheniscus humboldti*).

- **Housing**: birds are divided into two different exhibits, according to their environmental needs. Both exhibits are closed and the internal environment is carefully monitored. One exhibit hosts about 60 Humboldt penguins, while the other one houses about 160 penguins belonging to the three other species.

- **Water and Air Quality**: the quality of air and water is one of the most important tasks when managing a penguinarium. Both are constantly filtered and monitored for the presence of possibly pathogenic agents, such as fungi and bacteria. Monitoring is done through periodical air and water analysis and cultures.

- **Feeding**: penguins are fed with several different fish and marine organisms (herrings, squids, krill, etc.). The diet specifications depend on the penguin species.

- **Bird Identification**: two means of ID are used at Loro Parque for each individual: a plastic numbered wing-band, for the easy identification of each animal and a microchip, in the case the wing-band breaks or becomes unreadable, or there is the need to change it during moult.

Medical Issues

- **Sex determination**: due to the anatomical peculiarity and the huge amount of perivisceral fat, endoscopic sex determination is seldom performed in penguins. DNA related techniques are currently used.

- **Physical examination of Penguins**: the penguins are routinely examined. The physical examination goes through a check of the general body condition, birds are weighed, eyes are controlled for lesions, beak and oral cavity are examined for colour changes, focal lesions or diffuse alteration. Wings are checked for presence of bruising or other lesions. Feet must be carefully examined and if there are suspected bumblefoot lesions starting, these must be addressed immediately.

- **Routine checks**: penguins must be checked on a routine basis, so that every bird is carefully examined at least once per year. This is normally done out of the breeding season, preferably before it, in order to address any problems before the eggs are laid. It is very important to determine an individual baseline for each bird, so that in case of any symptoms, the collected samples can be compared with the "normal values" for the specific animal. What we consider very important is to have, at least, the following data from each bird:
  a) CBC (WBC/EWBC, PCV, Diff. count of WBC).
  b) Blood chemistry (AST, AU, LDH, Chol, CK, Bile Acid, Tot. Prot, EPH)
  c) *Aspergillus* titers.
  d) Choanal and Cloacal cultures.

- **Breeding**: it is very important to be ready with the appropriate nesting areas, different for each species, well before the breeding season. In our experience penguins don't have big problems with egg laying, but low fertility rates are often reported in literature.

- **Medical control of the chicks**: chicks must be weighed at day one. The umbilicus must be disinfected and sealed if it is still open. Typical problems of penguin chicks are poor growth rate, often resulting from the parents' misbehaviour or inexperience. Also omphalitis and subsequent septicaemia may sometimes be encountered. The chick may be weak and not able to hatch, so that assisted hatches are one of the typical emergencies in penguin neonatology

- **Viral Diseases**: very little is known about viral diseases that are specific of this avian order and only a few viral diseases have been reported in penguins. Most of these reports involve captive birds. Although Paramixovirus 1 infections have been documented in *Sphenisciformes*, cutaneous pox lesions have been reported in otherwise asymptomatic penguins, other infectios diseases that have been reported are: West Nile virus infection, herpes virusinfection and infectious bursal disease. in the Loro Parque exhibits we have never experienced viral outbreaks.

- **Bacterial pathogens:** Penguins are susceptible to the pathogenic bacteria that affect other birds. *E. coli*, *Pasteurella* spp. and *Klebsiella* spp., *Salmonella* and *Edwardsiella* can affect adult penguins as well as chicks. (Salmonella have been isolated in the 7% of wild gentoo penguins in the Birds Island). *Clostridium perfrigens* and *Pseudomonas* spp. *Streptococcus*, *Staphylococcus*, *Erysipelotrix*, *Mycobacteria* and *Mycoplasma* are also reported to be possible pathogens for *Sphenisciformes.*

- **Fungal pathogens**: Fungal diseases, especially aspergillosis are very well known diseases of captive penguins and can be extremely serious. These birds, as some other avian species from extremely cold climates, are particularly susceptible to *Aspergillus* infections. Environmental prophylactic measures, as well as early diagnosis, are the keys to successful Aspergillus management in the modern penguin exhibit.

- **Parasites**: although some parasites have been reported in literature, they are not considered a typical problem of penguins. The most studied penguin parasite is *Plasmodium*. Malaria, like aspergillosis, is a typical disease of captive penguins and also this disease can be controlled by strict management measures. This explains why a closed environment, can be extremely helpful in controlling this disease. The babesiosis (*Babesia peircei*) is commonly find in young African penguins, it is tough to be spread by ticks of the genus *ixodes*, allthough the theory is not proven. A diagnosis is made by a positive blood smear.

- **Environmental contaminants affecting penguin health**: penguins, like all the fish-eaters, are exposed to intoxication by pesticides accumulated in fish. This includes polychlorinated biphenyls (PBCs) and 2,3,7,8 tetrachlorodibenzo-p-dioxin (TCDD). Mortality can be high and strict control measures are necessary. One important thing is the choice of the fish provider. This will preferably be able to provide tested and certified fish and be insured for diseases or deaths depending on poor fish quality.

Penguins in the wild are susceptible to several infectious and parasitic agents but obvious sign of diseases are rarely reported, but the incidence of diseases in wild penguins is difficult to assess, as birds that are infected and develop a disease, are rarely available for sampling.

The presence of antibodies suggests that exposure to pathogenic agents may have occurred, although this may indicate the presence of serologically related non-pathogenic strains.

Studies in zoos show that penguins are susceptible to a wider variety of agents than those that have been detected in the wild. Because of their behaviour, living environment and their breeding areas, penguins are less exposed to direct contact with other avian species and vector of diseases.

The prevention and treatment of infectious diseases in zoos is very important.

For what the prevention of illness is concerned, designing and building special indoor facilities, where the control of plagues is a fact of primary importance, is a very good tool to avoid outbreaks of the most common infectious diseases.

Further, a correct food management and a strict control of the incoming fish (correct conservation during transport, presence of bacterial contaminants, abnormal growth of pathogenic bacterial) is imperative. Finally a correct food storing and a careful defrosting of frozen food will limit the chances to introduce pathogens in the penguin flock. .

Suggested Reading

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