WILDLIFE AND ZOO MANAGEMENT

Edited
by
O. A. Morenikeji

Wildlife and Zoo Management

Wildlife and Zoo Management

Editor

Olajumoke A. Morenikeji

IBADAN UNIVERSITY PRESS
2016

Ibadan University Press
Publishing House
University of Ibadan
Ibadan, Nigeria.

First Published 2016

ISBN: 978 – 978 – 54045 – 9 – 3

Contents

4

Husbandry Needs of Restrained Animals

G.O. Adeyemo

4.1 Introduction

In recent years, zoos have undergone considerable changes in both their structure and function. Whilst remaining attractive places to visit, zoos now seek a new image—one that emphasises their role in conservation and public education.

The history of zoos as menageries of animals in cramped conditions and maintained largely for human amusement has left a lasting impression of poor animal on some people. It is quite apparent that, for the most part until fairly recent times, the way in which wild animals were kept is something humankind should be embarrassed and ashamed of (Stevens and McAlister 2003). Development in the zoos has been achieved as a combination of three factors: zoo legislation and codes of practice, the development of captive animal exhibits, and improvements in husbandry and veterinary care.

Sound animal husbandry programmes provide systems of care that permit the animals to grow, mature, reproduce, and be healthy. Specific operating procedures depend on many factors that are unique to individual institutions. Well-trained and properly motivated personnel can often achieve high quality animal care with less than ideal conditions.

4.2 Animal Identification and Records

Animals should be permanently identified by a method that can be easily read. Identification of individual animals is desirable, but, in some circumstances, it is acceptable to identify animals by group, cage, or pen. Individual birds may be wing-banded or leg-banded. Ear-notching, ear tattooing, electronic transponders, and branding may be used for individual identification.

4.3 Nutrient Requirements of Zoo Animals

Nutrient requirements of zoo animals are best described as the types, amounts, rations and presentation of nutrients to support a near equivalent of natural life, reproduction and well-being of the captive animal. The variety of wildlife species kept in captivity is large and as a result so is the variability in nutritional ecology, digestive physiology and nutrient utilisation (Van Soest 1982; Hofmann 1989). Consequently, the feeding requirements vary considerably between different species (Ulrey 1996). For example, browsers such as giraffe, *Giraffa camelopardalis*, are thought to require browse to stimulate gut function and behavioural health and tend to select feeds relatively high in protein (Hofmann 2000; Claus et al. 2003). Conversely, grazers such as Arabian oryx, *Oryxleucoryx*, can be kept successfully on grass hay with small daily amounts of a low protein supplement.

Nutrient utilisation can vary due to anti-nutritive factors and nutrient ratios (Robbins 2001). For example, the availability of phosphorus (P), calcium (Ca), magnesium (Mg) and zinc (Zn) naturally bound with phytic acid in plants is limited for many monogastric animals (e.g. birds, primates), this is of no concern for ruminating animals because the phytate is destroyed by foregut microbial digestion.

However, does phytate limit the availability of these minerals in hindgut fermenters such as horses or elephants? There is no clear evidence (NRC, 2006) that phytate limits phosphorous uptake in the domestic horse, *Equus caballus*. Phytates are prevalent in some foods such as seeds (grains) and brans (Maynard 1984), and accounting for P, Ca, Mg and Zn supplying these foods to species that are considered to be unable to break down phytate requires caution. Additional nutrient balancing (e.g. with manufactured phytase) might be required and is widely practised in commercial poultry and swine feeds (NRC 1988, NRC 1994). However, the levels of grains and grain products should be limited in the diets of phytate sensitive species.

For several species, there is considerable variation in nutrient requirements if one allows for seasonality and changes in the physiological state (e.g. growing or lactating) of the animals

(Lechner-Doll 2000). Variation in body condition is part of many nutritional ecologies. Varying the types of feeds and feeding levels can help to mimic seasonality in captivity which, it is argued, helps maintain a healthy animal with a natural body condition (Lechner-Doll 2000).

Boredom and obesity are major problems in zoo animals in general and feed-related stereotypic behaviours, due to limitations of natural stimulants, are common (Ulrey 1996). Good nutritional management includes not only meeting the animal's differing physiological requirements, but also consideration for its psychological well-being. Unfortunately, many keepers tend to offer their animals very digestible, processed and often nutritionally-unbalanced feeds (e.g. high energy pellets, young grass, boneless meat, etc.) and make these available *ad lib*, which leads to over consumption and disease. For example, feeding too much energy (mostly from sugars, starches and fructans) through either pellets, grain or grass can cause metabolic bone disease (mbd) in ratites (Bennet et al. 1991) and rumen acidosis in zoo ungulates (Van Soest 1996); feeding de-boned meat (often done for reasons of tidiness) to captive carnivores and raptors is sadly a common practice and leads to mbd, suffering and death.

4.4 Feed and Water

Animals must be provided with feed and water in a consistent manner, on a regular schedule, in accordance with the requirements established for each species by the NRC (1985, 1988, 1994, 2001, 2007) and as recommended for the geographic area. When exceptions are required by an experimental or instructional protocol, these must be justified in the protocol and may require approval by the Institutional Animal Care and Use Committee (IACUC). Feeders and waterers must be designed and situated to allow easy access without undue competition (NRAES 1990; Lacy 1995; Pirkelmann 1995; Taylor 1995).

Sufficient water must be available to meet the animals' daily needs under all environmental conditions. Water troughs, bowls, or other delivery devices must be cleaned as needed to ensure adequate intake and to prevent transmission of microbial or contaminant associated disease. Non-municipal water sources

should be periodically tested for quality by an approved agency or laboratory. Large supplies of feed should be stored in appropriate, designated areas. Bulk feed storage containers and feed barrels must be well maintained and the lids kept securely in place to prevent entry of pests, water contamination, and microbial growth.

Containers should be cleaned as needed to ensure feed quality. The area around the containers such as the auger boot area should be cleaned regularly. Feed in sacks should be stored off the floor on pallets or racks, and each sack should be labelled with the contents and manufacture date or use-by date. All feedstuffs should be maintained in such a manner as to prevent contamination by chemicals and/or pests. For example, open feed sacks should be stored in closed containers, and mixing devices, utensils, feed delivery equipment, and feeders/feeding sites should be cleaned regularly to ensure adequate feed intake and prevent transmission of microbial- or contaminant-associated disease. Feed placed in carts or in other delivery devices should be fed promptly or covered to avoid attracting pests. An effective programme of vermin control should be instituted in feed storage areas. Animal care personnel should routinely inspect feed to identify gross abnormalities such as mold, foreign bodies, or faeces; such feed should not be fed until the abnormal components are removed or the feed is determined to be safe. Toxic compounds (Osweiler 1985) should be stored in a designated area away from feed and animals to avoid accidental consumption.

4.5 Excreta Management and Sanitation

A complete excreta management system is necessary for any intensive animal facility. The goals of this system are as follows:

- To maintain acceptable levels of worker health, animal health, and production through clean facilities;
- To prevent pollution of water, soil, and air;
- To minimise the generation of odors and dust;
- To minimise vermin and parasites;
- To meet sanitary inspection requirements; and
- To comply with local, state, and federal laws, regulations and policies.

A plan should be followed to ensure that the animals are kept reasonably dry, clean, and are provided with comfortable and hygienic surroundings. Good sanitation is essential in intensive animal facilities, and principles of good sanitation should be understood by animal care personnel and professional staff. Different levels of sanitation may be appropriate under different circumstances, depending on whether manure packs, pits, outdoor mounds, dirt floors, or other types of excreta management and housing systems are being used.

In some instances, animals may be intentionally exposed to excreta to enhance immunity. A written plan should be developed and implemented for the sanitation of each facility housing agricultural animals. Building interiors, corridors, storage spaces, anterooms, and other areas should be cleaned regularly and disinfected appropriately. Waste containers should be emptied and implements should be cleaned frequently. It is good practice to use disposable liners and wash containers regularly.

4.6 Social Environment

Animals are social by nature and social isolation is a stressor (Gross and Siegel 1981; Marsden and Wood-Gush 1986). Agricultural animals that normally live in herds or flocks under natural conditions that are used in research and teaching should be housed in pairs or groups when possible. Considerations involved in implementing social housing for agricultural animals are discussed by Mench et al. (1992). If social housing is not feasible because of experimental protocols or because of unpreventable injurious aggression among group members, singly-housed animals should be provided with some degree of visual, auditory, and(or) olfactory contact with other members of their species.

Socialisation to humans and regular positive human contact is also beneficial (Gross and Siegel 1982; Hemsworth et al. 1986, 1993). In some instances, one species can be used as a companion for another species (e.g., goats and horses (Gross and Siegel 1982; Hemsworth et al. 1986, 1993). Temporary isolation is sometimes required for an animal's safety (e.g., during recovery from surgery), but the animal should be returned to a social setting as soon as possible.

4.7 Husbandry

4.7.1 Animal Care Personnel

The principal scientist or animal management supervisor should make all animal care personnel aware of their responsibilities during both normal work hours and emergencies. A programme of special husbandry procedures in case of an emergency should be developed. It is the zoo facility management's responsibility to ensure that personnel caring for animals are appropriately qualified or trained. Protocols for emergency care must be developed and made available to all personnel.

4.7.2 Observation

Animals in intensive accommodation should be observed and cared for daily by trained and experienced caretakers. Illumination must be adequate to facilitate inspection. In some circumstances, more frequent observation or care may be needed (e.g., during parturition, postsurgical recovery, confinement in a metabolism stall, or recovery from illness). Regardless of accommodation, animal observations should be documented and husbandry or health concerns reported to the animal facility manager as appropriate.

4.7.3 Emergency, Weekend and Holiday Care

In emergencies, there must be rapid communication between facility security and fire personnel and staff members responsible for the care of animals. Names and contact information of those individuals should be posted prominently in the animal facility and provided to the security department or telephone centre. If posting names and contact information poses privacy or security issues, a contact number for a security or command center should be used instead. The institution must ensure that emergency services can be contacted at any time by staff members.

4.8 Standard Practices

Sometimes, procedures that result in temporary distress and even some pain are necessary to sustain the long-term welfare of animals or their handlers. These practices include (but are not limited to) comb-, toe-, and beak-trimming of chickens; bill-trimming of ducks; toenail removal, beak-trimming and snood

removal of turkeys; dehorning and hoof-trimming of cattle; tail docking and shearing of sheep; tail-docking, neonatal teeth-clipping, hoof-trimming, tusk-cutting of swine; and castration of males and spaying of females in some species. Some of these procedures reduce injuries to humans and other animals (e.g., cannibalism, tail biting, and goring). Castration, for example, reduces the chances of aggression against other animals. Bulls and boars also cause many serious injuries to humans.

4.9 Metabolism Stalls and other Intensive Procedures

Animals that are subjected to intensive procedures requiring prolonged restraint, frequent sampling, or other procedures experience less stress if they are trained to cooperate voluntarily with the procedure. Animals can be trained with food rewards to accept and cooperate with various procedures, such as jugular venipuncture.

4.10 Bio-security

The term bio-security has historically been defined as the security measures taken to prevent the unintentional transfer of pathogenic organisms and subsequent infection of animals by humans, vermin, or other means. For example, personnel working in swine/avian facilities should be immunised against influenza and receive training related to potential cross-contamination of agents between animals and humans.

4.11 Simple Bio-security Measures that can be Adopted in Zoos and around Animals

4.11.1 Keep it Clean

- Soil, organic material, mucus, saliva and manure can carry disease which then can easily be spread on clothing, equipment and vehicles.
- Washing your hands with soapy water before and after handling animals is one of the easiest bio-security measures you can take. This is particularly important if you are dealing with animals you suspect are unwell.
- Keeping equipment clean is also important. Don't share your animal's gear or equipment with others. This includes

drenching and injecting equipment, headstalls, lead ropes and saddler. If your equipment has been used on other animals, clean it thoroughly and then apply a disinfectant (disinfectant can be safely used on leather equipment such as saddles).

- Where animals from different properties are using the one vehicle, the interior of the float or truck should be washed out and disinfected before loading new animals.
- It is important to remember that you need to thoroughly clean an item before it will be satisfactorily disinfected.
- Keep storage areas clean, dry and tidy, ensuring feed bins have secure lids. This will assist in deterring wild birds, rodents and other pests.
- Clean out water troughs regularly and do not place them under trees or where birds or bats perch.

4.11.2 Manage Movement of Visitors

- Managing the movement of visitors on your property is one way of preventing pests and diseases spreading onto your property. Some diseases can be very easily spread from one animal to another on people's clothing, in their hair and on their vehicle.
- Have a designated area for visitors' parking which is well away from your shed, animal thoroughfares and paddocks.
- If your visitors have had contact with other animals prior to arriving on your property, ask them to wash their hands before patting or working with your animals. This is particularly important with animal scientists, veterinarians and other livestock service providers.
- Ensure they wear clean clothes and boots, or supply some for them to wear on your facility.

4.11.3 Quarantine New Animals

Quarantine is a period of isolation. A paddock that does not directly adjoin paddocks holding animals should be used, or a yard. With regards to birds, a separate cage or shed should be used. Animals and birds that are new to your property should be quarantined for one week before they are introduced to your

existing flock or herd. This will allow most disease symptoms to show before possibly infecting the remainder of your herd or flock.

4.11.4 Keep Records

- Keep a detailed log of animals that are coming to, and going out of your property. This information should include where the animals have come from, transport dates and details of any identification markings or tags.
- These records can greatly assist if there is an emergency such as animal disease outbreak in your area; the animal movements can be rapidly traced, and the disease contained.
- If you employ itinerant workers on your facility, keeping a record of when they arrive, when they leave, and their contact details (such as a mobile phone number), can also assist during an emergency situation.

4.11.5 Create Buffer Zone

Where possible, create a 'buffer zone' with other facilities through measures such as double fencing and wind breaks.

4.11.6 Feral Animals and Wild Birds

- Feral animals (such as foxes, wild dogs and cats) are known for attacking livestock, causing losses and injuries. The spread of pests and disease by feral animals is a major bio-security risk. Where possible, do not allow other animals to mix with feral animals.
- For avian species, you should adopt measures that will keep wild birds away from your facility. Netting over your chook run is highly recommended.
- Feed and water should be positioned so that they are not open and attract wild birds. Water supplied from dams should be treated before offering it to your birds.

4.11.7 Do not Feed Swill to Animals

Swill include food waste, garbage or other products likely to contain unsterilized meat. Swill feeding provides a critical opportunity for the establishment of FMD virus among pigs. Pigs are susceptible to FMD infection through their mouth. Most of the

FMD risk materials that might enter a country are likely to be in the form of illegally-imported meat products.

Overseas experience shows that pigs are the most likely animals to become exposed and infected due to their omnivorous (eating both meat and plant products) habits. Pigs excrete about 1,000 times more virus in expired air (aerosols) than other ruminants (cloven-hoofed animals). This makes it likely that once established as a result of feeding pigs swill, FMD could spread to nearby livestock and become well-established before being detected and reported. This is consistent with the experiences of other countries where swill feeding of pigs has been the cause of major FMD outbreaks.

4.11.8 Know What to Look for

As a zoo-keeper, know your animals well. Common signs of a sick animal can include:

- sores or ulcers,
- excessive dribbling from the mouth,
- diarrhoea especially with blood,
- large discharges from any orifice such as the nose,
- not eating properly or off their feed,
- dramatic decreases in production such as milk from cows or eggs from chickens,
- non-responsive animals,
- staggering or head drooping,
- severe lameness,
- swollen heads,
- inability to rise,
- un-explained deaths.

4.11.9 Report Potential Problems

Veterinary attention should be sought for sick animals. If you suspect a disease, isolate sick animals and do not visit neighbouring facility until the cause has been determined—this limits its chance of spreading.

4.11.10 Leave it Across Borders and Overseas

Food, plant material, and animal products from overseas—including many common souvenirs—could introduce some of the world's most serious pests and diseases into zoos, devastating our valuable recreational and tourism industries and unique environment.

4.11.11 Bio-security for specific Livestock Species

There are also some bio-security measures that you need to be aware of for specific animals.

4.11.12 Large Ruminants like Buffalos and Cattle

Large ruminants bio-security measures follow general principles of controlling stock movement, and disinfecting vehicles and clothes belonging to people travelling between zoos. Related measures to control foot and mouth disease include covering disinfectant footbaths between uses so they are not diluted by rain. Prevent cattle from coming into contact with animals that cannot develop the disease, but can transmit infected material—for example, dogs, cats, poultry and wild animals.

Other control measures include the control of fallen stock—animals that die on your facility because of accident or disease. These control measures are of particular relevance to the control of bovine spongiform encephalopathy. Carcasses are classed as animal by-products and must be disposed of under the rules of the nation.

4.11.13 Buicks and Pigs

Buicks and pigs bio-security procedures must be of a high standard to prevent the spread of infectious diseases such as swine influenza.

- Cleanse and disinfect any shared equipment before it enters and after it leaves your premises.
- Make sure that personnel in contact with animals at different premises take standard precautions, such as cleaning and disinfecting boots and clothing.

- Prevent people with flu-like symptoms coming into contact with animals.

4.11.14 Small Ruminants

Sheep and goat bio-security control follows the general principles of controlling movements of people and livestock, as well as disinfecting vehicles, equipment, clothing and footwear. Diseases of sheep and goats may not always be apparent in the early stages, so keepers should regularly monitor their animals for signs of illness. Fallen sheep and goats should be treated as animal by-products and disposed of using standard fallen stock procedures.

4.11.15 Birds

Zoo handlers can increase the bio-security of flocks through standard control measures, such as washing hands after handling birds and disinfecting shoe soles. Avian-specific measures include:

- Use of disposable protective clothing where practicable.
- Providing clean water and food—preferably indoors to prevent contamination by wild animals.
- Isolating new birds.
- Have a plan for bringing a flock indoors if necessary.
- Cleaning and disinfecting housing at the end of each cycle.

4.12 Conclusion

As the threats to wild animals continue to grow and their populations in the wild become more threatened, it is likely that the role of zoos will become more important. If this role is to be fully maximised, zoos must take steps to mimic animal's natural habitat and minimise their welfare costs. A balancing art that must be achieved to silence those advocating for the eradication of zoos.

References

Adeyemo, G.O. and Jesuyon, O.M.A. 2015. *Practical guide to animal handling and care* (2nd Edition.) Triumph Multiple Creation, 147pp.

Bennet, P.M., Jackson, N.L. and Olney, P.J.S. 1991. *Management guidelines for the welfare of zoo animals*, Ratites. The Federation of Zoological Gardens of Great Britain and Ireland, UK, p. 24.

Claus, M. 2003. Tannins in the nutrition of wild animals: A review. *Zoo Animal Nutrition*, Vol. II, Filander Verlag, Furth, pp. 53-89.

Gross, W.B. and Siegel, P.B. 1981. Long-term exposure of chickens to three levels of social stress. *Avian Dis.* 25: 312-325.

_____. 1982. Socialisation as a factor in resistance to infection, feed efficiency, and response to antigen in chickens. *American Journal of Veterinary Research* 43(11).

Hemsworth, P.H., Barnett, J.L. and Coleman, G.J. 1993. The human-animal relationship in agriculture and its consequences for the animal. *Anim. Welf.*, 2: 33-51.

Hemsworth, P.H., Barnett, J.L. and Hansen, C. 1986. The influence of handling by humans on the behaviour, reproduction and corticosteroids of male and female pigs. *Appl. Anim. Behav. Sci.* 15: 303-314.

Hofmann, R.R. 1989. Evolutionary steps of ecophysiological adaptation and diversification of ruminants: A comparative view of their digestive system. *Oecologia* 78: 443-457.

_____. 2000. The structure of the digestive systems in feeding of mammals: A comparative approach. *Zoo Animal Nutrition*. Filander Verlag pp. 163-181.

Lacy, R.C. 1995. Putting population viability analysis to work in endangered species recovery and small population management. *VORTEX* Version 7. User's Manual IUCN/SSC Conservation Breeding Specialist Group. Apple Valley, MN pp. 65-80.

Lechner-Doll, M. 2000. Nutritional management of ungulates in captivity: Should we learn from natural seasonality of the vegetation. *Zoo Animal Nutrition.* Filander Verlag, pp. 205-212.

Marsden, M.D. and Wood-Gush, D.G.M. 1986. The use of space by group-housed sheep. *Appl. Anim. Behav. Sci.* 15: 178.

Maynard, L.A., Loosli, J.K., Hintz, H.A. and Warner, R.G. 1984. *Animal nutrition*, 7th ed. McGraw-Hill, USA, p. 235.

NRAES, Pitt, R.E. 1990. "Silage and hay preservation". *Northeast Regional Agricultural Engineering Service (NRAES)*, Bulletin No. 5, Ithaca, New York, USA.

NRC. 2001. *Nutrient requirements of dairy cattle*. 7th Revised Ed., Washington DC, USA: National Academic, Press p. 108.

_____. 2006. *Nutrient requirements of horses*. 6th Revised Ed., Washington DC, USA: National Academic Press, pp. 71-76.

_____. 1994. *Nutrient requirements of poultry*. 9th Revised Ed., Washington DC, USA: National Academic Press, pp. 30-31.

_____. 1988. *Nutrient requirements of swine*. 9th Revised Ed., Washington DC, USA: National Academic Press, p. 28.

Osweiler, G.D., Carson, T.L., Buck, W.B. and Gelder, G.A. Van. 1985. *Clinical and diagnostic veterinary toxicology*. pp. xiv + 494pp.

Robbins, C.T. 2001. *Wildlife feeding and nutrition*. USA: Academic Press, pp. 1-6.

Schmidt-Nielsen, K. 1990. *Animal physiology, adaptation and environment*. 4th ed. Cambridge University Press, pp. 273-276.

Stevens, P.M.C. and McAlister, E. 2003. "Ethics in zoos". *International Zoo Yearbook*, 38: 94-101.

Shelley, E. Taylor. 1995. *Health psychology*. Third Edition. University of California, Los Angeles.

Ulrey, D.E. 1996. Skepticism and science: Responsibilities of the comparative nutritionist. *Zoo Biology* 15: 449-453.

Van Soest, P.J. 1987. *Nutritional ecology of the ruminant*. Ithaca, USA: Cornell University Press, pp. 199-202.