

Risk Assessment and Safety Considerations

Professionals in the field of animal care are beginning to understand the need to provide the animals in their care more in terms of daily physical and mental stimulation. This field is undergoing a revolution of sorts. It was not all that long ago that a “state of the art” animal enclosure was a sterile cement or tile cage, easily disinfected and devoid of articles that might prove hazardous to the animal. The intention was to protect the animals from a potentially dangerous environment, hunger, predators, social conflicts and disease. Animals were housed in sanitized environments, fed nutritionally balanced diets on regimented schedules, provided with compatible companions when possible and assigned secured territories. Zoo managers assumed the risk assessment responsibility for all aspects of the animals' environment. As a result, the opportunities for the animals to make choices within their environments became limited.

Animals in the wild engage in risk assessment every day of their lives. They must decide if the benefits outweigh the costs of crossing an open field in search of food, obtaining a drink at a waterhole frequented by predators, trespassing into obviously “marked” territories, or challenging another for the privilege of breeding rights. Sometimes their assessments are accurate; sometimes they prove harmful or even fatal. However, wild animals always have opportunities to make choices and exercise some control over their fate. Zoo managers generally have evaluated risks to zoo animals as either acceptable (i.e., introducing a pair for breeding purposes) or unacceptable (i.e., providing social carcass feedings that might provoke injuries) depending on the institution's agenda. But they too have made fatal errors in assessment (i.e., the male killed the female during breeding attempts) while the animals had little if any choice or control over their fate.

Today, enlightened zoo managers recognize that the “safe”, sterile “state of the art” enclosures of yesterday are not without risk. Boredom and frustration with their accompanying undesirable behaviors can negatively affect an animal as well as the public's perception of the quality of the animal's life. Enrichment programs can help remedy these problems. Enrichment is an essential tool for encouraging species-typical behavior to encourage normal levels of activity and foraging while allowing animals to adapt to changes in their environment (Maple Ct. al., 1995; Snowdon, 1991). Negative stimuli and stressors, and the opportunity to evaluate risk can actually be positive elements in the health and well being of an animal as they can elicit many natural behaviors and provide opportunities for the animal to gain coping skills. Animals should be able to adapt to changes in their environment and adapt to the stresses of captivity. The ability to deal with minor stress can alleviate the potential of panic when aspects of the animals' environment change. Key issues for animal managers to consider are the type of stress experienced and the length of exposure to a stressful situation. What options do the animals have for coping with that stress? Offering animals more choices and opportunities to learn coping skills can actually help to minimize the risk in stressful situations. Enrichment can be one of the most effective tools available to provide choice and “controlled complexity” to animals' lives.

Enriched environments are by definition more complex and therefore potentially more dangerous than the more typical sterile environments. Each enrichment idea falls somewhere within a continuum of low to high risk and of low to high benefit to the animals. The goal of enrichment

should be to maximize the benefit while minimizing unacceptable risks. All enrichment should be evaluated on three levels:

- 1) Whether the enrichment item itself poses an unacceptable risk to the animals;
- 2) What benefit the animals will derive from the enrichment;
- 3) Whether the manner of enrichment delivery is apt to lead to problems.

A written plan of action that eliminates the most dangerous risk factors while maintaining the benefits of a challenging and complex environment can help animal managers develop a safe and successful enrichment program. Keepers should evaluate new and creative enrichment ideas with their managers and staff from other departments (curatorial, janitorial, maintenance, veterinary, nutritional, etc.) to decrease the frequency of abnormal and stereotypic behaviors or low activity levels, and to fine-tune enrichment ideas. **FOR ENRICHMENT TO BE SAFELY PROVIDED, IT IS STRONGLY RECOMMENDED THAT EACH INSTITUTION ESTABLISH ENRICHMENT PROCEDURES AND PROTOCOLS AS WELL AS A CHAIN OF COMMAND THAT KEEPERS CAN FOLLOW.**

Items that prove to be enriching for one individual or group of animals may not work for others. When introducing a new enrichment item to animals that are easily stressed, it may be more appropriate to do so slowly. Starting with the item outside the cage and then moving it to a less traveled area of the exhibit for the animals to investigate is one method of accomplishing this. Placing a favored food on the item can also encourage curiosity. However, staff should be prepared to quickly remove the item if it creates panic within the animal population. It is important to remember that each enrichment category has its own inherent risks. The following is a small sample of safety considerations for various categories of enrichment.

Dietary Enrichment

- Food enrichment, if uncontrolled, can lead to obesity, tooth decay and deviation from the normal diet can cause nutritional problems. Keepers can consult with the nutritionist or commissary staff to determine the best method of introducing novel food items.
- New food items introduced without analysis may cause colic, rumenitis or metabolic acidosis in ungulates.
- Food items can spoil and cause animal illness if left in the exhibit for extended periods of time. Enrichment food items should be removed within a reasonable amount of time to prevent spoilage.
- Animals can have adverse reactions to toxic plants and chemicals. Keepers should be able to correctly discern between toxic and browse plants, ensure that browse is free of fertilizers and herbicides and wash plants to remove free ranging bird and animal feces and debris.
- Foraging or social feedings may give rise to aggression and possible injuries within the animal population.
- Competition for enrichment items may lead to social displacement of subordinate animals. These concerns can be minimized by providing enough enrichment to occupy all of the animals within the population.

- Carcass feedings for omnivores and carnivores may be hazardous if the source of the carcass is not determined and appropriate precautions taken. Diseased animals, chemically euthanized animals or those with an unknown cause of death are not appropriate for an enrichment program. Freezing the carcasses of animals that are determined to be safe to feed to exhibit animals can help minimize the risk of parasitism and disease. Providing enough carcasses in group feedings can minimize competition and aggression within an exhibit.
- Carefully introducing a group of animals to the idea of social feedings can be done by moving carcass pieces closer together at each feeding until the animals are sharing one carcass. This can allow social carnivores to exhibit normal dominance posturing while minimizing the possibility of aggression. During live feedings, prey animals may fight back. Care should be taken to ensure such prey can only inflict superficial wounds on zoo animals.
- Cage furniture may interrupt flight paths or entangle horns and hooves if poorly placed. Careful planning can prevent this.
- If unsecured, some items may fall on an animal or be used as a weapon and cause injuries.
- If position is not thoughtfully considered, limbs and apparatus may provide avenues for escape or may block access into exhibit safety zones, leaving subordinate animals feeling trapped and vulnerable.
- Animals that crib or chew wood should be provided with non-toxic limbs and untreated wood furniture.
- Water features should be tailored to the inhabitants to prevent drowning and ensure that animals such as box turtles can right themselves if they flip over on their backs.
- Animals can be injured in filtration systems if water intake areas are not protected.
- Substrates should provide adequate traction and not cause an intestinal impaction if ingested.
- Caution should be exercised when ropes, cables or chains are used to hang or secure articles to prevent animals from becoming entangled. Generally, the shortest length possible is recommended. Chain can be covered with a sheath such as PVC pipe; swivels can be used to connect the chain to the enrichment item to minimize kinking.

Olfactory Enrichment

- Scents from different animals or species can lead to aggression if there is an assertion of dominant animals or subordinate animals attempting to use enrichment to advance their status in the hierarchy.
- Animal feces used for olfactory enrichment should be determined to be parasite free through fecal testing and as with other animal by-products such as feathers, sheds, wool and hair, come from only healthy animals. Many of these items can be autoclaved for sterilization.
- Perfumes can be overwhelming to some animals (and keepers) and are therefore best used in open, ventilated areas.
- Some spices may be too strong or toxic to some animals.

Auditory Enrichment

- When provided with audio enrichment, animals may be less threatened by deflected sounds rather than those directed at the animals.
- Some animals may have adverse reactions to recordings of predator calls and should be closely observed when this type of enrichment is provided.
- Providing the animals with an option for escape or the means to mobilize for confrontation when predator calls are played can lessen the stress of this type of enrichment and allow the animals to investigate the sounds and their environment over a period of time.

Manipulatable Enrichment

- Individual parts or enrichment devices may be swallowed resulting in choking or asphyxiation.
- If ingested, indigestible enrichment items may cause a gut impaction or linear obstruction.
- Broken items may have sharp edges that can cut an animal. Only items that are appropriate for the species should be provided. For example, some devices will hold up to the play of a fox but not a wolf
- When building or designing enrichment items from wood, it may be wise to use dovetail cuts and glue rather than screws and nails. Rounded corners and sanded edges can prevent the animals from getting splinters.
- Many paints and other chemicals are toxic if eaten. When providing enrichment involving paint or other chemicals, only non-toxic items should be used.
- Destructible items such as cardboard boxes and paper bags should be free of staples, tape, wax, strings or plastic liners.

Evaluation of Risks

No enrichment program would be complete without evaluation of the effectiveness of each item as well its inherent risks. Evaluation may be in the form of scientific behavioral observation or via more simple keeper checksheets. Scientific evaluation allows animal managers to recognize situations that may be difficult to identify through casual observation. Evaluation permits zoo staff to analyze the effect of each enrichment item on the animals' behavior and fine-tune enrichment to maximize its benefits and improve upon the safety of the enrichment program

Conclusion

As keepers strive to improve the quality of the animals' lives, enrichment can be one of the most cost effective and efficient tools to accomplish this. Combined with animal husbandry practices, enrichment can lead to improved mental and physical well being of the animals. Enrichment is generally implemented at the keeper level and the importance of keeper involvement in an enrichment program cannot be understated. However, it is imperative that enrichment is delivered in a safe manner to prevent animal injury or death. Numerous aspects of the animals' lives should be considered in the provision of enrichment, but when properly planned and executed, enrichment can be a tremendous compliment to the animals' captive lifestyles.

ENRICHMENT HAZARDS

When designing, installing and implementing enrichment, the importance of following established institutional protocols can not be understated. To avoid potential animal enrichment hazards, the following questions should be considered:

- 1) Can the animals get caught in it or become trapped by it?
- 2) Can it be used as a weapon?
- 3) Can an animal be cut or otherwise injured by it?
- 4) Can it fall on an animal?
- 5) Can the animal ingest the object or piece of it? Is any part of it toxic, including paint or epoxy?
- 6) Can it be choked on or cause asphyxiation or strangulation?
- 7) Can it become lodged in the digestive system and cause gut impaction or linear obstruction?
- 8) In a multi-species exhibit or other social grouping, could a larger or smaller animal become stuck or injured by the object or get hung up on it (particularly a young animal)?
- 9) Can it destroy an exhibit?
- 10) If fecal material is used for enrichment, has it been determined to be free from harmful parasites?
- 11) Is food enrichment included as part of the animals' regular diet in a manner that will reduce the risk of obesity?
- 12) When introducing animals to conspecifics or in a multi-species exhibit, are there sufficient areas for them to escape undesirable interactions?
- 13) Can the manner of enrichment presentation (i.e., one item or items placed in a small area) promote aggression or harmful competition?
- 14) Has browse been determined to be non-toxic?
- 15) Do the animals show signs of allergies to new items (food, browse, substrates, etc.)?
- 16) Does the enrichment cause abnormally high stress levels?
- 17) Does the enrichment cause stimulation at a high level for extended periods of time that do not allow the animal natural down time in the species' normal repertoire (e.g., constant activity for public enjoyment when the animal would normally be inactive in its native habitat)?

The goal of any enrichment program is to stimulate naturalistic behaviors in captive animals. Unfortunately, it is difficult, if not impossible, to simulate nature without its inherent dangers. Rapid innovation in enrichment techniques by talented animal caregivers has provided a good deal of information, but at this point, very little testing.

Just as the benefits of many enrichment devices are discovered by trial and error, so too are the dangers. It is, therefore, imperative that any enrichment program be well thought out and researched in advance. Each facility must decide on its own tolerance level for acceptable risk. Management, veterinarians and keepers should all have input into what constitutes risk and how it will impact their enrichment program.

Before providing enrichment, keepers should get as much feedback as possible from staff, as well as from reference material. Common sense and experience will often identify potential dangers. However, if an unforeseen problem occurs, passing this information along to other professionals can be extremely valuable so that others may avoid similar difficulties.

Monitoring is especially important when introducing novel enrichment. Written evaluations of the enrichment and its results (whether positive, negative or neutral) are important in determining not only the effectiveness of each item, but also any safety concerns that might arise. When employing enrichment used by other facilities, one must be aware that group dynamics, personalities, age, etc. may alter results. For example, a device that is safely used by geriatric animals may not stand up to the stresses of playful younger animals.