The Zoo Veterinary Profession: Challenging, Interesting, Vibrant and Fulfilling

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In the early 1900s, zoos and veterinarians rarely worked together. Part of the problem was that it was difficult for vets to safely examine animals in close proximity. About 25-30 years ago, safe anesthetics became available and veterinarians could get close enough to animals to give physical examinations or apply medical treatment. Since then research on zoo animal health and disease has proliferated. Now zoo vets are not only providing health care for animals, they are also actively involved in zoo conservation programs. As more conservation challenges lie ahead, this field of medicine will continue to grow.

At present the zoo vets are bestowed with the responsibilities like

- Providing a preventative medicine program for all animals which includes nutrition, vaccinations; TB testing, dentistry, screenings for parasites, etc.
- Maintaining medical and progeny records of all animals under his institutional collection,
- Providing diagnostics (x-rays, ultrasounds, blood tests, etc.)
- Immobilizing animals chemically for exams, treatments, etc.
- Performing neonatal care and necropsies
- Participating in conservation by doing field work and research on endangered species
- Providing quarantine and pre-shipment exams for animals coming into or leaving the zoo
- Maintaining dialogue with other zoos and zoo vets
- Participating in conferences and meetings for research and conservation studies and so on…

Apart from the above responsibilities the zoo vets are actively engaged in developing disease surveillance strategies, Biosecurity practices, and disease outbreak containment protocols for zoos. The zoo vets as a part of the disease surveillance in zoos, follow the practice of performing complete necropsies on every animal that dies within the zoo and maintaining a record of it. Another important element in disease surveillance in zoos is the use of molecular diagnostics to identify and characterize novel agents responsible for disease outbreak. Finally, the proper use of disease risk assessment procedures, and proper communication of risks, is essential in navigating the complex realm of disease outbreak response and biosecurity in zoos and field conservation programs, thus making the profession an interesting, and challenging for a zoo vet.

Diet related factors provide significant challenges for zoo nutritionists and clinical veterinarians. The presence of multiple species in a naturalistic environment adds complexity to an already complicated problem. Many animal diets fed in zoos today are specifically formulated to meet the various nutritional needs of different species. In some cases, dietary supplementation or limitation of trace minerals or other nutrients is necessary for optimal health. However, when presented with the range of options necessary to feed the variety of animals in a mixed species environment, some animals will choose to eat diets that are less than ideal for them or they will overeat, which results in nutritional disorders. For example, overdose of iron in birds leads to hemosiderosis and/or hemochromatosis.[1] It is difficult to ensure that these and other susceptible species eat only low iron diets, especially when in mixed species aviaries with access to foodstuffs containing higher iron concentrations.

Metabolic bone disease (MBD) in numerous species, especially small primates[2] and reptiles[3], can manifest as osteoporosis, fibrous osteodystrophy, rickets, or folding fractures. It is due to prolonged imbalances of calcium, phosphorus and Vitamin D and in some species has been associated with inadequate exposure to UVB. Plant cover preventing adequate light penetration or large exhibits with long distance to the light source have been associated with MBD in reptiles and lack of UV-B has been associated with MBD in both reptiles and other animals.

Obesity and subsequent fatty liver with or without rupture can occur in birds or herbivores and carnivores, secondary to overeating or eating high calorie or high fat diets.

Finally, interspecies social interactions that restrict an animal's access to food or water can also negatively impact animal health and longevity; geriatric (old) or juvenile animals seem to be more at risk.

Challenges to the Zoo vets

The zoo vet profession is imposing challenges to the Zoo vets in

1. Meeting the challenge of preserving global biodiversity through reproductive science

Linking reproductive science to endangered species conservation is the essence of species survival and has become a research priority of the zoological parks.

Primary areas of study include gamete (sperm, egg) biology, embryology, endocrinology, behaviour, cryobiology, assisted breeding, and reproductive health.

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Some significant works done in western zoos in the above fields are as follows

- Technologies to assist breeding and managing threatened taxa, including developing consistently successful artificial insemination in the Eld's deer, Scimitar-horned Oryx, Cheetah, Black-footed ferret, Elephant, and Giant panda.
- First use of assisted breeding for large-scale production of Black-footed ferrets for reintroduction in the American West. Developing and implementing genome banking technology (frozen repositories of sperm, embryos, tissue, blood products, and DNA) to "insure" and assist managing species in zoos and in nature.
- Forging noninvasive techniques to safely measure hormones in more than 50 mammal and bird species, ranging from the Meerkat to the Bali mynah to the Killer whale etc.

2. Meeting the challenges of preserving Endangered Species

Protection in the wild is by far the optimal and preferred method for conserving threatened species. However, it is quite difficult to collect certain types of vital, physiological data about these animals, as these populations are quite vulnerable to catastrophes such as drought and poaching. Hence, captive populations with successful breeding programs are an insurance policy that should and can be part of a diversified strategy that maximizes options and minimizes disasters.

For assessing reproduction and-well being in threatened animals, knowing the hormonal patterns is important, as hormones control reproductive success and an animal's ability to cope with stress. Knowing an animal's hormone patterns assists with diagnosing and correcting hormone-related problems.

Historically, measuring hormones was done by taking blood samples in anesthetized animals—the only safe way, but nowadays methods to measure critical hormones without inducing stress—by analyzing hormones in feces, urine, and even saliva have been developed. This technology has been vital for understanding various aspects of infertility problems, aiding in the development of assisted reproductive techniques, and improving breeding management.

These "noninvasive" approaches offer extraordinary new opportunities for biologists to understand the fundamental mechanisms associated with endocrine control of general health and reproductive success. Because data can be obtained from voided urine or feces, reproductive and/or adrenal status can be assessed without the sampling procedures themselves causing stress (taking blood samples from anesthetized animals). In fact, excreted hormones can be superior to blood data because they represent average values pooled over time, rather than a single point-in time measure.

Among the many advantages, evaluating hormonal metabolites can allow biologists to determine

- reproductive activity and "stress" status (male and female), including puberty onset, the duration of sexual receptivity (estrus), and the effect of season and aging on reproductive function in captive and free-living animals
- behavioural cues most reliably predictive of reproductive activities
- pregnancy diagnosis and birth timing
- influence of social system (i.e., habitats containing single versus multiple animals; single sex versus mixed-sex groups) impact of restraint, anesthesia and translocation practices

Exciting new research focused on using these noninvasive methods can increase our fundamental knowledge about free-living wildlife. Hormone measures are providing important information on reproductive status, but it now is also possible to study the impact of human disturbance or environmental disrupters on animal well-being (i.e., forestry practices, agriculture, pollutants, and toxins). Eventually, these techniques may also be important for determining the effectiveness of pre-release conditioning and reintroduction on reproductive performance and animal well-being.

The knowledge on the above aspects will help us in gaining knowledge on the issues like how animals reproduce, and help in developing an improved understanding of population dynamics, and the impacts of human disturbance and the wisdom of undertaking animal translocations and reintroductions.

This information, on one hand allows managers of the zoo in modifying and enriching the zoo environments, thereby improving reproduction, health and animal well-being. And on the other hand the emerging discipline of **conservation endocrinology** can be used to provide wildlife managers and decision-makers with new and valuable information to ensure the survival of viable wildlife populations in nature.

In this aspect also the zoo vets play a vital role, thus making the *Zoo vet profession a challenging, interesting, vibrant and fulfilling.*

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[1] Lowenstine LJ, Munson L. Iron overload in the animal kingdom. In: Fowler ME, Miller RE Eds. Zoo and Wild Animal Medicine: Current Therapy 4. Philadelphia: WB Saunders 1999; 260-268.

[2] Montali RJ, Bush M. Diseases of Callitrichidae. In: Fowler ME, Miller RE Eds. Zoo and Wild Animal Medicine: Current Therapy 4. Philadelphia: WB Saunders 1999; 382.

[3] Fowler ME. Metabolic Bone Disease. In: Fowler ME Ed. Zoo and Wild Animal Medicine, 2nd ed. Philadelphia: WB Saunders 1986; 70-90