Lack of approved pharmaceutical agents and pharmacokinetic data in the literature for exotic, wildlife, and zoo species is a major issue for veterinarians treating these species. Zoo veterinarians take approved agents (veterinary or human) and extrapolate their use to non-approved species, often with little or no scientific basis to support drug or dose selection. Species differences in drug absorption, metabolism, distribution, and excretion have been well documented for domestic species. However, there has been limited research into similar information for non-domestic species.

With the possible exception of pet bird species, there is little information concerning pharmacokinetic parameters for drugs in non-domestic species. Zoo veterinarians often formulate the medication(s) into a meal, hoping that the animal will ingest it. Due to a lack of patient compliance, the veterinarian may resort to other means of drug administration. Additionally, due to the value of many zoo species, the traditional method of ‘trial and error’ for treatment selection and resulting compliance is often inappropriate, and lends itself to a mentality where no zoo veterinarian wants to be the first to administer an agent or formulation in an untested species.

While veterinary medicine is “one medicine”, there are differences which practitioners need to be aware of. One medicine is a central concept in zoological medicine in that vertebrate species are more similar than dissimilar. We do know that drug absorption can vary within and between species. When one considers the anatomical differences between true monogastrics (canine or feline species), hind-gut fermentors (rodents, rabbits, horses, or elephants), fore-gut fermentors (Colobus monkeys and kangaroos), and ruminants (cattle, goats, sheep, or antelope), the potential differences are staggering. This does not begin to address differences between organism class, such as several snake species ability to up- and down-regulate their digestive systems. This makes prediction of oral drug absorption dependent on both body temperature and time after feeding in these animals. Plasma protein binding can vary between species and is also temperature dependent. This is very important when treating poikilothermic (reptiles, amphibians, and fish) species and conducting pharmacokinetic studies with highly protein-bound pharmaceutical agents.

The large body sizes of some zoo species produces problems for treatment with pharmaceutical agents and places significant limitations on drug delivery. Aside from the weight of the animal, the size, thickness, and density of various anatomical structures can physically hinder drug administration and veterinary compounding issues in the US.

Treating the individual versus the group (herd, flock, etc.) is often a difficult part of zoological pharmacology. The techniques employed to treat the individual depends upon whether or not the patient is ‘cooperative’. There are inherent risks to those providing primary patient care to the animal (i.e., veterinarians and keepers), such as in dealing with poisonous snakes or carnivores. In cooperative or human-habituated patients, behavior can significantly change because of illness or pain so that the animal no longer lends themselves to traditional pharmaceutical therapy.

When injectable agents are used, darting can be a realistic option for short-term treatment of some species. Repeated administration of therapeutic and/or chemical restraining agents within a relatively short period of time can be traumatic for the patient. Use of manual restraint allows for more traditional administration of drugs (i.e., pilling, gavage, manual injection). Mechanical restraints are those methods typically associated with larger
animals. The use of food as a drug delivery device is often the first choice in exotic animal therapy. It can be very useful for hiding realistic amounts of drug when the agent to be administered can be taste-masked by the food item. Training an animal to easily accept treatment can be beneficial to both the animal and the veterinarian. Training reduces the stress often associated with medical treatment and increases the likelihood of compliance. One could imagine that long-acting formulations would be especially useful to an exotic veterinarian, particularly in the zoological arena. It would be very convenient to administer a pharmaceutical agent only once while the animal is being examined (typically under anesthesia) and not have to perform repeated administrations.

A cooperative patient in zoological medicine is one that will allow the veterinarian to perform a routine physical exam or administer medication on a routine basis with minimal manual restraint. Administration via i.m., s.c., or p.o. routes is the preferred choice when dealing with most exotic patients. Rectal administration is an underutilized route of administration in veterinary medicine. It is also a route that has potential in exotic medicine. By working at the ‘other’ end of the animal, the risk of injury decreases.

Choosing drugs for zoo species is ideally based on an accurate clinical diagnosis, available literature pertaining to treatment of the condition, and a review of approved drugs for domestic animals. The clinician then refers to published pharmacological data and anecdotal history of safe and effective use of the agent in the target species. This, unfortunately, rarely occurs as drug and dosage selection is often a clinical estimation or extrapolation. However, simply guessing at a dosage can have disastrous consequences as was illustrated in a case report where lysergic acid diethylamide (LSD) was tested in an elephant and the animal died violently within minutes.5

"No presently available chemical restraint agent is equally effective and safe for use with all 45,000+ vertebrate species".6 This statement relates not just to chemical restraint, but to therapeutic use in general within zoological medicine. Changes need to happen in minor species drug approval to make it easier for the needed information to get into the hands of veterinarians. The Minor Use and Minor Species Animal Health Act of 2004 has been signed address the lack of drug availability for minor species. An increase in basic pharmacokinetic parameters in zoological species will increase the therapeutic options for veterinarians.

Other routes of administration that have not been used to their full extent in zoological medicine are rectal, depo, and topical. Increased information and formulations that would allow for administration of appropriate therapeutic agents would be of great benefit.

I have attempted to bring to light some of the issues that face veterinarians on a daily basis when they deal with nontraditional species. It is understood that it is not economically feasible to develop every drug for every species. However, targeted approvals or research could greatly increase the efficacy and safety of current and future therapeutics. Also, this type of approach would increase the quality of care provided to zoological species under our care.7,8

References