CHALLENGES IN MARINE MAMMALS MEDICATION

Lack of approved medicines and pharmacokinetic data in the literature is a major concern for marine mammal's veterinarians all over the world. The daily clinical practice with these animals raises challenges in many aspects leading to an extralabel use of human and domestic animal medicines, simple compounding or other manipulations in the clinical setting, use of imported pharmaceutical products or extrapolating dosages and therapeutic regimes from domestic animals with little or no significant basis.

The present Formulary could be assist to practitioners in the selection of medication to marine mammals with significant basis in order to facilitate the accuracy and efficacy of the prescribed treatments. Even so, we must keep some general issues in mind:

Routes for Administering Drugs to Marine Mammals

Essentially all of the routes used to deliver drugs to domestic animals are available for delivering drugs to marine mammals. Practical considerations, however, frequently limit the choice and some clinical situations need anatomical adaptations.

- Oral administration (PO): is often the preferred route in an animal still taking feed regularly or being tube-fed routinely for nutritional support. The major considerations are food interactions and factors (physicochemical properties of the drug, stomach pH, gastrointestinal microflora, and anatomy) that might affect absorption.
- Subcutaneous administration (SC): may be problematic because of the blubber layer in most cetaceans and in adult pinnipeds, but can be effective in sea otters, fur seals and in young pinnipeds (prior to the development of the thick blubber layer).
- Intramuscular administration (IM): is frequently applied in marine mammals that are difficult to restrain or that are not being hungry. Be cautious and avoid superficial injection into the extensive subcutaneous blubber, which can result in failure to achieve any appreciable systemic distribution of highly lipid soluble medications. Precaution with the local effect derived from the irritation caused by some injectable drugs. Furthermore, very large individuals may require large volumes of drug, but the recommended total volume injected per site does not increase in scale with the mass of the animal. So, care should be taken to use multiple injection sites and to keep the drug volume per injection site reasonable.
- Intravenous administration (IV): it must be nearly perpendicular to the vessel, which can be quite deep, complicating catheterization.
- Intraperitoneal administration (IP): for nonirritating drugs. Needles must be suitable to penetrate the abdominal wall.
- Topical administration (TA): Baths and dips. The major challenge is to achieve appropriate contact time for drug efficacy in an aquatic environment. Ointments and salves are often specially compounded for marine mammals (lipid bases such as lanolin and petroleum jelly and human dental bases)

Alternative routes:

- For induction of anesthesia and targeted delivery of medications to the lungs: Intratracheal (IT) and inhalatory (IH) administration.
- For targeted delivery of medications to the respiratory system: aerosolization and nebulizing (by inhaler chamber/mask or by placing it in a nebulization chamber).

Dose Scaling

When pharmacological data for drugs in marine mammal do not exist, extrapolation of doses and pharmacokinetic parameters across species is necessary. Nevertheless, the practitioner should be cautioned that not all drugs scale well by body mass. A vast array of complex allometric equations, that compare drug parameters of interest (e.g., half-life, volume of distribution, clearance) to body weight, can be found in the literature; choosing which equation to use can be daunting.

In general, it is important to know the animal physiology and the expected metabolism and excretion routes of the drug when making decisions on scaling a dose between species. It is usually accepted that shared similarities between some domestic animals and marine mammal species are related with their phylogenetic relationship. So, near phylogenetic species could have a similar pharmacological response to same medical treatment. *Artiodactyla* (ruminants and pig) are phylogenetically related with cetaceans and domestic carnivores with pinnipeds; so, dose regimes for dolphins could be similar to those established for ruminants; regimes for sea lions and fur seals similar to those for dogs; and dosage for true seals similar to those for cats.

Drug interactions

At present, little data exists concerning drug interactions in marine mammals, but we must be prepared for the possibility of any drug interaction described in terrestrial animal occurring.

In the present Formulary, you must pay attention to the comments sections, where previously described drug interactions in different species are noted. When new combinations are considered, it is best to administer one drug at a time in an individual animal.