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A CCWHC Technical Bulletin:

Drug Residues in Wild Meat – Addressing A Public Health Concern

Veterinary drugs play a valuable role in wildlife management and research. They are used widely for a variety of reasons, in particular, the capture and restraint of wild animals (Table 1). However, the availability and use of veterinary drugs is threatened if government regulations or the public trust are violated.

Drug residues in wildlife are an important public health concern, especially for those who consume wild meat. Although the likelihood of consuming meat from a wild animal administered drug shortly before death is small, wildlife personnel (conservation officers, park wardens, biologists, veterinarians, etc.) are still confronted from time to time with the question, "Is the meat of a drugged animal safe to eat?" And, because data regarding the safety of drug residues and their rates of clearance from the tissues of wild animals are few, answers can sometimes seem uncertain. As a consequence, credibility may be weakened and the public left wondering.

Table 1. Types of drugs used for wildlife management and research.

Drug Type	**Purpose**	**Examples**
1. For capture, restraint, and reversal		
- anesthetics	To immobilize and restrain	ketamine, tiletamine, carfentanil
- sedatives	To facilitate safer immobilization	xylazine, medetomidine
- tranquilizers	To facilitate safer immobilization	diazepam, zolazepam
- reversal (or antagonist) drugs	To reverse immobilization	yohimbine, tolazoline
2. For disease conditions and injury		
- antibiotics	To prevent or treat bacterial infection	penicillin, oxytetracycline
- antihelminthics	To prevent or treat infection by parasitic worms (cestodes and nematodes)	ivermectin, levamisole
- vaccines	To prevent viral infection	rabies vaccine
- anti-inflammatories	To treat muscle and skeletal injury	ketoprofen
- vitamin E and selenium	To reduce the onset of capture myopathy	Selepherol®

Concern about drug residues extends also to food products derived from domestic livestock. Here, the concern is addressed, in part, by producers waiting for a specified time before slaughter or use of products like milk. This period, called the drug withdrawal time, is established for many drugs and is defined as the interval from when an animal is last given a drug to when it is considered safe for human consumption. The approval of new veterinary drugs, including determination of drug withdrawal times, is an expensive and lengthy process that involves research, development, and validation of new drugs for safety and effectiveness by drug companies, and a comprehensive scientific review of drug information by Health Canada's Veterinary Drug Directorate. For this reason, drug companies are unwilling to invest money and time to determine a drug withdrawal time for a product unless the market

for the drug is big enough to justify the expenditures.

The application of veterinary drugs to wildlife management is a limited market, in many cases too small to justify investment by drug companies. As a consequence, many of the drugs used by wildlife personnel were developed for use in domestic animals or humans, and the application to wildlife is carried out in an "extra-label" manner. Extra-label use is defined as the use of a drug product in a manner that is not consistent with uses indicated on the label (package insert or product monograph) of any drug product approved by Health Canada, or the use of a drug product that has never been approved by a regulatory authority in this country, e.g. Telazol®. Extra-label use is practised by a variety of people, including pharmacists, health technicians, feedlot managers, animal breeders, veterinarians, and wildlife personnel. The basis for extra-label use is reasonable extrapolations from drug safety and efficacy information established for other species, mostly domestic animals or humans.

Wildlife personnel have two options to answering the question, "Is the meat of a drugged wild animal safe to eat?" One is to conduct research into the safety of drug residues and their rates of clearance from the tissues of wild animals. The other is to extrapolate from established information for other species. Drug research with wild animals is limited by many uncontrollable factors, including variability in dosing levels, injection sites, and sampling times, and the small number of animals that can be killed for tissue collections. As a result, years of painstaking research can result in insufficient information to determine a drug withdrawal time. As an example, Telazol® is a veterinary drug that has not been approved for routine use by Health Canada, but nonetheless it is used by many as the drug-of-choice for the immobilization of polar, black, and grizzly bears in Canada. In the early 90's, three years of research was conducted to determine how long drug residues are likely to remain in tissues and fluids of polar bears after immobilization with Telazol®.[1] The investigators concluded that residues were quickly cleared from most tissues, and from these results it would be highly unlikely that a human consuming polar bear meat from an animal killed more than 24 hr after immobilization would experience any effect of the drug. Nevertheless, Health Canada decided that polar bear meat should not be consumed by humans for one year following immobilization, and that this long withdrawal period would remain in effect until more definitive toxicological and residue clearance studies could be conducted to support a shorter withdrawal period.[2] More recently, Health Canada has extended the one-year withdrawal for Telazol® to apply to all species and acquisition of this drug is not possible without first signing and dating the following statement: **"Treated animals must be identified with tags to indicate the date of treatment and they must not be used in food for human consumption for at least one year (12 months) following the latest treatment with this drug."** Clearly, determination of drug withdrawal times based on established information for other species is the more practical option.

Suggested withdrawal times for many of the drugs used in free-ranging wildlife in North America were determined by the Western Wildlife Health Committee of the Western Association of Fish and Wildlife Agencies in the mid-90's, and have since been adopted by many provincial, territorial, and state wildlife agencies (Table 2). Comparison with established times for captive or domestic animals indicates that conservative withdrawal times have been suggested for wildlife to prevent the occurrence of adverse reactions in humans consuming meat containing drug residues.

Table 2. "Suggested" withdrawal times for drugs used in free-ranging wildlife in comparison to "established" withdrawal times for the same drugs when used in captive red deer in New Zealand, and in domestic livestock in North America.

Drug **(Trade Names)**	**Withdrawal Time (days) Following Intramuscular Injection**		
	Free-Ranging Wildlife[A]	**Captive Red Deer[B]**	**Domestic Livestock[C]**
Acepromazine (Aceprom®, Atravet®, Notensil®, Plegicil®, Promace®)	14	na	7
Atipamezole (Antisedan®)	14	na	na
Carfentanil (Wildnil®)	30	7	30
Diazepam (Valium®, Zetran®)	14	na	na
Diprenorphine (M50-50®, Revivon®)	30	na	30
Etorphine (Immobilon®, M99®)	30	na	na
Ivermectin (Acarexx®, Heartgard 30®, Ivomec®)	49	28	49
Ketamine (Anaket®, Ketalean®, Ketaset®, Rogarsetic®, Vetalar®)	3	2	3
Medetomidine (Domitor®, Zalopine®)	14	na	na
Naloxone (Narcan®)	30	na	30
Naltrexone (Trexan®, Trexonil®)	30	na	30
Penicillin (long-acting) (Penlong XL®)	21	na	14
Tolazoline (Priscoline®, Tolazine®)	30	na	na
Xylazine (Anised®, Cervizine®, Cervizine 300®, Rompun®, Sedazine®, Tranquived®)	30	3	3
Yohimbine (Antagonil®, Yobine®)	30	1	7
Zolazepam and Tiletamine (1:1) (Telazol®, Zoletil®)	14	2	365

[A] Withdrawal times as suggested by the Western Wildlife Health Committee of the Western Association of Fish and Wildlife Agencies.
[B] Withdrawal times as established by the Ministry of Agriculture and Fisheries New Zealand.
[C] Withdrawal times as established by either Health Canada's Veterinary Drugs Directorate or the Food Animal Residue Avoidance Databank (FARAD) in the United States.
na – information not available.

Because many of the wild animals administered veterinary drugs are potential food-producing

animals (e.g., deer, elk, bear), it is essential that they are identified clearly by some sort of durable external marker, e.g., ear tag, neck collar. Further, the marker should display a unique number and an appropriate notification warning (e.g., NOTICE: Call "this phone number" prior to consumption) that refers the hunter to the agency responsible for administering the drug. Provided that agencies enforce strict guidelines on recording and cataloguing all drug administration information, wildlife personnel should be able to address with some degree of confidence questions regarding the safety of consuming meat from an animal killed after it was administered veterinary drugs. Animals killed within the drug withdrawal period should be condemned as unfit for consumption, and animals killed outside this range should pose no risk of any adverse drug effect.

References: 1. Semple, H.A. et al. 2000. Pharmacokinetics and tissue residues of Telazol® in free-ranging polar bears. J Wildl Dis 36: 653-662. 2. Calvert W. 1998. Research on polar bears in Canada 1993-1996. Proc 12th Working Meeting of the IUCN/SSC Polar Bear Specialist Group. Occasional Paper of the IUCN/SSC No. 19. pp. 69-91.

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