Drugs for Wildlife Capture

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Jon M. Arnemo, DVM, PhD, Dipl ECZM
Professor & Wildlife Veterinarian
Hedmark University College, Norway & Swedish University of Agricultural Sciences
Drugs

• Alpha-2 adrenoceptor agonists & antagonists
  – Medetomidine, xylazine, romifidine, detomidine
  – Atipamezole
• Dissociative anaesthetics
  – Ketamine, tiletamine
• Opioids
  – Etorphine, carfentanil, thiafentanil
  – Naloxone, naltrexone
• Benzodiazepine agonists & antagonists
  – Diazepam, zolazepam, midazolam
  – Flumazenil, sarmazenil
• ”Tranquilizers” (short and long acting)
• Analgesics (alpha-2’s, opioids, NSAIDs, locals)
• Gas anesthetics
• Euthanizing agents (barbiturates, guns)
Drug names

• Use generic names, NOT Trade Names®!
• E.g.: Tiletamine-zolazepam is known as Telazol®, Zoletil®, and Tilest®
• E.g.: Xylazine is known as Rompun®, Cervizine®, Anased®, Romazine®, Virbazine®, Virbaxyl®, Xyla-Ject®, Tranquived®, Gemini®, Xyla-Zed®, Xylaze®, Bomazine®, Chanazine®, and a number of other trade names
Publications/Written material

• “Chemical immobilization of wolverines with Telazol® from a helicopter” (Golden et al., Wildl Soc Bull 2002; 30: 492-497)

• The animals were darted with Telazol®, but they were immobilized with tiletamine-zolazepam which are the agents acting on the CNS

• ”Chemical immobilization of wolverines with tiletamine-zolazepam....”
Free-ranging vs. Captive animals

- Rule of thumb: 50-100% higher ED
- Stress: >50% higher ED (helicopter/chasing vs. bait/hide)
- Darting: 50% higher ED than hand syringe
- Medetomidine-Ketamine (mg/kg) in Reindeer:
  - Captive hs 0.1 M + 0.5 K
  - Captive dart 0.15 M + 0.75 K
  - Free-ranging helicopter: 0.1-0.2 M + 1.5-3.0 K
FIG. 4.9—Graphic presentation of the quantal dose-response relationship. Both normal and cumulative (integral) forms of the frequency distribution curve are shown.
FIG. 4.10—Quantal log dose-response curves for therapeutic and toxic (lethal) effects of a drug. Each curve represents the cumulative number of animals showing a particular response as the dose of the drug is increased. The margin of safety expresses the ratio of doses that will produce a toxic effect to those that will give a therapeutic effect in a certain percentage of animals treated.
Alpha-2 adrenoceptor agonists

- Detomidine
- Xylazine
- Medetomidine
Alpha-2 adrenoceptor agonists

- Xylazine (20-250 mg/ml): All species
- Detomidine (10 mg/ml): Equidae
- Medetomidine (1-40 mg/ml): All species
- Dexmed. (0.5-20 mg/ml): Little data on wildlife
- Romifididine (10 mg/ml): Little data on wildlife
- Equipotent sedative doses (mg/kg in sheep):
  \[0.05 \text{ Dex} = 0.01 \text{ M} = 0.03 \text{ mg D} = 0.05 \text{ R} = 0.15 \text{ X}\]
- Interspecies variation: 100 x
- Intraspecies variation: 100 x
- Should «never» be used alone in free-ranging wildlife
Mechanism of action – Alpha-2

• Pre- (and post-)synaptic alpha-2 adrenoceptors in central and peripheral nervous system (and elsewhere: postsynaptic smooth muscles, blood platelets, ++)

• Inhibits the release of transmitter substance (noradrenaline = norepinephrine)

• Subtypes of alpha-2: A, B, C, and D (only three types in any given species)

• Medetomidine (optical isomers):
  – 1 mg dexmedet (active component) ~ 2 mg racemic mix (Dexdomitor® vs Domitor®)
Pharmacodynamics – Alpha-2

- Sedation & reduced alertness
- Recumbency at high doses
- ”Ceiling” effect
- Analgesia & anxiolysis (cortisol reduced or increased)
- Bradycardia
- Initial hypertension followed by hypotension
- Emesis in certain species (canids and felids)
- Hypoinsulinemia followed by hyperglycemia
- Reduced gastrointestinal motility
- Respiratory depression
- Thermoregulatory changes
Medetomidine (Zalopine® 10 mg/ml)

- More potent than other alpha-2’s (10-50 x Xylazine)
- More selective (100 x Xylazine)
- Potentiate other CNS drugs to a greater extent
- Available as 20 and 30 mg/ml and as dry powder
Alpha-2 adrenoceptor antagonists

- Atipamezole: **Drug of choice**
- Yohimbine, Tolazoline, Idazoxane: **Not recommended**
- Atipamezole vs. Yohimbine: 100 x more potent; 200 x higher alpha-2:alpha-1 selectivity ratio
- Yohimbine without effect on xylazine in some species (bovids)
Atipamezole (Antisedan® 5 mg/ml)

• Reverses all effects of alpha-2 agonists
• Noradrenaline increase
• Overdosing: Overalertness; exitation
• Dose: 5 [10] mg Atipamezol per mg M [Dex] (raccoon dogs 10:1; cats 3:1; cattle 2:1)
• Administration: Half i.m./half s.c. (i.v. only for emergency situations!)
• Resedation in some species (lack of data in wildlife!): $T_{1/2}$ elimination in reindeer = 75 min for M and 60 min for A (i.v. adm); resedation after 1 hr
• 30-40 min after ketamine; 50 min after tiletamine (to avoid side effects from dissociatives)
Dissociative anesthetics - I
Dissociative anesthetics - II

• Phencyclidine: Banned in USA 1979; not available in Europe; still used in Africa (?)
• Ketamine (10-200 mg/ml, dry powder): All species
• Tiletamine-zolazepam (dry powder): Carnivores
• Potency: 1 mg P = 2-3 mg T = 5 mg K
• Duration of action: T = 3 x K (Half-life: 1.5 vs. 0.5 hrs)
• Should (always) be combined with a sedative (alpha-2 or benzodiazepine)
Mechanism of action - Dissociatives

- Complex; several sites of binding/action
- Inhibits excitatory effects of glutamate and aspartate on NMDA-receptors
- No known antagonist
Pharmacodynamics – Dissociatives

• ”Dissociative” anesthesia (dissociation between thalamus and limbic system)
• Immobilization and general anesthesia
• Good somatic, poor visceral analgesia
• Cataleptic state with open eyes, intact ocular, oral, pharyngeal reflexes
• Muscle rigidity/poor muscle relaxation with spontaneous limb movements
• Rough inductions and recoveries
• Should NOT be used alone in large mammals
Dissociative combinations

• Should be combined with alpha-2 agonists, benzodiazepines and/or opioids (effective doses reduced by 75-90%)

• XK, MK, MTZ, MKTZ, MKE, MKTZ-A3080

• Potentiation of TZ in brown bears: 10 mg TZ/kg vs. 2.5 mg TZ/kg + 0.05 mg M/kg

• Potentiation of K in mink: 50 mg K = 20 mg K + 2 mg X = 5 mg K + 0.1 mg M
Drugs etc

- At least 10 doses for immobilization
- Reversal agent(s)
- [Opioids: Human antagonist]
- Doxapram (Dopram®)
- [Adrenaline, atropine, analgesics – NSAID’s, diazepam, antibiotics]
- Syringes, needles
Dart gun, darts

- Dart gun (tested!) with new CO$_2$ cartridge (40 shots)
- One extra CO$_2$ cartridge, spare breech pin
- Loading equipment
- At least 10 darts & needles (4 per wolf, 2 per moose/bear)
- For remote areas/large projects: Bring an extra dart gun
- Recco® for recovery of lost darts
Monitoring/emergency

- Stethoscope
- Thermometer (plastic cover)
- Eye ointment
- Blindfold, headcover, earplugs
- Pulse oximeter
- Oxygen
- Ambubag and tubes
- Clipper (for IV access)
- Fluids (1-2 l of Ringer®)
- Surgical kit (wound treatment)
- Wolverine Bag®
- Stomach tube/rumen trochar (ruminants)
- [iSTAT, ECG for research]
- Euthanasia (firearm, drugs)
Field equipment (to carry) for wildlife capture & handling
(see lists in Handbook pp. 85, 144, 157)