

## Field Immobilization in Wild Mammals

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Veterinarians are frequently called upon to restrain a wide variety of captive and free range wild animals for various purposes like; i) Marking, sampling and translocation of wild fauna ii) Medical /surgical treatment iii) Seroepidemiological studies of infectious diseases iv) Molecular characterization of wild animals by DNA finger printing. v) Establishment of gene and cell banks vi) Development of assisted reproductive techniques and vii) Other research programme.

Field immobilization of wild animals contains elements of risk to personnel and to the animals. In order to minimize the risk and maximize the chances of success, it is important to keep in mind following considerations:

1. The personnel should have sound knowledge of animal behaviour and physiology.
2. There should be a real and justifiable purpose of capture.
3. Animals below 12-15 kg should be captured with physical means.
4. The technique should be safe and less traumatic.
5. The personnel should know the functioning and limitations of immobilizing drugs and delivery equipment.
6. Other factors such as disease, infection, estrus, pregnancy and lactation adversely affect the immobilization process.

### Drug Delivery Equipment

The equipment, used for administration of the drug to a site that allows absorption, should have following qualities:

- It should be safe to operator, easy to clean and repair.
- It should be fast to use and not affected by temperature, humidity and altitude.
- It should be trouble free reliable performance.
- It should have consistent dart accuracy at desired distance.
- It should have minimal impact trauma, tissue damage.
- It should have versatile use in different species.

Following equipment are used for administration of the drug in wild animals:

**Hand-held syringe:** Intramuscular injections can be given very quickly with the syringe held in the hand when the animal is sufficiently restrained. Disposable syringes and large gauge needles with **Luer- Lok** connection are desirable. In caged animals the drug is injected quickly when the animal presents a suitable muscular area near the side of the cage.

**Pole syringe:** It is a hypodermic syringe contained at the end of extension pole. They are used in animals not restrained but contained in a trap, snare, or cage etc. or passing through a narrow passage. A quick jab is necessary to effect administration of drug and the operator must maintain pressure against the animal until the entire drug has been injected. If the animal jumps away before all the drug is injected, a second injection is necessary. Sharp large-bore needles should be used for drug injection

### Blow gun:

By blowing into a 1-2 meter long pipe a trained operator can blow a small dart up to 10-15 meter. It is silent and uncomplicated, causes minimal impact trauma and can be suitable for immobilization of small animals. But practice is required for its accuracy. The leaky darts can be hazardous to the operator. Blow guns can be purchased commercially or designed using aluminum, copper, and stainless steel, plastic or other types of tubing of appropriate diameter. The discharge mechanism in most blow gun darts is compressed air or butane gas.

### Power projection system:

They are in the form of pistol or rifle. The short range projector (pistol) is a modified pellet gun powered by compressed CO<sub>2</sub> having 15m of range. The long projector (rifle) is also powered by compressed CO<sub>2</sub> and its range is 35m. The extra long range projector is powered by percussion caps. The strength of the caps used varies according to the distance from the target. The maximum range is 80m.

### Drug delivery darts:

Darts that are used in these systems come in a variety of types, sizes, and weights. Upon impact the drug is expelled through the needle, the plunger is pushed forward by explosive, air activated or spring activated detonating mechanism.

*Dart with explosive discharge mechanism:* It consist of aluminum or plastic body into which a small explosive cap is placed between plunger and the tail. Upon impact, a firing pin inside the cap is forced forward, against the resistance of a spring, detonating the charge. The expanding gas pushes the plunger forward and the drug is expelled through the needle. The speed of injection is 0.001 second thus may cause tissue damage.

*Dart with air activated discharge mechanism:* It consists of a aluminum or plastic body into which air is introduced through a one way valve in the tail place and compressed against the plunger. At impact a silicone seal is displaced, exposing a part in the side of needle. The plunger is pushed forward by air pressure.

*Dart with spring activated discharge mechanism:* It contains a coil spring behind plunger. After the drug is loaded into the front of the dart, a rubber seal is placed over the needle tip. The tail piece with coil spring is then screwed into the dart compressing the spring behind the plunger. Upon impact the needle penetrates the rubber seal and coil spring pushes the plunger forward expelling the drug.

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### Drugs used

A variety of drugs have been used to chemically restrain and immobilize the zoo and wild animals. The requirements of an ideal drug for the purpose are:

1. High therapeutic index to compensate weight estimation errors
2. High concentration to permit one-dart application
3. Long stability at room temperature
4. High compatibility with other drugs
5. Rapid induction time
6. Good sedative, analgesic and muscle relaxant properties
7. Minimal local or systemic side effects
8. Safe intramuscular application for remote delivery
9. Must have an antagonist

A single ideal drug has not yet been found. However, certain drugs meet many of the needs for individual species. A combination of compatible and complementary drugs may constitute the safest and most effective method to meet the ideal requirements for anesthesia for selected species.

Historically, paralyzing compounds including neuromuscular blockers were used but due to their narrow therapeutic index and other side effects on animals, today centrally acting compounds are favoured and available for a large variety of animal species. Centrally acting compounds used to chemically restrain and immobilize the zoo and wild animals mainly include **opioids** viz. Etorphine HCl (Antidote: Diprenorphine, Naloxone), Fentanyl citrate and Carfentanil citrate (Antidote: Naloxone), **Cyclohexamines** viz. Ketamine HCl (Antidote: No known antagonist, however, yohimbine is used as antidote), Tiletamine HCl and Tiletamine HCl - Zolazepam HCl combination commonly known as Telazol (Antidote : No antidote for tiletamine HCl, however, flumazenil is antagonist of Zolazepam), **Alpha<sup>2</sup> Adrenergic Agonists** viz. xylazine, detomidine and medetomidine or a combination of ketamine and xylazine and **Neuroleptics** viz. phenothiazine derivatives, the butyrophenones, and the benzodiazepines.

### Considerations for darting the animal

**Darts Preparation:** It is always advisable to use smallest darts with the highest available drug concentration because smaller darts have best ballistic properties, are least affected by wind and have less impact damage to the animal. The darts must be preloaded with drug for specific sizes/age group and proper marking be done on them to avoid mistakes while darting. If the dart is not completely filled with the drug, saline or sterile water may be added to drug to fill the dart. A barbed needle is preferred over plain needle to ensure full delivery of the drug at injection site. A barbed needle of 25 to 35 mm is sufficient for most of the species.

**Darting Technique:** For darting, the animal is brought within a practical darting distance by stalking, crawling or using hidden terrain or live bait or carcass. The animal may be guided or driven towards a shooting blind by workers or putting barriers. Darting may be done at feeding stations, water holes or at identified paths. Darting may be done from a vehicle, from back of horses or elephants or from air craft.

### Precautions at darting

- Only the muscle masses of shoulder, neck, rump and upper hind leg must be used as injection sites
- Keep the actual chase time as short as possible to avoid capture myopathy.
- Prevent the animal from entering water, dense growth or hazardous terrain.
- Have a conventional fire arms "back up" escort
- Even timid animal may attack in defense of young and during mating seasons
- The peculiarities of each species should be kept in mind
- Male deer of all species become aggressive in rut
- Avoid darting an elephant in a cow-calf group
- African lions are opportunistic predators and can be dangerous if some members of a pride are left
- Aquatic mammals such as polar bears and hippopotamus seek water after darting and may drown

### Post darting handling

- Avoid loud noises or talking while approaching the animal
- Additional half dose of drug may be injected, if needed
- Reverse immobilization if animal has gone down in a difficult terrain
- Excise the barbed darts surgically and dress the wound
- Establish patent airway by pulling tongue forward and cleaning the mouth (Doxapram HCl/antidotes in case of respiratory depression)
- Record all vital signs of the animal throughout the period of immobilization
- Apply a bland eye ointments and cover the eyes of the animal
- Protect the animal from inclement weather and extreme temperatures
- Ruminants must be kept in sternal recumbency with legs flexed and head lifted, however if the weight of the recumbent animal of large species is on the legs, their weight should be shifted every 30m to prevent damage to the muscles and tendons.
- Other species may be kept in lateral recumbency, but must be turned ventrally every 30 min till recovery.

### Field Emergencies

During the process of immobilization and capture physical trauma, hyperthermia, hypothermia, bloat, shock and capture myopathy may occur. These conditions may be preventive and must be managed. Capture myopathy is a life threatening syndrome that occurs as a result of sympathetic exhaustion from sustained stress, combined with intense muscular exertion. High levels of lactic acid in muscle fibers lead to the destruction of skeletal and cardiac muscle destruction, myocardial necrosis and heart failure release of myoglobin into blood causes kidney failure. The death may occur within 3-4 hrs to 3-4 weeks period depending on the severity of the syndrome. Capture myopathy can be prevented by reducing capture stress, fear and exertion. The animal should not be chased for more than 2m, prior to darting. If an animal can not be darted with this time the procedure should be discontinued for 24 hrs to prevent capture myopathy.