

Operational Guide

Chemical Capture



AMERICAN HUMANE

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Bill Brothers graduated from Cornell University, where he studied wildlife conservation and animal science. After teaching for several years, he managed several humane and animal control agencies. In 1985, he founded Animal Care Equipment & Services (ACES) to provide equipment, training, and other services to professionals who work with animals. In 1990, the Humane Society of the United States asked Bill to create a humanely-oriented course of instruction in chemical immobilization. Thousands of students have completed ACES' chemical capture certification training, and it continues to be highly acclaimed and in demand.

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Purpose

The purpose of this guide is to explain what chemical capture is and to give animal care and control professionals the basic knowledge to perform it as humanely and as efficiently as possible. This guide serves as a basic overview and does not replace hands-on training and certification. Due to the complexity of the drugs use, equipment usage and maintenance, the American Humane Association recommends those involved in chemical capture successfully complete at least an eight-hour certification class. (See training appendix for more details.)

Information provided refers only to terrestrial, warm-blooded mammals. Refer to an avian or reptile expert with chemical capture experience for consideration of its use on birds, reptiles, and other similar exotic and wild animals.

Introduction

There has been a dramatic evolution of both equipment and drugs in just the past few years. Equipment common just a short time ago is no longer considered appropriate or humane. The drugs have undergone a similar transformation.

This guide provides the latest information plus drug and equipment options so that your agency can make informed decisions about what will work best for your needs. No single type of equipment is best for all purposes, but some systems are more appropriate for certain types of work than others.

Remember, this is only the beginning. You must continually monitor updates in the field of chemical capture and work closely with your veterinarian for drug options, licensing requirements, and similar modifications.

What is Chemical Capture?

Chemical capture typically involves the use of anesthetic drugs to immobilize an animal for the purpose of capturing it. Chemical capture is most commonly accomplished by projection delivery of a dart containing an anesthetizing drug from a remote delivery system (i.e. rifle, pistol, blowpipe, or pole syringe).

Animal/wildlife control and welfare professionals, as well as zoo and wildlife workers, face many challenges in capturing stray and/or fractious canines, wildlife, livestock, and other animals that elude confinement by traditional trap and restraint methods. Running at large, these animals create public safety issues that include:

- Potentially fatal attacks on humans and other animals
- Threats to the animal's own well-being, if injured, sick, or in a dangerous location
- Risk of the spread of communicable diseases such as rabies and other vector-related zoonoses

Chemical capture is used as a last resort, and technical training is crucial for employee safety, animal safety, and public safety.

Chemical capture is commonly thought of as “tranquilizing” an animal, but this is a misnomer. In reality, it involves anesthetizing an animal under the most difficult of circumstances — without knowing the exact weight of the animal, without benefit of a pre-anesthesia veterinary exam, and without post-anesthesia supportive therapies readily at hand.

Therefore, undertake chemical capture:

- Only as a last resort, after alternative capture techniques has been exhausted
- Only by trained individuals
- Only with appropriate equipment and drugs

History

Various indigenous people on several different continents have employed chemical capture for thousands of years, using blowpipes made from native plants and darts made from wood dipped in naturally-occurring paralytic-type drugs.

A more technological approach traces back about 50 years ago with the development of darts that contained liquid immobilizing agents, which were injected into the animal through a hollow needle on the front of the dart. The delivery systems went to a modified shotgun-style gun. And, while the early immobilizing drugs were also paralytics, evolution moved toward safer, more humane anesthetic drugs. Those of us in the field expect the fairly dramatic and recent progress of both the drugs and the delivery equipment to continue.

Choosing Chemical Capture

When is Chemical Capture Appropriate?

Certainly, chemical capture can be an important tool for animals that are a danger to humans or other animals, are in danger themselves, or must be caught for other reasons. Once again, ALWAYS consider chemical capture as a last resort, only when other means have been exhausted or would not be appropriate.

Only trained individuals who are comfortable and knowledgeable about the appropriate procedure and drugs for the target animal should use the dangerous chemical capture drugs and equipment.

For safety's sake, always assure the following before undertaking chemical capture:

- Remove members of the public from the danger zone
- Develop a plan to either contain or reliably follow the animal after darting
- Find a solution that does not put the animal into an unnecessarily dangerous situation
- Bring other professionals with you during a darting (It is unsafe and unwise to attempt a darting alone.)

When is Chemical Capture Not Appropriate?

Because of its inherent dangers and complexities, chemical capture should not be used except when absolutely necessary, when the capture is important, and when alternatives have been considered or tried.

Consider certain environmental factors prior to using chemical capture:

Never use chemical capture near uncontrollable risks such as traffic on roadways, bodies of water, or cliffs. Once the chemical enters the animal's system, they quickly lose their ability to assess danger from these risks and may stumble into harm's way.

Never perform remote chemical capture on an animal weighing less than 25 pounds using equipment that does not allow a high degree of control over the dart's muzzle velocity. In general, the smaller and more delicate the target animal is, the riskier chemical capture becomes — especially when using gun-delivered darts.

Never allow unskilled or untrained personnel to perform chemical capture. What looks simple on television is actually a complex procedure requiring a high level of understanding to do humanely, safely, and correctly.

Don't believe the misperception that field sedation of an animal is a simple procedure that rarely results in problems. That is not true.

The person responsible for darting MUST determine if it is the most appropriate method of capture or if capture is indicated at all. If you are not comfortable with all aspects of the scenario, DO NOT do it. Either suggest alternative plans, or resolve all weak aspects of the chemical capture plan.

Safety is paramount — not only yours personal but also that of your colleagues, the public, and the animal. If you cannot assure a safe event for all concerned, do not proceed.

Never attempt chemical capture alone. Have at least one other person present to

help in case of accidental injury or drug exposure, to monitor dart flight path, and to follow the animal if it runs away. Adequately train and brief additional, support personnel on their responsibilities prior to commencing the capture. Do not use non-professionals (members of the public) under any circumstances.

The Effect on the Animal

Darted animals experience some degree of stress and trauma. Your responsibility is to keep it to an absolute minimum. A stressed or traumatized animal is far more difficult to capture and far more likely to suffer injury or death (See Capture-Related Emergencies).

The following formula shows what factors determine what the animal experiences upon dart impact:

$$IE = M \times V$$

Where:

- IE stands for Impact Energy (how hard the dart hits the animal)
- M stands for Mass (weight of the dart)
- V stands for Velocity (how fast the dart is moving upon impact)

To optimize your potential for a successful and trouble-free capture, you want to minimize the Impact Energy because the higher the Impact Energy, the greater the trauma and the stress to the animal. The lower the Impact Energy, the less likely it will be for the animal to get an “adrenaline rush” — delaying the onset of anesthesia and increasing the likelihood the animal will attempt to flee.

The goal is to have the dart impact be as non-traumatic as possible. This makes the animal more likely to remain in place so that the drugs work as quickly as possible.

This formula tells us two things, then; we want the dart to be as light in weight as possible, and we want it to be traveling at as slow a speed as possible.

Two factors determine the weight of the dart: the weight of the empty dart plus the amount of drug put into it.

When choosing a chemical capture system, look at the unloaded weight of the darts. Darts made entirely of metal can be two-to-three times heavier than darts made of plastic. Never use heavier darts on smaller animals such as dogs.

In selecting anesthetic drugs, choose the most concentrated versions available. (In xylazine, for example, use the 100 mg/ml strength and not the 20 mg/ml strength. In Telazol, consider mixing in half as much water to double the concentration.) Less concentrated drugs simply increase the amount of water, which increases the weight of the dart without providing any benefit.

The projector (gun) controls dart velocity. Some projectors provide very crude control over the dart velocity. Projectors powered by CO2 and featuring a gauge that tells you the exact pressure behind each dart give the best control. Whatever system is used, practice repeatedly to develop a high level of accuracy over the dart velocity.

While you want the dart moving as slowly as possible when it hits the animal, it must be traveling fast enough to penetrate into the muscle and inject. Some factors that determine desired velocity include:

- Thickness of the animal's coat and hide
- Its muscle density
- Its size and delicacy

- Weight of the loaded dart
- Your distance from the animal
- Wind velocity and direction

Remember, it is your job to reduce trauma to the animal to the bare minimum. This will make a huge difference in the success of your capture effort.

Recordkeeping/Reports

All animal control agencies should have a written policy and procedure manual regarding the use of chemical capture equipment and drugs. These crucial written guidelines need to establish a standard for “qualifying” after the worker has gone through the initial certification training. Qualifying ensures that the staff continues to hone skills, update knowledge, and complete inventory and maintenance on equipment and drugs.

Drug guidelines and protocols should strictly adhere to OSHA regulations and Material Safety Data (MSDS) instructions. This includes a full accounting and accurate records for the drugs used in chemical capture. Failure to do so can result in severe penalties and revocation of the holder’s DEA license.

Also, establish written guidelines for handling public relations and media in chemical capture situations. When all goes well with chemical capture, you may be lauded as heroes. However, if something goes wrong, it helps to have a prepared media kit with important information about your agency and the facts about chemical capture to share with the media and the public.

Complete an immobilization report form every time you use chemical capture. This form covers all aspects of the capture. Give a copy to the veterinary staff responsible for overseeing the animal during its recovery, so they know what drugs were given and when. Another copy often goes to a supervisor, so he can review all aspects of a case. Keep a copy for yourself and use it as a learning tool, especially on the acquired skill of weight estimation.

Use the sample Immobilization Report Form presented at the end of this guide as is if it suits your needs, or modify it as needed. You may also want to supplement your report with a narrative, as appropriate.

Training

Chemical capture is an inherently complex process with a number of dangers for both humans and animals.

The training is the first step to successfully complete a certification course. After certification, you must also continue your training to keep your skill levels high. Since there is some risk of lawsuit if an animal dies or a person is injured, maintain careful documentation of any and all training. The American Humane Association recommends that agencies using chemical capture establish a written training and qualifying protocol that requires a careful “paper trail” of compliance in case that agency faces a lawsuit.

In addition, keep all chemical capture equipment or drugs locked and inaccessible to anyone who is not fully qualified to handle them.

Preparing for Chemical Capture

Personal Safety

Your overriding concern should be your own safety and the safety of your colleagues. If an accident injures you or an assistant, the focus must immediately shift, and the capture event put on hold.

Risks to yourself and assisting personnel come from a variety of sources. One of the most serious is unintended drug exposure such as accidental injection or squirting onto the skin or into the eyes or mouth. Therefore, always wear protective gear such as surgical gloves and eye covering. Carry extra water to flush exposed areas, and carry loaded darts in such a way to minimize human exposure hazards.

Observe firearms safety protocols at all times. Always keep gun-type projectors in an un-fireable condition until you are actually ready to dart the animal. Never point a projector at any other person or in any direction where accidental discharge could injure someone.

Train persons performing chemical capture and those assisting them in first aid and CPR. Everyone involved should be prepared to apply these skills in the field quickly, if the need arises.

Public Safety

Always keep members of the public out of any danger zones surrounding a chemical capture event because there is significant risk of a bystander being struck by an errant dart that misses an animal. Ask for police presence any time members of the public might enter a danger zone. Be clear with the police about what areas you need secured before proceeding.

After chemical capture, sweep the area and remove all darts and equipment from the field. That includes locating any lost darts that should never be left where an accidental drug exposure could occur.

Keep all equipment and drugs secure in your facility and in the field, with no possibility that any unauthorized person could gain access to them. Keep drugs in a securely locked drug safe. Keep all darting equipment in a locked vehicle, when in the field.

Another public risk comes after an animal is darted and while waiting for the drugs to take effect. An animal may panic and try to escape with little regard for people in his way. As the drugs take effect, an animal may feel increasingly desperate. A vicious animal may become more so.

Animal Safety

Before proceeding with a chemical capture event, assess any environmental threats to the animal such as traffic, bodies of water, or high areas from which an animal could fall.

Determine whether you can increase containment of the animal to reduce its risk of running away. It not only takes longer for drugs to take affect in a running animal, but it can also be very difficult to track and locate him.

Take all steps possible to protect the welfare of the animal you are trying to capture. This includes minimizing pre- and post-capture stress (See Capture-Related Emergencies.)

Considerations/Commandments

Follow these “commandments” during any chemical immobilization:

Use the most humane capture technique for the most effective capture. Our objective is to take possession of the animal while inflicting the least amount of injury, pain, or stress.

Authorize only trained and responsible personnel to perform chemical capture.

Establish clear, written guidelines.

Keep equipment and drugs locked when not in use. (Only a few, trained individuals should have access.)

Use the lightest dart available to you.

Use the most concentrated form of the drug available.

Handle all drugs with extreme caution.

Use the lowest velocity setting suitable for your conditions.

Use the safest and most humane drugs and equipment available.

Have contingency plans for everything you do.

- What if you miss the target animal?
- What if it is not fully immobilized?
- What if the animal dies after being immobilized?

Completely secure your scene before proceeding.

- Remove all bystanders in any danger zone.
- Block animal escape routes.
- Have all support equipment and personnel ready.
- Have police at the scene to do crowd control.

Transfer a darted animal to veterinary care immediately.

Recover and remove all equipment, darts, and drugs from the scene following capture.

Fill out a complete immobilization report form.

Slightly “overdose” an animal rather than underdose it.

Wait 30 minutes before re-darting an animal that is not fully immobilized.

Be skilled in first aid and CPR.

Practice, practice, practice!

Executing Chemical Capture

Setting up the Capture

Prior to embarking on a chemical capture event, check your gear to make certain it is complete, well-organized, and functioning properly. (Do this on a regular basis.)

As you approach the capture scene, survey all aspects of the physical environment to minimize dangers and maximize capture success. Evaluate possible alternative capture techniques. Determine whether you can eliminate — or at least reduce — the possibility an animal can escape.

Determine the number of support personnel needed, including whether you need police to control nearby members of the public.

Prior to calculating the amount of drug to use, accurately estimate the weight of the animal. While studying the animal for its weight, evaluate its physical and mental conditions. For example, is it emaciated or sound? Is it displaying fear, aggression, or non-threatening behavior? These help you determine whether to go a little higher or a little lower on the amount of drug used.

Determine if you can get within an appropriate darting zone. You must be close enough to the animal to accurately dart it in an appropriate muscle mass. This may mean getting within the animal's "flight distance" by using blinds or barriers such as vehicle, foliage, or buildings.

Prepare darts before approaching the animal. After loading your primary dart and a backup dart (in case you miss), secure your unused equipment and drugs.

As you approach the animal, position yourself for a clear shot at the hindquarters. Often an animal will face you, which is an impossible shot. You may need a "distractor" — someone who can get the animal's attention and guide it to stand at an approximate 90-degree angle to the shooter.

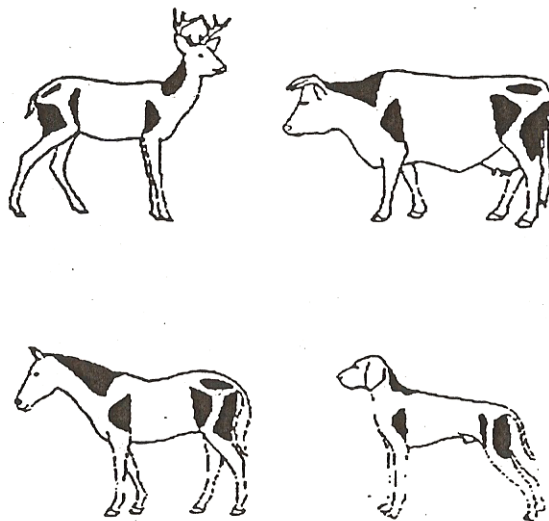


Figure 1. Hindquarters of sample animals for darting

When your target is clear and well-positioned, determine your distance from the animal and set your muzzle velocity adjustment to cause as little impact energy as possible yet still effect the injection. Slowly and calmly pull the trigger while steadily aiming. After the dart is discharged, stay still and calm and assess your success. Do nothing to cause the animal to bolt. In fact, all personnel should remain calm and in place until the animal succumbs to the effects of the drug.

Remember that no drug acts instantaneously, or even very quickly. Normally, it takes at least two to three minutes for an adequate amount of the drug to be carried by the bloodstream to the animal's brain to overwhelm it. If the

animal is stressed or threatened, it could take well over 20 minutes. How quickly induction happens is largely determined by your approach.

When the animal appears immobilized, slowly and calmly approach it from behind. Make no sudden movements or sounds. Gently and safely assess if it is immobilized. Apply restraint gear if appropriate (e.g., hobbles to larger animals, muzzle to dangerous dogs).

For most animal care and control captures, place the animal under veterinary care as quickly as possible, either by immediate transport to an appropriate facility or by on-scene veterinary personnel.

Begin immediate monitoring of TPR — temperature, pulse, and respiration — and keep a chart to show ongoing trends in these vital signs.

If an animal is not immobilized in a reasonable amount of time, determine if any of a number of things went wrong. Did the dart malfunction? Could your drugs be past their expiration date? Did the dart miss a muscle mass? Or, did you miss the animal entirely?

After waiting 30 minutes, assess the animal and decide if another darting is appropriate. Not waiting 30 minutes could lead to an unnecessary, and dangerous, overdose.

Capture-Related Emergencies

Chemical immobilization and capture has a number of inherent risks that can become emergencies to the animal is not properly managed. It is the operator's responsibility to be aware of these and to take all possible steps to eliminate them or to deal with them if they occur.

Physical Injury

Physical injury can occur at three major points in the immobilization process: events leading up to the darting, the dart impact, and immediately after dart impact (especially if the animal attempts to flee). Injuries can include tissue damage, lacerations, and fractures. Be prepared to administer first aid.

Hyperthermia

Increased body temperature is a common and dangerous post-darting complication caused by increased stress and decreased thermal regulation capability due to the effect of the anesthetic drugs. Assess body temperature and take immediate steps to control it, if there is a problem. Spraying the animal with cool water can be effective. It is best to avoid hyperthermia by not stressing or chasing an animal prior to darting.

Hypothermia

A decrease in body temperature is also dangerous and usually occurs in cold or wet conditions — especially if an animal runs away and isn't immediately found. Warm the animal as quickly as possible.

Capture Stress Myopathy

Animals that are stressed just prior to and during capture can quickly die after the drugs take effect as a result of a decreased ability of the animal to deal with biochemical changes occurring within its body. It is imperative not to dart an animal during or immediately after stressful activity. With capture stress myopathy, veterinary staff must begin immediate supportive therapy.

Respiratory Stress

Certain anesthetic drugs can compromise respiratory activity as can excessive restraint post-capture or inappropriate

positioning of the animal (especially in ruminants) to permit free breathing. Look for rapid, shallow breathing. Alleviate the cause, if possible. Be prepared to do mouth-to-nose resuscitation.

Bloat

An inability of abdominal gases to escape can lead to this potentially lethal condition. It is most common in ruminants that are not correctly positioned post-capture. Keep all ruminants in sternal recumbancy post-capture. Bloat can lead to compromised respiration and death.

Circulatory Failure

This most dangerous of all emergencies must be reversed in two to four minutes through CPR, or the animal will expire.

These emergencies demonstrate the importance of immediate veterinary monitoring and assistance as quickly post-capture as possible. The belief that animals are “just tranquilized” is inaccurate and dangerous. Provide veterinary care to all chemically immobilized animals. Failure to do so represents dereliction of responsibility to that animal.

Post-Capture Care

As soon as you judge complete anesthesia has occurred, the immobilizing team can carefully approach the animal. Cause no unnecessary or loud noises, and approach slowly and calmly. Covering the animal’s head and eyes with a towel or similar cloth is also recommended to help keep it calm.

Remember, that all precautions are made for worker safety!

Immediately check that the animal’s airway is open and free from obstruction from vomit. Be certain the animal is breathing. Ruminants should be placed in sternal recumbancy (on the chest) with the head lifted until recovery to avoid breathing and suffocation problems.

Veterinary staff should oversee the recovery process. If they are not on-scene, transport the animal without delay to a veterinary facility. If this is not possible, give the animal a physical to check for general good health and for any injuries that may have resulted during the immobilization. Barbed dart needles require surgical removal to avoid unnecessary tissue damage.

Check the animal’s vital signs — temperature, pulse, and respiration (TPR) — every few minutes. The team must be prepared to take immediate corrective action if any signs get out of the normal range. Maintain a chart showing each vital sign to make it easier to spot trends.

Recovery from chemical immobilization is truly a veterinary procedure requiring medical skills as well as possible specialized equipment and specific medications. Do not undertake chemical immobilization if these cannot be provided.

Pharmacology

Drug Classes

There are five categories of drugs associated with chemical capture.

Tranquilizers

This class of drugs tends to be associated with chemical capture though tranquilizers are not effective immobilizing drugs. They may be used in certain “cocktails” to take the edge off dissociative-type anesthetics, but tranquilizers, such as acepromazine or valium, do not in themselves cause immobilization and can be unpredictable in their effect on the animal.

Paralytics

Paralytic drugs, such as succinylcholine, are excellent immobilizing drugs but they should no longer be used in chemical capture. They have narrow safety margins, and they impart no calming, analgesic, or anesthetic effect. Slight overdoses can cause the animal to suffocate to death while being fully conscious and able to feel pain.

Narcotics

This class of drugs, which includes M99 and carfentanil, features excellent properties for field immobilization. Because of DEA restrictions on its availability and use, however, it is not available to animal care and control personnel. It will be found mainly in zoo or wildlife uses. The various narcotic drugs are very potent, fast-acting, and have antagonists for quick reversal. They also are very dangerous to humans through accidental exposure or abuse.

Sedatives

This class of anesthetics is very useful in chemical immobilization by animal care and control personnel, especially when

combined in a cocktail with a dissociative anesthetic. Xylazine (Rompun) and medetomidine (Domitor) are commonly available drugs from this class. Sedatives act on the central nervous system and produce a sedating effect and, in higher doses, an anesthetic effect. They are also muscle relaxants and strong analgesics. They are most effective on domestic animals but are less reliably effective on feral, wild, or very excited animals. They tend to be fairly long-lasting in their effect on the animal, so recovery can be prolonged, but they have antagonist drugs (reversing agents) that can bring the animal out of anesthesia very quickly. These sedatives are dose-dependent — the more you give, the more profoundly the animal is affected.

Dissociatives

The dissociative anesthetics – represented by ketamine and tiletamine (in Telazol) – are also dose-dependent and offer profound immobilization at recommended doses. Combining dissociatives with sedatives potentiates both drugs and gives a smoother, more-reliable induction and recovery. Ketamine is often combined with xylazine in a 5:1 ratio (5 parts ketamine 100 mg/ml with one part xylazine 100 mg/ml) for carnivorous (dogs, cats, etc) animals or 10:1 for ruminants since the latter are more sensitive to xylazine. Ketamine is metabolized more rapidly than the xylazine, so the sometimes-stormy recovery seen with ketamine is eliminated by the effect of the xylazine. Tiletamine is combined with a strong tranquilizer to create the highly effective capture drug Telazol. The dissociatives do not have antagonists.

Drugs of Choice

The American Humane Association recommends that any practitioner of chemical capture consult with a veterinarian to help determine which drugs would be best for a particular need. Your veterinarian can also help determine dosages for your target species. Each species has different sensitivities to the various drugs and, therefore, will have different recommended dosages.

Once you have selected the best immobilizing drugs for your needs, work with your veterinarian to create a chart for each species on which you intend to use your drugs. For dogs, for example, you might graduate your chart in ten pound increments, and for larger animals you may choose larger increments. Each species must have its own column, each drug its own chart.

The drugs currently recommended for animal care and control agencies and most others seeking to capture both domestic and wildlife species are xylazine, ketamine, and Telazol.

Telazol is increasingly being seen as a drug of choice because of its smooth and rapid induction period, reliable immobilization, and smooth recovery. Several characteristics of Telazol — such as short shelf life, cost, no antagonist, and larger dose volumes — may limit its choice by some users. Dose volumes can be reduced by adding half as much water

when reconstituting Telazol (which comes in powdered form in a bottle and is reconstituted by adding water), thereby doubling the concentration and halving the volume required without reducing the amount of drug given.

Some protocols call for ketamine and xylazine to be combined into a cocktail that improves the results of both drugs. While ketamine is the dominant drug, the addition of xylazine makes for a smoother induction, immobilization, and recovery. For carnivorous animals, such as dogs, a 5:1 mixture of ketamine (100 mg/ml) and xylazine (100 mg/ml) is recommended. Simply put 2 ml of xylazine in a 10 ml bottle of ketamine to achieve this cocktail called Capturall-5 (be sure to re-label your bottle to indicate the mixture). This combination should remain stable for six months or longer. A recommended field dosage of Capturall-5 is 6 mg/kg, but always consult your veterinarian on drug dosages.

Ketamine does not have an antagonist, but xylazine does (yohimbine). Ketamine is more quickly metabolized out of the body. If the recovery technicians feel reversal is recommended, ideally wait until the ketamine is substantially metabolized (usually 30 to 40 minutes).

The complexities of drug dosages require close consultation with a veterinarian experienced in immobilization.

Equipment

Types of Drug Delivery Equipment

The equipment used to deliver immobilization drugs to a target animal can vary anywhere from a hand-held syringe to a long-range rifle. Always select the least traumatic delivery system suitable for your conditions.

Hand-Held Syringe

Not commonly thought of in chemical capture situations, a hand-held syringe can be simple, gentle, and effective where an animal is confined in a trap or in a kennel-run. Use a hand-held syringe to inject directly into a muscle or to squirt the drug into the animal's mouth.

Pole Syringes

Essentially nothing more than a hand-held syringe with an extension to allow use over a longer distance (typically up to 10 feet) to inject the drugs intramuscularly, pole syringes come in a variety of designs. The basic design is just a “push-type” where you push the needle into the animal and when the hub of the needle hits the animal, the plunger moves forward to inject the drug. This can be painful to the animal and has a risk of the needle bending at the hub where it is likely to break off. If you use the push-type pole syringe, also use a “syringe guard” such as comes on the Zoolu Pole Syringe, which solves these problems. Another pole syringe design features a spring-loaded plunger that does not require you to push against the animal to effect the injection but simply to push on the plunger, which is much gentler. Yet another category of pole syringe is the “automatic injection” type, which can be either gas (butane) activated or spring-loaded. The spring-loaded type tends to be a little too

aggressive for animals under 200 pounds, but the gas-activated units are gentle.

Blowpipes

Harking back to age-old designs, updated blowpipes are often-overlooked as tools for delivering drug-carrying darts over relatively short distances (up to about 10 meters or 30 feet). With practice, you can develop good accuracy, and the impact is always gentle. While you can make your own blowpipe, a number of commercially made designs are well worth the modest investment.

Gun-Type Projectors

Made originally from modified shotguns, gun-type projectors now come in a wide variety of styles and functions. Some don't look like guns at all. More high-powered and long-range versions feature powder-charged propulsion for the darts in the form of .22 blank cartridges. Different strengths or “colors” of the cartridges adjust and determine muzzle velocity. Most systems in use by animal care and control agencies offer CO₂ or air propulsion for the dart. The most useful of these feature a pressure gauge so that you can determine the exact dart muzzle velocity for more accurate and gentle dart impact. Those without a gauge involve more guesswork on the impact energy of the dart as it hits the animal.

Darts/Needles

In North America, there are essentially two different dart diameters used — 11mm and 13mm. The two sizes are not interchangeable, but usually you can use different darts with the same diameter interchangeably.

Darts are made up of three distinct parts: the needle, the dart body, and the tailpiece. The needle can be either an “end-eject”

style where the liquid drug comes out the end of the needle (and which require some type of retaining device — such as a barb or collar — to hold the dart to the animal during injection) or “side-ported” (which do not tend to push out of the animal during injection and, therefore, do not require a retaining device).

The dart body is composed of two distinct parts — a chamber for holding the liquid drug (at the front of the dart) and some type of injection mechanism toward the rear of the dart. The two parts are separated by a moveable plunger which pushes the drug out through the needle into the animal. The injection mechanism can be either powder-charged or air- or gas-charged. The powder-charged type come either factory loaded for one-time use (Pneudart) or reusable and empty so that you insert the charge as you load the dart (Palmer Cap-Chur).

With the air or gas charged darts, you put either compressed air or butane into the darts after you have loaded the drug. When the needle enters the animal, a silicon sleeve covering the needle hole slides back to the hub of the needle, and the compressed air or gas moves the plunger forward to effect the injection.

Tailpieces are usually of a “wooly-ball” type or flat-disc type, both of which provide just enough drag at the tail end of the dart to keep the dart from tumbling. For long-distance shots, a number of available tailpieces impart a spin to the dart.

Choosing What’s Best for You

If you are new to chemical capture and are considering adding this technique to your arsenal of capture choices, the American Humane Association strongly recommends that you attend a certificated training course prior to purchasing equipment. During the course, instructors will explain the various equipment options, and you will have ample opportunity to use different systems to help you determine which would be most appropriate for your needs and budget. There are huge differences between the various systems, and there is no way to adequately appreciate these without handling them and seeing them demonstrated.

If you are a practitioner of chemical capture but have not kept up with newly available technology, take time well spent to also attend a certification course as a refresher and as a way of learning about recent advancements in the field. Both the equipment and the drugs have changed dramatically and will continue to do so.

If you are unable to attend a training course to learn about advances in technology and determine what would be best for you, contact an unbiased source that can assess your particular needs and steer you in the right direction.

As of this writing, the primary systems available in North America are Daninject, Distinject, Palmer Cap-Chur, Pneudart, and Telinject. Systems can go out of production, however, and new technology can be introduced at any time. It is important to stay current with new developments.

Summary

Chemical immobilization is, in reality, anesthesia of an animal under the most difficult of circumstances. It should only be performed by trained and skilled practitioners using the best drugs and equipment available. Animals recovering from their anesthesia should be under veterinary supervision.

Chemical capture can be an invaluable tool for animal care and control personnel responsible both for public safety and for protecting animals. Wildlife workers and zoos will also find chemical capture a valuable asset. Users of chemical capture must not downplay its complexity and seriousness, and they must realize that it

holds potential not only for considerable success but also for significant liability.

Animal care and control agencies and others adopting chemical capture should be trained and certified in the craft, keep their skill levels high through ongoing training, and use only appropriate drugs and equipment. Never consider chemical capture a “cheap” method of capture. In fact, practitioners must be prepared to make a significant investment of both time and money.

When done properly, chemical capture can be humane and successful. When it can't be done properly, it shouldn't be done at all.

Reference Materials

Books

Brothers, Bill (2001)
Chemical Immobilization and Humane
Animal Control: A Manual for
Administrative and Field Staff
Animal Care Equipment & Services, Inc.

Nielson, Leon, (1999)
Chemical Immobilization of Wild and
Exotic Animals
Iowa State University Press

Kreeger, Terry (1996)
Handbook of Wildlife Chemical
Immobilization

Occupational Health and Safety Administration (OSHA)

200 Constitution Avenue, NW
Washington, DC 20210
www.osha.gov

Chemical Capture Resources

Training Resources

Animal Care Equipment & Services, Inc.
4920-F Fox Street
Denver, CO 80216
Phone: 800-338-ACES (2237)
Fax: 303 298-8894
Website: www.animal-care.com
Email: info@animal-care.com

National Animal Control Association
P.O. Box 480851,
Kansas City, MO, 64148
Phone: 913-768-1319
Fax: 913-768-1378
Website: www.nacanet.org
Email: naca@interserv.com

Safe-Capture International, Inc.
P.O. Box 206,
Mt. Horeb, WI 53572
Phone: 608-767-3071
Fax: 608-767-3072
Website: www.safecapture.com
Email: safecaptur@aol.com

Equipment

Animal Care Equipment & Services, Inc.
4920-F Fox Street
Denver, CO 80216
Phone: 800-338-ACES (2237)
Fax: 303-298-8894
Website: www.animal-care.com
Email: info@animal-care.com

Dan-Inject of North America
P.O. Box 270837
Fort Collins, CO 80527
Phone: 866-327-8748
Fax: 970-377-8522
Website: www.dan-inject-northamerica.com

Palmer Chemical & Equipment Co., Inc.
P. O. Box 867, Palmer Village
Douglasville, GA 30133
Phone: 770-942-4395
Fax: 770-949-3562
Website: www.palmercap-chur.com

Pneu-Dart, Inc.
15223 Route 87 Highway
Williamsport, PA 17701
Phone: 570-323-2710
Fax: 570-323-2712
Website: www.pneudart.com
Email: info@pneudart.com

Telinject USA, Inc.
9316 Soledad Canyon Road
Agua Dulce, California 91390
Phone: 661-268-0915
Fax: 661-268-1105
Website: www.telinject.com
Email: telinject@aol.com

Zoolu Arms of Omaha
10315 Wright Street
Omaha, NE 68124-2547
Phone: 402-397-4983

Forms

CHEMICAL IMMOBILIZATION QUALIFYING REPORT

© 2005 ANIMAL CARE EQUIPMENT & SERVICES, INC.

DATE _____ NAME OF PERSON QUALIFYING _____
 TIME STARTED _____ NAME OF WITNESS(ES) _____
 TIME ENDING _____

FIELD KIT ASSESSMENT			YES	NO	TO BE ORDERED/COMMENTS
SUFFICIENT NUMBER OF DARTS					
SUFFICIENT NUMBER OF NEEDLES					
SUFFICIENT NUMBER OF COLLARS					
SUFFICIENT NUMBER OF SYRINGES					
AVAILABLE IMMOBILIZING DRUGS (KEPT SECURED)	NAME	EXP. DATE CK'D			
ALL EQUIPMENT IN WORKING ORDER, CLEAN & LUBRICATED					
SUFFICIENT PROPELLANT					
OTHER EXPLAIN –					
PROJECTOR ASSESSMENT			YES	NO	DESCRIBE/COMMENTS
SAFETY DEVISE WORKS AS DESIGNED					
PROJECTOR IS CLEAN AND FREE OF CORROSION					
SEALS ARE IN GOOD SHAPE					
NO LOOSE OR BROKEN PARTS					
NO OBSTRUCTIONS TO BARREL					

ACCURACY

QUALIFIER HITS WITHIN 2" OF INTENDED MARK (3) TIMES AT: (INDICATE DISTANCE FROM BULLSEYE AT)

1 ST ATTEMPT	20' _____	40' _____	60' _____	80' _____
2 ND ATTEMPT	20' _____	40' _____	60' _____	80' _____
3 RD ATTEMPT	20' _____	40' _____	60' _____	80' _____

FIELD CONDITIONS

WIND SPEED _____ WIND DIRECTION _____ TEMPERATURE _____

AVAILABLE LIGHTING (CLOUDY, OVERCAST, BRIGHT, HAZEY) _____

COMMENTS _____

DART LOADING ASSESSMENT

C O M M E N T S

PRACTICE LOADING (3) DARTS WITHOUT MAKING AN ERROR ☐ YES ☐ NO _____

REUSABLE DARTS ARE DISCHARGED, CLEANED & DRIED AFTER USE ☐ YES ☐ NO _____

DISPOSABLE DARTS ARE DRAINED AFTER USE ☐ YES ☐ NO _____

OVERALL RATING OF SKILLS

☐ EXCELLENT ☐ PROFICIENT ☐ FAIL

COMMENTS (INCLUDE EQUIPMENT SHORTAGES, BREAKAGE, ETC) _____

SIGNED _____ DATE _____ COPIES TO: _____

WITNESSED _____ DATE _____

Chemical Immobilization Field Report Form

CASE # _____

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ANIMAL ID # _____

-AGENCY INFORMATION & FIELD LOCATION-

DATE _____ TIME _____ AM/PM AGENCY _____ CALLED IN BY _____

FIELD OFFICER(S) _____ AUTHORIZED BY _____

ADDRESS LOCATION _____ CROSS STREETS OR MAJOR INTERSECTION _____

REASON FOR CAPTURE _____

CONDITION OF THE ANIMAL _____

BEHAVIOR OF THE ANIMAL _____

OTHER KNOWN HISTORY _____

DESCRIBE CONDITION OF CAPTURE (WEATHER, TRAFFIC, SPECTATORS, ETC) _____

WITNESS CONTACT INFO _____

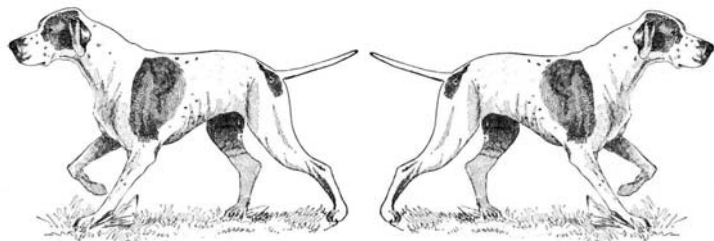
-ANIMAL INFORMATION-

SPECIES _____ BREED/TYPE _____ COLOR _____ MARKINGS _____ M / F ALT? EST. AGE _____

COLLAR? _____ TAGS? _____ SCANNED FOR MICROCHIP ☐ NO ☐ YES _____ # _____

OTHER KNOWN ANIMAL INFORMATION _____

ESTIMATED WEIGHT _____ (LBS OR KG) ACTUAL WEIGHT _____ (LBS OR KG)



CIRCLE SITE OF INJECTION

-EQUIPMENT AND DRUGS UTILIZED-

EQUIPMENT USED _____

TIME OF INJECTION _____ AM / PM

TIME OF IMMOBILIZATION _____ AM / PM

ELAPSED TIME _____ HR & MIN

DISTANCE OF SHOT _____ FT / YARDS

DRUGS USED _____ CONC. _____ (MG/ML)

DRUGS USED _____ CONC. _____ (MG/ML)

RECOMMENDED DOSAGE = _____ (MG/LB)
OR _____ (MG/KG)**-DOSAGE CALCULATION-**WT _____ (LB OR KG) X REC. DOSAGE _____ (MG/LB) = _____ MG ÷ CONCENTRATION = _____ (ML)
VOLUME INJECTED _____ (ML) DART SIZE _____ NEEDLE SIZE (GAUGE) _____

REACTION OF ANIMAL TO DARTING _____

ADVERSE REACTIONS _____

TIME _____ AM / PM VITAL SIGNS (TPR): TEMP _____ PULSE/MIN _____ RESPIRATION/MIN _____

TIME _____ AM / PM VITAL SIGNS (TPR): TEMP _____ PULSE/MIN _____ RESPIRATION/MIN _____

-POST IMMOBILIZATION INFORMATION-

VET HOSPITAL NAME _____ ADDRESS _____

ATTENDING VETERINARIAN _____ PHONE _____ TIME PLACED UNDER VET CARE _____ AM / PM

ADDITIONAL DRUGS ADMINISTERED (ANTIBIOTICS, ANTAGONISTS, ETC) _____

AMOUNT ADMINISTERED AND ROUTE _____

ANIMAL TRANSPORTED TO (FACILITY) _____ SHELTER IDENTIFICATION # _____

INCOMING DATE _____ FINAL DISPOSITION _____ DATE OF DISPOSITION _____

OWNERS NAME _____ ADDRESS _____ PH _____

COMMENTS _____

OFFICER SIGNATURE _____

(ATTACH ANY OTHER DOCUMENTATION)