

Section 5.2.5. Safe Animal Capture and Sampling

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Objective: To provide principles and general considerations for the safe capture of wild animals and safety of personnel during these captures.

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The authors assert that animal capture and sampling should always occur in compliance with all applicable laws and regulations and should only be undertaken after securing all necessary permits and approvals, including ethical approvals.

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Section 5.2.5a. Learning Objectives and Confirmation of Knowledge

If you understand the material in this Guide, you should be able to:

- Explain the PREDICT [Bushmeat Sampling Methods \(Section 5.2.12.\)](#).
- Safely participate in animal capture activities.
- Identify potential personnel risks of injuries and risks of exposure to zoonotic pathogens associated with the capture of wild animals.
- Develop a personnel safety plan for animal capture activities.
- Identify potential risks of injury or harm to animals that may be captured and identify ways to minimize those risks.
- Identify potential risks for captured wild animals of exposure to human pathogens during restraint and sampling, and develop ways to minimize those risks.
- Explain the special hazards associated with the use of anesthetic drugs and other chemicals used in animal capture.
- Explain important precautions to protect animals when the animals are anesthetized or physically restrained.

Confirm you understand the material of this Guide

When you are familiar with the information in this Guide, take the PREDICT quiz [Safe Animal Capture and Sampling \(Section 8.4.4.\)](#).

Section 5.2.5b. Principles & Guidelines for Personnel Safety & Health During Wild Animal Capture

General Principles on Personal Safety

Capture, handling, and anesthesia of wildlife during field projects are often carried out in remote areas away from medical assistance. Therefore, every possible effort must be made to prevent injuries to personnel. The following precautions should be considered for fieldwork that involves handling animals for diagnostic sample collection:

Field teams, particularly animal capture teams, must be prepared to deal with potentially hazardous situations and have contingency plans in place to respond to accidents, injuries or other unexpected circumstances.

Investigators implement measures, in accordance with protocols or established guidelines, to protect their staff, co-workers and themselves against possible injury or exposure to potentially dangerous procedures, drugs, chemicals, animals, or animal fluids and waste.

Investigators must clearly identify and discuss with project personnel the hazards to human health and safety and the appropriate safety precautions to be taken when working with wild animals.

Investigators should ensure that all project personnel are properly trained, have written procedures, and have the appropriate protective clothing and personal protective equipment (PPE) for their safety.

Investigators should familiarize themselves with known biohazards specific to the species under study and with the procedures to avoid exposure to these agents.

Personnel should work in teams of at least two people in the field, especially when involved in physical or chemical restraint and handling of animals or other high-risk situations.

If an animal becomes difficult to handle safely, the handler should release the animal if it is safe to do so. Additional restraint, chemical or physical, may be needed to adequately control the animal safely (see section below).

Keep an open route of escape when working with animals.

Personnel may need to wear protective clothing including protective footwear with non-slip soles, sturdy clothing (e.g., long-sleeve shirts, long trousers, plastic aprons, etc.), gloves, and face masks. The appropriate protective clothing depends on site and species-specific field conditions.

Field workers should be trained in the tasks and safety procedures relevant to the animal capture and handling activities, including how to avoid injury from equipment or animals and how to avoid exposure to potential pathogens. They should also be trained to avoid transmission of human pathogens to captured animals.

Special considerations:

Individuals with known allergies associated with animals, with immune deficiency diseases, or on immunosuppressant therapy, should not engage in studies involving the handling of wild animals.

Certain animals, including but not limited to bats, dogs, and non-human primates, are known to harbor disease agents considered to be deadly to humans such as rabies. Any capture and manipulation of these animals warrant that the handlers wear double gloves, catching gloves (if necessary), and immediately report any bites or exchange of blood/fluids to supervisors, field coordinator, or medical professionals if present in the area. Preventative vaccination is recommended.

General Guidelines on Safe Handling of Animals

Supervising veterinarians and other trained PREDICT staff will handle animals as part of surveillance activities and sampling fieldwork. Staff must be trained on the potential hazards and safe handling techniques for the specific types of animals they are likely to handle. Animal hazards may include injuries due to sudden animal movements, bites and scratches, and

exposure to zoonotic pathogens. The following precautions should be considered for the safe handling of animals:

Handlers should have a basic understanding of the animal's typical behavior.

All animal handlers should be trained in basic animal handling techniques and those techniques should be used consistently. Improvements to techniques should be tested and implemented when available.

Generally, slow and deliberate movements should be used around animals.

Animal behavior can be unpredictable. Therefore, personnel should remain constantly alert when handling wild animals. Personnel should watch for warning signs of animal aggressiveness and fear. These signs vary with animal species and may include vocalizations, raised fur, flattened ears, twitching tails, or bared teeth. An animal that feels threatened or cornered may be more aggressive than under normal circumstances.

Extra caution should be used when handling animals that are sick, hurt, or are new mothers or highly territorial species.

If capture and sampling procedures may cause pain, animals should be handled safely and humanely under the supervision of a veterinarian trained in wild animal chemical immobilization and animal restraint devices.

Workers should use extreme caution when giving injections and handling sharps around animals; sudden animal movements could cause a needle stick injury to the personnel or injury to the animal's vital organs.

Investigators should be aware of the potential for human pathogen transmission to wildlife and ensure adequate use of protective equipment to avoid exposing animals. In addition, sick workers should not be allowed to participate in animal handling.

Safe Operation of Equipment

All personnel involved in wildlife capture should have current training in the use of pertinent equipment, including but not limited to different kind of traps, nets, and snare poles (rabies-poles used for capture and restraint. Specific on appropriate capture and handling of PREDICT target species are described in the taxa-specific PREDICT protocols. Overall field team knowledge on the correct use of equipment will help to minimize injury due to accident or the misuse of equipment during animal capture and handling. Use of drug delivery equipment, such as dart rifles, dart pistols and darts, jab-sticks (pole-syringes) must be done under the supervision of a veterinarian trained in wild animal physical and chemical restraint.

Safe Use of Anesthetic Drugs and Other Chemicals

Capture of free-ranging wildlife may place personnel at risk of injury and anesthesia or other forms of chemical immobilization may be necessary. All use of drugs or chemicals must be done under the supervision of a veterinarian trained in wild animal physical and chemical restraint. Injury can occur, not only from animal attacks, but also capture equipment, or exposure to potent drugs. Every possible effort must be made to minimize the probability of human injury when undertaking chemical restraint and/or anesthesia of wildlife. The following precautions should be followed when using anesthetic drugs or other chemicals:

The risks involved in using drugs for the capture and immobilization of wildlife must be identified and communicated to all project personnel.

At least two people on the team should be trained in first aid and cardio-pulmonary resuscitation (CPR) (one of the two should be a person NOT in charge of handling anesthetics). First aid or CPR may be required in an accidental drug exposure emergency. A well-stocked first aid kit customized for each project should be kept within easy reach during fieldwork activities.

An evacuation plan for an anesthetic drug related accident should be developed and communicated to all field personnel. Local medical authorities should be informed of the potential hazards of the field work and an evacuation plan to medical facilities should be discussed prior to beginning fieldwork.

All drugs and chemicals used in field research should be handled in such a way as to prevent human exposure. Researchers or personnel authorized to use immobilization drugs should protect themselves against eye, respiratory and cutaneous exposure to drugs and chemicals and accidental injection. The use of gloves, long-sleeve clothing, and protective goggles and/or face-shields may be indicated in some cases.

Those utilizing immobilization drugs for restraint of wild animals should have the appropriate training and information available to aid in their medical care should accidental contamination occur. It is advisable to always have drug manufacturer information for all medications in use as some human emergency facilities will not be familiar with drugs used for the immobilization of wildlife particularly in countries where such drugs are not available commercially.

It is recommended to work in pairs when utilizing highly potent drugs, so that there is constant monitoring of the person handling anesthetics. When anesthesia drugs being used have an appropriate reversal agent, both people should carry a full dose of reversal drugs (for human treatment) at all times. There should be adequate quantities (for human treatment) of reversal drugs on hand in the field if these exist. Potent anesthetic drugs should be handled only by trained veterinarians.

When darts are used to restrain animals, every reasonable attempt should be made to recover all darts that miss the target animal as they contain chemicals that could pose a public or

animal health risk. As with syringes used to draw up medications, darts should be placed in a special container to avoid accidental exposure to personnel.

National and local regulations with regard to drugs, specialized equipment (rifles, pistols), and liability issues concerning medical treatment of humans and/or human well-being should be clearly understood and followed before fieldwork begins.

Biohazards and Zoonotic Diseases

Investigators and field workers are at risk of exposure to zoonotic diseases (diseases transmitted from animals to humans). Pathogen transmission may occur through direct contact with contaminated dirty hands and equipment, bites and other direct exposure to animal fluids (blood, urine, saliva) or inhalation of contaminated dusts. Investigators and supervisors should familiarize themselves with known biohazards specific to the species under study and with the procedures to avoid exposure to these agents as detailed in the taxa-specific protocols.

Prior to fieldwork, the Country Coordinator or field supervisors should provide training and information regarding all potentially hazardous biological or zoonotic agents that may be encountered in the field situation or that are relevant to the species under study.

Personnel must wear the specified PPE, as indicated for each taxonomic group. Additional PPE could be warranted given certain field situations, and or as determined by the PREDICT field supervisor. PPE is required to prevent bites or scratches. Protective eyewear and respirators is also needed to prevent exposure to pathogens transmitted by splashing of body fluids or secretions, or inhalation of contaminated aerosols.

The Country Coordinator or field supervisor must ensure that safety procedures are established for the conduct of postmortem examination in the field and that appropriate protective equipment (e.g. aprons, gloves, face-masks, eye protection, etc.) is available and used correctly. The Country Coordinator is responsible for ensuring that all personnel be trained in the postmortem techniques appropriate for the species.

Field workers should wash hands or use disinfecting hand wipes frequently before and especially after animal capture and field activities. Frequent handwashing is the best defense against diseases transmitted through contact with contaminated animal saliva, other body fluids and wastes.

If injured by an animal or potentially exposed to a diseased animal, workers should immediately report to their supervisor and/or coordinator and seek the appropriate medical attention and follow-up. See [Section 3. Emergency Preparedness](#) for detailed instructions and accident reporting forms.

Field personnel should also take precautions (i.e. long sleeve shirts, insect spray, etc.) to avoid exposure to external animal parasites such as ticks, fleas, as well as to animal feces that may contain internal animal parasites (ova or larvae) infective to humans.

If personnel become sick or show unusual symptoms they should immediately report this to the supervisor and should contact medical authorities knowledgeable about the diseases and parasites in the region. Field staff should discuss animal and field exposures and potential zoonotic hazards with their medical care staff.

Immunizations and Pre-Exposure Screenings

The Country Coordinator or field supervisor should ensure that personnel have consulted with a human health worker with regard to the immunizations required prior to participating in fieldwork that involves handling animals. See [Emergency Preparedness \(Section 3.\)](#) for details and immunization forms.

Vaccines and immunizations will vary depending on the geographical area, animal species to be handled, and personal medical history. Only a human health professional can provide vaccination and immunizations to the staff.

Due to the significant risks of working with wild mammals (bats, rodents, etc.), field personnel should be required to receive pre-exposure rabies vaccination (before starting any field project) for themselves. Tetanus immunization should also be required for all staff that will have any contact with wild animals.

Pre-exposure screening for tuberculosis is required for personnel that will be handling non-human primates. Tuberculosis screening and interpretation of results should only be conducted by a human health professional.

Training Records

A record must be kept of all training given to PREDICT personnel and reported into the EIDITH system for tracking training activities. For each training activity (on-the-job, self-study, small group training, workshop) the following information should be reported into the EIDITH system for tracking training activities (see [Section 8.3.1. Training Management Forms](#)) for training forms and directions on how to enter data into EIDITH):

- Date of training
- Type of training (workshop, on-the-job, simulation, field or lab training)
- Location of training (town and country)
- Topics covered
- Instructor(s)
- Trainees' names, gender, phone, email, title, organization, and sector

Country Coordinators and field supervisors should maintain a record (on the PREDICT report form) of any injuries or illnesses incurred while handling wildlife (whether in the field or laboratory). Such information should accompany the individual when examination or treatment

by a medical practitioner is needed. See [Emergency Preparedness \(Section 3.\)](#) for accident reporting forms.

Applicable local regulations regarding the documentation and reporting of workplace injuries should be consulted and followed.

Field supervisors should also maintain a record and pertinent product information of all immobilization drugs in their possession and as well as their usage.

Section 5.2.5c. Principles and Guidelines for Animal Care and Safety during Capture

All appropriate measures should be taken to minimize injury or harm to animals during capture and handling. Animals can sustain injuries or develop pathologic conditions during capture that could put their life in danger or decrease their chances of survival in the wild. Appropriate handling and restraint techniques should be used, and training in how to apply them should be provided to avoid injury to animals.

The investigator also must ensure that all workers fully understand and are trained in the techniques to be used for restraint and handling of wild animals. Improperly trained individuals or improperly applied techniques could harm the animal during capture and handling. Capture and handling can be accomplished using physical or chemical restraint or a combination of both.

Several factors must be considered to determine what type of restraint will be used on a specific project:

- Animal species and condition (sick, stressed, nursing, etc.)
- Safety for the staff to carry out the capture
- Animal safety
- Feasibility of accomplishing the capture's objective with the type of restraint
- Availability of drugs and specialized equipment to carry out the capture procedure
- Ability to protect, observe, and assist an animal until it has fully recovered after the procedure

Physical Restraint

Physical restraint may be most appropriate for some species and/or for short procedures. Animal handlers must ensure that physical restraint is performed in such a way that the animal will not suffer excessive stress or any injury during the process.

Physical restraint should be accomplished with necessary PPE, including latex or nitrile gloves and specialized equipment such as leather gloves, nets, rabies-poles, as needed for the species

being handled. The capture team must be capable of correctly using and operating such equipment to avoid animal and human injuries during capture.

At a minimum, disposable gloves must be worn during handling and during the operation of specialized equipment. Researchers must be trained and capable of using and operating all equipment used for capture to avoid injuring the animal. When using leather gloves to restrain an animal, the operator must ensure that excessive pressure is not applied to avoid suffocating the animal. When using nets to capture wild animals, removal from the net should occur immediately to avoid further entanglement and possible fatal and non-fatal injuries to the animal.

The risk of causing trauma to an animal when using a snare or rabies-pole is high, thus the benefits should outweigh the risks when considering their use. If using a snare-pole, it is important that the snare be placed around the neck AND one of the front legs of the animal to prevent the risk of asphyxiation.

In certain cases and with species that are vulnerable to stress, chemical restraint may be more appropriate.

Chemical Restraint

Chemical restraint should be considered when physical restraint is not safe for either the personnel or the animal being captured. Chemical restraint should be performed by veterinary professional with previous experience and specialized training in the use of anesthetic drugs and field anesthesia procedures.

The following considerations should be taken into account when deciding to chemically restrain an animal:

Considerations in Drug Selection

- Investigators should be familiar with the different drugs and drug combinations that can be used to safely capture a particular wild animal species.
- All drugs have intrinsic cardiovascular effects. The supervising veterinarian must be familiar with these effects and how to respond to any complications caused by these effects.
- Supervising veterinarians must be aware of any contraindication for the use of particular drugs on target species under the existing conditions.
- Investigators and supervising veterinarians should be aware of the availability (or lack of) of certain anesthetic drugs (and their reversal agents) and the regulations in place to import them into the country.

Considerations in Drug Administration

- During field captures, drugs that are often administered by injection can be administered via hand injection, pole-syringe (manual, spring-loaded) or darts (dartgun or blow darts).

- Staff should be familiar with the use of equipment (darts, pole-syringes) to avoid harming the animal during drug administration and immobilization.
- When hand injection is elected, the correct size needle should be used to avoid excessive trauma to the muscle or a penetrating wound in vital organs.
- Staff using darts to administer drugs should be trained in the use of the equipment required for the species and field setting. In general, only animals >15kg should be darted with powered dart-delivery equipment (i.e. pistols, guns).
- Darts have the potential to cause trauma if projected with excessive force or injected into a non-targeted area. Practice is the best way to assure that appropriate force is used when darting an animal.

Sites of Injection

- Anesthetic drugs should be injected into large muscle masses.
- Excessive force should be avoided when firing a dart as this could result in broken bones or perforation.
- Darts placed into the abdominal or thoracic areas are potentially fatal for the animal. Personnel should take great care to avoid placing a dart into one of these body areas.

Monitoring Anesthesia

- Anesthesia should be kept as brief as possible to minimize risks.
- When an animal is under chemical restraint, it should be monitored constantly to detect possible complications during anesthesia.
- An anesthetized animal should never be left unattended.
- Anesthetized animals cannot regulate their body temperature. Measures should be taken to prevent hyper- or hypothermia.
- Monitoring should include at least temperature, heart rate, respiratory rate and partial saturation of oxygen using a portable pulse-oximeter.
- The staff should be trained to respond properly to any emergency or complication occurring during anesthesia (e.g., how to treat hyperthermia), and appropriate reversal/termination of anesthesia to avoid complications.

Recovery

- Animals must be released only once fully recovered from anesthesia .
- Animals should be allowed to recover in safe areas, away from hazards and areas where potential predators or aggressive con-specifics may be present.
- Once released, the animal must be observed for as long as is required to ensure it is awake, alert, and active
- If the animal suffers an injury during capture, the injuries should be treated appropriately before releasing the animal.
- If the injury sustained is life-threatening or will render the animal incapable of surviving in the wild, humane euthanasia should be considered. In some cases placing injured animals in rehabilitation facilities might be an option.

Note: A wealth of knowledge and expertise, as well as additional training materials are available within the PREDICT consortium. Staff should raise any concerns or questions regarding procedures for safe and ethical animal capture and handling to their partner surveillance leads. Regular surveillance team operational meetings are held to address questions or concerns encountered during surveillance activities and facilitate cross-partner distribution of knowledge and best practices in safe animal capture and handling.

Section 5.2.5d. Safe Animal Capture Guide Checklist

Procedures Checklist: Personnel working in the field with wild animals should follow these basic personal procedures:

- Coordinators should provide all personnel a “Useful Contacts” list with address and numbers of local medical and emergency response services.
- Researchers working with wild mammals should consider pre-exposure rabies vaccination.
- Rabies vaccination should be given to personnel who routinely handle high-risk species in the wild (bats, raccoons, etc).
- Researchers and their assistants should also consider vaccination against tetanus in those situations where exposure to this pathogen is possible.
- Individuals who are exposed to potential vectors of rabies (e.g. animals with neurological signs) should immediately report the exposure to medical authorities and the supervisor.
- All animal tissues, fluids, and excrement should be handled so that the potential for human contact is minimized.
- Staff should thoroughly wash and/or sanitize hands and any other contaminated skin surfaces with a germicidal skin cleanser immediately after handling wild animals or their samples.
- All personnel handling wild animals should practice good hygiene and avoid rubbing their eyes after animal handling.
- Appropriate planning and specific precautions (trained staff, equipment and tools in good working condition, PPE, etc.) should be taken in order to prevent injuries from bites, scratches and skin punctures from wild animals. Even minor wounds or scrapes may become infected and can potentially result in disease transmission.
- If an injury occurs, clean the wound with a disinfectant and immediately contact a coordinator/supervisor.
- Where there is a risk from aerosolized pathogens from saliva, feces or urine, protective gear such as gloves, eye protection, respiratory protection (masks, face-shields or respirators), foot protection and protective clothing should be used as necessary.
- Researchers should always wear gloves and facemask when handling sick or dead animals.
- Personnel performing post-mortem examinations in the field should wear at least a plastic apron, gloves and facemask or goggles.
- After any post-mortem examination is performed, staff should wash and disinfect hands and any other contaminated skin surface.
- All contaminated equipment should be cleaned and disinfected immediately after use while still wearing the appropriate PPE. Disposable used equipment must be adequately disposed of on site (i.e. buried, burnt, etc).
- All drug containers, needles, scalpel blades, suture needles and other sharp instruments should be used and disposed of in a manner that prevents accidental human injury.
- Physical restraint of wild animals should be kept as brief as possible.
- Care should be exercised when using equipment such as nets, gloves, rabies-pole, etc to capture wild animals.
- Staff should be familiar with dart equipment, sites of injection and drugs when chemical restraint is elected.
- Anesthesia monitoring equipment and emergency drugs must be available and staff should be familiar with their use.
- Staff will make sure each animal is fully recovered from anesthesia prior to release.
- A list of the equipment and supplies needed to correctly implement the recommendations of this Safety Guide for Animal Capture for Sampling is available and checked prior to departing for the field.

Checklist for Supplies for Animal Capture Activities

Check as appropriate:

PPE

- Nitrile (recommended) gloves
- Leather or kevlar gloves
- Face-mask
- Respirator
- Goggles
- Face-shield
- Disposable (Tyvek) suit
- Sharp-container
- Closed-toed shoes

Monitoring

- Thermometer
- Stethoscope
- Stopwatch or other timing device
- Pulse oxymeter with probes
- Penlight
- Warm-water bottles (to prevent hypothermia)
- Buckets or water bottles (to prevent hyperthermia)

Immobilization equipment

- Dart equipment (rifle/pistol/blowpipe, CO₂ or powder cartridges, and dart protectors)
- Drugs (sedatives, tranquilizers, anesthetic drugs, reversals or antagonists)
- Calculator to use for calculating drug dosages
- Darts and dart needles
- Ropes/hobbles
- Nets
- Pole-syringe
- Cargo-net
- Blindfold
- Ear-plugs
- Carrying bags
- Syringes and needles
- Towels
- Snare-pole

Emergency

- Emergency medications (doxapram/ atropine/epinephrine/diazepam)
- IV catheters
- Fluids (NaCl, lactated Ringer's, Dextrose)
- IV administration set
- Antibiotics, disinfectants
- Tongue swabs
- Vet wrap and tape
- Flashlight
- Minor surgery (and suture) pack
- Euthanasia solution
- Alcohol (to treat hyperthermia)
- Tissue glue or super-glue
- Blanket/towel (to help treat hypothermia)

- Cold pack/hot pack
- Laryngoscope, tracheal tubes, ambu bag

Recovery and release

- Crates/containers in which to place animal during recovery
- Binoculars

Section 5.2.5e. References

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