



National Centre for Disease Control



Government of India



Ministry of Environment,  
Forest and Climate Change,  
Government of India

# Guidelines for Occupational Health and Safety in the Context of Human–Wildlife Conflict Mitigation

**Taking a Harmonious Coexistence Approach**



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**Taking a Harmonious Coexistence Approach**

# Abbreviations

|         |                                                                      |         |                                                                         |
|---------|----------------------------------------------------------------------|---------|-------------------------------------------------------------------------|
| ANM     | Auxiliary nurse midwife                                              | IFS     | Indian Forest Service                                                   |
| ASHA    | Accredited social health activist                                    | IUCN    | International Union for Conservation of Nature                          |
| AWW     | Anganwadi worker                                                     | JFM     | Joint forest management                                                 |
| BMZ     | German Federal Ministry for Economic Cooperation and Development     | MoEF&CC | Ministry of Environment, Forest and Climate Change, Government of India |
| CPR     | Cardiopulmonary resuscitation                                        | MoHFW   | Ministry of Health & Family Welfare                                     |
| CCTV    | Closed-circuit television                                            | NCDC    | National Centre for Disease Control                                     |
| CWLW    | Chief Wildlife Warden                                                | NDRF    | National Disaster Response Force                                        |
| CZA     | Central Zoo Authority                                                | NGO     | Non-governmental organisation                                           |
| DBT     | Direct benefit transfer                                              | NTCA    | National Tiger Conservation Authority                                   |
| DFO     | Divisional Forest Officer                                            | NTG     | National Technical Group                                                |
| DLCC    | District-Level Coordination Committee                                | NWAP    | National Wildlife Action Plan                                           |
| EDC     | Eco-development Committee                                            | OPs     | Operating procedures                                                    |
| EIA     | Environmental impact assessment                                      | PA      | Protected area                                                          |
| EWRR    | Early Warning and Rapid Response                                     | PCCF    | Principal Chief Conservator of Forest                                   |
| GIS     | Geographical information system                                      | PPE     | Personal protective equipment                                           |
| GIZ     | Deutsche Gesellschaft für Internationale Zusammenarbeit              | PRT     | Primary Response Team                                                   |
| GoI     | Government of India                                                  | RFID    | Radio frequency identification                                          |
| HOFF    | Head of Forest Force (in a state)                                    | RRT     | Rapid Response Team                                                     |
| HSC     | Human–snake conflict                                                 | SDRF    | State Disaster Response Force                                           |
| HWC     | Human–wildlife conflict                                              | SFD     | State forest department                                                 |
| HWC–MAP | Human–Wildlife Conflict Management Action Plan                       | SHG     | Self-help group                                                         |
| HWC–NAP | National Human–Wildlife Conflict Mitigation Strategy and Action Plan | SLCC    | State-Level Coordination Committee                                      |
| HWC–SAP | State-Level HWC Mitigation Strategy and Action Plan                  | SOPs    | Standard operating procedures                                           |
| IDSP    | Integrated Disease Surveillance Programme                            | STG     | Standard Treatment Guidelines                                           |
|         |                                                                      | WII     | Wildlife Institute of India                                             |
|         |                                                                      | WLPA    | Wild Life (Protection) Act, 1972                                        |

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# 1. ABOUT THE GUIDELINES

## 1.1 THE OVERALL CONTEXT

- These “Guidelines for Occupational Health and Safety in the Context of Human–Wildlife Conflict Mitigation: Taking a One Health Approach” get the overall context from the Wild Life (Protection) Act, 1972, National Wildlife Action Plan (2017-31)<sup>1</sup> and National Human–Wildlife Conflict Mitigation Strategy and Action Plan (HWC-NAP) (2021-26)<sup>2</sup>. HWC-NAP provides the overall conceptual and institutional framework for implementing the guidelines. This document takes into consideration the existing policies, guidelines, advisories and good practices issued by the Government of India and various state governments related to health emergencies and potential health risks arising out of human–wildlife conflict (HWC) situations.
- These guidelines take into consideration the advisory to deal with human–wildlife conflicts (MoEFCC, 2021), which seeks expedited inter-departmental coordinated and effective action by state governments/ UT administrations to prevent and deal with HWC and associated death/injury/permanent incapacitation of human beings/domestic animals/livestock due to attack by wild animals or loss of crops and property as well as accidental deaths of wild animals listed in schedules I–IV of the Wild Life (Protection) Act, 1972. These guidelines take into consideration the ‘National One Health Programme for Prevention and Control of Zoonotic Diseases’ being implemented by the Ministry of Health & Family Welfare (MoHFW), Government of India in coordination with the Ministry of Fisheries, Animal Husbandry and Dairying and the Ministry of Agriculture.
- The following guidelines are to provide guidance on selected species: guidelines for mitigating human–Leopard, –Elephant, –Gaur, –Snake, –Crocodile, –Wild Pig, –Bear, –Blue Bull, –Rhesus Macaque, and –Blackbuck conflicts.
- The following guidelines on cross-cutting issues are to provide guidance on selected issues: Guidelines for Cooperation between the Forest and Media sector in India: Towards effective communication on Human–Wildlife Conflict Mitigation; Crowd Management in Human–Wildlife Conflict Related Situations; and

Addressing Health Emergencies and Potential Health Risks Arising Out of Human–Wildlife Conflict Situations: Taking a One Health Approach.

## 1.2. PURPOSE AND SCOPE

- These guidelines aim to prevent and mitigate accidents, occupational injury, illness, exposure to threats to safety and other hazards faced by personnel associated with management of wild animals in conflict.
- These guidelines focus on developing a common understanding, among the key stakeholders, on the occupational health and safety issues associated with restraint/handling of wild animals, safety training programmes and hazard and risk assessment and provide knowledge of the medical evaluations, vaccinations or immunisations (tetanus, rabies, etc.) involved and the laws in place in India for ensuring occupational health and safety when managing wild animals-in-conflict.
- These guidelines serve as a basis for overall long-term planning and coordination of occupational health and safety measures at the national, state and division levels, taking a One Health approach<sup>3</sup>.
- In general, these guidelines apply to all stakeholders involved in managing wild animals in conflict, including but not limited to, various line departments (the police, the disaster management, rural development, irrigation, agriculture, animal husbandry, urban development, education and health departments, Panchayati Raj Institutions, the railways, municipalities, etc.). Sections in these guidelines are meant to be used by the state forest department and Rapid Response Teams responsible for long-term planning and execution of HWC mitigation plans and measures.
- The guidelines will be able to bring in more effectiveness and efficiency when they are fully integrated into the Division-Level HWC Management Action Plans (HWC-MAP) and State-Level HWC Mitigation Strategy and Action Plans (HWC-SAP) and into the implementation plans of the National One Health Programme for Prevention and Control of Zoonotic Diseases, being implemented by the Ministry of Health & Family Welfare (MoHFW).

<sup>1</sup> MoEF&CC (2017). National Wildlife Action Plan (2017-35)

<sup>2</sup> National HWC Mitigation Strategy and Action Plan of India (2021-26), available from <https://moef.gov.in/wp-content/uploads/2022/01/National-Human-Wildlife-Conflict-Mitigation-Strategy-and-Action-Plan-of-India-2.pdf>

<sup>3</sup> One Health is a collaborative, multi-sectoral and trans-disciplinary approach—working at the local, regional, national and global levels—with the goal of achieving optimal health outcomes, recognising the interconnection between people, animals, plants and their shared environment.

### 1.3. APPROACH

- The development and implementation of these guidelines is driven by a harmonious-coexistence approach<sup>4</sup> to ensure that both humans and animals are protected from negative impacts of HWC.
- The development of these guidelines and the intended implementation are driven by a participatory approach. These guidelines are intended to facilitate participatory planning, development and implementation of the measures with key sectors and stakeholders at the national, state and local levels. While the overall planning and coordination of human–animal conflict mitigation operations will be the responsibility of the state forest department, all other concerned key departments and agencies participate in and support the operations and carry out their functional responsibilities in coordination with the forest department to implement these guidelines.
- These guidelines may be used in the field, with the help of the Implementer’s Toolkit, which provides detailed information, formats and checklists to be used for health emergencies.
- These guidelines may be provided to each forest range, RRT, PRT, district administration, police station at a HWC hotspot, hospital, district disaster management authority, panchayat and wildlife expert and to other key stakeholders as mentioned in these guidelines.
- The documents may be translated into the local language for the field teams. Specific elements such as checklists, especially those needed for emergency response situations, may be printed in large-size posters and placed prominently on the walls of the HWC Mitigation Hubs and in similar control rooms of other stakeholders such as the police, district administration, hospitals, accredited social health activists (ASHAs) and anganwadi workers (AWWs).

### 1.4. LEGAL AND POLICY FRAMEWORK FOR IMPLEMENTING THE GUIDELINES

- These guidelines may be read in conjunction with the existing relevant legal and regulatory frameworks. Also, any change in the legal provisions would require revisiting the guidelines. Refer to the supplementary framework of the HWC-NAP for more details on the specific legal provisions for HWC mitigation.

### 1.5. INSTITUTIONAL MECHANISM FOR IMPLEMENTING THE GUIDELINES

- The institutional mechanism outlined in the HWC-NAP may be followed for implementing these guidelines.
- Implementation of these guidelines will be anchored in each district at the District-Level Coordination Committee (DLCC), chaired by the respective District Collector, where the system of regular feedback and fine-tuning of the protocols and processes will be done to customise these to suit the local conditions.
- An effective coordination with the institutions responsible for implementing the National One Health Programme for Prevention and Control of Zoonotic Diseases and the National Rabies Control Programme<sup>5</sup>, being implemented by the Ministry of Health & Family Welfare (MoHFW), Government of India, may further strengthen the implementation feasibility of these guidelines.

<sup>4</sup> ‘Harmonious coexistence’ is defined as a dynamic but sustainable state in which humans and wildlife adapt to living in shared landscapes, with minimum negative impacts of human–wildlife interaction on humans or on their resources and on the wildlife or on its habitats. The mitigation measures designed using this approach maintain a balance between the welfare of animals and that of humans in which both are given equal importance. Overlap in space and resource use is managed in a manner that minimises conflict.

<sup>5</sup> National Rabies Control Programme National Rabies Control Programme :: National Centre for Disease Control (NCDC)

## 2. CONTEXT AND SITUATION

Mitigating human-wildlife conflict (HWC) invariably includes tracking, capture, tranquilisation, restraint/handling of dangerous wild animals, using hazardous scheduled drugs and exposure to zoonotic diseases. These present unique risks and hazards that require specialised skills, education and awareness to prevent harm.

Wildlife managers, veterinarians, biologists and members of response teams face numerous and diverse hazards and risks classified as physical, biological, chemical, mental/psychological and allergic hazards of the profession and an increased risk of allergen-induced anaphylactic shock. In the context of HWC, a hazard is the inherent danger involved in the capture, tranquilisation and translocation of a wild animal in conflict. The risk is a measure of the likelihood of a drastic consequence of wild animal restraint/handling and the inherent hazards of such operations.

The potential hazards associated with human-wildlife conflict mitigation (types of hazard and their consequences) are the following:

**Physical Hazards.** Injuries due to unsafe mechanical and physical conditions due to inadequate equipment, vehicles and ancillary equipment, inadequate occupational hygiene, heat and hypothermia and injuries due to mechanical objects. Injuries due to kicks, scratches and bites are unavoidably associated with most animal contact. Working with equipment and ponderous animals and, such as metal cages can injure and stress muscles and joints. The potential for wet muddy areas in animal conflict situations increases the risks of slipping and falling.

**Chemical Hazards.** Exposure to drugs and chemicals used in field operations; secondary exposure through conflict mitigation strategies.

**Biological Hazards.** Exposure to disease-causing pathogens (Annexure 3.1) due to bites, ingestion, inhalation, mauling, stings and scratches, exposure to biological samples, etc.

**Psychological and/or Physiological factors.** stress, allergies, other pre-existing conditions, fatigue, anxiety, psychosomatic disorders, congenital heart defect (CHD), hypertension, locomotor disorders.

**Retaliations from Key Stakeholders.** In some cases, the political and local situations can be hazardous. The public, whom the response team is trying to help, may, by itself, be a potential risk. Unruly crowds can create a danger for all the people involved in HWC mitigation activities through unpredictable and irrational behaviour. The HWC team personnel may be aware of such human-related risk factors and take appropriate action, including co-option of law enforcement personnel in the response team.

**Weather and Environmental Hazards.** Weather conditions can also pose a risk, particularly in areas where the HWC mitigation team encounters extremes of temperature, rainfall and altitude or situations with flash floods, landslides or avalanches. The HWC team may thus be well prepared for the weather conditions as well as the terrain that may be encountered. Prevalent weather conditions may be assessed prior to attempting HWC mitigation operations, and the operation may be continued only if favourable conditions exist.

**Firearms Safety-** Personnel untrained in use and safe handling of firearms, or use of poorly maintained firearm equipment, can endanger the health and safety of personnel involved in HWC management operations.

Steps need to be taken to recognise and assess potential risks and hazards for the safety of the personnel and the wild animal involved in a conflict situation and to minimise the risks inherent to the capture, restraint and translocation of a wild animal in conflict.

### Zoonotic diseases based on pathogenic organism

- Bacterial, Rickettsial and Chlamydia! diseases – Anthrax, Brucellosis, Leptospirosis
- Viral diseases – Rabies, Nipah virus infection, Influenza type A, Kyasanur forest disease (KFD), Viral hepatitis
- Fungal diseases – Aspergillosis, Cryptococcosis
- Parasitic diseases – Leishmaniasis, Toxoplasmosis, Trypanosomiasis

### Zoonotic threats from different animal taxa

- Mammals – Rabies, Tuberculosis, Anthrax, Brucellosis, Nipah virus infection, Kyasanur forest disease (KFD), Crimean Congo Haemorrhagic Fever
- Avians – Psittacosis, Salmonellosis, Avian influenza
- Reptiles and Amphibians – Campylobacter, Salmonellosis
- Aquatic creatures – *Clostridium botulinum*, Listeriosis, Salmonellosis



### 3. PRINCIPAL ELEMENTS OF OHS GUIDELINES

The primary goal of an occupational health and safety programme is good coordination and teamwork amongst members, towards a common goal, preventing exposure and reducing the risk of occupational hazards, thereby contributing to the success of the HWC operations.

The following elements are essential components of an effective occupational health and safety programme.

#### 3.1. HAZARD AND RISK ASSESSMENT

- Understanding potential hazards that are inherent to HWC management, such as likely injuries from handling animals, exposure to scheduled wildlife-restraint drugs, allergens or zoonoses; ascertaining the level of risk; and determining preventive and control measures required in different HWC situations.
- Team members participating in HWC mitigation may be assessed for their fitness on the basis of the following:
  - the extent and level of participation in occupational health and safety training programmes for dealing with wild animals
  - the susceptibility of the personnel
  - the past history of occupational illness or injury when dealing with conflict.
- Team members may complete the hazard and risk assessment checklist for personnel having contacts with diseased animals.

#### 3.2. PERSONAL HYGIENE

- The team members may follow the hygiene protocol, which includes the following:
  - Maintaining personal cleanliness and hygiene
  - Use of suitable clothing, gloves, masks, head covers, coats, coveralls, shoe covers, etc. when dealing with wild animals
  - Follow the protocol, including hand-washing and changing clothes wherever necessary
  - Carrying out procedures so as to minimise risks of splashes, spills and generation of aerosols

#### 3.3. VETERINARY FACILITY FOR TREATMENT OF INJURED ANIMALS

Personnel involved in medical management in veterinary hospitals or makeshift field hospitals may understand the chemical and biological dangers associated with the facility.

- Keep the facility clean and ensure that emergency safety devices (fire extinguishers, eye washes, etc.) are easily accessible and in working order.
- Ensure that all personnel wear protective clothing such as lab coats, a pair of overalls/dungarees, gloves and safety glasses.
- Do not eat, drink, smoke, store food and food utensils or apply cosmetics or lip balm when in the veterinary facility.
- Avoid wearing loose clothing, jewellery, shorts, open-toed shoes or sandals.
- While loading dart guns with chemicals and drugs, avoid spillovers and careless handling.
- Wash hands after handling infectious material and before leaving the facility. Hand sanitisers containing 70% alcohol may be used.
- Decontaminate all contaminated materials before disposal or reuse, and decontaminate surfaces after any bio-hazardous materials are spilt.
- Personnel must use special facilities and safety equipment as recommended and dispose of hazardous or contaminated waste according to the existing guidelines.

#### 3.4. PERSONAL PROTECTION

- Obtain and use personal protective equipment (PPE), including clothing, shoes, shoe covers, gloves, arm protectors, masks, face shields, hearing protection equipment, respirators and any other items that may be needed for specific purposes.

#### 3.5. MEDICAL EVALUATION AND PREVENTIVE MEDICINE FOR PERSONNEL

- Comply with required medical evaluations for high-risk positions and those with substantial contact with wild animals.
- Comply with the immunisation and vaccination requirements for personnel dealing with HWC.
- The public health institutions may consider pre-exposure vaccination of the healthcare workers handling the biomedical waste and the possibility of exposure to zoonotic diseases.

### 3.6. PERSONNEL TRAINING

The key element to a successful accident prevention programme relating to occupational safety and health is competency-based training in health and safety issues. The RRTs/PRTs are the first responders in any HWC emergency situation and may promptly act according to the roles and responsibilities assigned to each member and draw lessons from the training undergone for managing such situations.

- Competency-based training programmes may be planned and implemented in line with the Supplementary Framework to HWC-NAP on Establishment and Capacity Development of Response Teams<sup>6</sup>.
- In addition to the training programmes and measures suggested in the supplementary framework, the following specific measures may be implemented for enhanced effectiveness in ensuring OHS for the personnel engaged in HWC mitigation operations:
  - Training of officials in the use of these guidelines and tools
  - Bi-annual mock drills involving all personnel for reinforcing the learning through practice
  - Monthly or bi-monthly checks and cleaning of equipment
  - Regular meetings to promote safe work practices, issuing safety newsletters and electronic bulletin boards (can be helpful in dissemination of information)
  - The National One Health Programme for Prevention and Control of Zoonotic Diseases has developed IEC material for priority zoonotic diseases such as KFD, brucellosis, Nipah, CCHF, leptospirosis, rabies, anthrax etc. This IEC material<sup>7</sup> may be used for training and awareness programmes.
  - Customised training modules for each staff category and development of specialised training modules according to their responsibilities
  - Wildlife managers and veterinary medical officers may receive specialised training apart from occupational health and safety in the following disciplines: basic concepts of wildlife biology; ecology; conservation; habitat ecology; population ecology; wildlife and population management; wildlife laws and jurisprudence; wildlife forensics and illegal trade; wildlife health;

wildlife capture, restraint and immobilisation; and human–wildlife interface issues.

- Medical doctors may be trained in providing care and treating HWC-related human emergencies and medical conditions, including administration of anti-venom, as well as antidotes to drugs used in HWC activities.
- Staff members handling biomedical waste (BMW) may be trained regularly in biomedical waste management.
- Personnel may learn general safety rules and safe operating procedures, learn about ergonomic hazards and be trained in specific protocols.
- All personnel may be aware of their specific roles and duties and the hazards associated with those duties (such as zoonoses, chemical hazards, physical hazards and allergies and handling waste material).
- Training programmes should provide personnel with information about the levels of risk associated with working with animals and personal health conditions.
- Make certain that personnel are proficient in implementing safety precautions.
- Posters and pictorial guides may be used for providing briefings about procedures.
- Periodic refresher training programmes on safety and health care may be conducted.

### 3.7. RECORD KEEPING

- Maintain records of the medical history, past accidents, exposure, injuries and pre-existing health conditions of all personnel.
- A monthly record of the biomedical waste generated may be maintained.
- Reference material available in a basic library of reference books and journals should be readily accessible.
- A computer with high-speed Internet access may be made available to the veterinarian in charge of the HWC team.
- Web resources and email contact with colleagues are invaluable sources of information in solving many intricate HWC operations.

<sup>6</sup> Supplementary Framework to HWC-NAP on Establishment and Capacity Development of HWC Mitigation Response Teams, available from <https://moef.gov.in/wp-content/uploads/2022/01/National-Human-Wildlife-Conflict-Mitigation-Strategy-and-Action-Plan-of-India-2.pdf>

<sup>7</sup> IEC material on Zoonotic Disease developed by NCDC under the National One Health Programme for Prevention & Control of Zoonoses IEC Material on Zoonotic Disease :: National Centre for Disease Control (NCDC)

## 4. OCCUPATIONAL HAZARDS AND RISKS

- Personnel managing HWC meet many challenging situations that involve dangers and threats to their health, safety or personal well-being from the animals, the habitats, the human population and the interventions involved in the capture, tranquilisation and translocation of wild animals. Understanding the hazards associated with the operation is helpful in planning work and avoiding mishaps. Information from a hazard analysis will determine the appropriate use of standard precautions, personal protective equipment and workplace safety and health programmes to minimise or mitigate risks. A hazard analysis will provide inputs for preventing and eliminating hazards, reducing injuries and illnesses, reducing high compensation costs and increasing productivity.
- Review hazards regularly and repeat the analyses when the nature of the task changes or when an incident happens.
- The HWC mitigation team is grouped in the following according to the specific functions and duties and their vulnerability to the hazards.
  - The administration team (personnel manning administrative offices and control rooms) ensures compliance with protocols and maintenance of records. It coordinates the OHS programme and communication between different offices and individuals, serves as a contact place and information dissemination centre and maintains emergency contact. This team coordinates with animal rescue facilities and animal release sites and maintains an equipment list and a database of personnel training records.

The administrative personnel who do not have direct/substantial animal contact in their daily tasks and functions, but who may need to visit field operations in the course of their duty are placed in the low-risk category and may report any medical condition for which medical examination and treatment are required.
  - The wild animal tracking and surveillance team uses field craft to read animal signs and follow a wild animal in conflict. It communicates with other teams to capture and relocate an animal.

The wild animal tracking and surveillance team and the frontline HWC mitigation workers are very vulnerable to animal attacks (high risk) when tracking animals, and the injuries could take the form of bites, sprains, scratches and in extreme cases body disfigurement, bone fractures and deep, grievous injuries. Sometimes death results. Infectious agents in animal fluids and faeces can cause exposure to bacteria, fungi, parasites, protozoa, rickettsia, viruses and blood-borne pathogens,
- The veterinary team (veterinarians, paramedics, biologists, animal keepers) reaches the identified animal in conflict and restrains it (physically/chemically). The team places it in an appropriate cage/kraal and carries out treatment of the animal. If necessary, the team releases the animal in the wild.

The veterinary personnel who do have direct/substantial animal contact in their tasks and functions are vulnerable (high risk) to bites, sprains and scratches from animal handling, burns, skin irritation, inhalation and ingestion of chemical agents, zoonotic diseases acquired from animals and allergies from exposure to animal urine, contaminated litter, dander, hair, bacteria, fungi, parasites, protozoa, rickettsia, viruses and blood-borne pathogens.
- The logistics team (transport, communication, use and maintenance of equipment) provides communication support and various items equipment for physical and chemical restraint and maintaining crowd control.

The logistic team is also vulnerable (medium risk) to animal attacks and has direct/moderate animal contact in the course of its tasks and functions relating to capture of animals, placing them in cages/kraals and transporting them to rescue facilities and release locations. Members of this team are moderately prone to all the hazards faced by the veterinary team.
- All the team work may be carried out in tandem.

## 5. PREVENTION AND CONTROL MEASURES

The following measures may be implemented to avoid, reduce or eliminate exposure to hazards and risks.

- Avail services of veterinarians with knowledge and competency (biology of the species, wildlife-related zoonoses and use of different anaesthetic drugs) related to the capture, tranquilisation and translocation of different animal species.
- The animal handling during a rescue operation may follow the hygiene protocol, and the waste management may be in accordance with safe operating procedures.
- Ensure that all the field personnel are in good physical and mental condition, with preventive vaccination and other prophylactic measures taken prior to embarking on field operations.
- Team members may have basic first-aid and cardiopulmonary resuscitation (CPR) training to deal with potential health hazards that could arise during the capture or handling of animals.
- Personal protective equipment (gloves, uniforms, gowns, aprons, masks, hard hats, safety glasses, steel-toed boots, respirators, etc.) may be worn to avoid any injury/infection.
- Use equipment (barriers, trenches, traps, cages, nets, remote drug delivery systems, capture and transportation equipment, stretchers, tourniquets, etc.) that is well maintained for smooth performance. Follow the operating procedures, and only trained personnel may be authorised to use it during operations.
- Animal transportation is to be done using appropriate cages. Provide food and water and maintain a slow, constant speed to avoid any injury to the animal.
- Personnel may be familiar with standard emergency procedures (evacuation routes, emergency exits, emergency contact phone numbers) and coordinate with appropriate public health, veterinary, medical and emergency services (ambulance, fire, police) and administrative departments to handle emergencies and accidents.
- Some zoonotic diseases can be prevented by appropriate immunisation or vaccination; wearing gloves and protective clothing when handling species with zoonotic disease potential; participating in medical consultations and surveillance; and avoiding high-risk animals and situations.
- Follow strict protocols for handling and transporting animals and for collection and handling of samples. Use personal protection equipment (PPE), disinfect and decontaminate all equipment. Provide proper training in the use, handling, maintenance and disposal of the equipment, firearms, chemicals and drugs involved in the HWC operations. Follow the protocols of vaccination and prophylactic measures.
- Maintain the requisite permissions of the competent authority relating to the use of equipment, drugs, chemicals, infrastructure, vehicles, route permits, etc. that are required for dealing with accidents or emergencies.
- Keep adequate stocks of first-aid kits and anti-venom kits.
- Participate in training programmes relating to animal handling, personal hygiene, disinfectant use, basic first-aid and cardiopulmonary resuscitation (CPR), bio-hazardous waste management, equipment maintenance, use of safety devices, emergency procedures, reporting protocols of accidents and exposure to zoonotic agents and conducting hands-on experiential training programmes and mock drills.
- A hazard analysis lists the potential hazards associated with HWC mitigation and the protocols to be followed to reduce/eliminate the potential threats and risks. Biological-source hazards can be reduced by following a series of key steps:
  - When there are any suspicious animal deaths or multiple deaths, the carcass must be removed to a designated bio-safety necropsy facility instead of completing a necropsy in the field to avoid spreading infections. However, this may not be possible in the case of large mammals.
  - Samples may not be collected from live trapped animals to obtain genetic information for reference in areas where highly infectious zoonotic diseases are endemic.
  - For collecting samples from animals, use chemical restraint instead of physical restraint to avoid direct contact with animals and body fluids.
  - Store samples at approved and dedicated specimen storage locations according to the protocols.
  - Use standard equipment for remote delivery of injections and drawing blood samples.
  - Work in teams with assigned tasks and exercise greater vigilance when completing field necropsies.
  - Use PPE and appropriate equipment to prevent exposure to hazards.

# TOOLBOX

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## Protocol 1:

### Standard Protocol on Personal Protective Equipment (PPE) for Human Health and Safety during HWC Mitigation Activities

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Understanding the potential hazards before any field intervention involving handling of animals (live or dead) is crucial for selecting the right PPE. This is determined by (a) risk assessment of the workplace, the task and the associated hazards (the kind of PPE adopted will depend on the kind of work involved, the danger of exposure to chemicals, drugs, bodily fluids, carcasses and other bio-hazardous material) and (b) reviewing Material Safety Data Sheets (MSDS) or other suitable resources regarding chemicals that may be used during the planned activities.

The following categories of appropriate PPE are to be used in the field, depending on the activity.

- 1. Eye and face protection.** Eye protection may be achieved by wearing protective eye-wear to prevent or reduce the risk of exposure. General safety glasses and impact-resistant safety glasses are sufficient for most animal handling in the field. They are especially important when chemical immobilisation or biological sample collection procedures are involved. However, it is crucial to wear full-face shield masks and N93 respirators during post-mortem examinations of carcasses, especially those found in areas where certain highly infectious zoonotic diseases such as anthrax, tuberculosis, Nipah virus infections and Kyasannur Forest Disease (KFD) are endemic.
- 2. Hand protection.** Gloves are only needed when an animal, animal tissue, drugs, chemicals or carcasses are directly handled. Gloves may be worn at all times when handling a live, or dead, animal. Selecting the right gloves depends upon the type of activity in which personnel are involved (thick leather gloves for handling and restraining animals, latex or nitrile gloves for all other purposes). The gloves do degrade over time and may be replaced if the shelf life has been exceeded. For biological sampling, sterile light latex, vinyl or nitrile gloves are preferable as they offer ease of movement and do not hinder the function of the hands and fingers. Gloves may be used in two layers to avoid contamination in case there is a breakage. When using caustic disinfectants for cleaning environmental surfaces, one can use heavy duty reusable latex or nitrile gloves. All gloves must be test-fitted to ensure proper fitting and coverage prior to use in the field. Improperly fitting gloves can lead to serious accidents and exposure to harmful chemicals or biological agents.
- 3. Body protection.** Cotton or cotton blend overalls are a must in the field when handling animals for any purpose. Aprons are occasionally used in instances where limited contamination is anticipated. For all other non-contact or negligible-hazard risks, regular clothing should suffice. All protective body covering should fit comfortably and fit snugly. Cotton and spun material gowns, overalls and aprons may be washed and reused or disposed. However, they should not be washed in the same equipment or area as used for household clothes. The degree of fluid resistance varies among these materials. This is why fluid-resistant clothing may be used if body fluid contamination is anticipated. Shoes may be covered with stretchable disposable booties to prevent contamination. The soles of the shoes may be disinfected before and after each procedure. When working with carcasses, especially animals suspected to have died of disease or ill-health, or carcasses in areas where highly infectious zoonotic diseases are endemic, Tyvek or other impermeable, biosafety recommended coveralls, face and head shields and boot covers may be used.
- 4. Respiratory protective equipment.** These are useful when there is potential for exposure to biological or chemical hazards as outlined in the SOP. Various respiratory kinds of protective equipment are available, and proper fitting and use are crucial for efficient protection. Surgical masks protect against fluid splashes and large droplets and do not require test-fitting. N95 respirators and other heavy-duty respirators (half-mask, full-face and respirator cartridges) may be used when potential bio-hazards are anticipated. The efficiency of these respirators is dependent on proper fitting. Therefore, test-fitting is a must before using them. They should fit snugly around the nose and eyes. An adequate number of masks should be available in the field to ensure that all personnel are protected at all times.

### General do's and don'ts

- Work from clean to dirty.
- Limit your movement from one place to another to avoid contamination.
- Remove PPE carefully in the field and store or dispose of it in a bio-hazard bag.
- Change into clean clothes before you head out of the field.
- All used PPE should be sterilised properly in a place designated for disinfection of contaminated materials. Do not carry it home or to your office.
- Do not touch your face, PPE or other surfaces with soiled hands.
- The following disinfectants may be used for disinfection of surfaces and discarded material:
  - i) Borax
  - ii) 5% formalin
  - iii) Sodium hypochlorite (0.5%)
  - iv) 70% ethyl alcohol (for disinfecting instruments)
  - v) 5 % sodium carbonate
- Rubbing alcohol, 70% ethanol, quaternary ammonium compounds or other sanitisers should be used to disinfect and sanitise hands after all activities have been completed.

### References

- Standard operating procedure #710- Personal Protective Equipment Requirements. 2018. Comparative Medicine & Animal Resources Centre. McGill University.
- Standard Operating Procedure: Managing Disease Risk in Wildlife Management. 2017. Department of Biodiversity, Conservation and Attractions. Government of Western Australia.
- Occupational Health: A Manual for Primary Health Care Workers. 2001. WHO Regional Office for the Eastern Mediterranean, Cairo.



## Protocol 2:

### Protocol on Vaccination and Prophylactic Measures Prior to Embarking on HWC Activities

Prior to embarking on any field procedures involving working with wild animals, it is recommended that the vaccination and prophylactic protocols be followed.

*Remember that there might be additional vaccines or prophylaxis required, depending on the geographic area you are working in and the kind of disease or health threat arising from the wildlife present in that region. It is best to consult the local public health department to identify all potential vaccines and preventive medications required prior to working with wildlife in that region.*

#### 1. Vaccination (preventive and curative)

**a. Anti-rabies vaccine.** Pre-exposure vaccination includes four doses taken at 0, 7 and 21 or 28 days. Booster doses are given if the serological titres of virus neutralising antibodies decrease to below 0.5 IU/ml in serological screening conducted every two years after vaccination. The WHO now has new recommendations for post-exposure prophylaxis (PEP), which should be performed by a trained medical practitioner. It involves determining the category of exposure as explained in the following.

Category I: Touching or feeding animals, licks on intact skin

Category II: Nibbling of uncovered skin, minor scratches or abrasions without bleeding

Category III: Single or multiple trans-dermal bites or scratches, contamination of mucous membrane or broken skin with saliva from animal licks, exposure due to direct contact with bats

Individuals with WHO Category II or III exposure should receive PEP without delay. PEP consists of the following steps:

- All bite wounds and scratches should be attended to as soon as possible after the exposure. Thorough washing and flushing of the wound for approximately 15 minutes with soap or detergent and copious amounts of water is required.
- Where available, an iodine-containing, or similarly viricidal, topical preparation should be applied on the wound.
- RIG should be administered for severe Category III exposure. Wounds that require suturing should be sutured loosely, only after RIG infiltration into the wound.

- A series of rabies vaccine injections should be administered promptly after an exposure. These may include five doses at 0, 3, 7, 14 and 28 days after exposure. A tetanus toxoid should also be administered to prevent tetanus.

**b. Anti-tetanus vaccine.** Taken once every 10 years if already immunised with five or six doses as a child. If not, two doses, 21 days apart, followed by boosters every 10 years.

**c. Hepatitis A and B vaccines.** Currently these are advised for all adults in India. Administer a three-dose series of HepB to those persons not previously vaccinated. The second dose should be administered one month after the first dose. The third dose should be administered at least two months after the second dose (and at least four months after the first dose). If the combined hepatitis A-and-hepatitis B vaccine is used, administer three doses at 0, 1 and 6 months. Alternatively, a four-dose schedule, administered on days 0, 7, 21 to 30, followed by a booster dose at Month 12, may be used. Adult patients receiving haemodialysis or with other immunocompromised conditions should receive one dose of 40 µg/ml administered on a three-dose schedule or two doses of 20 µg/ml administered simultaneously on a four-dose schedule at 0, 1, 2 and 6 months.

#### Prophylactic medication

**b. Anti-malarials.** Malaria is a risk in most parts of India. Get an anti-malaria prescription if working in a malaria-prone region and follow the doctor's instructions for taking the pills.

**c. Topical insecticides** against ticks and mites

**d. Anti-allergens.** For those suffering from allergies to pollen, animal hair, etc.

**2. Prevention and prophylaxis.** Bugs (such as mosquitoes, ticks and fleas) can spread a number of diseases in India. Many of these diseases cannot be prevented with a vaccine or medicine. You can reduce your risk when working in wilderness areas or in areas with potential exposure to wildlife during HWC activities by taking the following steps to prevent bug bites:

- Cover exposed skin by wearing long-sleeved shirts, long pants and hats.
- Use mosquito-repellent clothing.
- Use an appropriate insect repellent.

- Use permethrin-treated clothing and gear (such as boots, pants, socks and tents). Do not use permethrin directly on skin.
- Check your entire body for ticks after any outdoor activity. Be sure to remove ticks properly.
- Use a bed net if the area where you are sleeping is open to the outdoors.
- For protection against ticks and mosquitoes, use a repellent that contains 20% or more DEET for protection that lasts up to several hours.
- Apply hydrocortisone cream or calamine lotion to reduce itching.

## References

- [https://www.who.int/neglected\\_diseases/news/Rabies\\_WHO\\_has\\_published\\_new\\_recommendations\\_for\\_immunization/en/](https://www.who.int/neglected_diseases/news/Rabies_WHO_has_published_new_recommendations_for_immunization/en/)
- National Rabies Control Programme. National Guidelines on Rabies Prophylaxis. 2015. National Centre for Disease Control., Delhi. [www.ncdc.gov.in](http://www.ncdc.gov.in)
- Zoonotic Diseases of Public Health Importance. 2016. Zoonosis Division. National Centre for Disease Control, Delhi. <https://ncdc.gov.in/WriteReadData/l892s/File618.pdf>
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### Protocol 3:

#### Protocol on First-Aid and CPR for Field Emergencies during HWC Mitigation Activities

HWC mitigation activities by their nature entail a certain degree of risk and danger to all the personnel involved. While all efforts must be made to prevent and avoid injury or danger to humans and animals in the field, accidents do occur. In these instances, it is important to be aware of the protocol for managing and treating such cases to preserve life, prevent further injury and ensure proper healing. Protocol for first-aid and first response during human field emergencies:

1. The most important thing to remember during field emergencies is to be calm, cool and confident.
2. It is important to have at least one member of the HWC team trained in handling field emergencies and first-aid and first-response procedures.
3. In the case of a field-related accident, injury (equipment or animal related), snake bite, etc., first ensure your own safety.
4. Next, evaluate the situation for further threats, extent of damage, number of personnel involved and kind of accident or emergency.
5. Check the person over. If they are not responsive and not breathing normally, then their heart has stopped working and they are having a cardiac arrest.
6. Depending on the level of threat, call the nearest doctor, clinic or hospital for an ambulance to be prepared to receive the patient. A list of the nearest health care facilities with the requisite emergency care kits (e.g., ventilators, oxygen support, anti-snake venom kits, anti-rabies shots) or those where the personnel are registered under medical insurance plans should be prepared by each HWC team (Annexure 3.4).
7. For any field-related injury, perform the following first-aid to prevent aggravation of the injury and to promote healing before hospitalisation:

**(A) Animal bite.** The primary aim of first-aid for animal bites is to control bleeding and prevent infections.

- a. Thoroughly irrigate the wound with copious amounts of clean water and iodine.
- b. DO NOT cover the wound with a dressing or bandage. Cover with a light gauze, if necessary.
- c. Note any unusual signs and symptoms in the injured person.

**(B) Snake bite.** The primary aim of snake bite management is to mitigate the spread and effect of the venom (details in Annexure 3.2).

- a. Treat the wound as with any animal bite.

- b. Note signs and symptoms as they appear, according to the protocol.

c. Follow the three R's:

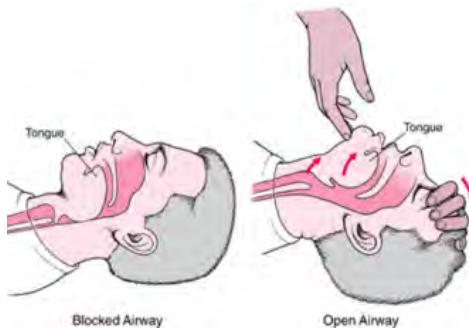
- i. Rest. Using a crepe bandage or similar bandage, bind the affected limb firmly. Reduce the activity of the casualty.
- ii. Reassure. Calm the patient.
- iii. Rapid evacuation. Immediately make arrangements to transport the casualty to a hospital.

#### **(C) Physical injury due to falls or animal attack or other causes.**

The primary aim of administering first-aid for a physical injury is to stabilise the patient until they can be taken to the nearest clinic/hospital for proper medical treatment. Once the patients(s) and injury are established, examine the patient for the ABCDES of first-aid.

- a. **Airway.** Ensure that the patient's airway is open. Tilt the head back. This lifts the tongue away from the airway and prevents blockage. Feel for and remove obstructions, if any (Fig. 1).
- b. **Breathing.** Ensure the patient is able to breathe. With the head tilted back (Fig. 2), Look for the rise and fall of the chest. Listen for breathing sounds. Feel for the breath on the face/cheeks and check the chest-wall integrity and symmetry.
- c. **Circulation:** Ensure that the heart is functioning and that there is no bleeding. Ensure that the heart is beating and that the circulation is active. Look at the skin colour, look for major bleeding, and look for capillary refill. Listen to the chief complaint/level of response (LOR). Feel for the pulse, its quality and its location (radial, femoral, carotid).
- d. **Deficits:** Assess the neurological status of the casualty – whether the casualty is alert and oriented, whether there any disabilities (injuries). Look at the casualty's behaviour and response. Listen to how the casualty is speaking – clearly, coherently or slurred. Feel to check for head injuries

- e. Environment: Ensure that the casualty is comfortable. Protect the patient from exposure to the environment—heat, cold, rain.
- f. Spine: C-spine (cervical spine)—stabilise the C-spine to prevent further injury.
  - (i) Cardio-pulmonary resuscitation (CPR). Perform CPR if necessary. Chest–mouth CPR should be performed only by a



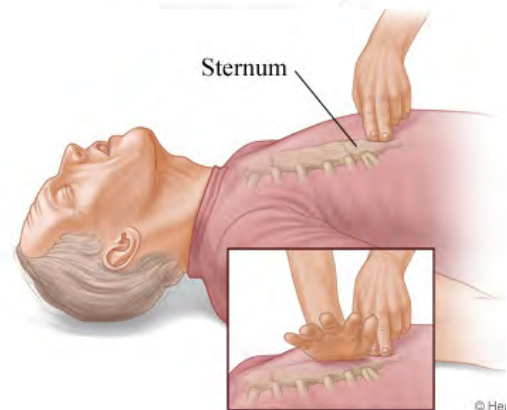
person trained in CPR. Untrained persons can perform non-mouth CPR. Detailed procedures are listed at the end of this protocol.

- (ii) Once the patient is stabilised, transport her or him to a hospital in an ambulance or appropriate vehicle with as little disturbance as possible.
- (iii) At the hospital, inform the doctor about the situation, the source of injury, the animal species involved, the snake species (in the case of a venomous snake bite), the chemical involved (in the case of chemical exposure), the medical history of the patient (if known) and any other relevant information.

**(D) Any other ailment**, e.g., cardiac arrest, pre-existing ailments. Depending on the cause of accident or emergency, follow the protocol for physical injury as appropriate and transport immediately to the nearest clinic/hospital.

## Detailed procedure for CPR

- Chest–mouth CPR should be performed only by a person trained in CPR.



- Untrained persons can perform non-mouth CPR. Detailed procedures are listed at the end of this protocol.
- Place the patient on his or her back with the body stretched out and head tilted back (see accompanying figure).
- Perform the three steps of CPR:
  - Chest compressions—restore blood circulation with chest compressions.
  - Airway—clear the airway.
  - Breathing—give mouth-mouth rescue breaths.
- Give 30 chest compressions:
  - Kneel next to the person.
  - Place the heel of one hand in the centre of their chest (sternum; see figure).
  - Place your other hand on top of the first. Interlock your fingers.
  - With straight arms, use the heel of your hand to push the breastbone down firmly and smoothly so that the chest is pressed down between 5 and 6 cm, and release.

- Do this at a rate of two chest compressions per second for 30 compressions.
- Airway—Tilt the head back to open the airway.
- Two breaths:
  - Support the patient's jaw and open their mouth.
  - Pinch the patient's nostrils shut.
  - Form a seal over the patient's mouth and breathe into their lungs until they are fully inflated.
  - Remove the mouth to allow exhalation.
  - The two breaths should take no longer than 5 seconds.
  - Repeat until an ambulance arrives.
- Breath-to-compression ratio: 2/30—for every two breaths, perform 30 chest compressions.
- Even if you have not been trained in CPR with rescue breathing, you can still use hands-only CPR. Giving rescue breaths helps survival. But if you don't want to give rescue breaths, hands-only CPR is still likely to increase a person's chance of survival. Never do nothing.

- Put one hand on top of the other, interlinking your fingers. Your hand on the bottom should have the fingers open. Lock your fingers together, knuckles up.
- Then push down, in the middle of the chest right on the sternum.
- Push down 5 or 6 cm. That is about 2 inches.
- Push hard and fast about two times a second and 120 compressions per minute.
- Do not worry about hurting someone.
- A cracked rib can be mended—just concentrate on saving a life.
- Keep this up until the ambulance arrives.

**References:**

- <https://www.bhf.org.uk/how-you-can-help/how-to-save-a-life/how-to-do-cpr/hands-only-cpr>
- Wilderness First-aid. Hanifl Centre for Outdoor Education and Environmental Study, Mussoorie, India.

## Protocol 4:

### Protocol on Occupational Health and Safety during Pre-capture, Capture (Physical/Chemical) and Handling of Wild Animals

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Preparedness is one of the most important preventative measures that can be undertaken during any HWC mitigation operation. This includes preparedness prior to capture, during capture, while handling animals and during the transport of an animal to the destination. Standard safety procedures relating to PPE; the use, storage and handling of drugs and chemicals used during HWC activities; managing accidental exposure to capture drugs; first-aid, CPR, accidents and emergencies; vaccination and prophylaxis; and firearm safety have been dealt with in separate protocols. This protocol deals with safety procedures to be adopted with respect to the equipment used (including equipment used for chemical immobilisation), as well as animal-related accidents that may arise, during HWC mitigation operations.

#### 1. Precautions for prevention of accidents related to equipment used

Wildlife capture and immobilisation necessitates the use of a wide array of equipment. For example, immobilisation drugs are delivered remotely using dart projectors, also known as remote drug delivery systems (RDDS), during the capture process. In certain other cases, alternative methods of capture (using physical restraint devices such as nets, traps, slings or cages) are used. Firearms are also carried as a backup when working with potentially dangerous carnivores or mega herbivores. All this equipment has the potential to induce severe trauma to humans when used inappropriately. Thus, these systems should be treated with the utmost respect, and personnel dealing with them should have proper training and practice in using the same. Further, field equipment should be maintained periodically, including cleaning, repair and proper lubrication. The operational status of the equipment should be verified before each capture operation.

##### 1.1 Remote drug delivery systems

Darts with immobilising drugs are delivered to an animal using an RDDS, powered either by a powder charge or compressed gas (air or CO<sub>2</sub>). These darts should thus be always treated as firearms, and personnel using RDDSs should have appropriate firearms training and practice firearms safety rules (see Protocol on Firearms Safety for further information). The following points may be considered in particular:

- Keep RDDSs unloaded when they are not actually in use.

- Whenever an RDDS is handled or handed to someone, visually check the barrel to ensure that it is empty.
- Do not load the chamber until deployment in the field, and never perform any undesired action with loaded equipment.
- Never alter or modify RDDSs, and have them serviced only by authorised dealers. These are complicated systems that are designed by experts to function properly in their original factory settings.
- Keep practicing with the RDDS in your possession whenever time permits, to get used to its functionalities.
- RDDSs should always be stored safely, in lockable and dry cabinets/carrying boxes and kept away from the reach of children and unauthorised persons.
- Lastly, never handle RDDSs under the influence of alcohol, intoxicants or even prescription drugs that can alter the state of the mind.

#### Physical capture equipment

The process of capture and restraint of wildlife often requires physical restraint (or a combination of physical and chemical restraint) using a wide variety of capture and handling devices that are available. These include corrals, bomas, drive nets, net guns, drop/rocket nets, mist nets, leg-hold traps, foot snares, box traps and cage traps. Some of these systems also pose potential risks to human health. The following points should thus be considered:

- Leg-hold traps and foot snare springs can produce significant bruising or crush injuries if improperly handled. They should always be deployed with extreme caution, using thick protective gloves and clothing. When not in use, the traps should always be kept in the closed/triggered position.
- Boma capture, or capture using drive nets, usually involves manual pursuit or chasing of hoof stock, thereby posing a potential injury risk to the personnel involved, either through physical falls or through the animals themselves. Proper precautions, including baffle boards and shin/arm/groin/chest guards, should always be used to avoid such injuries.
- Net guns and cannon nets have the potential to cause severe injuries to personnel if the lead weights present at the four corners strike the personnel. Caution should be exercised to avoid the same by keeping a close watch on the target animal's surroundings for

the presence of humans before triggering the systems. Since power from gunpowder is used to propel the nets, net guns should be treated with the same respect as firearms.

- Trap cages are often used for species that are difficult to pursue or approach on foot. Since they are used mainly to capture large predators, trap cages should be sturdy, well maintained and escape-proof to avoid any untoward accidents.
- Vehicle safety. Conflict mitigation and capture operations necessitate the use of various kinds of motor vehicle, including tractors (with or without trailers), lift trucks or cranes, 4 × 4 trucks and transport, patrol or other utility vehicles. To ensure personnel safety, only authorised personnel with a driving license and trained in the motoring of such vehicles should be designated to use such vehicles. These vehicles should be properly maintained, and it should be ensured that they are suitable for the task assigned. Further, these vehicles should have warning devices, such as hooters, and be properly labelled as 'Rescue' vehicles to facilitate easy identification during field operations.

## 2. Precautions for prevention of animal-related accidents

Animal-related accidents during capture and immobilisation can be categorised into three main types: physical injury directly inflicted by animals, such as bites, kicks, claw scratches, crush injuries, horn wounds; physical injury, such as falls, trips, abrasions, due to accidents or failure to observe other hazards; and, biological or systemic injury sustained through zoonotic diseases transmitted from handling potentially diseased animals. The following precautions must be observed to prevent such injuries:

- Personnel working in HWC response teams should be educated adequately regarding the natural history and behavioural aspects of the target species, viz., the size and power of the animal or the species in general; the natural group instincts and hierarchical behaviour of the animal; the predatory nature of the animal; the reaction of humans and animals to fear; and the fact that some animals have an innate ability to kill/injure.

The response team should be provided with adequate apparel or PPE such as long-sleeved shirts/dungarees, slip-proof shoes, baffle boards, shin/arm/groin/chest guards and bite-proof helmets. Face protection, such as masks or goggles, may be appropriate where there is a risk of body fluids splashing on the face, particularly the eyes. Any employee required to wear respiratory protective equipment (RPE) should undergo a face-fit test to ensure that the equipment can be worn correctly. For more information, refer to the Protocol on PPE.

- Public health professionals should be consulted to determine disease threats and vaccine requirements or prophylaxis in response teams specific to the geographic region in which the HWC mitigation operations are being carried out. On the basis of these inputs, the entire team should be subjected to prophylaxis regimens, including booster doses at suggested intervals. For more information, refer to the Protocol on Vaccination and Prophylaxis.

## References

- McKenzie, A. A. 1993. (Ed.) The Capture and Care Manual: Capture, Care, Accommodation and Transportation of Wild African Animals. Wildlife Decision Support Services CC and The South African Veterinary Foundation. 629 pp.
- Handbook of Wildlife Chemical Immobilization. Fifth edition. Terry J. Kreeger and Jon M. Arnemo. 2018.

## **Protocol 5: Protocol for Firearm Use and Safety during HWC Mitigation Operations**

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There will be occasions during HWC mitigation operations when the use of firearms will be justified in order to put down animals in conflict that cannot be rescued or rehabilitated. In such cases, HWC mitigation teams may have to resort to using these firearms, and therefore it is important to follow important safety protocols to avoid accidents and unintentional harm to humans or animals. It must be pointed out that during HWC mitigation activities, all remote injection systems (blowpipes, gas-powered pistols and rifles) are also to be treated as firearms and are therefore also referred to as such in this protocol.

The following safety precautions and protocols must be followed during the handling of any firearms during HWC activities.

No HWC team member should handle any firearms before they have been briefed on their safe use by an appropriate expert.

### **1. The following firearms safety protocol should be followed:**

- a. All firearms are to be handled as if loaded at all times.
- b. On picking up a firearm or receiving one from someone else, make sure it has been made safe (safety catch on, if it has one, and not pressurised).
- c. Always point firearms at the ground or, if not possible, at least away from people and animals.
- d. Always delay loading firearms (even with darts) until they are required for use (this will depend on the situation).
- e. Always delay pressurising firearms until the last safe moment.
- f. Always keep the safety catch on until the firearm

is required for use

- g. Always keep watching the widest possible arc (for people or other animals moving into the firing line) until the last safe moment.

### **2. Use the marksmanship principles when discharging any firearm:**

- a. The position and hold must be firm enough to support the firearm.
- b. The firearm must point naturally at the target without any undue physical effort.
- c. Ensure that the sight is aligned with the target before firing.
- d. The shot must be released and followed through without undue disturbance of the position.
- e. After discharging any firearm, make sure that it is made safe before doing anything else.
- f. Check that the safety catch is on (reapplied), if the firearm has one.
- g. Check that the firearm is de-pressurised fully before and after handling it.
- h. Check that the firearm is stored securely or responsibly before it is passed to someone else.
- i. For darts and drugs, follow the following procedure:
  - i. Wear protective hand and eye cover whilst preparing darts.
  - ii. Always work in pairs when using dangerous drugs.
  - iii. Have appropriate reversal drugs readily available for use if required.
  - iv. Do not carry pressurised darts unprotected.
  - v. Handle darts carefully after use as per the SOPs 'Safety during Captures' and 'Safe Usage and Storage of Drugs'.



## Protocol 6:

### Protocol on Safe Usage and Storage of Drugs Used in HWC Mitigation

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Drugs designed for remote delivery are often very potent. Serious toxicity and even death can result from accidental human contact with these drugs. Capture drugs must always be handled with care, and the level of vigilance must always be high. The following points must be kept in mind during the use, handling, storage and transport of drugs or chemicals used during HWC mitigation:

1. Drugs designed for capture of wild animals should only be handled by registered veterinary practitioners who are thoroughly trained in the use of capture drugs and wildlife restraint and anesthesia techniques.
2. All legal requirements and regulations regarding ordering, storage, use, inventory and disposal of these drugs should be strictly observed.
3. The veterinarian should regularly review and rehearse safety and emergency procedures with all the staff members concerned.
4. This protocol on safe usage, storage, disposal and accidental exposure to drugs used to capture wild animals should be kept with the immobilisation and emergency kits at all times and should be available during such procedures.
5. All personnel involved in wild animal captures should be made aware of the potential danger from accidental exposure to the drugs.
6. Use potent drugs only in the presence of a second person who is trained in their use and in the management of accidents.
7. Always wear goggles or safety glasses, a face mask or shield and protective gloves (preferably two pairs), especially when working with potent narcotics. Where possible, wear long-sleeved and long-legged pants and a shirt or coveralls. Coveralls can be quickly removed if a drug is spilled on them.
8. Know basic first-aid techniques, including CPR.
9. Always concentrate on what you are doing and work in an orderly fashion
10. NEVER eat, drink, smoke or rub your eyes when working with capture drugs.
11. If you have cuts or abrasions on your hands, apply a plaster on the affected area and wear gloves.
12. Clean water in a proper container should be readily available during immobilisation operations to flush any spilled drug from skin.
13. Drugs should be drawn into syringes just before use to avoid keeping filled syringes. Also keep reversal agents (for the animal) in labelled syringes for ready use if required. Record the name and amount of the immobilisation agent before the vials are opened and maintain a record of the amounts used, dates used, species used on, etc. to maintain an inventory.
14. Be careful never to inhale drugs that are in powder or aerosol form.
15. Never work with opioid drugs in a moving vehicle.
16. Never work with opioid drugs without having the human antidote at hand in the first-aid kit.
17. Darts should be loaded slowly and away from other people.
18. Do not push air into the vials of potent drugs as the drugs may leak out.
19. Use a small syringe with a thin needle for drawing up concentrated solutions.
20. Never over-pressurise bottles containing these drugs. In high-altitude or other high-pressure areas, use a drug chamber (made of a simple cardboard box) to avoid accidental release.
21. Keep the bevel of the syringe and needle pointed away from you at all times.
22. Use pliers to replace or remove needle caps.
23. Loaded darts should be capped and placed in safe, leak-proof containers that are clearly marked with the name of the immobilising agent used. All items similarly contaminated by the drug, such as used darts and loading syringes should also be placed in the same container for rinsing or disposal later.
24. Consider all dart guns as loaded and all darts as filled until you know otherwise.
25. Lock all capture drugs away when they are not being used.
26. Label all drugs, containers, unused darts and filled syringes that are not used immediately.
27. Avoid using narcotic drugs such as etorphine and carfentanil in blow pipes. If possible, use a hand-held pump instead of blowing using blow pipes.
28. All personnel should stand behind the veterinarian or person operating the dart gun during the immobilisation procedure to avoid mishaps due to accidental misfiring.
29. All darts, syringes and immobilisation guns should be treated as fully loaded firearms.
30. Once animals are darted, the darts should be removed carefully to prevent accidental release of un-released, pressurised drugs.

31. Blood from a dart wound may contain the drug.
32. After the capture procedures have been completed, all darts, syringes and needles shall be properly disposed of or properly stored for proper disposal.
33. Darts should be de-pressurised before they are cleaned and rinsed.
34. Needles and used syringes should be disposed of in the sharps container along with empty drug bottles.
35. In case of any contact with skin or mucous membranes, wash immediately using copious quantities of water.
36. Be very careful when removing darts from recumbent animals.
37. Symptoms of narcotic spills/contact/overdose in humans should be monitored. Prompt should be action taken when the following symptoms are noticed:
  - nausea and vomiting
  - dizziness and discoordination
  - respiratory depression

- cold skin
- severe drop in blood pressure
- loss of consciousness
- muscle rigidity
- pin-point pupils/miosis

These symptoms can progress to coma and cardiovascular collapse with severe intoxication.

#### **References/Sources**

- Petrini, K. R. and Keyler, D. E. 1993. Immobilizing agents-: Developing an urgent response protocol for human exposure. Proceedings of American Association of Zoo Veterinarians.
- McKenzie, A. A. 1993. (Ed.) The Capture and Care Manual: Capture, Care, Accommodation and Transportation of Wild African Animals. Wildlife Decision Support Services CC and the South African Veterinary Foundation. 629 pp.

## Protocol 7:

### Protocol on Response and First-Aid for Accidental Exposure to Drugs Used in HWC Mitigation

When appropriately used, chemical immobilisation can be employed to safely restrain and capture many species, thereby minimising stress and the risk of injuries associated with other restraint methods. Because smaller volumes of drugs are more easily delivered via remote drug delivery systems, most drugs used for wildlife anaesthesia are extremely potent and pose significant hazards to the people using them. This is especially true for potent opioid drugs such as carfentanil, thiafentanil, etorphine, alpha-2 agonists and medetomidine and psychotropic drugs such as ketamine. Accordingly, capture drugs must always be handled with the utmost care and highest level of caution. The following protocol must be followed in case of an accidental exposure to drugs used for capture of wild animals during HWC mitigation activities:

1. In case of an accidental exposure to a narcotic or immobilising agent, immediately call for expert medical help as it requires at least two persons to handle a drug accident victim effectively.
2. Observe and note the symptoms seen on exposure to the drugs (including the package insert of the drug), preliminary first aid and treatments given and the response.
3. When a person exposed to a drug is treating himself or herself, another person should be made aware of the nature of the drug, the symptoms observed and the treatment undergone.
4. The personnel involved in tranquilisation must all know the drugs used, and the ready-to-use labeled antidotes should be kept in the kit, along with details about the mode of administration when accidental exposure to drug occurs. In case the drug used is not known, a general antidote such as naloxone may be administered after consultation with experts. Limit the drug absorption by washing the contact surface with copious amounts of water.
5. When drug absorption occurs in a limb, apply a tourniquet proximal to the injection site to delay distribution of the drug. Release the tourniquet once the antidote has been administered and has had a chance to be absorbed. Do not keep a tourniquet on for more than 40 minutes.
6. Precautions during accidental exposure to drugs.
  - Monitor the patient continuously and determine the quantity of the specific drug absorbed and give an additional dose of the antidote if required.
  - Keep the patient in the shade and loosen or remove all restrictive clothing.
  - Try to keep the patient's body temperature normal, and keep him or her warm.
  - Keep reassuring the patient to remove any fear and panic and provide all comfort.
  - Support the circulation by laying the patient horizontally on his or her side to prevent vomiting. Keep the legs slightly higher than the rest of the body. In severe cases, establish an IV drip as soon as possible, before the blood pressure drops. Administer CPR (see separate protocol) if needed.

#### 7. First-aid kit for capture operations

##### Basic components

| Equipment                                    | Emergency Medicaments                           |
|----------------------------------------------|-------------------------------------------------|
| Pulse-oxymeter—1                             | Intravenous saline (0.9%) solution—2 litres     |
| Stethoscope—1                                | Intravenous colloidal solution—2 litres         |
| Thermometer—1                                | Naltrexone hydrochloride* (50 mg/ml) × 1        |
| Ambu® bag with face mask—1                   | Yohimbine/atipamazole (20 mg/ml) × 1            |
| Portable oxygen cylinders—10–15 liters       | Hydrocortisone (250 mg) × 1                     |
| IV drip sets × 2                             | Diazepam (2 mg) × 10                            |
| Sterile IV cannulas—21G × 5                  | Atropine (5 mg) × 5                             |
| Adhesive tape—2                              | Adrenaline (20 mg) × 5                          |
| Disposable syringes—2 ml and 10 ml × 10 each | Respiratory analeptics (doxapram hydrochloride) |
| Hypodermic needles—18G and 21G × 20          | Neostigmine (10 mg)                             |
| Pressure bandage, roll gauze and cotton      | Broad spectrum antibiotics × 2                  |
| Scissors and forceps × 2 each                | Antiseptic ointments or powders × 2             |
| Tourniquet and clamp × 1 set                 | Anti-snake venom serum × 2                      |

\*Naloxone can also be used, if available, though doses can vary from 1 to 5 mg per kg body weight.

#### 8. Exposure to specific drugs/drug classes

- a. **Narcotics/opioids.** These include currently used drugs such as etorphine, carfentanil and thiafentanil, although many new opioids may soon be used in the country.

These drugs are similar in their action and toxicity. Etorphine has been used as the specific example here, with 1 mg of carfentanil being equivalent to 2.5 mg of etorphine and 15 mg of thiafentanil being equivalent to 1 mg of etorphine.

- Etorphine is not absorbed through intact skin; nevertheless, always wash off any etorphine as soon as possible after it comes into contact with skin.
- Etorphine is absorbed through broken skin (cuts), as well as via the membranes of the eyes, nose and mouth.
- Never put anything into your mouth or rub your eyes with your hands when working with etorphine.
- First-aid
  - Immediately inject up to 1 mg of naloxone IV, followed by 0.4–0.8 mg IV every 2–4 minutes post-exposure. Note that IV administration of naloxone can cause nausea and vomiting.
  - Alternately, administer 25–50 mg (0.5 to 1.0 ml) of naltrexone IM (leg or arm), followed by 25–50 mg (0.5 to 1.0 ml) of naltrexone IV into a vein of the forearm. If you cannot find a vein, administer the naltrexone into the muscle as well and massage the area.
  - Try to determine the amount of etorphine that has been absorbed.
  - Use an additional 1 ml of naltrexone per 1 mg of etorphine.
  - If there is no improvement, or if there is deterioration, give additional naltrexone.
  - The breathing will begin to improve instantaneously upon administration of the antidote, with the rate and depth of breathing improving.
  - Naltrexone is a very safe antidote, and overdosing does not occur.
  - Administer additional naltrexone if the breathing remains slow or shallow.
  - If there has been no response to the antidote and the condition is critical, administer doxapram at 3 ml/70 kg IV after a consultation. The dose can be repeated every 10 minutes, but doxapram in high doses can cause convulsions.
- b.** Shift the patient to a medical facility as soon as possible and inform the physician about the specific drug to which there has been exposure, the symptoms observed and the treatment given.
- c. Alpha-2 agonists.** These include drugs such as xylazine, detomidine and medetomidine. Xylazine is rarely fatal even at high doses. Medetomidine, on the other hand, can cause human intoxication with a very small-volume exposure—150 µg can induce significant bradycardia and a reduction in blood pressure. A dose of 120 µg (0.012 ml of 1% solution) of medetomidine has been reported to induce sleep

in 50% of human males.

The main signs of intoxication by alpha-2 **agonistic drugs include**

- bradycardia
- irregular heartbeat
- hypotension
- sleep and unconsciousness
- respiratory depression
- First-aid
  - Only supportive care can be provided.
  - If the heart rate falls below 40 beats per minute, give 0.5 mg atropine.
  - This can be repeated three times every 5 minutes until the heart rate increases.
  - Do not use an antidote (atipamezole)—atipamezole is not approved for human use and can compound the problem.
  - Fluid therapy
  - Administration of supplemental inspired oxygen and ventilator support

**c. Cyclohexamines.** These include drugs such as tiletamine and ketamine.

- Signs of intoxication
  - Initially, this group produces symptoms of excitability.
  - Large doses can result in severe respiratory depression, hypertension and eventually coma.
- First-aid
  - No antagonist is currently available.
  - Remain with the exposure victim, keep the patient comfortable, monitor the respiration, and be prepared to provide CPR if necessary.
  - Transport the patient to a hospital as soon as possible.
  - The physician should be informed about the particular drug exposed to, its quantity (if assessed) and the first-aid given. Provide the package insert of the drug to the treating physician.
  - If the patient was exposed to Telazol® (tiletamine/zolazepam), the physician is to be informed that the effects are similar to those of ketamine and diazepam.

**d. Other drug classes include** alpha-2 antagonists (e.g., yohimbine, tolazoline, atipamezole), butyrophenones (e.g., azaperone, haloperidol, droperidol), phenothiazines (e.g., acepromazines, Cclorpromazines) and benzodiazepenes (e.g., diazepam, midazolam). Many of these drugs have not

been tested on humans or have not been linked to specific symptoms of poisoning. In case of accidental exposure to these drugs, follow the general protocol given in the foregoing.

### **References/Sources**

- Petrini, K. R. and Keyler, D. E. 1993. Immobilizing agents-: Developing an urgent response protocol for human exposure. Proceedings of American Association of Zoo Veterinarians.
- McKenzie, A. A. 1993. (Ed.) The Capture and Care Manual: Capture, Care, Accommodation and Transportation of Wild African Animals. Wildlife Decision Support Services CC and the South African Veterinary Foundation. 629 pp.

## PROTOCOL 8:

### Standard Protocol for Human Health and Safety During Collection, Handling, Storage and Transport of Samples

It is common practice to collect biological samples from wild species during HWC mitigation activities. Appropriate protocols for sample collection, handling, storage and transport should be strictly followed to avoid endangerment of human health and safety. Proper handling during sample collection and transportation also ensures that the sample quality is maintained and that the samples can be used for diagnostic and other tests.

The following precautions are necessary:

All biological specimens are potentially infectious and should be treated as bio-hazards and should be handled with utmost care.

- All personnel participating in HWC mitigation activities and in sample collection and transportation activities must be briefed about the safety precautions before sample collection activities to avoid accidental exposure to biological, chemical or physical hazards.
- The HWC mitigation response team should always carry a first-aid kit in their vehicle and be aware of the safety of themselves, their team members and the animals concerned.
- Prior to sample collection, a risk analysis exercise should be conducted to identify potential threats/hazards to human safety, which include the following:
  - Bites and scratches. During HWC mitigation operations, wild animals (carnivores, crocodilians, snakes, etc.) may cause bites, scratches and other injuries. Therefore, for protection, PPE customised for species-specific behaviour should be used. All injuries should be immediately cleaned, disinfected and treated appropriately. Snake-bite treatment protocols should be followed immediately in case of snake bites, and a medical doctor should be consulted immediately. It is advisable to take prophylactic vaccinations (tetanus, rabies, etc.) as per the guidelines available with the National Centre for Disease Control (NCDC), New Delhi. Zoonoses are diseases transmitted by wild animals (e.g., rabies, tick-borne diseases, brucellosis, anthrax, toxoplasmosis, leptospirosis and salmonella), especially when there is close contact during HWC mitigation, sample collection, handling and transport activities. All personnel involved must be made aware of threats from, as well as the transmission routes of, the same. All personnel must take precautions and follow management protocols to minimise the risk of disease transmission to protect themselves and their team members.

- Allergies. Some personnel may develop allergies when they come in contact with animal materials such as hair and dander. Personnel with a predilection to developing allergies should wear respiratory masks, gloves and fully covering pants/shirts when handling animals. People with severe animal-associated allergies, or with compromised immune systems (due to autoimmune or immune-deficiency diseases or immunosuppressant therapy) should not be involved in handling of wild animals in HWC mitigation activities.
- Chemicals. Personnel should be aware of the dangers of the chemicals they use in the field. They should read and be aware of the Material Safety Data Sheets (MSDS) relevant to the chemicals they may be using (e.g., methylated spirits, ethanol). Many of the chemicals used for biological sample storage and transport may cause irritation to skin and mucous membranes on contact. Wash the areas involved with plenty of water and contact a physician if the irritation persists. If these chemicals are ingested, drink copious amounts of water and call a physician.
- Fire risk. Personnel intending to clean and sterilise equipment by flaming should be aware of the associated fire risk and take appropriate actions to reduce this risk.

#### Protocol for biosafety during sample collection, handling, storage and transport

- Only trained and experienced personnel (or those working directly under the supervision of such personnel) should collect biological samples from live or dead animals. Personnel handling animals should be trained in appropriate capture and handling protocols for the species concerned, while those collecting samples should be trained in appropriate biosafety protocols for sample collection from live and dead wild animals.
- All materials and equipment used for collection should be ready a priori.
- Hands should be thoroughly cleaned before and after collection procedures.
- Appropriate PPE should be worn by the personnel while handling the animal and during collection of samples, and the PPE should be disposed of appropriately after use (as given in the waste disposal section of this SOP).
- Although it is difficult to ensure sterile conditions in the

field, it is important to ensure cleanliness throughout the sample collection and transport procedure to minimise the risk of exposure to identified threats and to obtain good samples.

- Ensure that live animals are properly restrained before attempting to collect samples.
- In the case of dead animals, ensure that the vicinity of the dead animal is clean and free of flies and other insects that may potentially cross-contaminate from the carcass to the personnel. Avoid coming into contact with leaked body fluids.
- If possible, ensure that the area to be sampled is free of ecto-parasites (ticks, mites) before proceeding with the sampling.
- In case of any spillage or leakage of samples (e.g., body fluids), they should be cleaned and disinfected carefully to minimise further exposure, and all areas should be disinfected immediately.
- All needles, sharps and contaminated cotton or equipment should be disposed of in a bio-hazard bag or sharps container to minimise exposure.
- Make sure that there is no visible contamination or leakage outside the sample container and that no sharps are present that could potentially expose the person opening the package to pathogens or other risks.
- Sample collection tubes and vials should be labelled properly with species ID, individual ID, place of collection, date of collection and type of sample. Labelling should ideally be done before the sampling procedure to ensure cleanliness. Labelling after sample collection should be done using clean, new gloves and pens that have not been used for collecting the sample. Labels should be non-absorbent or waterproof, preferably laminated.
- All equipment used to obtain tissue samples should be cleaned and disinfected between animals and prior to returning the equipment for storage. This can be done

by flaming:

- a. Dip the equipment to be used for obtaining the sample into 70% ethanol and clean it with a swab to remove gross dirt, leftover tissue, etc. (Note: Since ethanol is a highly flammable substance, care should be taken that only the equipment needing to be flamed comes into contact with the ethanol.)
  - b. Clean up any spillages immediately, including any ethanol on hands and clothing. Wait until the spilled ethanol has evaporated before continuing with the procedure.
  - c. Re-dip the equipment to be used for obtaining the sample in the ethanol and flame the cutting part with a lighter or portable flame torch. (Note: The flame from ethanol is not visible in sunlight.)
  - d. Allow the equipment to cool before using it.
  - e. DO NOT allow contact with any other biological material (including human fingers) before the next animal is sampled.
- Flaming is the most common method for cleaning and disinfecting equipment, but in fire-risk areas it may not be possible to use it or it may not be appropriate. Using 70% isopropyl alcohol medical swabs is a suitable alternative.
  - For single-step disinfection, equipment can be soaked in a disinfectant solution (e.g., 10% bleach or other commercial disinfectant) for 10 minutes and rinsed subsequently with de-ionised water.

## References

- Department of Biodiversity, Conservation and Attractions (2017). Standard Operating Procedure: Tissue Sample Collection and Storage for Mammals. Perth, WA: Department of Biodiversity, Conservation and Attractions.
- Standard Operating Procedures. 2003. Veterinary Wildlife Services, South Africa.

## Protocol 9:

### Protocol for Storage, Transport, Treatment and Disposal of Biomedical Waste Generated During HWC Mitigation Operations

Waste management practices should primarily focus on minimising the health problem and reducing the potential risks to workers associated with HWC operations. The biomedical waste (BMW) produced in the process of chemical immobilisation, capture, handling, care and transportation of wild animals involved in HWC and collection of samples from them may generate health risks.

BMW waste generated in HWC situations and rescue centres may consist of:

- Anatomical waste such as tissues, body parts or whole carcasses
- Animal waste such as faeces and vomitus produced during transportation and in rescue facilities
- Waste items such as needles, syringes, scalpels, broken glass ampoules and injection bottles
- Used or discarded medicine and drug vials, wound-dressing material, material contaminated with blood, used infusion sets

These wastes carry a greater risk of infection and injury than do any other waste. Therefore, safe and reliable methods of waste handling are essential. These methods must comply with the Bio-Medical Waste Rules, 2016. A casual and improper approach to waste management may have serious public health and environmental health consequences.

1. The concept of 3Rs (reduce, recycle and reuse) should reflect in the handling of biomedical waste. According to WHO's Safe Management of Wastes from Health-Care Activities, the BMW disposal method should be used to prevent, reduce, reuse, recycle, recover, treat and, lastly, dispose of waste.
2. Other wastes should be disposed according to the following rules:
  - Radioactive wastes as covered under the provisions of the Atomic Energy Act, 1962 (33 of 1962).
  - Hazardous chemicals as covered under the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989.
  - Solid wastes as covered under the Municipal Solid Waste (Management and Handling) Rules, 2000.
  - Lead acid batteries as covered under the Batteries (Management and Handling) Rules, 2001.

- Hazardous wastes as covered under the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008.
- Waste covered under the e-Waste (Management and Handling) Rules, 2011.
- Hazardous micro-organisms, genetically engineered micro-organisms and cells as covered under the Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms, Genetically Engineered Micro-organisms or Cells Rules, 1989.

Safe storage, transport and disposal of biomedical waste (BMW) generated during HWC mitigation activities

1. All waste generated during HWC mitigation activities, such as gloves, disposable coveralls, syringes, needles, empty drug containers, used and disposable equipment and any other disposable material should be segregated and stored in respective bags (see Annexure 3.7). Segregation helps reduce the effort required in subsequent steps of handling, recycling, illegal reuse, treatment and disposal of waste.
2. Persons handling BMW should wear appropriate PPE such as gloves, aprons, masks and leg-covering boots or boot covers when handling the waste.
3. All sharp objects must be collected in puncture-proof sharps containers to avoid accidental injury and exposure.
4. The BMW should be stored in the designated area with proper labelling, and the storage area should be marked with a caution sign. Any wild animal-anatomical waste must not be stored without the permission of the Chief Wildlife Warden.
5. The waste should be transported for treatment in a closed vehicle in the designated container/bag, properly tied, labelled and made spill-proof, with a document signed by the veterinary doctor that mentions the date, site, quantity and destination.
6. The transport vehicle used must have closed partitions so as to prevent direct contact between the waste and scavengers and the staff carrying it.
7. The driver of the transport vehicle should also be trained in the procedures to be followed in the case of an accidental spillage or exposure, including filling out an accident report form (Annexure 3.8).



8. BMW should be transported to a common bio-medical waste treatment facility' (CBMWTF) nearby for treatment and disposal. As per the Bio Medical Waste Rule, 2016, a rescue centre/health care facility, or other centres, generating BMW shall not establish an on-site treatment and disposal facility if a service of a CBMWTF is available within a 75-km radius.
9. Disposal of waste in rural areas or remote areas should be carried out only with prior approval from the prescribed authority, using deep-burial methods, as per the standards specified in Schedule-III of the Bio Medical Waste Rule, 2016.

## References

- Bio-Medical Waste Management Rules, 2016. Ministry of Environment, Forest and Climate Change. Government of India. Gazette of India, Extraordinary, Part II, Section 3, Sub-section (i).
- [https://www.aiims.edu/images/pdf/Departments\\_Centers/BiomedicalWaste.pdf](https://www.aiims.edu/images/pdf/Departments_Centers/BiomedicalWaste.pdf)



# TOOLS

## Tool 1: Zoonotic diseases that can be transmitted from wild animals

| S. no.           | Disease                                                                                 | Animal                                                                         | Probable means of spread to man                                                                             |
|------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>BACTERIAL</b> |                                                                                         |                                                                                |                                                                                                             |
| 1                | Anthrax                                                                                 | Mammals, especially elephants, deer, antelopes, large carnivores               | Through the skin, inhalation or ingestion of spores                                                         |
| 2                | Brucellosis                                                                             | Large herbivores, large carnivores, cattle, sheep, goats, pigs, dogs           | Direct contact with excretions and secretions, including the milk, of infected animals                      |
| 3                | Tetanus                                                                                 | Mammals                                                                        | Bite wounds, contamination with spores                                                                      |
| 4                | Salmonellosis                                                                           | Reptiles, birds, poultry, rodents                                              | Ingestion of food and water contaminated with faeces                                                        |
| 5                | Glanders                                                                                | Equids and felids                                                              | Nasal discharge and necropsy exposure                                                                       |
| 6                | Leptospirosis                                                                           | Most domestic and wild animals, especially rodents, foxes, felids, hares, bats | Direct contact with urine or tissues or aborted foetus                                                      |
| 7                | Plague                                                                                  | Rodents, hares, cats and dogs                                                  | Fleas, contact with sick animals, inhalation                                                                |
| 8                | Psittacosis                                                                             | Parakeets, pigeons and geese                                                   | Inhalation and contact with faeces or feathers                                                              |
| 9                | Pasteurellosis                                                                          | Domestic and wild animals                                                      | Contact and ingestion of infected material                                                                  |
| 10               | Tularaemia                                                                              | Rodents, dogs, cats and sheep                                                  | Contact with infected animals and arthropod bites                                                           |
| 11               | Tuberculosis                                                                            | Cattle, pigs and non-human primates                                            | Inhalation and ingestion                                                                                    |
| 12               | Relapsing fever, scrub typhus, Rocky Mountain spotted fever and other tick-borne fevers | Rodents, mammals                                                               | Tick bites                                                                                                  |
| <b>FUNGAL</b>    |                                                                                         |                                                                                |                                                                                                             |
| 13               | Ringworm                                                                                | Mammals and birds                                                              | Direct contact and fomites                                                                                  |
| 14               | Aspergillosis                                                                           | Birds                                                                          | Inhalation of spores                                                                                        |
| <b>PARASITIC</b> |                                                                                         |                                                                                |                                                                                                             |
| 15               | Malaria                                                                                 | Non-human primates                                                             | Mosquito bites                                                                                              |
| 16               | Amoebic dysentery (protozoal origin)                                                    | Non-human primates, reptiles                                                   | Contact, ingestion of contaminated food and water with faeces                                               |
| 17               | Giardiasis                                                                              | Non-human primates, dogs                                                       | Contact, ingestion of contaminated food and water with faeces                                               |
| 18               | Trypanosomiasis                                                                         | Wild and domestic ruminants, dogs and cats                                     | Bites of infected tsetse flies, contamination of wounds with faeces of bugs and blood transfusions          |
| 19               | Toxoplasmosis                                                                           | Felids, canids and other mammals                                               | Ingestion of contaminated food and water with faeces of cats and ingestion of infected meat                 |
| 20               | Echinococcosis and hydatidosis                                                          | Wild carnivores, dogs and cats                                                 | Ingestion of contaminated food and water with faeces of animals                                             |
| 21               | Visceral larva migrans                                                                  | Wild carnivores, dogs and cats                                                 | Ingestion of uncooked meat, food and water contaminated with faeces of animals, contact                     |
| 22               | Trichinosis                                                                             | Pigs, bears and carnivores                                                     | Ingestion of infected raw or half-cooked meat                                                               |
| 23               | Taeniasis and cysticercosis                                                             | Ruminants, pigs, cattle                                                        | Ingestion of eggs in raw or improperly cooked meat                                                          |
| 24               | Sarcocystosis                                                                           | Wild canids, wild and domestic ruminants, dogs, pigs                           | Ingestion of raw or improperly cooked meat, ingestion of food and water contaminated with faeces of animals |

| S. no.       | Disease                                                                                              | Animal                                                                                         | Probable means of spread to man                                            |
|--------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| <b>VIRAL</b> |                                                                                                      |                                                                                                |                                                                            |
| 25           | Rabies                                                                                               | Mammals and bats                                                                               | Bites of diseased animals, inhalation                                      |
| 26           | Nipah virus infection                                                                                | Bats                                                                                           | Inhalation of air contaminated with droplets containing the virus          |
| 27           | Kyasanur Forest Disease (KFD)                                                                        | Macaques                                                                                       | Bites from infected ticks                                                  |
| 28           | Influenza type A (H1N1, H2N2, etc.)                                                                  | Water and migratory birds, poultry, pigs                                                       | Inhalation of air contaminated with droplets containing the virus          |
| 29           | FMD                                                                                                  | Cattle, pigs, wild ruminants                                                                   | Contact                                                                    |
| 30           | Equine encephalomyelitis                                                                             | Rodents, reptiles, amphibians, monkeys, dogs, cats, foxes, skunks, cattle, pigs, birds, equids | Mosquito bites                                                             |
| 31           | Hepatitis E virus (HEV) infection                                                                    | Non-human primates, rodents, pigs, sheep                                                       | Ingestion of contaminated food and water with faeces of animals, contact   |
| 32           | Japanese B encephalitis                                                                              | Wild birds, pigs and horses                                                                    | Mosquito bites                                                             |
| 33           | Lymphocytic choriomeningitis                                                                         | Monkeys, dogs, guinea pigs                                                                     | Excretions and secretions of sick animals                                  |
| 34           | Viral haemorrhagic fever (multiple species—<br>Filoviridae, Ebola virus, Lassa virus, Marburg virus) | Non-human primates, bats                                                                       | Inhalation of air contaminated with droplets containing the virus, contact |
| 35           | Other arboviral infections (togaviruses, <i>Flavivirus</i> , bunyaviruses, arenaviruses)             | Insects, wild and domestic birds, bats, deer, rodents                                          | Tick or mosquito bites                                                     |
| 36           | SARS-CoV-1 and SARS-CoV-2-related diseases                                                           | Bats, pangolins (?)                                                                            | Inhalation of air contaminated with droplets containing the virus, contact |
| 37           | Ranikhet disease                                                                                     | Fowl, including peacocks, poultry                                                              | Contact with sick birds                                                    |

## Tool 2: Snake-bite management

(Adapted from: STANDARD TREATMENT GUIDELINES: Management of Snake Bite, Quick Reference Guide, January 2016, Ministry of Health & Family Welfare, Government of India)

Envenoming due to snake bites causes approximately 49,000 deaths, annually, in India (Mohapatra et al., 2011). Of these, about 67% are due to the bite of the common krait (Majumdar et al., 2014). Timely clinical intervention and administration of anti-snake venom (ASV) is the only way to save lives. The clinical presentation of a snake bite victim depends upon the species of snake, the amount of venom injected, season of the bite, whether the snake is fed or unfed, the site of the bite, whether the area was covered or was not covered, whether the bite was dry or incomplete, whether there were multiple bites, venom injection in vessel, the weight of the victim and the time that elapsed between the bite and the administration of ASV. The venom concentration and constitution depends on environmental conditions as well as the snake's age and the darkness of its colour (Bawaskar HS et al., 2014).

### FIRST-AID MEASURES after snake bites

#### Do's

- Seek medical help right away.
- Call an ambulance (toll free no. 102, 108, etc.) or arrange to transport the patient to a medical health facility with an anti-snake venom (ASV) facility as quickly, safely and passively as possible, by vehicle, boat, bicycle, motorbike, stretcher, etc. Create a list of the closest such facilities as indicated in Tool 3.
- Keep the person calm. Reassure the person that around 70% of all snake bites are from non-venomous species and that snake bites can be effectively treated in an emergency room.
- Restrict the movements, and keep the affected area below the heart level to reduce the flow of venom. Remove any rings or constricting items because the affected area may swell.
- Immobilise the limb in the same way that a fractured limb is. Use bandages or cloth to hold the splints (wooden sticks, rulers, etc.), but do NOT block the blood supply or apply pressure.
- Create a loose splint (it should be possible to insert one finger) to help restrict the movement of the area.
- Ideally, the patient should lie in the recovery position (prone, on the left side), with his/her airway protected to minimise the risk of aspiration of vomitus.
- If the area of the bite begins to swell and change colour, the snake was probably venomous.
- Monitor the person's vital signs—temperature, pulse, rate of breathing and blood pressure—if possible. If there are signs of shock (such as paleness), lay the person flat, raise the feet about a foot, and cover the person with a blanket.

#### Don'ts

- Do NOT waste time in traditional first-aid methods.
- Do NOT allow the person to become over-exerted. If necessary, carry the person to safety.
- Do NOT apply a tourniquet.
- Do NOT block the blood supply or apply pressure.
- Do NOT apply cold compresses to snake bites.
- Do NOT cut into a snake bite with a knife or razor.
- Do NOT try to suck out the venom by mouth or wash the wound.
- Do NOT give the person stimulants or pain medications unless a doctor tells you to do so.
- Do NOT give the person anything by mouth.
- Do NOT raise the site of the bite above the level of the person's heart.
- Do NOT attempt to kill or catch the snake as this may be dangerous. Bring in the dead snake only if it is already dead and if this can be done safely.
- Do NOT waste time hunting for the snake, and do NOT risk another bite if it is not easy to capture the snake. Be careful of the head when transporting it, even if the snake is dead—a snake can actually bite for several hours after it is dead (from a reflex).

For further information, please refer to the 'Guidelines on Human-Snake Conflict Mitigation: Taking a Harmonious-Coexistence Approach'.

### References

- Mohapatra B, Warrell DA, Suraweera W, Bhatia P, Dhingra N, Jotkar RM, Rodriguez PS, Mishra K, Whitaker R, Jha P, for the Million Death Study Collaborators. Snakebite mortality in India: A nationally representative mortality survey. *PLOS Tropical Neglected Diseases*. 2011. DOI: 10.1371/journal.pntd.0001018
- Majumder D, Sinha A, Bhattacharya SK, Ram R, Dasgupta U, Ram A. Epidemiological profile of snakebite in South 24 Parganas District of West Bengal with focus on underreporting of snakebite deaths. *Indian J Public Health* 2014;58: 17–21.

### Tool 3: List of government hospitals or clinics stocking rabies vaccine, anti-venom and antidotes

| Facility type                              | Name of hospital/ clinic/PHC/medical facility | Name of contact person | Address | Telephone numbers (ambulance number) |
|--------------------------------------------|-----------------------------------------------|------------------------|---------|--------------------------------------|
| Emergency                                  | 1.                                            |                        |         |                                      |
|                                            | 2.                                            |                        |         |                                      |
| Anti-snake venom (ASV)                     | 1.                                            |                        |         |                                      |
|                                            | 2.                                            |                        |         |                                      |
| Anti-rabies vaccination                    | 1.                                            |                        |         |                                      |
|                                            | 2.                                            |                        |         |                                      |
| Drug and chemical poisonings and antidotes | 1.                                            |                        |         |                                      |
|                                            | 2.                                            |                        |         |                                      |

### Tool 4: Line departments and other personnel involved in HWC

| Department/ agency                                                 | Name of contact person | Address | Telephone/email |
|--------------------------------------------------------------------|------------------------|---------|-----------------|
| Police                                                             |                        |         |                 |
| Fire brigade                                                       |                        |         |                 |
| Chief Medical Officer (CMO)                                        |                        |         |                 |
| Chief Veterinary Officer (CVO)                                     |                        |         |                 |
| Block Development Officer                                          |                        |         |                 |
| District Magistrate (DM)                                           |                        |         |                 |
| General Manager (GM), zonal railways, Indian Railways              |                        |         |                 |
| General Manager (GM), state power corporation                      |                        |         |                 |
| Road and Transport Department                                      |                        |         |                 |
| Division-level Rapid Response Team                                 |                        |         |                 |
| Range-Level Rapid Response Team                                    |                        |         |                 |
| Community-Level Primary Response Teams under the area of operation |                        |         |                 |

## Tool 5: Infrastructure and equipment for managing HWC mitigation measures

| S. no.                                       | Item                                | Details                                                                                                                                |
|----------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cages for carnivores</b>                  |                                     |                                                                                                                                        |
| 1                                            | Trap cages                          | Number of cages per RRT to be decided on the basis of frequency of conflict incidences per week per site                               |
| 2                                            | Transportation box                  | Box should be blind from all sides, with holes for ventilation at appropriate height (size as per requirement of species and utility). |
| <b>Cages for ungulates and other species</b> |                                     |                                                                                                                                        |
| 3                                            | Transportation crates               | Box should be blind from all sides, with holes for ventilation at appropriate height (size as per requirement of species and utility). |
| 4                                            | Monkey crates                       | As per requirements.                                                                                                                   |
| 5                                            | Other crates                        | For birds, reptiles, etc.                                                                                                              |
| <b>Equipment and material</b>                |                                     |                                                                                                                                        |
| 6                                            | Net                                 | Net size 3 m × 3 m, gap size 2 inches × 2 inches, material for net preferably cotton or material used in drop net                      |
| 7                                            | Ropes (half inch width/gauge)       | (A) Plastic/nylon rope—length 5 m, 2 nos.<br>(B) Cotton rope—length 5 m, 2 nos.<br>(C) Mountaineering rope—length 5 m, 2 nos.          |
| 8                                            | Ropes of different sizes and gauges | Ten ropes of different lengths (2–10 m) and gauges (0.25- to 2-inch); One cotton rope of 0.5-inch gauge and 30 feet length.            |
| 9                                            | Blindfold cloth                     | Linen or soft cotton cloth, length 2–3 feet, width 6–7 inches. Cloth must be fitted with Velcro on its ends for easy closure.          |
| 10                                           | Rope ladder                         | Length 50–60 feet with bamboo paddle. Rope gauge should not be less than 2 inches.                                                     |
| 11                                           | Swiss knife with pliers             | Knife should be checked for other attachments (pliers, size 8 inches).                                                                 |
| 12                                           | Muzzles                             | Muzzle size should be according to the requirement of the species.                                                                     |
| 13                                           | Multiple utility toolkit            | A good quality toolkit with handy drill machine.                                                                                       |
| 14                                           | Auto-release catcher                | Auto-release catcher                                                                                                                   |
| 15                                           | Auto-release snare pole             | Auto-release snare pole                                                                                                                |
| 16                                           | Snake tongs                         | Snake tongs should be available                                                                                                        |
| 17                                           | Hanging balance                     | Capacity up to 100 kg                                                                                                                  |
| 18                                           | Straighter                          | Straighter                                                                                                                             |
| 19                                           | Belts                               | Nylon or rubber belts—width 3–4 inches and length 2–3 m                                                                                |
| 20                                           | Spray bottle                        | Ten-litre spray bottle for cooling animals during hot and dry summers                                                                  |
| 21                                           | Bungee cords with hooks             | Bungee cords of different lengths with hooks for tying and securing purposes                                                           |
| 22                                           | Teflon tape                         | Without adhesive (for locking jaws of crocodilians)                                                                                    |
| 23                                           | Tents and sleeping bags             | Lightweight tents and sleeping bags for two or three persons                                                                           |



| S. no. | Item                         | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 24     | Winch                        | Capacity of up to 1 ton                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 25     | Collapsible aluminium ladder | Collapsible aluminium ladder of bigger size fitted within vehicle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 26     | Reinforced work gloves       | Reinforced, heavy-duty work gloves to provide grip on ropes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 27     | Baffle board                 | A ply board of size 2 feet × 3 feet and 2–3 mm gauge with holes for grip ropes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 28     | Stretchers for animals       | Readymade or custom-made for specific species, for moving injured or immobilised animals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 29     | Stretchers for humans        | For moving injured personnel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 30     | Poles, GI/MS pipe            | 2 inch diameter, length 2, 3 and 4 m, 6 to 10 nos.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 31     | Wireless set                 | Fitted in field vehicle; also two walkie-talkie sets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 32     | GPS                          | Available in parks and sanctuaries                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 33     | Range finder                 | Available in parks and sanctuaries                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 34     | Binoculars                   | Available in parks and sanctuaries                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 35     | Still camera or video camera | As available                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 36     | Utility boxes and tool boxes | One medium-/large-sized box that can hold the items listed in the next row                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 37     | Items for utility box        | <ul style="list-style-type: none"> <li>a) Scissors (medium)</li> <li>b) Knife – 2 (one medium and one big ‘khukhari’ size)</li> <li>c) Bucket (15 l) with mug</li> <li>d) Pickaxe</li> <li>e) Spade</li> <li>f) Axe—small and medium</li> <li>g) ‘Sabbal’ (two—4 feet and 6 feet long—can also be used as leverage)</li> <li>h) Hammer—4 kg</li> <li>i) Hacksaw (portable handsaw)—size 8 inches, with extra blades</li> <li>j) Jerry can, 20 litre capacity</li> <li>k) Gunny bags/canvas bags, or canvas sheet 2 m × 2 m, 5 nos.</li> <li>l) Search light and torch (3 cells)</li> <li>m) Binding wire, 500 g</li> <li>n) Garden nylon pipe, 0.5-inch gauge, 20 feet</li> <li>o) Nut bolts (10 nos. of different sizes)</li> <li>p) Nails—500 g, of mixed sizes</li> <li>q) Tags (plastic)</li> <li>r) Needle (Suja and Sutli) for gunny bag packing</li> <li>s) Water bottle—2 litres, 5 nos.</li> <li>t) Towel, napkins</li> <li>u) Bed sheet</li> <li>v) Dhurries (to sit on or use as equipment to set up space)</li> <li>w) Cotton waste to keep equipment clean</li> </ul> |

| S. no.                     | Item                      | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 38                         | Clothing                  | For uniforms to identify RRTs:<br>a) Dungarees of same colour<br>b) Same-coloured camouflage jackets, or vests, with fluorescent markings<br>c) Gamchha (thin big towels)<br>d) Rubber gumboots<br>e) Field boots or high-ankle hiking boots<br>f) Same-coloured caps with visors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Chemical restraints</b> |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>First-aid box</b>       |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 39                         | First-aid box for humans  | As mentioned in Protocol 2.5.7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 40                         | First-aid box for animals | First-aid box is obligatory. So we will have to prepare it with the items and medicines listed here.<br>i) Tincture of iodine—200 ml<br>ii) Tincture of benzoin—200 ml<br>iii) Spirit—500 ml<br>iv) Potassium permanganate powder—50 g<br>v) Antiseptic cream (Topicure)<br>vi) Dressing kit with large-size gauze dressing<br>vii) Disposable hypodermic needles—18-inch, 25 nos.<br>viii) Injectable solutions of:<br>Ibuprofen—30 ml, 5 nos.<br>Meloxicam—30 ml, 5 nos.<br>Diazepam—30 ml, 5 nos.<br>Xylazine—50 ml, 2 nos.<br>Ketamine—50 ml, 2 nos.<br>Yohimbine—50 ml, 5 nos.<br>Sevite-E—2 nos.<br>Dexona 30 ml—5 nos.<br>Atropine—10 nos.<br>Doxopram—5 nos.<br>Epinephrine—5 nos.<br>Tetanus toxoid—10 nos.<br>Vitamin K (Cromostal)<br>Long-acting antibiotic, 50 ml—5 nos.<br>Aminophylline<br>Atipamezole, 30 ml—5 nos.<br>Calcium gluconate<br>Dextrose 50%<br>Diphenhydramine<br>Naloxone<br>Vasopressin<br>Normal saline—10 bags<br>ix) Trocar-cannula (to puncture belly) |

| S. no.                   | Item                                       | Details                                                                                                                                                                                                         |
|--------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Darting equipment</b> |                                            |                                                                                                                                                                                                                 |
| 41                       | Blow pipe                                  | Plastic or lightweight alloy blow pipe<br>Blow pipe with all associated accessories<br>25 darts and needles—all categories for ungulates and carnivores                                                         |
| 42                       | Immobilisation remote drug delivery system | 11-mm barrel and additional 13-mm barrel                                                                                                                                                                        |
| 43                       | Vario syringes with stabilisers            | i) 3 ml—25 to 50 nos.<br>ii) 2 ml—20 nos.<br>iii) 5 ml—10 nos.<br>iv) Practice syringes—25 nos.                                                                                                                 |
| 44                       | Vario and other needles                    | i) Elephant cannula—10 nos.<br>ii) 1.5 mm × 30 mm—2 packets<br>iii) 2.0 mm × 30 mm—4 packets<br>iv) 2.0 mm × 40 mm—4 packets                                                                                    |
| 45                       | De-venting pin                             | 5 nos.                                                                                                                                                                                                          |
| 46                       | Syringe connectors                         | 5 nos.                                                                                                                                                                                                          |
| 47                       | Silicone sleeves                           | Green and red—2 packets each                                                                                                                                                                                    |
| 48                       | Silicone oil                               | 2 vials                                                                                                                                                                                                         |
| 49                       | Distilled water                            | 25–30 vials                                                                                                                                                                                                     |
| 50                       | CO <sub>2</sub> cylinders                  | 50–100 nos.                                                                                                                                                                                                     |
| 51                       | Safety caps for syringe                    | 10 nos.                                                                                                                                                                                                         |
| 52                       | Foot pump with meter                       | 1 no.                                                                                                                                                                                                           |
| 53                       | Drug delivery equipment case               | Mostly supplied with the dart gun. If not, procure it.                                                                                                                                                          |
| 54                       | Pencil box                                 | To keep drug-filled syringe during field operations—4 nos.                                                                                                                                                      |
| 55                       | Equipment case                             | Fishing tackle box to keep all chemicals/drugs and accessories of darting-related items. A separate box may be required for first-aid kits.                                                                     |
| 56                       | Mobile refrigerator                        | Small portable refrigerator for sample preservation—dual mode operation—electricity and vehicle                                                                                                                 |
| <b>Vehicles for RRTs</b> |                                            |                                                                                                                                                                                                                 |
| 57                       | Main vehicle                               | This vehicle will keep all items, equipment and other accessories except the dart gun, gun-related accessories and drugs. This vehicle should have sitting space for four to six persons, excluding the driver. |
| 58                       | Supporting vehicle                         | Scorpio-type AC vehicle—must have 4 × 4 options. All darting-related equipment and drugs will be carried in this vehicle.                                                                                       |

*Note: While every attempt has been made to include everything that a Rapid Response Team (RRT) might require to address HWC mitigation situations, this list may not be exhaustive, and teams are encouraged to add any other equipment they consider important for managing HWC mitigation activities at their sites.*

## Tool 6: Types of biomedical and biohazard waste

| बायो मेडिकल वेस्ट / BIO MEDICAL WASTE                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• मानवीय अंग एवं जीव वेस्ट<br/>(मानवीय टिश्यू, शारीरिक अंग वेस्ट)</li> <li>• रक्त से सनी वस्तु<br/>(पट्टी, प्लास्टर, ब्लड बैग)</li> <li>• अवधि समाप्त दवाइयाँ<br/>(एंटीबायोटिक्स दवाइयाँ)</li> <li>• कैमिकल वेस्ट<br/>(जैव-विज्ञान में इस्तेमाल कैमिकल)</li> <li>• रक्त से दूषित लीनेन, बिस्तर</li> <li>• लेबोरेटोरी वेस्ट<br/>(ब्लड बैग, कल्चर, माइक्रोऑर्गेनिज़्म स्पेसिमेन)</li> </ul> | <p style="text-align: center;"><b>पीला थैला / YELLOW BAG</b></p>                                                                            | <ul style="list-style-type: none"> <li>• Human &amp; Animal Anatomical Waste<br/>(Tissues, Organs, Body Parts, Fetus etc.)</li> <li>• Soiled Waste<br/>(Dressings, Plaster Casts, Cotton Swabs, Residual/Discarded Blood Bags)</li> <li>• Expired or Discarded Medicine<br/>(Antibiotics etc.)</li> <li>• Chemical Waste<br/>(Discarded Reagents, Disinfectants)</li> <li>• Discarded Linen, Mattresses &amp; Beddings</li> <li>• Pre-Treated Microbiology, Bio-technology &amp; Clinical Lab Waste<br/>(Blood Bags, Cultures, Residual Toxins, Dishes &amp; Devices, Microorganism specimen)</li> </ul> |
| <ul style="list-style-type: none"> <li>• साइटोटोक्सिक वेस्ट<br/>(साइटोटोक्सिक दवाइयाँ से दूषित वायल, एम्प्यूल, प्लास्टिक इत्यादि)</li> </ul>                                                                                                                                                                                                                                                                                     |                                                                                                                                             | <ul style="list-style-type: none"> <li>• Cytotoxic Waste<br/>(All items Contaminated with Cytotoxic drugs along with glass or plastic ampoules, vials etc.)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>• रीसायकल योग्य इन्फैक्टेड वेस्ट<br/>(ट्यूब, बोतल, इंट्रावीनस ट्यूब और सेट, कैथेटर, यूरीन बैग, बिना सूई की सिरिंज, वैक्यूएनर एवं दस्ताने)</li> </ul>                                                                                                                                                                                                                                      | <p style="text-align: center;"><b>लाल थैला / RED BAG</b></p>                                                                                | <ul style="list-style-type: none"> <li>• Contaminated Waste (Recyclable)<br/>(Tubings, Plastic Bottles, Intravenous tubes &amp; sets, Catheters, Urine Bags, Syringes without needle, Vaccutainers and Gloves)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                |
| <ul style="list-style-type: none"> <li>• नुकीला एवं धातु वाला वेस्ट<br/>(सूई, सूई लगी सिरिंज, स्कालपेल्स, ब्लेड एवं अन्य नोकदार वस्तु)</li> </ul>                                                                                                                                                                                                                                                                                | <p style="text-align: center;"><b>सफेद डिब्बा / WHITE CONTAINER</b><br/>(पंचर, टैम्पर और लीक प्रूफ) / (PUNCTURE, TAMPER AND LEAK PROOF)</p> | <ul style="list-style-type: none"> <li>• Waste Sharps Including Metals<br/>(Needles, Syringes with fixed Needles, Needles from needle tip cutter or Burner, Scalpels, Blades, Contaminated Sharp objects)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                     |
| <ul style="list-style-type: none"> <li>• कांच का वेस्ट<br/>(टूटा हुआ कांच, दवाई की बोतलियाँ एवं एम्प्यूल)</li> <li>• धातु वाले इम्प्लांट</li> </ul>                                                                                                                                                                                                                                                                              | <p style="text-align: center;"><b>गत्ते का डिब्बा / CARDBOARD BOX</b><br/>(नीले चिन्ह के साथ) / (WITH BLUE MARKING)</p>                     | <ul style="list-style-type: none"> <li>• Glassware<br/>(Contaminated Broken/Discarded Glass, Vials, Ampoules)</li> <li>• Metallic Body Implants</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                               |

(Source: [https://www.aiims.edu/images/pdf/Departments\\_Centers/BiomedicalWaste.pdf](https://www.aiims.edu/images/pdf/Departments_Centers/BiomedicalWaste.pdf))

**Tool 7: Format (Form-1) for reporting an accidental spillage or exposure of biomedical or bio-hazard waste**

- 1. Date and time of accident: .....
- 2. Type of accident: .....
- 3. Sequence of events leading to accident: .....  
.....
- 4. Has the authority been informed immediately? .....
- 5. The type of waste involved in accident: .....  
.....
- 6. Assessment of the effects of the accident on human health and the environment .....  
.....
- 7. Emergency measures taken: .....  
.....  
.....
- 8. Steps taken to alleviate the effects of accidents: .....  
.....  
.....
- 9. Steps taken to prevent the recurrence of such an accident: .....  
.....  
.....
- 10. Does the facility has an emergency control policy? If yes, give details: .....  
.....  
.....

Date: .....

Signature.....

Place: .....

Designation

.....

**Tool 8: Hazard and risk assessment sheet**

**Hazard and Risk Assessment Sheet**

Name of the assessor\_\_\_\_\_

Location:

| Identify hazards | What are the hazards and potential harm associated with each activity? | Level of hazard (Low/Moderate/High) | Action to reduce/minimise risk—by whom and when | Hazard controls | Training required |
|------------------|------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------|-----------------|-------------------|
|                  |                                                                        |                                     |                                                 |                 |                   |
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|                  |                                                                        |                                     |                                                 |                 |                   |

## Tool 9: Health assessment for persons involved in managing wild animals

All personnel who have contact with wild animals during HWC mitigation operations must fill this form!!

Name of the person \_\_\_\_\_ M/F \_\_\_\_\_ Age \_\_\_\_\_

Local address: \_\_\_\_\_

Permanent address: \_\_\_\_\_

Phone number: \_\_\_\_\_

Designation: \_\_\_\_\_

These answers are confidential and should be discussed directly with a health care provider. Answer Yes or No.

A. Nature and scope of work for HWC mitigation

B. Is animal husbandry an essential part of your duties (providing food/water, cleaning cages, grooming animals, etc.)?  
Yes/No

Tick the following:

- No animal contact
- No direct contact, but enter animal facility
- Involved in restraint/handling of wild animals and conducted procedures on live animals and “unfixed” tissues and fluids.
- Handles, restrains, collects specimens or administers drugs to live animals.
- Performs invasive procedures such as surgeries and necropsies.

C. Does your work with animals require you to be in contact with agents that are infectious to humans (blood or other tissues from animals infected or contaminated with a pathogen)? List the agent(s).

D. Do you have known or suspected allergies to animals?

E. Do you have chronic health problems (diabetes, asthma, high blood pressure, etc.)?

F. Do you have renal or liver disease?

G. Do you have heart disease?

H. Do you have immune system deficiencies (or other medical conditions that may limit your ability to carry out your duties)?

I. Do you have pre-existing allergic tendencies (hay fever, eczema, cholinergic, latex, etc.)?

J. Do you work directly with the rabies virus or have direct contact with animals quarantined for rabies surveillance?

K. Will the work involve any of the following?

1. Biological agents
  - a. Recombinant DNA Yes/No
  - b. Infectious agents Yes/No
2. Human blood, tissues or cells Yes/No
3. Physical agents
  - a. Caustic material, flammables or cryoagents Yes/No
  - b. Noise Yes/No
  - c. Radiation Yes/No
  - d. Extreme environmental conditions Yes/No
4. Chemical agents
  - a. Anaesthetic gases Yes/No
  - b. Drugs/chemotherapeutic agents Yes/No

L. Have you been seriously ill or injured during the last 5 years? Provide a description:

M. Are you currently receiving medical treatment/counselling? Provide a description:

N. Do you take any medications routinely? Provide a description:

O. Record of vaccinations received (name of vaccine and date received):

Signature: \_\_\_\_\_ Date \_\_\_\_\_

Name: \_\_\_\_\_

## 6. USE OF LEARNINGS FROM THE GUIDELINES TO FURTHER STRENGTHEN INSTITUTIONAL AND POLICY FRAMEWORK ON HEALTH EMERGENCIES IN HWC SITUATIONS IN INDIA

These guidelines are expected to serve as a capacity development instrument, given that a robust and structured feedback mechanism will be put in place by the DLCCs and SLCCs to document the feedback received from the implementation of these guidelines.

- The feedback from the use of these guidelines may, therefore, be consolidated to form the basis for fine-tuning health emergencies and addressing the long-term risk of zoonotic and other emerging diseases during an HWC and for understanding capacity needs for effectively

implementing the inter-agency coordination mechanism and taking a One Health approach.

- In the long term, the feedback may be consolidated and used in further revising/updating the capacity development strategies, Division-Level HWC Management Action Plans and National and State HWC Strategy and Action Plans.
- Feedback from the inter-agency teams will be used to further strengthen our understanding of the operationalisation of the One Health approach.

## 7. PROCESS OF DEVELOPMENT AND PILOT TESTING OF THESE GUIDELINES AND THE CONSULTATION PROCESS

- A dedicated framework of experts (Annexe 1) was formed, with the core team consisting of representatives from government agencies, SFDs, research institutions, civil society institutions and international organisations and independent wildlife policy experts. The experts were a mix of scientists, wildlife managers, public health experts, medical professionals, veterinary experts, policy experts and capacity development experts.
- A common understanding was developed on the overall purpose, scope, approach and methodology<sup>8</sup> <sup>9</sup>. The experts had different roles in the drafting and editing process, viz., they were Coordinating Lead Authors, Lead Authors, Contributing Authors and Review Editors. The Author Group worked on developing these guidelines between July 2019 and August 2021, during which period they consulted a larger group of experts and stakeholders via workshops, meetings and consultations. The authors reviewed the documents and guidelines available from the MoEF&CC and different states, and relevant information and recommendations were brought into the new document. The National Technical Group (NTG), consisting of experts from MoEF&CC, Wildlife Institute of India (WII) and Deutsche Gesellschaft für Internationale

Zusammenarbeit (GIZ) and independent wildlife and policy experts, was formed for the overall steering and facilitation of the process. The Working Group on Pilot Implementation of Guidelines and HWC-NAP was formed to facilitate the planning and implementation of the pilot testing, consultations and final editing of the draft guidelines and HWC-NAP. Detailed terms of reference were provided for each category, and meetings and workshops of the Author Group were facilitated under the Indo-German Cooperation Project on Human–Wildlife Conflict Mitigation.

- The draft guidelines and HWC-NAP were pilot tested at selected HWC hotspots in India to receive feedback on the feasibility and acceptability of the recommendations expressed in the guidelines, using a structured process and tools. On the basis of the feedback received during fortnightly meetings and one-to-one consultations with managers, the draft of the guidelines was revised.
- A committee was constituted by MoEF&CC in December 2022, consisting of officials from MoEF&CC and the state forest departments of Bihar, Haryana, Karnataka, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal to review and finalise the guidelines.

## 8. MONITORING AND EVALUATION OF GUIDELINES

- This set of guidelines is not a static document; rather, it is a living document. It will keep abreast of the various developments in field implementation methods and wildlife research. For this, the feedback from field practitioners and other wildlife experts may be analysed to assess the specific elements and sections that need to undergo changes. A review of the guidelines is planned

every 5 years, from 2023 onwards. However, a mid-term review process in 2024 may be desirable. In the long term, the review cycle of these guidelines can be aligned with the review cycle of HWC-NAP.

- A detailed mechanism, templates and guidance for collating information and feedback related to the use of these guidelines may be developed.

<sup>8</sup> Approach paper: <https://indo-germanbiodiversity.com/pdf/publication/publication19-04-2021-1618808050.pdf>

<sup>9</sup> Human-Wildlife Conflict Mitigation Instrument- Strengthening Capacities to Address the issues related to zoonotic and other emerging diseases: Taking a One Health Approach <publication02-06-2022-1654169065.pdf> ([indo-germanbiodiversity.com](https://indo-germanbiodiversity.com))



# ANNEXE 1

## NATIONAL TECHNICAL GROUP (NTG)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Shri Bivash Ranjan, <i>IFS</i> , Additional Director General of Forest (Wildlife), Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India (Gol)<br>Dr S P Yadav, <i>IFS</i> , Former Additional Director General of Forest (WL), MoEF&CC, Gol (December 2021 to March 1, 2022)<br>Shri Soumitra Dasgupta, <i>IFS</i> , Former Additional Director General of Forest (WL), MoEF&CC, Gol (June 2019 to November 2021) | Chairperson     |
| Shri Rohit Tiwari, Inspector General of Forest (WL), MoEF&CC, Gol                                                                                                                                                                                                                                                                                                                                                                              | Member          |
| Shri Rakesh Kumar Jagenia, Deputy Inspector General of Forest (WL), MoEF&CC, Gol                                                                                                                                                                                                                                                                                                                                                               | Member          |
| Dr Sunil Sharma, <i>IFS</i> , Joint Director (WL), MoEF&CC, Gol<br>Dr R. Gopinath, <i>IFS</i> , Former Joint Director (WL), MoEF&CC, Gol (June 2019 to December 2020)                                                                                                                                                                                                                                                                          | Member          |
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| Shri P C Tyagi<br><i>IFS</i> (Retd.), Former Principle Chief Conservator of Forests-Head of Forest Force, Tamil Nadu                                                                                                                                                                                                                                                                                                                           | Member          |
| Late Shri Ajay Desai<br>Wildlife Expert (June 2019 to November 20, 2020)                                                                                                                                                                                                                                                                                                                                                                       | Member          |
| Dr Sanjay Gubbi<br>Wildlife Expert, Nature Conservation Foundation (June 2019 to November 20, 2020)                                                                                                                                                                                                                                                                                                                                            | Member          |
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## WORKING GROUP ON PILOT IMPLEMENTATION OF GUIDELINES AND HWC-NAP

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