# HEALTH AND NUTRITIONAL MANAGEMENT OF WILD ANIMALS IN INDIAN ZOOS

केन्द्रीय चिड़ियाघर प्राधिकरण
Central Zoo Authority

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# CONTENTS

CHAPTER 01

# INTRODUCTION

# 1. Introduction

The Central Zoo Authority (CZA), Ministry of Environment, Forest & Climate Change (MoEF&CC), Government of India, a statutory body has been entrusted with the task of ensuring optimum well-being of captive wildlife in Indian Zoos. The authority has issued policy documents and guidelines towards this end since its inception. The same are codified in the Recognition of Zoo Rules and various guidelines issued by the Central Zoo Authority on various aspects of zoo management at different occasions. Detailed guidelines on disease diagnosis and management of wild animals in Indian context have been developed by the Indian Veterinary Research Institute, Bareilly under the aegis of the Central Zoo Authority and provide valuable information on day to day management **[Swarup, D., Das, A., Saini, M., Kumar, P., Sharma, A.K. and Pal, A. (2009). Standard Guidelines and Protocols for Disease Diagnosis and Cure of Wild Animals for Indian Zoos. Indian Veterinary Research Institute, Bareilly and Central Zoo Authority, Anoopam Press, Bareilly].**

Zoological Parks have become increasingly important in the global conservation effort aimed at maintaining genetically healthy and viable captive wild populations as well as in supporting *in-situ* conservation of species under threat of extinction. The success achieved in maintaining wild animals in captivity is attributed to our enhanced ability in providing adequate nutrition and health care at these institutions for wild animals maintained in artificial environments. Effective management of captive wildlife today integrates various disciplines including Animal Ecology, Biology, Behaviour, Physiology, Genetics, and Nutrition. This is further strengthened by providing species-specific housing needs, appropriate preventive healthcare interventions and adequate Veterinary support. This latter necessitates a strong Veterinary infrastructure and support to ensure well-being of animals in captivity.

The Central Zoo Authority in its 29th Meeting held on 19.06.2017 desired that the Authority should come up with a strategy and document for monitoring of overall health condition and hygiene in the zoos. Accordingly, a Committee was formed consisting of Zoo Veterinarians and Scientists from the Indian Veterinary Research Institute (IVRI), Bareilly; Wildlife Institute of India (WII), Dehradun and Laboratory for Conservation of Endangered Species (LaCONES), Centre for Cellular and Molecular Biology (CCMB), Hyderabad to formulate a document. Subsequently, a Sub-committee consisting of three Chief Wildlife Warden of the States and four members of the CZA and an expert Veterinarian has been constituted for the purpose. After detailed deliberation, the document on Health and Nutritional Management of Wild Animals in Indian Zoos has been approved and adopted by the Central Zoo Authority in its 31st Meeting held on 26th June, 2018. The objective of this document is to provide necessary guidance to the management of the Zoos with respect to Health and Nutritional Management of captive wild animals.

A Sub-Committee was constituted vide Member Secretary, CZA letter No.7-7/2016-CZA(AK)/1311/ 2017 dated 10th July 2017 for addressing the issues that lead to effective monitoring of the quality and quantity of food being provided to the animals in the zoos, their housing, overall health condition and hygiene. Besides, it was decided to set up a transparent system for procurement of the animal feed and medicines in zoos. The Sub-Committee was tasked with developing a concept plan that addresses the following issues in the veterinary healthcare for Large, Medium, Small and Mini zoos in the country:

a. Diagnostic kits (including equipment) and essential veterinary drugs required for better management and healthcare of the zoo animals housed in various categories of zoos in India.
b. Effective monitoring of quality and quantity of food provided to the animals in zoos.
c. Recommendations for setting up a transparent system in zoos for procurement of animal feed and medicines.
d. Suggest ways and means to develop strategy and proposal to effectively monitor the above issues.

This manual addresses the issues that lead to effective monitoring of the quality and quantity of food being provided to the animals in the zoos, their housing, overall health condition and hygiene and to set up a transparent system for procurement of the animal feed and medicines in zoos.

The deworming, vaccination and disinfection schedule being followed in the 17 recognised large category zoos in the country has been annexed for reference and guidance.

**Operation Theatre**

**Laboratory**

CHAPTER 02

# DIAGNOSTIC KITS
## (INCLUDING EQUIPMENT)

## 2. Diagnostic Kits (including equipment)

The ability to effectively diagnose and manage disease/ illness in wild animals depends on Veterinarian's knowledge and understanding of various species maintained in the collection besides their ability to effectively use available diagnostic tools. In this regard, various diagnostic kits and equipment are commercially available. However, their utility lies in the ability to collect, store and analyse specified samples according to defined protocols and in subsequently interpreting the results for developing required treatment regimens. It further calls for appropriate veterinary infrastructure including laboratory to support such initiatives in management of sick/ injured/ diseased animals in captivity.

For large animal collections, in-house facilities with infrastructure, manpower and ability to perform routine examinations are critical, while for smaller collections services of external agencies can be utilized. Besides, the veterinary conditions that require surgical intervention, segregation of diseased animals due to the zoonotic nature of diseases require infrastructure that includes treatment rooms for minor interventions, to fully equipped operation theatres for surgical interventions, besides quarantine and isolation wards for recuperation and segregation of diseased animals. Additionally treatment areas, storage and office space, animal ambulances, transport cages and other vehicles are required to move diseased animals and requisite personnel should be available in the zoos.

Every zoo, irrespective of its category, should have basic veterinary infrastructure for catering to the day-to-day and emergent needs, and based on number of animals housed, it should have adequate facilities to deal with the problem/ emergency. Efforts should be made by collaborating/ liasioning with other scientific veterinary Institution/ establishment having advance diagnostics equipments and facilities and expertise to address

gaps in expertise and infrastructure. Zoo medicine is a rapidly evolving field that is quite vast and exhaustive in contrast to the limited capacities of professionals available in the zoos. It further supports the need for continuous skill up-gradation programs for the professionals engaged in the zoos to keep abreast with the advancements made in the area of zoo medicine.

The species collection in the zoo plays an important role in the type of infrastructure required. Table below summarizes the infrastructure needed for management of diseased animals and the details of veterinary infrastructure and equipment for different categories is provided below:–

**Veterinary Infrastructure:**

| S.No. | Facility | Large Zoo | Medium Zoo | Small Zoo | Mini Zoo |
|---|---|---|---|---|---|
| 1 | Veterinary Hospital | √ | √ | √ | √ |
| 2 | Office space for Veterinary officers, Pharmacist, office staff | √ | √ | × | × |
| 3 | Indoor Patient Ward (Herbivore and Carnivore) | √ | √ | √ | × |
| 4 | Quarantine/ Isolation Ward | √ | √ | √ | × |
| 5 | Hand-rearing Unit/ Nursery | √ | √ | √ | × |
| 6 | Veterinary/ Medicine Store Room | √ | √ | √ | × |
| 7 | Laboratory | √ | √ | × | × |
| 8 | Operation Theatre | √ | √ | × | × |
| 9 | Record Room/ IT setup (Computer) | √ | √ | √ | × |

**Other Facilities:**

| S.No. | Facility | Large Zoo | Medium Zoo | Small Zoo | Mini Zoo |
|---|---|---|---|---|---|
| 1 | Feed Store | √ | √ | √ | √ |
| 2 | Food Processing Unit/ Animal Kitchen | √ | √ | × | × |
| 3 | Post-mortem Room | √ | √ | √ | × |
| 4 | Carcass Disposal Facility (Incinerator) | √ | √ | √ | × |
| 5 | Veterinary Library | √ | × | × | × |

## Veterinary Equipment:

| S.No. | Facility | Large Zoo | Medium Zoo | Small Zoo | Mini Zoo |
|---|---|---|---|---|---|
| 1 | Critical Care Unit (Incubator Chamber for prematurely born animals, Nebulizer, Oxygen cylinder with trolley, Suction Machine) | √ | √ | × | × |
| 2 | Diagnostics and Monitoring Systems (E.C.G., Ultra-sonography Machine with rectal and abdominal probes, X-ray Machine-Fixed/ Portable etc.) | √ | × | × | × |
| 3 | Health Monitoring Equipment (Otoscope, Pulse Oximeter etc.) | √ | √ | × | × |
| 4 | Basic Monitoring Equipment (Stethoscope, Digital Thermometer etc.) | √ | √ | √ | √ |
| 5 | Hydraulic Operating Table and OT Surgical Lights | √ | √ | × | × |
| 6 | Surgical supplies (Dressing Drum, Surgical Packs) | √ | √ | √ | × |
| 7 | Miscellaneous Equipment (Autoclave, Hot air Oven) | √ | √ | √ | √ |
| 8 | Miscellaneous Supplies (Nail Cutter/ Hoof Trimmer, Fomentation Lamps, etc.) | √ | √ | √ | √ |
| 9 | Stretcher on trolley | √ | √ | √ | √ |
| 10 | Skin Electrosurgical Cautery, Diathermy Machine | √ | √ | × | × |
| 11 | Post Mortem Set | √ | √ | √ | √ |
| 12 | Emergency First-aid Box for animals and human along with Snake bite kit | √ | √ | √ | √ |
| 13 | Medicine/ Anaesthesia tool kit box | √ | √ | √ | √ |

Basic diagnostic capabilities that can be carried out in zoo include facilities for microbiological, parasitological, haematological, bio-chemical examinations besides other laboratory procedures that may be region or species specific. Due knowledge of bio-hazards and bio-safety procedure needs to be in place. The list of laboratory equipment, chemicals and laboratory supplies for each category of zoo is provided below:

## Laboratory Equipment:

| S.No. | Facility | Large Zoo | Medium Zoo | Small Zoo | Mini Zoo |
|---|---|---|---|---|---|
| 1 | Laboratory Chemicals (Acetone, Ethanol, Acid Alcohol, Chloroform, Methanol, Sodium Carbonate, RBC and WBC diluting fluid etc.) | √ | √ | × | × |
| 2 | Laboratory Stains (Carbol Fuchsin, Giemsa Stain, Leishman's Stain, Malachite Green Stain, Methylene Blue, Picric Acid, Safranin Stain, Crystal Violet Stain, Gram's Iodine Solution) | √ | √ | × | × |

| | | | | | |
|---|---|---|---|---|---|
| 3 | Veterinary Blood/Serum Auto-analyzer Serology and Biochemistry Kits and Reagents, Miscellaneous chemicals etc. | √ | √ | × | × |

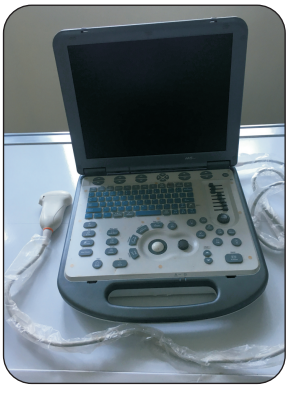
## Laboratory Supplies:

| S.No. | Facility | Large Zoo | Medium Zoo | Small Zoo | Mini Zoo |
|---|---|---|---|---|---|
| 1 | Biological Blood sampling systems (Blood Vacutainers, Serum and Sample Collection Vials, Eppendorf Tubes, Sterile Swabs etc.) | √ | √ | √ | √ |
| 2 | Centrifuge accessories (Falcon / Conical Centrifuge Tubes) | √ | √ | √ | √ |
| 3 | Laboratory glassware (Microscopic Slides, Cover Slips, Glass Flask, Graduated Beaker, Graduated Centrifuge tube Graduated Pipette, Funnel Glass Slide, Glass Stirrer, Beaker, Test Tube etc.) | √ | √ | × | × |
| 4 | Diagnostic supplies (Blood Sugar Strips, pH Papers and Field Based Diagnostic Kits) | √ | √ | × | × |
| 5 | Miscellaneous items (Micropipette, Glass Pipettes, Wintrobe's Tube, Western Green Tube, Watch Glass, Powder Microbiological Culture Media) | √ | √ | × | × |

## Veterinary Supplies:

| S.No. | Facility | Large Zoo | Medium Zoo | Small Zoo | Mini Zoo |
|---|---|---|---|---|---|
| 1 | Field based Disease Diagnostic Kits (Commercial) | √ | √ | √ | √ |

Electro Surgical Unit



Colour Dopler Ultrasound

CHAPTER 03

# ESSENTIAL VETERINARY DRUGS

## 3. Essential Veterinary Drugs

The enhancement of ability in effectively diagnosing diseases is complimented by availability of a range of veterinary drugs and procedures that can be effectively used to rehabilitate diseased wild animals. The choice of drugs and their dosage depend on the taxonomic group to which the patient belongs, the life-stage of the patient and the severity of the disease condition, i.e. diseases that are diagnosed in the early stages of their progression require lower dosages, for shorter duration while for acute conditions the converse may apply.

Zoos in the country need to maintain stocks of drugs that take into consideration the animal collection (drugs that are effective for veterinary management of species in the zoos collection). The drugs procured should have long expiry periods (minimum 1 year). They should have been manufactured recently so that their shelf - life shall be longer for usage in the zoo. The drugs should be stored in a manner that ensures its efficacy i.e. drugs and medicaments should be maintained in temperature, light and humidity conditions that are optimal for ensuring that they remain effective till expiry. Infrastructure for proper storage of drugs and medicaments along with requisite inventory management and disposal of expired drugs in a safe manner should be available in zoos. The drugs and medicaments to be maintained by various categories of zoos are provided below.

| S.No. | Facility | Large Zoo | Medium Zoo | Small Zoo | Mini Zoo |
|---|---|---|---|---|---|
| | **ESSENTIAL VETERINARY DRUGS** | | | | |
| 1 | Range of Antibiotics | √ | √ | √ | √ |
| 2 | Anaesthetics, Local anaesthetics | √ | √ | √ | √ |
| 3 | Muscle Relaxants | √ | √ | √ | √ |
| 4 | Respiratory Stimulant | √ | √ | √ | √ |
| 5 | Anaesthetic Reversals (antagonists) | √ | √ | √ | √ |

| | | | | | |
|---|---|---|---|---|---|
| 6 | Antihemorrhagics | √ | √ | √ | √ |
| 7 | Steroidal anti-Inflammatory drug | √ | √ | √ | √ |
| 8 | Non-steroidal Anti-Inflammatory drug | √ | √ | √ | √ |
| 9 | Antiemetic | √ | √ | √ | √ |
| 10 | Antidiarrheal | √ | √ | √ | √ |
| 11 | Antiparasitic | √ | √ | √ | √ |
| 12 | Antifungal | √ | √ | √ | √ |
| 13 | Antihistaminic | √ | √ | √ | √ |
| 14 | Bronchodilators | √ | √ | √ | √ |
| 15 | Calcium supplements | √ | √ | √ | √ |
| 16 | Diuretics | √ | √ | √ | √ |
| 17 | Fluid replacer | √ | √ | √ | √ |
| 18 | Immune-stimulant | √ | √ | √ | √ |
| 19 | Immunosuppressive drug | √ | √ | √ | √ |
| 20 | Laxative | √ | √ | √ | √ |
| 21 | Nutritional supplement | √ | √ | √ | √ |
| 22 | Multi-vitamins, etc. | √ | √ | √ | √ |

CHAPTER 04

# ANIMAL RESTRAINT EQUIPMENT AND DRUGS

## 4. Animal Restraint Equipment and Drugs

Wild animals are dangerous and need to be handled in humane manner that ensures safety of both the care-givers and the animals. Animals need to be restrained for different activities that include routine health check-up (veterinary care, surgical intervention, vaccination, blood collection, or sterilization), research purpose (genetic health analysis, assisted reproductive techniques), or for conservation and management purposes (translocation and reintroduction). Some of these operations in select animals can be performed by use of physical restraint methods while others require chemical immobilization.

Species appropriate physical restraint devices such as squeeze cages, snares, nets, crushes, chutes, and drugs and equipment as required for chemical immobilization should be present in all zoos to handle emergencies and regular animal health management.

A Zoo Veterinarian must be well familiar with the darting equipment and the usage of clinical dosages of anaesthetics and its reversals for effective management and health check-up procedures of precious endangered wildlife species in the zoo. Various guidelines and manuals on the subject are available and may be form a basis for effective capture techniques.

The essential equipments and drugs for restraint and capture of captive wild animals is mentioned below:

**Surgical Drum**

**Incinerator**

| S.No. | Facility | Large Zoo | Medium Zoo | Small Zoo | Mini Zoo |
|---|---|---|---|---|---|
| | **Animal Restraint Equipment and Drugs** | | | | |
| 1 | Pole Snares/ Ketch All Pole | √ | √ | √ | √ |
| 2 | Capture Nets and ropes | √ | √ | √ | √ |
| 3 | Jab Sticks | √ | √ | √ | √ |
| 4 | Species specific cages (trapping/ transport) | √ | √ | × | × |
| 5 | Treatment (Squeeze) Cage | √ | √ | √ | × |
| 6 | Remote Drug Delivery System (Long-range Projectors) | √ | √ | × | × |
| 7 | Other Remote Drug Delivery System (Short-range Projectors, Pneumatic Blowpipe etc.) | √ | √ | × | × |
| 8 | Remote Drug Delivery System (Blow Pipes) | √ | √ | √ | √ |
| 9 | Darting accessories (Darts, Syringes, Needles, Propelling etc.)/ Foot Pump/ $CO_2$ Canisters for remote drug delivery systems | √ | √ | √ | √ |
| 10 | Immobilization Drugs<br>Xylazine HCl<br>Ketamine HCl<br>Yohimbine HCL<br>Tolazoline<br>Diazepam<br>Acepromazine<br>including emergency lifesaving drugs etc. | √ | √ | √ | √ |
| 11 | Other Restrictive Immobilization Drugs (Narcotics, other psychotropic drugs etc.) | √ | × | × | × |

**Dan Inject JM**

CHAPTER 05

# EFFECTIVE MONITORING OF QUALITY AND QUANTITY OF FOOD PROVIDED TO THE ANIMALS IN ZOOS

## 5. Effective Monitoring of Quality and Quantity of Food Provided to the Animals in Zoos

Nutrition is one of the most critical components of animal management as the quality, quantity and type of food has direct impact on the health of the species. Provision of adequate, hygienic and balance diet is essential for upkeep of animals in good condition in captivity. A thorough understanding of nutritional requirement, physiological functions, sociological and behavioural attitude, food preference and acceptability / palatability, locally available food ingredients and their nutritional value is necessary prior to any diet formulation. In broader sense the diet needs to be formulated based on species concerned, their food habits, nutritional requirement and should proximate to the natural diet of the wild counterparts. Improper diet in a non-conducive environment may cause repression of growth, delayed sexual maturity, low conception rate, high prenatal / neonatal mortality, infertility and increased susceptibility to infectious diseases. Therefore, it is important to ensure that the animal consumes adequate and balanced diet, which should be tested on routine basis for nutritional quality and microbial contamination.

Feed components that are required in large quantities by zoos include concentrates, meat and poultry products, milk, green fodder and feed supplements. The quantity and type of feed required varies according to the size of the animal collection and the species housed. The details in this regard may be sought from the guidelines prepared by Indian Veterinary Research Institute, Bareilly under the aegis of the Central Zoo Authority. **[Das, A., Saini, M.,Dutta,N., Sharma,K., Saha, S.K., Das, B.C., Swarup, D. and Sharma, A.K. (2013). Standardization of Animal Diets in Indian Zoos, Indian Veterinary Research Institute, Bareilly & Central Zoo Authority, New Delhi].** It is available at (http://cza.nic.in/standietainmal.pdf)

The qualitative aspects of feed are equally important to the quantitative aspects, it is essential that zoos ensure availability of uncontaminated feed for the animals in their care. Regular inspection of feed before acquisition and distribution and random inspection, each by different level of personnel can ensure maintenance of qualitative and quantitative aspects of feed. The basic assessment can include **daily inspection of feed items by an authorized officer, weighing of all feed items provided to the zoo animals, maintenance of detailed records and proper storage.**

Vendors of repute should be engaged for regular supply of feed. This, along with collection of random samples of feed entering the zoo and examination by certified laboratories, can address issues like nutritional quality, presence of contaminants and toxicants.

Besides the routine food and fodder provided to the zoo animals, feed supplements are quite important and should be provisioned at every zoo. These may include nutritional supplements, multivitamin mixtures, Calcium supplements, salt lick etc. can be included in the ration further to qualitative analysis of the feed and fodder.

**Animal Feed**

CHAPTER 06

# SUGGESTED WAYS AND MEANS FOR SETTING UP TRANSPARENT SYSTEM IN ZOOS FOR PROCUREMENT OF THE ANIMAL FEED AND MEDICINES FOR THEIR HEALTHCARE

## 6. Suggested Ways and Means for Setting up Transparent System in Zoos for Procurement of the Animal Feed and Medicines for their Healthcare

Transparency in procurement of items in zoos ensures availability of proper supplies and minimizes wastages, restricts pilferage or other malpractices. A realistic consumption pattern for feed and veterinary supplies needs to be prepared by the Zoo authorities in consultation with the veterinary professional and biologist based on prescribed standards and previous experience and the items requisitioned accordingly. The demand for the medicines and routine veterinary supplies can be made on a quarterly basis instead of bulk purchase for longer periods at a time with maintenance of relevant records for inventory control. This would ensure proper usage and avoid wastage due to the supplies not being used or crossing their expiry period. Routine checks in the purchases should be in place to ensure proper accountability and value for expenditure incurred. The details are summarized below:-

i. Assessment of requirement of feed items (grains, pulses, cattle feed, poultry feed, Pre mix feed) for a month based on consumption pattern during previous months.
ii. Terms and conditions clearly spelt out for specific grain/ feed quality required.
iii. Perishable items may be stored in refrigerator (4°C) (Vegetables, fruits, fish and meat).
iv. Bulk purchasing of medicine should be discouraged and the expiry date at the time of purchase should not be less than 1 year.
v. The medicines and supplements should be from reputed firms and procured preferably on quarterly basis.
vi Stock book of medicine need to be maintained properly with detailed records of daily use.

**Suggested ways and means to develop strategy to monitor the above issues.**

Strategy and proposal to effectively monitor the quality and quantity of supplies provided to the animals is summarized below:-

i. **Setting up a Monitoring Team in each Zoo:** A team to monitor quality and quantity of supplies including procurement of items should be constituted and managed by the Zoo Director locally with support of Zoo Veterinarian, Biologist, local subject expert (Veterinary Institution) and member of the Non-Governmental Organization. They should be responsible for preparing realistic demands for feed and medicine and the administrative wing of the zoo should supervise the procurement process. Periodic check of the items procured till their disposal should be in place.

ii. **Proper Veterinary setup in zoos:** The well-being of housed animals depends on a sound veterinary program including appropriate infrastructure facilitated by skilled veterinary professional and staff. The veterinarian needs to be abreast with the procedures and can play an important role along with zoo officials in ensuring adequate health services and there is transparency in procurement of items. In order to achieve the optimal benefit of the zoo animal health program, the veterinarian should be an active participant of the institution's management team. Regular programs to enhance skills of veterinary professional need due consideration besides development of a cadre of professionals providing these specialized services. This would ensure continuity of service of skilled professionals contributing in zoos.

iii. **Health Advisory Committee:** Every zoo should have a health advisory committee with active participation of external experts to guide on veterinary interventions required in the zoo and also to check the effectiveness of procedures carried out. Besides, the zoo should also encourage regular visits of experts to guide on specific problems that may be encountered.

iv. **Monitoring of feed, fodder, meat, eggs and supplements**: Regular monitoring of quantity and quality of items provided to the zoo animals should be in place. The items with short shelf life (meat, fish and eggs) should be evaluated based on physical attributes along with laboratory support that would provide results in field itself. For items with longer shelf-life, the quality should be assessed by subjecting the samples to detailed laboratory examination including nutritional analysis (proximate principles), microbiological analysis (bacterial and fungal load/ contamination) and toxicants (HCN, pesticides, weedicides etc.) from reputed laboratories/ Institutions. The items so procured should be stored in **moisture proof, rodents proof, insect proof and other pest proof environments and should be subjected to regular checks by zoo officials. The procedures to ensure proper handling, storage and processing of food items are laid down in the CZA guidelines. (Available at .....)**

v. **Maintaining proper records:** Sound veterinary records form the basis for planning and formulating effective health management strategies. Proper veterinary records reduces loss of animal due to disease since one can track the nature of all treatments (type of medication, dosage, duration), surgical procedures, anesthetic procedures (type of agent, dosage, effect), result of all laboratory tests and immunization records with all relevant dates. Ideally these records should be computerized for easy retrieval and maintained under the direction of the veterinarian. Copies of these veterinary records must accompany animals when they are transferred to another institution or they must be sent in advance of shipment. Duplicate record sets should be stored at another site, or in a fire proof or theft proof safe on site and should also be digitized. Format for select records to be maintained in zoo are provided in Annexure I.

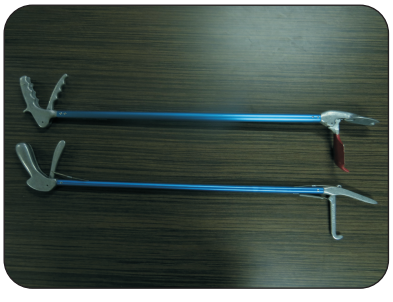
**********

In-Patient Ward

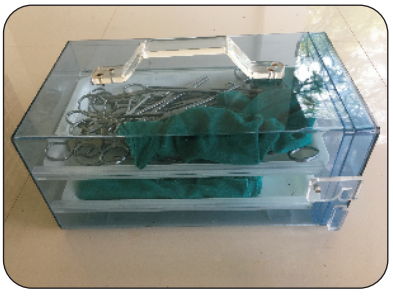
Blood Counter

Dist Inject Dart & Accessories

Haemocytometer



Snake Tong



Surgical Intrument Box

## Annexure - I

**Formats of select prescribed records to be maintained in zoos**

**.....Zoological Park**

### Animal History Card

Stock Register S. No.----------  Housed in ----------

| | |
|---|---|
| Name | Scientific Name |
| Sex | Vernacular Name |
| Distinguishing Mark | Habitat |
| Parentage | Schedule |

| Acquisition | Disposal |
|---|---|
| 1 - How and from where required disposed | How and where disposed |
| 2 - When acquired | 2 - When disposed off |
| 3 - Age and arrival | 3 - Age at disposal |
| 4 - Size and weight on arrival | 4 - Size and weight |
| 5 - Pathological findings in case of death | |

Normal Temperature
Gestation Period
Feed given

Other Information

.....Zoological Park

## Animal History Sheet

| | |
|---|---|
| Vernacular (local) name & Common Name : | Scientific name of the species : |
| House name and ID number of the animal : | Sex : Male/Female |
| Distinguishing mark : | Type of marking - Transponder/ Ear tag / Ring/ Others : |
| National Studbook number of the animal : | International Studbook number of the animal : |
| Sire : (Name and National Studbook number) | Dam : (Name and National Studbook number) |
| Date of Birth (dd:mm:yyyy) | When and from where acquired |
| Physical health check-up details : | Genetic health check-up details : |
| Date of death or other mode of disposal (dd:mm:yyyy) | Remarks : |

.....Zoological Park

## Animal Treatment Card

| | | | |
|---|---|---|---|
| 1. | Card No. | : | |
| 2. | Common Name & Individual Name (if any) : | | |
| 3. | Scientific Name | : | |
| 4. | Animal ID | | |
| 5. | National Studbook No. (if any) | : | |
| 6. | Sex : Date of Birth/Age : | | |
| 7. | Date of time of illness | : | |
| 8. | Date of time of treatment | | |
| 9. | History of Illness | : | |
| 10. | Physical details | : | |
| | Body weight: | : | Respiration : |
| | Temperature: | : | Mucous membrane : |
| | Pulse: | : | Secretion, if any : |
| 11. | Physical Analysis: | : | |
| | Gait | : | Defecation : |
| | Urination | : | Feeding habit : |
| 12. | Tests Conducted | | |
| | Urine | : | Skin scrapings : |
| | Faecal | : | Blood : |
| | Biopsy | : | X ray : |
| 13. | Other examination (if any) | | |
| 14. | Remarks | | |

**Veterinary Officer**

| Date | Details of observations and treatment given | Signature of Veterinary Officer |
|---|---|---|
| | | |

## Deworming Sheet

| S.No. | Deworming Date | Dewormer Used | Due Date | Remarks |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## Deworming Register

| S.No. | Date | Drugs/ Doses | Due Date | Remarks/ Examination |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## Vaccination Sheet

| S.No. | Date | Vaccine | Due Date | Remarks/ Examination |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## Vaccination Register

| S.No. | Date | Vaccine | Due Date | Remarks/ Examination |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

## Immobilization Register

| S.No | Date | Animals | Drugs & Doses | Time of Sedation | Time of Recovery | Remarks/ Examination |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## Prophylactic Register

| Date | Prophylactic/ Vaccination | Name of Animal | Remarks |
|---|---|---|---|
| | | | |
| | | | |

## Pathology Register

| S. No. | Date | Animals | Symptom | Pathological Finding | Diagnosis/ Remarks |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

## Histopathology Register

| S.No. | Date | Animals | Sample with Departure date | Result and date received |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## Treatment Register (Indoor and Outdoor)

| S.No. | Species | Symptom | Diagnosis | Treatment | Remarks |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

Xray Machine

Portable Oxygen Cylinder

## *Post-mortem* Report

**……Zoological Park**

No…..... Date : ….....……

Species

Scientific Name Sex

Age Size Weight

Time, date & place of death

Time & date of Post-mortem examination

Short history of illness, if any

A. General description

B. Organ-wise description

(1) Head and neck…… (a) Skull and brain
(b) Cervical vertebrae

(2) Thorax …… (a) Lungs
(b) Heart
(c) Ribs

(a) Lungs
(b) Heart
(c) Ribs

(3) Abdomen ……

(a) Liver
(b) Stomach
(c) Intestine
(d) Kidney
(e) Spleen

(4) Pelvic girdle ……

(a) Uterus Ovaries
(b) Bladder
(c) Genital passage

(5) Limbs .....

(a) Fore limb
(b) Hind limb

(6) Any other special features :
Biological tests done (if any)

(i) Blood
(ii) Urine
(iii) Discharge
(iv) Biopsy

(7) Opinion

(8) Instruction for disposal

Place : .....

Date :

Signature…….....…..

Name …….

Designation ……..
(Seal)

Signature.....

Name ……..……

Designation ……..
(Seal)

.....Zoological Park

## *Post-mortem* Register

| S.No. | Species | Date & Time of Death | Cause of Death | Disposal of Carcass | Death Occurred in Enclosure or Hospital | Sig. Vet Doctor | Sig. Asst. Vet Doctor | Sig. Curator | Sig. Head Keeper |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

.....Zoological Park

## Keeper's Diary

Name of the Zoo Keeper .....

Section/Beat .....

Day & Date .....

| S.No. | Enclosure | Species/ Individual Sex | Observation |
|---|---|---|---|
| | | | |

**Signature of the Keeper**

**Signature of the Animal Supervisor**

.....Zoological Park

## Daily Report

**Day & Date.....**

| S. No. | Section/ Beat & Enclosure | Species/ Individual | Observations | Action taken/ Required |
|---|---|---|---|---|
| | | | | |

| (Signature) | (Signature) | (Signature) | (Signature) |
|---|---|---|---|
| In-Charge, Animal Section | Biologist | Veterinary Officer | Director |

.....Zoological Park

## Daily Report

Date : .....

| S.No. | Item | Name of Animal | Sex | Enclosure | Remarks |
|---|---|---|---|---|---|
| 1 | Receipts | | | | |
| 2 | Birth | | | | |
| 3 | Transfer | | | | |
| 4 | Mating Activity | | | | |
| 5 | Disposal | | | | |
| 6 | Death | | | | |
| 7 | Diet Change | | | | |
| 8 | Other Observation | | | | |
| 9 | Maintenance Required | | | | |

10. Prophylactic measures adopted

**Signature of Reporting Officer**

11. Sickness (Out Patient)

12. Sickness (In Patient)

**Signature of Veterinary Officer**

13. General remarks action taken of director

**Signature of Director**

.....Zoological Park

## Annual Inventory Report for Year (31 March……..…to 01 April…….……)

**Endangered Species**

| S.No. | Species of Mammals | Scientific Name | Opening Stock as on 31 March | | | | Birth | Acquisition | Disposal | Death | Closing Stock as on 01 April | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CARNIVORES | | M | F | U | T | M:F:U | M:F:U | M:F:U | M:F:U | M | F | U | T |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| | HERBIVORES | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| | PRIMATES | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| | RODENTS | | | | | | | | | | | | | |
| | Total - | | | | | | | | | | | | | |
| S.No. | Species of Birds | Scientific Name | Opening Stock as on 31 March | | | | Birth | Acquisition | Disposal | Death | Closing Stock as on 01 April | | | |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| | Total - | | | | | | | | | | | | | |
| S.No. | Species of Reptiles | Scientific Name | Opening Stock as on 31 March | | | | Birth | Acquisition | Disposal | Death | Closing Stock as on 01 April | | | |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| | Total - | | | | | | | | | | | | | |
| | Total Animals- | | | | | | | | | | | | | |

M : Male; F : Female; U : Unknown; T : Total

## Other than Endangered Species

| S.No. | Species of Mammals | Scientific Name | Opening Stock as on 31 March | | | | Birth | Acquisition | Disposal | Death | Closing Stock as on 01 April | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CARNIVORES | | M | F | U | T | M:F:U | M:F:U | M:F:U | M:F:U | M | F | U | T |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| | HERBIVORES | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| | PRIMATES | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| | RODENTS | | | | | | | | | | | | | |
| | Total - | | | | | | | | | | | | | |
| S.No. | Species of Birds | Scientific Name | Opening Stock as on 31 March | | | | Birth | Acquisition | Disposal | Death | Closing Stock as on 01 April | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | Total - | | | | | | | | | | | | | |
| S.No. | Species of Reptiles | Scientific Name | Opening Stock as on 31 March | | | | Birth | Acquisition | Disposal | Death | Closing Stock as on 01 April | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | Total - | | | | | | | | | | | | | |
| | Total Animals- | | | | | | | | | | | | | |

M : Male; F : Female; U : Unknown; T : Total

.....Zoological Park

## Quarterly Inventory Report
## Endangered Species

| S.No. | Animal Name | Scientific Name | Opening Stock as on ..... | | | | Birth | | | Acquisition | | | Disposals | | | Deaths | | | Closing Stock as on ..... | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Birds | | | M | F | U | T | M | F | U | M | F | U | M | F | U | M | F | U | M | F | U | T |
| 1 | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | | | |
| Total Birds | | | | | | | | | | | | | | | | | | | | | | |
| Mammals | | | M | F | U | T | M | F | U | M | F | U | M | F | U | M | F | U | M | F | U | T |
| 1 | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | | | |
| Total Mammals | | | | | | | | | | | | | | | | | | | | | | |
| Reptiles | | | M | F | U | T | M | F | U | M | F | U | M | F | U | M | F | U | M | F | U | T |
| 1 | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | | | |
| Total Reptiles | | | | | | | | | | | | | | | | | | | | | | |
| Total Animals- | | | | | | | | | | | | | | | | | | | | | | |

M : Male; F : Female; U : Unknown; T : Total

## Stock Register

### Receipt

| S.No. & Date | Species | Date of Arrival in Zoo | No. Arrived | | | By Birth | Other Sources | | | Total No. in Stock | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Male | Female | Total | | Donation | Rescued | Exchange | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

### Disposal

| S.No. & Date | Species | Date of Disposal from Zoo | No. Disposal off | | | How Disposed off | | | | Total No. in stock | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Male | Female | Total | By Death | Donation | Release to Wild | Exchange | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

### Number of Animals Species Exhibited by the Zoo

| Stock position during the current financial year | | | |
|---|---|---|---|
| Number of Species | Stock position on the close of preceding year | Births / Acquisitions / Deaths / Disposal | Stock as on the date of application |
| Mammals | | | |
| Birds | | | |
| Reptiles | | | |
| Amphibians | | | |
| Fishes | | | |
| Invertebrates | | | |

## Annexure - II

## A. Preventive Health Protocols

### 1. Sanitation and Disinfection Protocol

| Disinfectant and Sanitation | | | | | |
|---|---|---|---|---|---|
| S.No. | Enclosure Premises | Animal Feeding and Night Cells | Animal field (Lopping/ Cleaning/ Soil/ Spraying) | Drinking water Tank & Bowls | Cleaning of a Large Pond/ Moat |
| 1 | Daily | Daily | Every Months | Daily | Every 15 days |

**Note-**

- Before use of any disinfectant, remove most of unused feed from feeding utensils, incubators and inside the buildings.
- Remove and dispose the garbage at least twice daily.
- Do not enter the kitchen with dirty shoes or barefoot. Provision of foot bath with potassium permaganate lotion near the kitchen and feed store is must.
- Drinking water must be changed every day, whether it is dirty or not and a veterinary professional needs to check this.
- Floor should be hand scraped to remove any dung or manure, food, or debris. After that wet cleaning with water should be done (use of pressure water pumps).
- Use proper and correct strength and spraying rate of the disinfectant solution, otherwise it will be ineffective against the microbes.
- Some common disinfectant are Quaternary Ammonium salts, Sodium Hydroxide, Phenol-based compounds, Lime, Aldehydes, Iodophores, Chlorine Compounds, Chlorhexidine, Potassium Permaganate etc.

Note: Do not use irritants like phenyl inside the animal house.

*Swarup, D., Das, A., Saini, M., Kumar, P., Sharma, A.K. and Pal, A. (2009). "Standard, Guidelines and Protocols for Disease diagnosis and Cure of Wild Animals for Indian Zoos". Indian Veterinary Research Institute, Bareilly, Anoopam Press, Bareilly.*

## 2. Preventive Medicine ( Deworming)

| Deworming and Fecal Examination | | |
|---|---|---|
| **Animal Species** | **Frequency of Fecal Examination** | **Deworming** |
| Canids, Feline, Herbivore, Primates, Rodents, Birds, Reptiles | Monthly (Zoo laboratory)<br><br>Quarterly basis (Scientific Institutions/Veterinary College laboratory) | Subsequent to results of fecal examination and may be carried out on quarterly basis. Endoparisitcides used for deworming may be changed regularly to avoid drug resistance.<br>*Swarup, D., Das, A., Saini, M., Kumar, P., Sharma, A.K. and Pal, A. (2009). "Standard, Guidelines and Protocols for Disease diagnosis and Cure of Wild Animals for Indian Zoos". Indian Veterinary Research Institute, Bareilly and Central Zoo Authority, Anoopam Press, Bareilly* |

## 3. Preventive Medicine ( Vaccination)

| Vaccinations for Zoo Animals | | |
|---|---|---|
| **Animal** | **Details** | **Remarks** |
| Feline | Feline distemper, Feline Panleukopenia, Feline Calicivirus, Feline Leukemia, Rhinotracheitis, CD, Rabies, Leptospirosis, Trypanosomiasis | Reference: Swarup, D., Das, A.Saini, M.Kumar, P.Sharma, A.K. and Pal, A. (2009). "Standard, Guidelines and Protocols for Disease diagnosis and Cure of Wild Animals for Indian Zoos." Indian Veterinary Research Institute, Bareilly, Anoopam Press, Bareilly. |
| Canids | Canine Distemper, Adenovirus Type 1, Adenovirus Type 2, Hepatitis, Parainfluenza, Parvovirus, Leptospira Canicola, Leptospira Grippotyphosa, Leptospira cterohaemorrhagiae and Leptospira Pomona\ Rabies | |

| | | |
|---|---|---|
| Primates | Diphtheria, Tetanus, Pertussis; Tetanus toxoid; Measles, Mumps and Rubella | |
| Ursids | Leptospirosis, Rabies | |
| Bovids, Cervids and other Artiodactylids (Giraffe), Perrisodactylids Rhinoceros) and elephants | FMD, HS, BQ, Tetanus toxoid, Theileriasis, Piroplasmosis | |

## Choice of Antibiotic/ Antimicrobial for Specific Organ System Infections

| Infection Organ/System | First-Choice drugs | Alternate - Choice Drugs |
|---|---|---|
| Skin : Pyoderma or other skin infection | Amoxicillin-clavulanate Cephalosporin | Trimethoprim-sulfonamides, Fluoroquinolone*, Clindamycin Oxacillin |
| Urinary Tract | Cephalosporin Amoxicillin/ampicillin Amoxicillin-clavulanate | Trimethoprim-sulfonamides Fluoroquinolone*, Tetracycline |
| Respiratory Tract | Amoxicillin-clavulanate Fluoroquinolone Cephalosporin | Macrolide (erythromycin, azithromycin) Aminoglycosides (amikacin, gentamicin) Clindamycin, Chloramphenicol Extended- spectrum cephalosporin┼ |
| Septicemia‡ | Amoxicillin-clavulanate cephalosporin | Aminoglycoside Extended-spectrum cephalosporin |
| Bone and Joint | Fluroroquinolone Cephalosporin Amoxicillin-Clavulanate | Trimethoprim-sulfonamides Clindamycin, Extended-spectrum cephalosporins , Fluoroquinolone |
| Intracellular Pathogens | Doxycycline, Fluoroquinolone | Azithromycin, Clindamycin |

* fluoroquinolone = enrofloxacin, difloxacin, marbofloxacin,

┼ Extended-spectrum cephalosporin = second – generation or third-generation drugs (eg: cefotetan, cefotaxime, cefpodoxime).

‡ Combinations of drugs are often used in acute febrile septicemia. Such combinations may include a betalactam plus an aminoglycoside or a fluoroquinolone plus amoxicillin-clavulanate.

**Dental Machine**

**Deep Freezer**

## Annexure - III

**Vaccination Schedule of captive animals in the recognised large category zoos in India**

### 1. Arignar Anna Zoological Park, Vandalur

| Animals | Vaccines | Booster |
|---|---|---|
| **FELIDS** | | |
| Royal Bengal Tiger ( Including White Tigers) | IRT, FPV, FCV, RABIES | Annual |
| Lion | IRT, FPV, FCV, RABIES | Annual |
| Leopard | IRT, FPV, FCV, RABIES | Annual |
| Jaguar | IRT, FPV, FCV, RABIES | Annual |
| **CANIDS** | | |
| Stripped Hyna | DHLPPi, RABIES | Annual |
| Wild Dog | DHLPPi, RABIES | Annual |
| Jackal | DHLPPi, RABIES | Annual |
| Wolf | DHLPPi, RABIES | Annual |
| **HERBIVORES** | | |
| Elephants | HS, ANTHRAX , TETANUS | Annual |
| Zebra | HS, TETANUS | Annual |
| Giraffe | HS,TETANUS | Annual |
| Wild Ass | HS,TETANUS | Annual |
| Indian Gaur | FMD, BQ, HS | Annual, Pre Monsoon |
| Nilgai | FMD, BQ, HS | Annual, Pre Monsoon |

## 2. Assam State Zoo, Guwahati

| Species | Vaccine | Diseases covered | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elephant | Raksha -O - Vac | Foot & Mouth disease | | | | X | | | | | | | | |
| Rhinoceros & Elephant | Raksha Rab/ Rabigen | Rabies | | | | | X | | | | | | | |
| Elephant Rhinoceros | Raksha Anthrax | Anthrax | | | | | | X | | | | | | |
| Elephant | Tetanus Vac | Tetanus | | | X | | | | | | | | | |
| Rhino | Tetanus Vac | Tetanus | | | X | | | | | | | | | |
| Tiger/ Lion/ Common Leopard/ Panther | Feligen<br>Fel -O Vax | Feline rhino trachitis/Pan leucopenia (Feline distemper)/ Calici | | | | | | X | | | | | | |
| Large Felids | Truquine Inj.** Imidocarb Inj | Haemoparasitic | | | | | X | | | | | | X | |

** Preventive dose

N.B:- Fel-O Vax is not available since Jan' 2012

## 3. Bannerghatta Biological Park, Bengaluru

| Species | Vaccine | Interval |
|---|---|---|
| - | - | January |
| Felids | CV cats | February |
| Gaur, Elephant, Spotted deer, Hog deer, Thamin deer, Black buck, Nilgai | FMD | March |
| Same as above | FMD | April |
| - | | May |
| Canids & Bears | CV dogs | June |

| | | |
|---|---|---|
| Gaur, Elephant | HS | July |
| - | - | August |
| Gaur, Elephant | FMD | September |
| - | FMD | October |
| - | FMD | November |
| Gaur, Elephant | HS | December |

## 4. Pilikula Biological Park, Mengaluru

| Species | Vaccine | Interval | Dose |
|---|---|---|---|
| Felids | Feline panluekopenia + feline rhinotracheitis + feline calci virus trivalent (killed vaccine) | Annual | 1 ml S/C |
| | Rabies cell culture (inactivated) | | |
| Canids | Canine distemper + canine adenovirus type 2 (CAV-2) + canine parvo virus vaccine (attenuated live virus) | Annual | 1 ml S/C |
| | Infectious canine hepatitis | Annual | 1 ml S/C |
| | Rabies cell culture (inactivated) | Annual | 1 ml S/C |
| Ursids | Rabies cell culture (inactivated) | Annual | 1 ml S/C |
| Birds | Lasota vaccine | Annual | Through drinking water |

## 5. Indira Gandhi Zoological Park, Visakhapatnam

| Species | Vaccine | Interval | Dose |
|---|---|---|---|
| | **CARNIVORES** | | |
| Felines | 1. Feligen CRP<br>2. ARV | Annual | |
| | 3. Triquin | | |
| Canines | 1. 1.9 in one<br>2. ARV | Annual | 1.00 cc s/c<br>1.00 cc s/c |
| Elephant | 1. Tetanus toxoid | | 1.00 cc s/c |

## 6. Kamla Nehru Zoological Garden, Ahmedabad

| Species | Vaccine | Interval |
|---|---|---|
| Lion, Tiger, Leopard | Fel – O - Vax | Every year in the month of April |
| All Bird | F1. Lasota Strain Vaccine for R.D. | Every six month, September & March |
| Elephant | Tetanus | Every year |
| Lion, Tiger, Leopard | Inj. Triquine | Every six month |

## 7. Kanpur Zoological Park, Kanpur

| Species | Vaccine | Interval |
|---|---|---|
| **Carnivore** | | |
| | FEL-O-VAX (IML) single dose (killed virus) | |
| Felids (Lion, Tiger, Leopards, Jungle Cat, Leopard Cat) | Feline calci / panleukemia, F. rhinotraechitis | March/April |
| | live canarypox vector vaccine* | |
| | Ribagen mono (1m1) single dose | |
| Canids (Jackal, Hyena, Fox) | DHPPIL, ARV | |
| Herbivores | Nil | |
| Birds | Nil | |
| Reptiles | Nil | |

**NOTE-**

1. Booster is given after four weeks of initial vaccination
2. *As per recommendation of Indian Veterinary Research Institute (IVRI) Bareilly, this vaccine was first time given to those leopards which are to be sent to Lion Safari Etawah.

## 8. Mahendra Chaudhury Zoological Park, Chhatbir, Punjab

| Species | Vaccine | Dose Rate & Route |
|---|---|---|
| Lion | Nobivac Rabies | 1ml S/C |
| Tiger | Nobivac Rabies | 1ml S/C |
| Leopard | Nobivac Rabies | 1ml S/C |
| Jaguar | Nobivac Rabies | 1ml S/C |

## 9. Nandankanan Biological Park, Bhubaneshwar, Odisha

| Species | Vaccine | Vaccine against | Interval |
|---|---|---|---|
| **Carnivores** | | | |
| Lion , Tiger, Leopard, leopard cat, jungle cat | Fel – O - Vax or BioFel - PCHR | Feline pan leucopenia | Annually (In the month of July) |
| Hyenas, Jackal | Multivalent vaccine | Distemper, Parvo, hepatitis, Leptospira Parainfluenza | Annually (December) |
| Elephant | | Haemorrhagic septicemia | Half yearly (Dec. and June- 1st wk) |
| | | Foot & Mouth | Annually (Feb. 3m Wk) |
| | | Tetanus | Half Yearly (May & Nov. 3rd Wk) |
| | | Rabies | Annually (July 1st Wk) |
| | | Black Quarter | Feb. and Aug. (1st wk) |
| | | Anthrax | Annually (January) |
| Four horned Antelope | | Black Quarter HS | Every 6 months |
| Gaurs | Raksha- Triovac | Trivalent (HS, BQ, FMD) | Annually |

| Species | Vaccine | Chemoprophylaxis against | Interval |
|---|---|---|---|
| **Carnivores** | | | |
| Tiger, Lion, Leopard | Triquin | Trypanosomiasis | (Quarterly)<br>1st Week of Dec<br>1st Week of April<br>1st Week of August |
| **Herbivores** | | | |
| Zebra, Nilgai<br>Sambar<br>Swamp deer<br>barking deer<br>Manipuri deer<br>Mouse deer<br>hog deer<br>four horned antelope<br>black buck<br>white buck<br>spotted deer | 3D & 2D | Tuberculosis | 3D - (60 days)<br>Dec & Jan every year<br>2D - (120 days)<br>Feb to May every year |
| **Avian** | | | |
| Birds | Sulfquinoxaline | Coccidiosis | (Twice, One month interval during monsoon) |

## 10. National Zoological Park, New Delhi

| Species | Interval |
|---|---|
| Canidae | Yearly |
| Felidae | Yearly |
| Herbivores/ proboscides | Yearly |
| Ursidae | Yearly |
| Primates | Yearly |

## 11. Nawab Wajid Ali Shah Zoological Garden, Lucknow

| Species | Details |
|---|---|
| Feline (Yearly) | Feline Panleukopenia, Feline Calicivirus, Feline Leukemia, Rhinotracheitis, Trypanosomiasis |
| Canids (Yearly) | Canine Distemper, Adenovirus Type 1, Adenovirus Type 2, Hepatitis, Parainfluenza, Parvovirus, Leptospira, Rabies |

## 12. Nehru Zoological Park, Hyderabad

| Species | vaccine and dosage/qty used | Disease | Periodicity | Remarks |
|---|---|---|---|---|
| Carnivores (Lion, Tiger, panther, Jaguar, Cheetah) | Feligen 1ml. S/C | Feline Distemper | March (once in a year) | I$^{st}$ vaccination will be given at 60 days and booster dose will be given on 90 days and repeat once in a year.2 |
| Canids (Hyena, Wolf, Jackal) | Canign 1ml S/C | Canine Distemper | May (Once in a year) | I$^{st}$ vaccination will be given at 60 days and booster dose will be given on 90 days and repeat once in a year. |
| Carnivores | Triquin 3ml for large and 2ml for small carnivores S/C | Tripanozo-miasis | June & December (Every 6 months) | - |
| Indian Gaur Barking Deer Thamin Deer and Swamp Deer | Enterotoxaemia vaccine 5ml S/C for Gaur and 2ml S/C for deer | Enterotoxaemia | June & December (every 6 months) | Vaccines were conducted due to endemic area. |
| Giraffe, Indian gaur, Barking Deer, Thamin Deer, White Buck, Goral and Swamp Deer | Enterotoxaemia vaccine 5ml S/C for Gaur and 2ml S/C for deer | Pasturello-sis (Haemorra-ges and Septicemia) | April & October (Every 6 months) | Vaccines were conducted due to endemic area. |
| Giraffe, Elephant Indian Gaur Swamp Deer Thamin Deer Goral and White Buck | 5ml for Giraffe, 10ml for Elephant, 2ml for Deer S/C | Foot and Mouth Disease | October to February (Every 6 months) | Vaccines were conducted due to endemic area. |

## 13. Sakkarbaug Zoological Park, Junagadh

| Species | Vaccine | Interval |
|---|---|---|
| Feline | Fel-o- vax vaccine/ Biofel PCHR | Cubs at two month age, Boostering once in a year |
| Canine | a) Nobivac R (Rabies) Vaccine<br>b) Nobivac DHPPi Vaccine<br>c) Nobivac Leptospira Vaccine | Pups at three month age, Boostering once in a year |
| Birds | Ranikhet Vaccine - RD Lasota | Annually/ Periodically |

## 14. Sanjay Gandhi Biological Park, Patna

| Species | Drug | Periodicity | Quantity & Variation |
|---|---|---|---|
| Feline (Big Cat) | 1. Fel-O-Vax PCT | Annually | 1 dose per adult |
| | 2. Antitryps =Triquin | | 0.25 ml per 10 kg body wt |
| Elephant | 1. Tetvac | Annually | 2 ml per adult |
| | 2. FMD Vaccine | | 2 ml per adult |

**Note**: As per need after blood screening report, Antitryps vaccine may be repeated half-yearly.

## 15. Sri Chamarajendra Zoological Garden, Mysuru

| Species | Vaccine | Periodicity |
|---|---|---|
| **Felines** | | |
| Tiger, Lion, Leopard, Jaguar, Leopard cat, Jungle cats, Civet cat, Palm civet | Feline vaccine (Feligen) | Annually |
| | Anti-rabies Vaccine | Annually |
| **Canines** | | |
| Indian grey wolf, Wild dog, Jackal | DHPPI + L | Annually |
| | Anti-rabies Vaccine | Annually |
| Hyenas | DHPPI + L | Annually |

| | | |
|---|---|---|
| | Anti-rabies Vaccine | Annually |
| **Herbivorous** | | |
| Gaur, Giraffe, Rhinoceros, Cape buffalo, African elephant, Asian elephant | FMD and HS | Bi-annually |

**Note:** Quantity depends upon the body weight of the animal, species and drugs to be given.

## 16. Sri Venkateswara Zoological Park, Tirupati

| Species | Vaccine | Dose per animal | Interval |
|---|---|---|---|
| Large Carnivores | Triquin | 3 ml | June & December |
| Large Carnivores | Fel 'o' Vax | 1 Dose | April |
| Large Carnivores | Anti Rabis | 1 Dose | June |
| Large Carnivores | D.H.P.P.I. + L | 1 Dose | June |
| Birds | Lasota Strain | 1 Dose / bird | February |

## 17. Thiruvananthapuram Zoo, Thiruvananthapuram

| Species | Disease or vaccine | Vaccine type | Frequency | Month+ |
|---|---|---|---|---|
| Primates | Poliomyelitis | MLV | Annual | January |
| | Measles | MLV | Annual | January |
| | Mumps | MLV | Annual | January |
| | Rubella | MLV | Annual | January |
| | Canine distemper | Ferret distemper | Annual | March |
| | DPT / tetanus | K | Annual | February |
| Candidae (jackal) | Canine distemper | MLV | Annual | March |
| | Canine adeno virus 2 | MLV | Annual | March |
| | Canine parvo virus | K | Annual | March |
| | Canine para influenza | MLV | Annual | March |
| | Leptospirabacterin cl | K | Annual | March |
| | Rabies | K | Annual | April |

| | | | | |
|---|---|---|---|---|
| Felidae (exotic cats) | Feline pan leucopenia | K/MLV | Annual | May |
| | Feline rhinotracheitis | K/MLV | Annual | May |
| | Feline calcrivirus | K/MLV | Annual | May |
| | Rabies | K | Annual | April |
| | Canine distemper | Ferret distemper | Annual | March |
| | Triquin | | Every 3 months | |
| Ursidae (Bears) | Canine adeno virus 2 | MLV | Annual | March |
| | Leptospirabacterin cl | K | Annual | March |
| | Canine distemper | Ferret distemper | Annual | March |
| | Rabies | K | Annual | April |
| Hyaenidae (Hyena) | Canine distemper | MLV | Annual | March |
| | Feline pan leukopenia | K/MLV | Annual | May |
| Artiodactytla/ Ruminantia (Deer, Antelope) | FMD | O, A, ASIA 1 | Every 6 months | October, April |
| | HS/BQ | K | Annual | August |
| Perrisodactyla Equidae (Zebra) | Equine rhino pneumonitis | K | Annual | September |
| | Leptospirabacterin 5 way | K | Annual | September |
| | FMD | O, A, ASIA 1 | Every 6 months | October, April |
| Proboscidea (elephant) | Anthrax | K | Annual | October |
| | Tetanus | Toxoid | Biannual | January, June |
| Birds (Anserines) | Duck pasteurella | Niranam strain | Every 6 months | February, August |
| | Duck viral enteritis | | Annual | February |
| Pheasants (Peacock) | New castle | F/K | | |

(Triquin-Quinapyraminesulphate & Quinapyramine chloride {3:2})

## Annexure - IV

## De-worming Schedule of Captive Animals in the Recognised Large Category Zoos in India

### 1. Arignar Anna Zoological Park, Vandalur, Chennai

| Species / Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lion | | | | *** | | | *** | | | *** | | |
| Tiger | | *** | | | *** | | | *** | | | *** | |
| Panther | | | *** | | | *** | | | *** | | | *** |
| Jaguar | | | | | | | | | | | | |
| Bear | *** | | | *** | | | *** | | | *** | | |
| Hyena | | | *** | | | *** | | | *** | | | *** |
| Wild dog | *** | | | *** | | | *** | | | *** | | |
| Wild boar | *** | | | *** | | | *** | | | *** | | |
| Elephant | | | *** | | | *** | | | *** | | | *** |
| Indian gaur | *** | | | *** | | | *** | | | *** | | |
| Deer | | *** | | | *** | | | *** | | | *** | |
| Otter | | | | | | | | | | | | |
| Wild ass | | *** | | | *** | | | *** | | | *** | |
| Monkey | *** | | | *** | | | *** | | | *** | | |
| Jackal | | *** | | | *** | | | *** | | | *** | |
| Zebra | *** | | | *** | | | *** | | | *** | | |
| Giraffe | | | | | | | | | | | | |
| Hippopotamus | | | *** | | | *** | | | *** | | | |
| Nocturnal animals | *** | | | *** | | | *** | | | *** | | |
| Terrestrial birds | | *** | | | *** | | | *** | | | *** | |
| Aquatic birds | | | | | | | | | | | | |
| Ostrich & | | *** | | | *** | | | *** | | | *** | |
| Birds of prey | | | | | | | | | | | | |
| Snakes | *** | | | *** | | | *** | | | *** | | |
| Crocodile/ | | | *** | | | *** | | | *** | | | *** |
| Tortoise | | | | | | | | | | | | |

## 2. Assam State Zoo cum Botanical Garden, Guwahati

| Species/ Class | Drugs used | De-worming Schedule | Variation | Dose |
|---|---|---|---|---|
| Herbivores | ➢Albendazole<br>➢Fenbendazole<br>➢Ivermectin | ➢ Quarterly February May | ➢ On specific diagnosis for Helminthiasis in | ➢ Albendazole: 5 mg/ kg body wt.<br>➢ Fenbendazole: 5 mg/ kg |
| | ➢Oxyclozanide<br>➢Levamisole | August, November<br>➢As single dose | Particular animal/s<br>➢ Rotation of the deworming drugs to avoid drug resistance and other side effects | body wt.<br>➢ Ivermectin: 0.2 mg/ kg body wt.<br>➢ Oxyclozanide: 10 - 15 mg/ kg body wt.<br>➢ Levamisole: 7.5 mg/ kg body wt. |
| Carnivores | ➢Albendazole<br>➢Fenbendazole<br>➢Levamisole<br>➢Praziquantel | ➢ Quarterly (February, May, August, November)<br>➢ Once a day for 3 days | ➢ On specific diagnosis for Helminthiasis in particular animal/s<br>➢ Rotation of the deworming drugs to avoid drug resistance and other side<br>➢ Combination of 2 or more drugs | ➢ Albendazole: 10 -15 mg/ kg body wt.<br>➢ Fenbendazole: 50 mg/ kg body wt.<br>➢ Levamisole: 7.5 mg/ kg body wt.<br>➢ Praziquantel: 7.5 mg/ k g body wt. |
| Primates | ➢ Albendazole<br>➢ Fenbendazole<br>➢ Ivermectin<br>➢ Oxyclozanide<br>➢ Levamisole | ➢Quarterly (February, May, August, November)<br>➢As single dose | ➢On specific diagnosis for Helminthiasis in particular animal/s<br>➢Rotation of the deworming drugs to avoid drug resistance and other side effects<br>➢Combination of 2 or more drugs | ➢ Albendazole: 25 mg/ kg body wt.<br>➢ Fenbendazole: 20 – 50 mg/ kg body wt.<br>➢ Ivermectin: 0.2 mg/ k g body wt.<br>➢ Oxyclozanide<br>➢ Levamisole: 5 – 10 mg/ kg body wt.<br>➢ Praziquantel: 15 – 40 mg/ kg body wt.<br>➢ Pyrantel Pamoate: 1 mg/ kg body wt. |
| Birds | ➢ Albendazole<br>➢ Fenbendazole<br>➢ Levamisole<br>➢ Praziquantel | ➢ Quarterly (February May August | ➢On specific diagnosis for Helminthiasis in particular | ➢ Fenbendazole: 7.5 mg/ kg body wt.<br>➢ Levamisole: 7.5 mg/ kg body wt. |

| Species/ Class | Drugs used | De-worming Schedule | Variation | Dose |
|---|---|---|---|---|
| | | November<br>➢ As single dose | animal/s<br>Rotation of the deworming drugs to avoid drug resistance and other side leffects<br>Combination of 2 or more drugs | ➢ Praziquantel: 10 – 15 mg/ kg body wt. |
| Reptiles | ➢Albendazole<br>➢Fenbendazole | ➢ Quarterly (February, May, August, November)<br>➢ As single dose | ➢On specific diagnosis for Helminthiasis in particular animal/s<br>➢Rotation of the deworming drugs to avoid drug resistance and other side effects<br>➢Combination of 2 or more drugs | ➢Albendazole<br>➢Fenbendazole: 25 – 50 mg/ kg body wt.<br>➢Ivermectin: 0.2 mg/ kg body wt. |

### 3. Bannerghatta Biological Park, Bengaluru

| Month | De-wormer |
|---|---|
| January | Parental Palmate/ Plozin (3 in 1) |
| April | Oxyclosanide, Levamizole / Plozin |
| July | Albendazole/ Fenbendazole |
| October | Ivermectin/ Fenbendazole |

- Faecal examination of the samples are conducted randomly to assess the presence of the parasites/ eggs

## 4. Dr. K. Shivrama Karanth Pilikula Biological Park, Mangaluru

| Species | Interval | Drug and Dose |
|---|---|---|
| Big Cats | 3 months | Combination of Fenbendazole, Praziquantel and Pyrantel Pamoate |
| Small Cats | 3 months | Fenbendazole: 25 mg/ kg P/O |
| Jackals | 3 months | Fenbendazole: 50 mg/ kg P/O |
| Bears | 3 months | Fenbendazole: 25 mg/ kg P/O |
| Wild Boar | 3 months | Ivermectin: 0.2 mg/ kg P/O |
| Primates | 3 months | Fenbendazole: 25 mg/ kg P/O |
| Deer and Antelopes | 3 months | Vermectin: 0.2 mg/ kg P/O |
| Porcupine | 3 months | Fenbendazole: 20 mg/ kg P/O |
| Squirrels | 3 months | Fenbendazole: 20 mg/ kg P/O |
| Anseriformes (Ducks and Geese) | 3 months | Fenbendazole: 10 mg/ kg P/O |
| Galliformes (Pheasants) | 3 months | Fenbendazole: 20 mg/ kg P/O |
| Ciconiiformes (Spoonbill & Ibis) | 3 months | Fenbendazole: 25 mg/ kg P/O |
| Psittaciformes (Parrots & Parakeets) | 3 months | Albendazole: 20 mg/ kg P/O |
| Pelican | 3 months | Fenbendazole: 20 mg/ kg P/O |
| Columbiformes (Pigeons & Doves) | 3 months | Fenbendazole: 20 mg/ kg P/O |
| Raptors | 3 months | Fenbendazole: 20 mg/ kg P/O |
| Ratites | 3 months | Albendazole: 10 mg/ kg P/O |
| Owls | 3 months | Fenbendazole: 25 mg/ kg P/O |
| Snakes | 3 months | Fenbendazole: 25 mg/ kg P/O |
| Crocodiles and Tortoises | 3 months | Fenbendazole: 50 mg/ kg P/O |

*Routine faecal sample examination is done for all zoo collections at 3 months interval for estimation of parasitic load and if found positive, therapeutic drugs at prescribed doses will be administered.

## 5. Indira Gandhi Zoological Park, Vishakhapatnam

| Species | Drugs name | Dosage | Periodicity |
|---|---|---|---|
| Carnivores | Ivermetin | 0.2 mg / kg body wt. | Once in 3 months. |
| | Drontalphs | 1 tab / 10 kg body wt. | |
| | Kiwoff | 1/4$^{th}$ tab/ 2 - 3 kg body wt. | |
| | Fenbendazole | 25 - 50 mg /kg body wt. | |
| | Pycantal Pamoat | 1 tab / 10 kg body wt. | |

| | | | |
|---|---|---|---|
| Herbivores | Fenbendazol | 5 mg / kg body wt. | Once in 3 months. |
| | Albendazol | 25 mg / kg body wt. | |
| | Ivermectin | 0.2 mg / kg body wt. | |
| Aves | Piperzine | 30 ml / 100 birds | Once in 3 months. |
| | Levamisole | | |
| Reptiles | Albendazole | | Once in 3 months |
| | Fenbendazole | | |
| | Ivermectin | | |

## 6. Kamla Nehru Zoological Garden, Ahmedabad

| De-wormer used | Time of de-worming |
|---|---|
| Bolus & Liquid of Albendazole group | Every 2-3 months de-worming is being done by different de-wormer to avoid resistance |
| Bolus of Fanbendazole group | |
| Bolus or Liquid of Ivermectine group (for endo & ecto parasite) | |
| Note: In case of positive faecal sample report, animals are dewormed again. | |

## 7. Kanpur Zoological Park, Kanpur

| Animal | Month | Drugs used |
|---|---|---|
| Carnivore | February<br>June<br>October | Nilzan, Oxyclozanide, Piperazine, Fenbendazole, Albendazole, Praziquintal, Parantelpaomate, Ivermectin |
| Herbivores | June<br>December | Nilzan, Oxyclozanide, Piperazine, Fenbendazole, Albendazole, Praziquintal, Parantelpaomate, Ivermectin |
| Birds | June<br>December | Piperazine, Fenbendazole, Albendazole, Praziquintal |
| Reptiles | As and when required | Ivermectin by s/c route 0.2 mg/kg |

## 8. Mahendra Chaudhary Zoological Park, Chhatbir, Punjab

| Species | Antihelminthic Drug Used | | Month | Dosage/ Route |
|---|---|---|---|---|
| Lions<br>Tigers<br>Leopards<br>Jaguar | Praziquantel<br>Pyrantel Pamoate<br>Fenbendazole | Combination | April | 5 mg/ kg p.o.<br>6 mg/ kg p.o.<br>20 mg/ kg p.o. |
| | Ivermectin | | December | 6 mg/ kg p.o. |

| | | | | |
|---|---|---|---|---|
| Hippopotamus | Albendazole | Combination | April | 6 mg/ kg p.o. |
| | Ivermectin | | | 5 mg/ kg p.o. |
| | Fenbendazole | | December | 10 mg/ kg p.o. |
| Wild boar | Ivermectin | | April | 5 mg/ kg p.o |
| | Fenbendazole | | December | 10 mg/ kg p.o. |
| Primates | Ivermectin | | April | 5 mg/ kg p.o |
| | Praziquantel | Combination | December | 3 mg/ kg p.o. |
| | Pyrantel Pamoate | | | 6 mg/ kg p.o. |
| | Fenbendazole | | | 20 mg/ kg p.o. |
| Elephants | Albendazole | | April | 2.5 mg/ kg p.o. |
| | Fenbendazole | | December | 7.5 mg/ kg p.o |
| Himalayan Black Bear Sloth Bear | Albendazole | Combination | April | 15 mg/ kg p.o |
| | Ivermectin | | | 5 mg/ kg p.o. |
| | Fenbendazole | | December | 50 mg/ kg p.o |
| Barking Deer Sangai Deer Mouse Deer | Fenbendazole | | April & December | 7.5 mg/ kg p.o. |
| Four Horned Antelope, Chinkara | Fenbendazole | | April & December | 7.5 mg/ kg p.o. |
| Jungle Cat | Fenbendazole | | April | 20 mg/ kg p.o. |
| | Praziquantel | Combination | December | 5 mg/ kg p.o. |
| | Pyrantel Pamoate | | | 6 mg/ kg p.o. |
| | Fenbendazole | | | 7.5 mg/ kg p.o. |
| Hyena Jackal | Fenbendazole | | April | 20 mg/ kg p.o |
| | Praziquantel | Combination | December | 5 mg/ kg p.o |
| | Pyrantel Pamoate | | | 6 mg/ kg p.o. |
| | Fenbendazole | | | 7.5 mg/ kg p.o. |
| Swamp Deer Hog Deer Goral Bison | Fenbendazole | | April & December | 7.5 mg/ kg p.o |
| Zebra | Ivermectin | | April | 5 mg/ kg p.o. |
| | Fenbendazole | | December | 7.5 mg/ kg p.o. |
| Smooth Coated Otter | Albendazole | | April | 10 mg/ kg p.o. |
| | Fenbendazole | | December | 10 mg/ kg p.o. |

| | | | | |
|---|---|---|---|---|
| Fruit Bat<br>Porcupine<br>Civet Cat | Fenbendazole | | April | 7.5 mg/ kg p.o. |
| | Praziquantel | Combination | December | 5 mg/ kg p.o. |
| | Pyrantel Pamoate | | | 6 mg/ kg p.o. |
| | Fenbendazole | | | 20 mg/ kg p.o. |
| Blue Bull,<br>Black/ White Buck<br>Spotted Deer,<br>Sambar | Albendazole | | April | 10 mg/ kg p.o. |
| | Fenbendazole | | December | 7.5 mg/ kg p.o. |

## 9. Nandankanan Biological Park, Bhubaneswar

| Type of animal | Enclosure number | Period (month) | Time (Week) |
|---|---|---|---|
| Carnivores (at 3 months interval) | 30, 31, 32, 33 and Tiger Safari, Lion Safari (tiger section) | March | 1st Week |
| | | June | 1st Week |
| | | September | 1st Week |
| | | December | 1st Week |
| | 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 90, 91. (Tigers, Lions, Jackal, Leopards) | March | 2nd Week |
| | | June | 2nd Week |
| | | September | 2nd Week |
| | | December | 2nd Week |
| | Small Cats, Small Mammal House, Mouse Deer, Indian Hare, Giant Squirrel, Nocturnal House, Bear Safari, Sloth and Himalayan Bears | March | 3rd Week |
| | | June | 3rd Week |
| | | September | 3rd Week |
| | | December | 3rd Week |
| Herbivores (at 3 months interval) | Herbivore Safari, Spotted Deer, Elephants | February | 1st Week |
| | | May | 1st Week |
| | | August | 1st Week |
| | | November | 1st Week |
| | Rhinoceros, Hippopotamus, Giraffe, Zebra Sangai Deer, Barking Deer | February | 2nd Week |
| | | May | 2nd Week |
| | | August | 2nd Week |
| | | November | 2nd Week |
| | Sambar, Swamp Deer, Spotted Deer, Nilgai, Hog Deer, Black Buck, White Buck, Four Horned Antelope, Primates including Chimpanzee and Orang-utan | February | 3rd Week |
| | | May | 3rd Week |
| | | August | 3rd Week |
| | | November | 3rd Week |
| Birds (at 3 months interval) | Enclosures 1 to 13, enclosures inside the children park | January | 1st Week |
| | | April | 1st Week |
| | | July | 1st Week |
| | | October | 1st Week |
| | Emu, Cassowary, Aquatic bird, Peacock, Lesser Adjutant Stork, Open Bill Stork, Sarus Crane, Black Swan, Mandarin Duck, Rose Ringed Parakeet, Brahminy kite | a J nuary | 2nd Week |
| | | April | 2nd Week |
| | | July | 2nd Week |
| | | October | 2nd Week |
| Reptiles | All Snakes, Star Tortoise, Monitor Lizard | March | 1st Week |

| Type of animal | Enclosure number | Period (month) | Time (Week) |
|---|---|---|---|
| (at 3 months interval except | | June | 1st Week |
| | | September | 1st Week |

**10. National Zoological Park, New Delhi**

| Month | Test/ Activity |
|---|---|
| April | Faecal Analysis |
| May | De-worming |
| August | Faecal Analysis |
| September | De-worming |
| December | Faecal Analysis |
| January | De-worming |

**11. Nawab Wajid Ali Shah Zoological Garden, Lucknow**

| Species | Duration |
|---|---|
| Feline | Every 3 months |
| Canine | Every 3 months |
| Herbivore | Every 6 months |
| Primates | Every 6 months |
| Birds | Every 6 months |

**12. Nehru Zoological Park, Hyderabad**

| Month | Species |
|---|---|
| January | Birds & Reptiles |
| February | Carnivores |
| March | Herbivores & Primates |
| April | Reptiles & Birds |
| May | Carnivores |
| June | Herbivores & Primates |
| July | Reptiles & Birds |
| August | Carnivores |
| September | Herbivores & Primates |
| October | Reptiles & Birds |
| November | Carnivores |
| December | Herbivores & Primates |

Rotational de-worming with following helmethic drugs will be carried out to avoid drug resistance in the individuals.

1. **Fenbendazole –** Herbivores, Carnivores
2. **Albendazole –** Herbivores and Carnivores
3. **Mebendazole –** Primates and Monkeys
4. **Ivermetine –** Herbivores and Carnivores
5. **Piperzine adepate –** Birds and Reptiles

**13. Sakkarbaug Zoological Park, Junagadh**

| Animal Group | Medication | Period | Remarks |
|---|---|---|---|
| Carnivore | (Panacure) Fenbendazole: 50mg/ kg for 3 days | Three months interval | Every time use different drugs |
| | Tab. Plozin: 1 tab/ 10 kg | | |
| | (Albomar) Albendazole: 50 mg/ kg for 3 days | | |
| Herbivore | (Panacure) Fenbendazole: 10mg/ kg for 3 days | Five months interval | |
| | (Albomar) Albendazole: 10 mg/ kg for 3 days | | |
| Birds | (Panacure) Fenbendazole: 10 – 20 mg/ kg for 3 days | Five months interval | |
| | (Albomar) Albendazole: 10 – 20 mg/ kg for 3 days | | |
| ¾ Random faecal samples of all animals and birds examined for Parasitic infestation | | Daily | |
| ¾ If samples found positive for any parasites then individual animals are de-wormed | | Next day of | |

**14. Sanjay Gandhi Biological Park, Patna**

| Species | Drug | Periodicity | Quantity & Variation |
|---|---|---|---|
| Lion (adult) | Fenbendazole | Quarterly | 1.5 gm for three days |
| Tiger (adult) | Fenbendazole | Quarterly | 1.5 gm for three days |
| Leopard (adult) | Fenbendazole | Quarterly | 750 mg per for 3 days |
| Jungle Cat | Fantas Plus<br>Fenbendazole: 150 mg<br>Praziquantel: 50 mg | Quarterly | 1/2 tab for 3 days |
| Leopard Cat | Fantas Plus<br>Fenbendazole: 150 mg<br>Praziquantel: 50 mg | Quarterly | 1/2 tab. for 3 days |
| Fishing Cat | Fantas Plus<br>Fenbendazole: 150 mg | Quarterly | 1 tab. per adult |

| Species | Drug | Periodicity | Quantity & Variation |
|---|---|---|---|
| | Praziquantel: 50 mg | | |
| Wolf | Fantas Plus<br>Fenbendazole: 150 mg<br>Praziquantel: 50 mg | Quarterly | 2 tab per adult for 3 days |
| Hyena | Fantas Plus<br>Fenbendazole: 150 mg<br>Praziquantel: 50 mg | Quarterly | 2 tab per adult for 3 days |
| Indian Fox | Fantas Plus<br>Fenbendazole: 150 mg<br>Praziquantel: 50 mg | Quarterly | 1/2 tab for 3 days |
| Jackal | Fantas Plus<br>Fenbendazole: 150 mg<br>Praziquantel: 50 mg | Quarterly | 2 tab for 3 days |
| Sloth bear | Fenbendazole/<br>Ivermectin | Quarterly | 1.5 gm/ adult<br>50 mg/ adult |
| Himalayan Black Bear | Fenbendazole/<br>Ivermectin | Quarterly | 1.5 gm/ adult<br>60 mg/ adult |
| Monkey, Langur | Albendazole | Quarterly | 5 - 7 mg/ kg body wt |
| Ungulates | Fenbendazole/<br>Ivermectin | Quarterly | Fenbendazole: 5 mg/ kg body wt<br>Ivermectin: 1 mg/ 5 kg body wt |
| Rhinoceros | Fenbendazole | Quarterly | 9 gm per adult |
| Elephant | Fenbendazole | Quarterly | 12 gm per adult |
| Bison (adult) | Fenbendazole<br>Ivermectin<br>Albendazole | Quarterly | Fenbendazole: 3 gm<br>Ivermectin:100 mg<br>Albendazole: 3 gm |
| Porcupine | Mebex<br>Mebendazole: 100 mg | Quarterly | 1/2 tab per adult |
| Squirrel | Ivermectin | Quarterly | 1 – 2 mg |
| Giraffe (adult) | Fenbendazole | Quarterly | 2.5 - 3 gm per adult |
| Hippopotamus | Fenbendazole | Quarterly | 8 gm/ adult |
| Zebra | Fenbendazole/<br>Ivermectin | Quarterly | Fenbedazole: 1.5 gm<br>Ivermectin: 80 mg |
| Chimpanzee | Albendazole | Quarterly | 400 mg/ per adult |
| Peafowl, Pheasant | Albendazole | Quarterly | 5 mg/ kg body wt. |

| Species | Drug | Periodicity | Quantity & Variation |
|---|---|---|---|
| Birds (Companion birds) | Worm out Gel 20 gm/L Praziquantel 20 gm/L Oxfendozole | Quarterly | 2 ml in 160 ml water 5 mg/ kg body wet |
| Emu | Mebex Mebendazole; 100 mg | Quarterly | 150 mg |
| Ostrich | Mebex Mebendazole: 100 mg | Quarterly | 200 mg per adult |
| Cassowary | Mebex Mebendazole: 100 mg | Quarterly | 150 mg |
| Rosy Pelican | Mebex Mebendazole: 100 mg | Quarterly | 100 mg per bird |

**Note:**

- Faecal sample examination is done in the 2nd week of March, June, September, December respectively and subsequently de-worming is done in the 3rd week of the same month.
- After deworming adjunct medication is followed.

**15. Sri Chamarajendra Zoological Garden, Mysuru**

| Species | Medication | Periodicity |
|---|---|---|
| **Felines**<br>Tigers<br>Lions<br>Leopards<br>Jaguars<br>Leopard cats<br>Jungle cats<br>Civet cats<br>Palm civets | Combination of Praziquantel, Pyrantal Pamoate and Fenbendazole | Quarterly |
| **Canines**<br>Indian grey wolf<br>Wild dogs<br>Jackals | Combination of Praziquantel, Pyrantal pamoate and Fenbendazole | Quarterly |
| **Hyenas** | Combination of Praziquantel, Pyrantal pamoate and Fenbendazole | Quarterly |
| **Bears** | Albendazole | Quarterly |

| Species | Medication | Periodicity |
|---|---|---|
| | ¾ Fenbendazole | |
| **Primates** | ¾ Albendazole<br>¾ Fenbendazole | Quarterly |
| **Herbivorous**<br>¾ Gaurs<br>¾ Giraffes<br>¾ Rhinoceros<br>¾ Cape Buffalo<br>¾ African Elephants<br>¾ Asian Elephants<br>¾ Spotted deers<br>¾ Nilgai<br>¾ Swamp Deer<br>¾ Barking deer<br>¾ Hog deer<br>¾ Thamin deer<br>¾ Antelopes | ¾ Albendazole<br>¾ Fenbendazole<br>¾ Ivermectin | Quarterly |
| Birds<br>¾ All Birds | ¾ Fenbendazole and Praziquantel combination.<br>¾ Albendazole | Quarterly |
| Crocodiles and other reptiles | ¾ Fenbendazole and Praziquantel combination.<br>¾ Albendazole | Quarterly |
| Snakes | ¾ Albendazole and Pyrantel Pamoate combination | Quarterly |

**Note:** Quantity depends upon the body weight of the animal, species and drugs to be given.

**16. Sri Venkateswara Zoological Park, Tirupati**

| Month | Animals |
|---|---|
| April | Elephant, Wild Boar, Reptile, Carnivores, Sloth Bear & Bird |
| May | Birds |
| June | Herbivore, Carnivore, Sloth Bears, Primates & Birds |
| July | Wold Boars, Reptiles & Birds. |

| | |
|---|---|
| August | Larger & Lesser Carnivores, Sloth Bears & Birds |
| September | Herbivores, Primates & Birds |
| October | Elephants, Wild Boars, Reptiles, Carnivores, Sloth Bears & Birds |
| November | Birds |
| December | Herbivores, Carnivores, Sloth Bears, Primates & Birds |
| January | Wold Boars, Reptiles & Birds. |
| February | Larger & Lesser Carnivores, Sloth Bears & Birds |
| March | Herbivores, Primates & Birds |

De-wormers used:

1. Albendazole, Fenbendazole, Praziquintal, Piperazine & Levamesole.
2. Deworming medicines are changed every six months.
3. Dosage of De-wormers as indicated in the literature.

**17. Thiruvananthapuram Zoo**

| Animal Group | Frequency | Month |
|---|---|---|
| Primates | Every 6 months | December, June |
| Canidae (Jackal) | Every 3 months | April, July, October, January |
| Felidae (exotic Cats also) | Every 6 months | April, October |
| Ursidae (Bears) | Every 6 months | May, November |
| Hyaenidae (Hyena) | Every 6 months | June, December |
| Artiodactytla<br>Ruminantia (Deer, Antelope) | Every 6 months | May, November |
| Perrisodactyla<br>Equidae (Zebra) | Every 6 months | April, October |
| Proboscidea (Elephant) | Every 6 months | May, November |
| All birds | Every 6 months | March, September |
| All reptiles | Every 6 months | April, October |

Note: Frequency will be increased based on the faecal sample examination results and additional useof ectoparasitcides based on ectoparasitic load.

## Annexure - V

**Disinfection Schedule in the Large Category Recognized Zoos in India**

### 1. Arignar Anna Zoological Park, Vandalur, Chennai, Tamil Nadu

**Weekly Schedule:**

1. Regular Preventive disinfection (500 ml of Kohrsolin- Th in 50 L of water 1 %.)
2. Specific disinfection:
   i. Bactericidal and Fungal - add 1500ml of Kohrsolin- Th in 50 L water 3% dilution, contact period 3 hrs.)
   ii. Vaccination Covered virus - add 500ml Kohrsolin- Th in 50L)
   iii. Vaccination Uncovered virus ( add 1500ml of Kohrsolin- Th in 50 L water 3% dilution , contact period 3 hrs.)
   iv. For Tuberculosis- add 2000 ml of Kohrsolin- Th in 50 L water 4 % dilution.
   v. In house spray – Add 250ml of Kohrsolin- Th in 50 L water 0.5% dilution
3. Proper cleaning of exhibits/ housing areas
4. Cleaning of feed/ water troughs
5. Application of turmeric powder inside (floor and walls) and around enclosures.
6. Providing adequate disinfection with 1% Potassium permanganate both as dips and rinses.
7. Removal of left over feed in the exhibit
8. Disinfection of Vehicles that used inside the zoo, especially vehicles having everyday access to the feed store (feed / beef/ fish supply vehicle/ tractors)
9. Cleaning and disinfection of equipments with 1% Potassium permanganate before and after use.
10. Rodent control by proofing, physical barriers

**Monthly Schedule**

1. For specific disinfection
2. Spraying of Butox / Clinar inside enclosures

3. Applying calcium carbonate during onset of rainy seasons at the enclosures ( mud / swampy) as a disinfection protocol

**Quarterly Schedule:**

1. Clearing of weeds /vegetation
2. Scraping of top soil substrate.
3. Testing the pH of the water in avian enclosures (marine) recycling/ refilling if found acidic.
4. Addition of 5-10L of SOKRENA –WS (Di-Decyldimethyl ammonium choride) in one hectare pond with an average depth of 1 metre.

**Annual Schedule:**

1. Fumigation
2. White washing
3. Painting
4. Change of sand/ Fumigation of old sand substrate

### 2. Assam State Zoo, Guwahati, Assam

| Weeks/ Disinfection Schedule | I | II | III |
|---|---|---|---|
| 1 week | Disinfection by using Gas Burner | Sprinkling of Bleaching Powder (outside the enclosures, in the drains etc.) | Sprinkling of KM No. 4 (Aquatic birds enclosures/ reptiles etc.) |
| 2 week | Disinfection by using disinfectant Solution like Glutaralddehyade, Alkyl dimethyl benzyl, Ammonium chloride etc. | | |
| 3 week | Same as week 1 | Same as week 1 | Same as week 1 |
| 4 week | Same as week 2 | Same as week 2 | Same as week 2 |

### 3. Bannerghatta Biological Park, Bengaluru, Karnataka

1. The animals have to be shifted to a secure location before commencement of cleaning.

2. The holding house has to be cleaned with fresh water thoroughly.
3. Phenyl application to the holding houses.
4. Removal of phenyl after 10 min of application by fresh water
5. Sprinkling of cleansing grade disinfectant (biokleen/ khorsolain) throughout the holding house and passages
6. Filling foot dip with fresh water mixed with potassium permanganate
7. Gas burning of enclosures to be done once a month

**4. Pilikula Biological Park, Mangaluru, Karnataka**

Potassium permanganate (1% solution) is provided as foot dip for each animal house and at all the entrances of the zoo, through which people and vehicles enter the zoo premises.

Gluteraldehyde disinfectant is used to spray the animal houses, open enclosures and foot paths for the visitors at one month interval.

Didecyl dimethyl ammonium chloride water sanitizer is added to the drinking water provided for animals, birds and snakes.

**5. Indira Gandhi Zoological Park, Vishakhapatnam, Andhra Pradesh**

**Disinfectants :** Acifer & Corcilin is being used as Disinfectants.

**6. Kamla Nehru Zoological Garden, Ahmedabad, Gujarat**

| Date | Section of Disinfection | Drug Used |
|---|---|---|
| 1st to 10th of every month | Monkey, Emu, Sambar, Parakeet, Pelican, Pheasant, Hospital, Reptiles | Kohrsolin, Butox, Dish drop, Combiclean |
| 11th to 20th of every month | Crocodile, Lion, Tiger, Leopard, Bear, Elephant, Hippopotamus, Jackal, Hyena and all Deer | Kohrsolin, Butox, Dish drop, Combiclean |

| Details | Period | Purpose |
|---|---|---|
| Disinfection By chemical disinfectant<br>**a.** Disinfection of animals house by spraying of chemical infectant (Khorsoline)<br>**b.** Disinfection of enclosures and surrounding visitor's path by spraying of chemical disinfectant. | Once in a week | To remove infective organisms |

| Details | Period | Purpose |
|---|---|---|
| **Disinfection By chemical disinfectant**<br>**a.** Disinfection of animals house by spraying of chemical infectant (Khorsoline)<br>**b.** Disinfection of enclosures and surrounding visitor's path by spraying of chemical disinfectant. | Once in a week | To remove infective organisms |
| **Disinfection by flame burning**<br>- Animal House and Kraal<br>- Enclosure | Once in a week<br>Whenever required | To remove chemical resistant organisms |
| Ecto-parasite and pest control by fire burning in enclosure | Whenever required | |
| Lime and bleaching powder treatment to open area | Whenever required | |

## 7. Kanpur Zoological Park, Kanpur, Uttar Pradesh

### BIRDS

| Species | Site Name | Activity | Months/Days |
|---|---|---|---|
| All birds | Enclosure and water bowls | Cleaning | Daily |
| All birds | Feeding place and water bowl | Lime paint | Every Monday |
| All birds | House and pen | Pesticide Spray | Last week of March, June, September and October |
| Pelicans and Other Water Birds | Water Tank | Change of Water and Cleaning | Every week |

### HERBIVORES

| Species | Site Name | Activity | Months/Days |
|---|---|---|---|
| All herbivores | Enclosure and Feeding Platform | Cleaning | Daily |
| All herbivores | Feeding Platform | Lime paint | 1st and 15th of Every Month |
| All herbivores | Enclosure | Lime sprinkle and then brooming | April, June, September, October (Any date) |

| | | | |
|---|---|---|---|
| All herbivores | Enclosures and houses | Pesticide spray | June (Any date) |
| All herbivores | Drinking water tanks | Lime washing | Every Week |
| | | Change of water and cleaning | Daily |
| Hippopotamus and Himalayan Black Bear | Moat/Water tank | Change of water and cleaning | Every week |
| Orangutan and Bonnet monkey | Moat | Change of water and | Once in 3 months |
| Rhinoceros | Tank | Cleaning | Every 15 days |

## CARNIVORES

| Species | Site Name | Activity | Months/Days |
|---|---|---|---|
| All carnivores | Meat House | Cleaning of meat, mucous layer and fat removal | Daily |
| All carnivores | Meat House | $KMnO_4$ washing | Daily |
| All carnivores | Meat House | Calcium Powder Addition | Daily |
| All carnivores | Meat House | Germicide washing | Every week (Thursday) |
| All carnivores | Feeding area and drinking water bowls | Cleaning | Daily |
| All carnivores | Enclosures and houses | Washing with disinfectant | Every week (Monday and Thursday) |
| All carnivores | All iron materials in houses | Blowtorching | March, July, August, December (1' week) |
| Tiger | Wet Moat | Cleaning | Once in a month |

## REPTILES

| Species | Site Name | Activity | Months/Days |
|---|---|---|---|
| Crocodile/Caiman/ Alligator/Gharial | Water Tank | Change of Water and Cleaning | Every 15 days |
| Snakes | Enclosures | Cleaning | Every alternate day |
| Snakes | Water Tanks | Change of Water and Cleaning | Every Week |

## FISH AQUARIUM

| Species | Site Name | Activity | Months/Days |
|---|---|---|---|
| All Fish Species | Aquarium | Cleaning | Every Week |
| | Filter | Cleaning | Every Week |

**Note:**

1. Daily cleaning of houses and feeding cum sleeping cells by kohrsolin-Th
2. Food distribution vehicle is fumigated with formaldehyde and $KMnaO_4$ mixture every Fortnight.
3. Pest control: Regular pest control measures - It is done twice a year with the help of experts from Pest Control of India.

### 8. M.C. Zoological Park, Chhatbir, Punjab

**Daily**

| |
|---|
| 1. Collect all feed wastage of carnivores in the polythene disposal bag and kept in red colour bin |
| 2. Collect all the excreta of carnivores in the polythene disposal bag and kept in the blue colour bin |
| 3. After disposal of excreta Collect all the excreta of carnivores from the open enclosure spread the lime powder on the soil at site. |
| 4. Washing the floor and walls of the animal housing area with pressure pump sweep and wipe properly |
| 5. Collect all the bins from the carnivores houses and incinerate all the feed wastage and excreta everyday |
| 6. Burn all the excreta and other feed wastage of other animals buried in the pits under the layer of lime powder |
| 7. All the fodder wastage and dung of herbivores also has been removed from the surrounding of animal's enclosures including the Elephants and its disposal 1 km away from the animal enclosure area and further utilized for vermi-compost or the pit compost |
| 8. Footbath maintenance with the solution of Kmno4 4% /kohorsline at the entrance of all building animal houses and feed store. |

### Weekly

| |
|---|
| 1. Wet the surface of floor and walls with hot boiled water |
| 2. Spread the solution of 5% dilution with KMNO4 / Bleaching powder/castic soda flakes alternatively |
| 3. Scrapping the surface of floor and walls with iron brush |
| 4. Rinsed the surface with hot boiled water completely |
| 5. Dry surface with wiper or floor duster effectively |

### Fortnightly

| |
|---|
| Flame burning of floor and walls of animal houses. |

### Yearly

| |
|---|
| Washing of vehicles/equipments/other buildings with solution of 5% kmno4 while washing of all the buildings. |

### 9. Nandankanan Biological Park, Bhubaneshwar, Odisha

**Daily:**

1. Removal of faecal material & left over bone of carnivore and feed/fodder of herbivores.
2. Cleaning of drains with diluted phenyl.
3. Refilling of potassium permanganate solution at foot bath.

**Weekly:**

1. Cleaning of feeding & watering trough with bleaching powder.
2. Cleaning of feeding cubicle with 5% potassium permanganate Solution.
3. Treatment of drains with bleaching powder.
4. Pest control in and around feeding cubicle.
5. De-weeding & cleaning in and around the enclosure.
6. Cleaning & burning of all debris in exhibit & dry moat areas.

**Monthly:**

1. Spraying of acaricide after disposal of leftover bones from bone pits.
2. Water purifier e.g. SokrenaWS treatment of all water storing areas.
3. Kohrsolin TH ground spray in and around enclosure.
4. Disposal of leftover bones from bone pits and

**In alternate month:**

1. Acaricide body spray on tigers, lions, leopards.
2. Acaricide ground spray just after de-weeding
3. Pumping out, de-silting, lime washing of wet moats.

**In Six months:**

1. Flame sterilization of enclosure wall, floor, transportation cages etc. (March and November every year)
2. White washing of feeding & drinking troughs.

**Annually:**

1. Removal of top soil of kraals, intensively used area & refilling.
2. Painting of chain link mesh, animal cages, sliding doors & squeeze cages.
3. Enclosure wall, roof top both inside and outside to be lime washed.
4. Lime spreading in herbivore enclosures.

### 10. National Zoological Park, New Delhi

**Yearly schedule of Dengue, Malaria, Fly & Rat control**

| Month | Fly Control (Flycobait) | Fly trap | Baygon/ Finit spray | Rat | Abate | Lime Powder | Drinking Water Tank & Water Cooler (Aqua guard Cleaning) | Malaria Oil | Fogging Spray |
|---|---|---|---|---|---|---|---|---|---|
| Jan. | – | | -- | Everyday throughout the year | – | Twice in a month | Everyday throughout the year | -- | – |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Feb. | -- | | Once in a month | -Do- | | -Do- | -Do- | -- | |
| March | Every day | Twice in a month | Twice in a month | -Do- | Once in a month | -Do- | -Do- | Twice in a month | Once in a month |
| April | Twice in a week | -Do- | -Do- | -Do- | Thrice in a month | -Do- | -Do- | -Do- | -Do- |
| May | Weekly | -Do- | -Do- | -Do- | Thrice in a month | -Do- | -Do- | -Do- | -Do- |
| June | Twice in a week | Once in a month | Once in a month | -Do- | Thrice in a month | -Do- | -Do- | -Do- | -- |
| July | Weekly | Twice in a week | -Do- | -Do- | Thrice in a month | -Do- | -Do- | Thrice in a month | -Do- |
| Aug. | Twice in a week | -Do- | Twice in a week | -Do- | -Do- | -Do- | -Do- | Thrice in a month | -Do- |
| Sept. | Every day | -Do- | Twice in a week | -Do- | -Do- | -Do- | -Do- | -Do- | -Do- |
| Oct. | Every day | Once in a month | Once in a month | -Do- | -- | -Do- | -Do- | -Do- | -- |
| Nov. | -- | -- | -- | -Do- | -- | -Do- | -Do- | -- | |
| Dec. | -- | – | -- | -Do- | -- | -Do- | -Do- | -- | -- |

## Prophylactic Medicine for Zoo Animals

| Family | Prophylactic treatment |
|---|---|
| Primates | Vitamin/liver/Minerals supplements once in a month |
| Canidae | Vitamin/liver/Minerals supplements once in a month |
| Felidae | Vitamin/liver/Minerals supplements once in a month |
| Ursidae | Vitamin/liver/Minerals supplements once in a month |
| Herbivores Artiodactyl/Deer | a) Salt lick in a year<br>b) Vitamin/liver/Minerals supplements once in a month |
| Proboscidae | a) Himalayan Batisa<br>b) Vitamin/liver/Minerals supplements every months |
| Birds/Pheasants | Vitamin/liver/Minerals supplements once in a month |
| Reptiles | Vitamin/liver/Minerals supplements once in a month |
| Primates | Vitamin/liver/Minerals supplements once in a month |

## 11. Nehru Zoological Park, Hyderabad, Telangana

| Name of the species | Type of enclosure | Disinfection used | Purpose of disinfectant used |
|---|---|---|---|
| Carnivore | 1. Night house disinfection | 1. Aciphor liquid 2%<br>2. Khursolin 2% | Antimicrobial and germicidal |
| | 2. Footbaths | 1. Potasium Permanganate solution 10% | Antiseptic |
| | 3. Enclosure | 1. Spraying of lime and bleaching outside of the enclosure for every (15) days | Antiseptic |
| Herbivores | 1. Foot Baths | 1. Aciphor liquid 2%<br>2. Khursolin 2% | Antimicrobial and germicidal |
| | 2. Foot baths | 1. Potasium Permanganate solution 10% | Antiseptic |
| | 3. Enclosure | 1. Spraying of lime and bleaching outside of the enclosure for every (15) days | Antiseptic |
| Primates | 1. Foot baths | 1. Aciphor liquid 2%<br>2. Khursolin 2% | Antimicrobial and germicidal |
| | 2. Foot baths | 1. Potasium Permanganate solution 10% | Antiseptic |
| | 3. Enclosure | 1. Spraying of lime and bleaching outside of the enclosure for every (15) days | Antiseptic |

1) Cleaning with Aciphor (or) Kharsolin 2% solution daily in the cage (Night house).
2) Bleaching of all wet moats every 15 days.
3) Whitewash to all night houses for every three months.
4) Slake lime pasting to all water troughs for every three months
5) Sprinkling of lime and bleaching (3:1) for every (15) days and every season in all cages and kraals.
6) Burning of enclosure during winter season for pest control.
7) Butax spray 2% to all Herbivores kraal to prevent ticks, mites, flees whenever required for pest control.

## 12. Sakkarbaug Zoological Park, Junagadh, Gujarat

| Details | Period | Purpose |
|---|---|---|
| Disinfection By chemical disinfectant<br>a Disinfection of animals house by spraying of chemical infectant (Khorsoline)<br>b Disinfection of enclosures and surrounding visitor's path by spraying of chemical disinfectant. | Once in a week | To remove infective organisms |
| Disinfection by flame burning<br>- Animal House and Kraal<br><br>- Enclosure | Once in a week<br><br>Whenever required | To remove chemical resistant organisms |
| Ecto-parasite and pest control by fire burning in enclosure | Whenever required | |
| Lime and bleaching powder treatment to open area | Whenever required | |

## 13. Sanjay Gandhi Biological Park, Patna, Bihar

| Species | Drug | Periodicity | Quantity & Variation |
|---|---|---|---|
| Ungulates | Turning of soil and lime treatment | Quarterly | As needed |
| | Moat cleaning | Every Monday | |
| Birds | Kohrsolin-TH | Fortnightly | 100 ml per 10 litre of water as spray for regular dis-infection |
| | Turning of soil and lime treatment | Quarterly | As needed |
| Feline, Canidae | Nighthouse disinfection by blow gun firing followed by turmeric powder spray. | Every Monday | As needed |
| | Outdoor enclosure soil and lime treatment | Quarterly | As needed |

**Note** :- As per requirement disinfection is performed before the schedule time.

## 14. Sri Chamarajendra Zoological Garden, Mysuru, Karnataka

| Enclosure | Disinfectant | Type | Enclosure type |
|---|---|---|---|
| **Felines**<br>• Tiger<br>• Lion<br>• Leopard<br>• Jaguar<br>• Leopard cat<br>• Jungle cat<br>• Civet Cat<br>• Palm civet | **Kohrsolin-Th**<br>( Glutaraldehyde ┼1, 6-Dihydroxy 2, 5-Dioxahexane ┼Polymethyl derivative)<br>**Microlyse**( 4%w/v Benzalkonium Chloride Solution) | Bactericidal and viricidal | 1. Holding rooms are washed with disinfectants daily.<br>2. Day kraal and exhibit area will be disinfected once in a month |
| **Canines**<br>• Indian grey wolf<br>• Wild dog<br>• Jackal | **Kohrsolin-Th**<br>**Microlyse** | Bactericidal and viricidal | 1. Holding rooms are washed with disinfectants daily.<br>2. Day kraal and exhibit area will be disinfected once in a month |
| **Hyena** | **Kohrsolin-Th**<br>**Microlyse** | Bactericidal and viricidal | 1. Holding rooms are washed with disinfectants daily.<br>2. Day kraal and exhibit area will be disinfected once in a month |
| **Bear** | **Kohrsolin-Th**<br>**Microlyse** | Bactericidal and viricidal | 1. Holding rooms are washed with disinfectants daily.<br>2. Day kraal and exhibit area will be disinfected once in a month |
| **Primate** | **Kohrsolin-Th**<br>**Microlyse** | Bactericidal and viricidal | 1. Holding rooms are washed with disinfectants daily.<br>2. Day kraal and exhibit area will be disinfected once in a month |

| | | | |
|---|---|---|---|
| **Herbivorous**<br>• Gaur<br>• Giraffe<br>• Rhinoceros<br>• Cape Buffalo<br>• African Elephant<br>• Asian Elephant<br>• Spotted Deer<br>• Nilgai<br>• Swamp Deer<br>• Barking Deer<br>• Hog deer<br>• Thamin deer<br>• Antelope | **Kohrsolin-Th**<br>**Microlyse** | Bactericidal and viricidal | The enclosures in the herd animals: Racking, spraying of disinfectant and cleaning of moats will be taken up once in three months periodically. |
| **Birds**<br>• All Birds | **Virkon S**<br>(Sodium Chloride + Salt containing Potassium monopersulphate potassium hydrogen sulphate/potassium sulphate) | Bactericidal and viricidal | Once in three months<br><br>Daily<br>Daily |
| | **Kohrsolin-Th**<br>**Microlyse** | | |
| **Crocodile and other Reptiles** | **Kohrsolin-Th**<br>**Microlyse** | Bactericidal and viricidal | Once in a week |
| **Snakes** | **Kohrsolin-Th**<br>**Microlyse** | Bactericidal and viricidal | Once in a week |
| **Zoo Pathways Entry gate foot dips and Goods carriage vehicles** | **Virkon S**<br>( Sodium Chloride + Salt containing Potassium monopersulphate potassium hydrogen sulphate/potassium sulphate)<br>**Kohrsolin-Th**<br>**Microlyse** | Bactericidal and viricidal | Daily |

15. Sri Venkateswara Zoological Park, Tirupati, Andhra Pradesh
Hamadryas Baboon and Rhesus Monkey

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 15-05 | 14-07 | 13-09 | Spraying of bleaching powder (1:4) / + Sprinkling of lime powder, Butox |
| | 15-11 | 14-01 | 14-03 | |
| Pest Control | 15-05 | 14-07 | 13-09 | Spraying Butox of 2% + Krosholine 1% |
| | 15-11 | 14-01 | 14-03 | |
| Bush Clearance | 13-07 | 12-11 | 13-03 | All the bushes must be cleared and taken outside the animal enclosure |

Spotted Deer, Barking Deer, Hog Deer, Swamp Deer, Nilgai, Indian Gaur, Blackbuck, Four Horned Antelope

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 15-05 | 14-07 | 13-09 | Spraying of bleaching powder (1:4) / + Sprinkling of lime powder, Butox |
| | 15-11 | 14-01 | 14-03 | |
| Pest control | 15-05 | 14-07 | 13-09 | Spraying Butox of 2% + Krosholine 1% |
| | 15-11 | 14-01 | 14-03 | |
| Bush clearance | 13-07 | 12-11 | 13-03 | All the bushes must be cleared and taken outside of the enclosure |

Wolf, Jaguar, Leopard

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 15-05 | 14-07 | 13-09 | Spraying of bleaching powder (1:4) / + Sprinkling of lime powder, Butox |
| | 15-11 | 14-01 | 14-03 | |

| | | | | |
|---|---|---|---|---|
| Pest control | 15-05 | 14-07 | 13-09 | Spraying Butox of 2% + Krosholine 1% |
| | 15-11 | 14-01 | 14-03 | |
| Bush clearance | 13-07 | 12-11 | 13-03 | All the bushes must be cleared and taken outside of the enclosure |

Tiger, Lion, White Tiger, Hyena, Wild dog

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 19-05 | 19-07 | 19-09 | Spraying of bleaching powder (1:4) / + Sprinkling of lime powder, Butox |
| | 19-11 | 19-01 | 19-03 | |
| Pest control | 19-05 | 19-07 | 19-09 | Spraying Butox of 2% in the Night house + Krosholine 4% |
| | 19-11 | 19-01 | 19-03 | |
| Bush clearance | 18-07 | 18-11 | 18-03 | All the bushes must be cleared and taken outside of the enclosure |

Jackal, Porcupine, Wild boar, Sloth bear, Mandril, Olive Baboon, Langur, Elephant

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 19-05 | 19-07 | 19-09 | Dusting the moat with lime or bleaching powder + sprinkling of lime power |
| | 19-11 | 19-01 | 19-03 | |
| Pest control | 19-05 | 19-07 | 19-09 | Spraying Butox of 2% in the Night house + Krosholine 4% |
| | 19-11 | 19-01 | 19-03 | |
| Bush clearance | 18-07 | 18-11 | 18-03 | All the bushes must be cleared and taken outside of the enclosure |

Star Tortoise, Python, Mugger Crocodile, Salt Water Crocodile and Gharial

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 24-05 | 24-07 | 24-09 | Dusting the moat with lime or bleaching powder + sprinkling of lime power |
| | 24-11 | 24-01 | 24-03 | |
| Pest control | 24-05 | 24-07 | 24-09 | Spraying Butox liquid 2% + Krosholine 4% |
| | 24-11 | 24-01 | 24-03 | |
| Bush clearance | 22-07 | 23-11 | 23-03 | All the bushes must be cleared and taken outside of the enclosure |

Rose Ring Parakeet, Indian Peafowl, White Ibis, Painted Stork, Purple Heron, Grey Pelican, Rosy Pelican

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | Activity | To be carried out on | Medicine and Dose | Spraying of bleaching powder and lime + Sprinkling of lime powder (1 :4) |
| | 24-11 | 24-01 | 24-03 | |
| Pest control | 24-05 | 24-07 | 24-09 | Spraying Butox of 1% |
| | 24-11 | 24-01 | 24-03 | |
| Bush clearance | 07-07 | 08-11 | 07-03 | All the bushes must be cleared and taken outside of the enclosure |

White Peafowl, Lady Amherst Pheasant, Painted Spur fowl, Indian Peafowl, Patridge Grey, Grey Jungle Fowl, Red Spur Fowl, Red Jungle Fowl, Silver Pheasant, Kalij Pheasant

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 08-05 | 07-07 | 07-09 | Spraying of bleaching powder + Sprinkling of lime powder |
| | 08-11 | 07-01 | 07-03 | |
| Pest control | 09-05 | 10-07 | 09-09 | Spraying Butox of 2% in the night house + Krosholine 1 % |
| | 09-11 | 10-01 | 09-03 | |

Sulphur crested Cockatoo, White Cockatoo, African Grey Parrot, Rainbow lorry, Alexandrine Parakeet, Plum headed Parakeet, Star tortoise, Grey Cockatiel, Silver Pheasant, Pied Cocktail, Lutino Cockatiel, Masked Love Bird, Fishers Love Bird, Lutino Budgerigars, Albino Budgerigars, Livingstone Turaco, Lady Amherst Pheasant, Red Lory, Indian Peafowl, Hans Macaw, Ring neck Pheasant, Japanese quail, Star tortoise, Sun Conure, House Sparrow, Jandaya Conure, Chattering lory, Eclectus Parrot, Silver Pheasant, Green wing Macaw, Indian Peafowl.

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 08-05 | 07-07 | 07-09 | Spraying of bleaching powder + Sprinkling of lime powder |
| | 08-11 | 07-01 | 07-03 | |
| Pest control | 09-05 | 10-07 | 09-09 | Spraying Butox of 2% in the night house + Krosholine 1 % |
| | 09-11 | 10-01 | 09-03 | |

**Emu**

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 24-05 | 24-07 | 24-09 | Dusting of moat with lime or bleaching powder + sprinkling of lime powder |
| | 24-11 | 24-01 | 24-03 | |

| | | | | |
|---|---|---|---|---|
| Pest control | 24-05 | 24-07 | 24-09 | Spraying Butox of 2% in the night house + Krosholine 1 % |
| | 24-11 | 24-01 | 24-03 | |
| Bush clearance | 22-07 | 23-11 | 23-03 | All the bushes must be cleared and taken outside of the enclosure |

## Spotted Deer, Sambar

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 06-05 | 06-07 | 06-09 | Spraying of bleaching powder (1:4) / Butox + sprinkling of lime powder |
| | 06-11 | 06-01 | 03-03 | |
| Pest control | 08-05 | 08-07 | 08-09 | Spraying Butox of 2% + Krosholine 1% |
| | 08-11 | 08-01 | 08-03 | |
| Bush clearance | 03-07 | 03-11 | 03-03 | All the bushes must be cleared and taken outside of the enclosure |

## Lion

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 24-05 | 24-07 | 24-09 | Dusting of moat with lime or bleaching powder + sprinkling of lime powder |
| | 24-11 | 24-01 | 24-03 | |
| Pest control | 24-05 | 24-07 | 024-09 | Spraying Butox of 2% in the Night house + Krosholine 2% |
| | 24-11 | 24-01 | 24-03 | |
| Bush clearance | 22-07 | 23-11 | 23-03 | All the bushes must be cleared and taken outside of the enclosure |

## Grey Jungle Fowl (Conservation Breeding Centre)

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 08-05 | 07-07 | 07-09 | Spraying of bleaching powder and lime + sprinkling of lime powder (1 :4) |
| | 08-11 | 07-01 | 07-03 | |
| Pest control | | | | Spraying Butox of 2% in the Night house + Krosholine 1% |
| | 09-11 | 10-01 | 09-03 | |

## Quarantine Ward

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 24-05 | 24-07 | 24-09 | Dusting of moat with lime or bleaching powder + sprinkling of lime powder |
| | 24-11 | 24-01 | 24-03 | |
| Pest control | 24-05 | 24-07 | 024-09 | Spraying Butox liquid 2% |
| | 24-11 | 24-01 | 24-03 | |
| Bush clearance | 22-07 | 23-11 | 23-03 | All the bushes must be cleared and taken outside of the enclosure |

## Animal Rescue Centre

| Activity | To be carried out on | | | Medicine and Dose |
|---|---|---|---|---|
| Moat Disinfection | 24-05 | | | 24-07 |
| Out-side of the moat | 24-11 | 24-01 | 24-03 | Sprinkling of lime powder (4 :1) |
| Pest control | 24-05 | 24-07-2017 | 024-09 | Spraying Butox of 2% in the Night house + Krosholine 2% |
| | 24-11 | 24-01 | 24-03 | |
| Bush clearance | 22-07 | 23-11 | 23-03 | All the bushes must be cleared and taken outside of the enclosure |

## 16. Thiruvanthapuram Zoo, Thiruvananthapuram, Kerala

1. Tyre dips at all main entry to the whole campus.
2. Additional tyre dips at service gates of the zoo.
3. Foot dips at the all the entrance of visitors, employees, each enclosure, zoo hospital impatient ward, zoo office etc.

Epidemiological intelligence date is collected and disinfectants are changed accordingly. The main surveillance is for FMD, HPAI, , Canine Distemper

For FMD - 3% Sodium Hyprochloute
HPAI - QAC, 2% Sodium Hyprochloute
CD - Bleach 1.30, QAC

When there is no threat PP, Phenyl, QACetc is issued in the foot baths. The idea is to prevent the minimum infected close reaching the susceptible animals prevent the index case. This zoo was able to contain FMO for the last ten years, CD for last five years and HPAI has never occurred

The main methods used for disinfection are:

1. Heat-moist heat -Dry heat- a mixture of diesel and petrol is used to flame large enclosure especially in case sever ecto-parasite infested
2. Water- High pressure water jet sprayer is filled in carnivore cage.
    a. Imported high pressure water jet is used to clear enclosure surfaces.
3. Physical scrub cleaning with water is done on daily basis in all animal houses.
4. Turmeric powder is used in cages especially animals of larger fields.
5. Phenyl, soap solution, chlorhexidine hydrogen peroxides alcohols, QAC, iodine compounds, bleaching power, sodium carbonate, quick lime and common salt are other commonly used agent.

# NOTES

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केन्द्रीय चिड़ियाघर प्राधिकरण

**Central Zoo Authority**

(STATUTORY BODY OF THE MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA)

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