Bio-Secure feed store At Kanpur Zoological Park

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Zoological parks are public places where a collection of wild animals are maintained for education, awareness, research and conservation purposes. Visitors come to the zoological park mostly for recreation. The aim of the zoo manager is to maintain the zoo in such a way to inspire empathy for wild animals in the visitors. All this is possible only when the animal collection is maintained in good health and is kept in enclosures that emulate the natural surroundings of the animal.

Kanpur Zoological Park was established on an undulating area of 76.56 ha. The area was in Bangar area of the river Ganges. Khadar is an extension of the sandy banks of the river which further extends into Bangar. The entire area had been planted by George Burney Allen who was a British industrialist during the pre-independence period between 1813-1819. Hence the area of the zoological park is also known as Allen Forest and, indeed, the zoo gives the feel of natural forest. The animal enclosures are designed on the modern management principles and give sufficient space for the animals inside the enclosures, to express their biological behaviour and proper exercise. Thus the environment in which the animals are kept is consistent with good zoo practice which shows them in a good light to the public and enhances the respect of some visitors towards the animals.

From time to time in a zoo, animals contract a variety of infections due to feral animals inside the zoo, contact of visitors, contact with the zoo staff, etc. In turn the zoo staff are in contact with zoo animals. Diseases transmitted from human to the animals and vice versa are called zoonoses. Foodstuffs which come from the farm and the dry feed stored in the zoo store also carry the disease spreading germs and also attracts flies and rodents which spread the diseases.

Some of the many diseases of wild animals and the causative organisms are in page 4.

Biosecurity: Biosecurity is a set of preventive measures designed to reduce the risk of transmission of infectious diseases, quarantined pests, invasive alien species, living modified organisms. While biosecurity does encompass the prevention of the intentional removal (theft) of biological materials from research laboratories, this definition is narrower in scope than the definition used by many organizations and institutions, such as the United Nations Food and Agriculture Organization.

Feed is mixed on the platform

Weighing fresh fruits on electronic weighing machine

These preventative measures are a combination of systems and practices put into place at legitimate bioscience laboratories to prevent the use of dangerous pathogens and toxins for malicious use, as well as by customs agents and agricultural and natural resource managers to prevent the spread of these biological agents both natural and managed. Although security is usually thought of in terms of "Guards, Gates, and Guns", biosecurity encompasses much more than that and requires the cooperation of scientists, technicians, policy makers, security engineers, and law enforcement officials.

Biosecurity is defined as -

" *all the cumulative measures that can or should be taken to keep the diseases away (viruses, bacteria, fungi,*

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Fly proof doors

Plastic containers to transport feed to enclosures

protozoa, parasites), from a farm and to prevent the transmission of diseases (by humans, insects, rodents, and wild birds/animals) among the resident animals of the infected farm and from an infected farm to the neighboring farms."

FAO uses the term, *Biosecurity*, in relation to sanitary, phytosanitary and zoosanitary measures applied in food and agricultural regulatory systems. FAO uses the term synonymously with "*Biosecurity* in food and agriculture". *Biosecurity* is a relatively new concept and a term that is evolving as usage varies among countries with different specialist groups using it in different ways. For FAO, *Biosecurity* broadly describes the process and objective of managing biological risks associated with food and agriculture in a holistic manner.

Many of the diseases are transmitted through contaminated food and water. In Kanpur Zoological Park, the water is pumped from deep bore wells, hence the contamination of water is a remote possibility. Thus the first step in bio-security forms the food bio-security measures.

Keeping this in view the store of the Kanpur zoo was found unfit to check the depredations of the rodents and house flies. The store was renovated with funds from Central Zoo Authority in the year 2008-09. With the financial assistance from the CZA the ceiling of the store was replaced and white washed. The zoo store has three big halls, a toilet and another room. One of the halls is used for storing of fresh fruits and vegetables in which the fruits and vegetables are weighed, cleaned with Potassium permanganate solution, then cleaned with fresh water and sent to various enclosures for consumption. The entrance of these halls had wooden frame and doors and floor had ceramic tiles. The weighing was done with the help of a simple balance. As only fresh vegetables and fruits are kept here for a very small period, there was not much problem of hygiene in this section.

The other hall in which the dry feed is stored has a cemented floor and the doors and frames were made of wood. The feed mix was prepared on the floor and then stored in gunny bags. This hall attracted rodents. The rodents even cut the wooden frame and entered the hall for dry feed. Another problem was the vendors and the staff entering into the store without going through any self-sanitation and thus had chances of spreading infections. Earlier the feed was transported in iron containers which ran a risk of getting corroded and leading to infections. Keeping these in view a series of initiatives were taken, which are listed below:

1**.** More than six pairs of footwear were kept at the main entry gate to the store. The staff, the supervisors and the vendors were instructed to leave their own footwear outside the stores and wear the footwear provided by the zoo.

2. They were advised to sanitize themselves in the washroom attached with the stores (the wash room was a lavatory earlier, though it was not used for defecation, it was converted into a bathroom by closing the w.c.).

3. The staff who weigh the fresh stores were provided with aprons, so that the contact between the clothes and the fresh stores like fruits and vegetables could be avoided.

4. The wooden doors in fresh vegetable and fruit stores were replaced with iron doors with mosquito proof nets. Wooden frames were replaced with angle iron frames. Similarly in the dry stores the wooden frames were replaced with angle iron frames and the doors were replaced with fully paneled iron doors and another pair of doors with only mosquito proof nets were fixed. This arrangement was done with a view to keep rats away when

the stores is not in use. When the stores is in use for preparing the feed mix (feed mix is prepared in the zoo itself by purchasing various cereals and pulses and are ground and then are mixed in predetermined percentages by weight to prepare a balanced diet) fully paneled doors are kept open and the mosquito proof net doors are closed, so that free circulation of air is not inhibited and the flies and rodents are controlled.

5. The dry ration stores had cemented floor and the feed mixture was prepared on the floor, this had every chance of contaminating the feed mix. Hence a raised platform of about 9 inches from the ground level was constructed and floor tiles were fixed on it. Now the feed is mixed on an elevated platform, hence the possibility of contamination has been minimized. Similarly floor tiles were laid in the entire hall and wall tiles were also fixed up to the height of 6 feet from the ground level, so that the hall remains safe from dampness.

6. When the feed mix is prepared, the ground up cereals, pulses, husks, mineral mix and liver tonics are thoroughly mixed. Dust is raised when the feed combination is manually mixed. This may cause dust allergy for the staff so to overcome this possibility, face masks have been provided to the staff.

7. An exhaust fan is fitted in the dry ration store to suck out the dust raised during mixing of the feed.

8. A cement masonry rack was constructed on one side of the hall, to stack the feed mix prepared. This rack was also tiled. Some air space was left between the wall and the rack so that air circulation of the rack is not obstructed and moisture deposited on the joint of wall and the rack is done away with.

9. Stainless steel containers were bought to stock the feed in place of iron containers to eliminate the problem of corrosion.

10. An electronic balance is placed in the stores for taking the accurate weights of fresh stores so that predetermined weight of proper feed quantity is supplied for the consumption of animals.

Washing vegetables

Stainless steel containers for storing after cleaning

11. The fresh stores such as vegetables and fruits were washed in iron containers kept on the floor. Presently two stainless steel wash basins have been fixed in fresh vegetable and fruit stores for washing with potassium permanganate solution and then subsequent cleaning with water.

12. Similarly a stainless steel wash basin has been provided in the meat house for proper washing of meat before serving.

13. The vegetables and fruits are transferred to heavy duty plastic containers after weighing and cleaning. The plastic containers are regularly washed with proper detergents and once in a week in mild acid solutions. This would ensure germ free environment for the feed.

Thus the steps taken have helped in reducing the disease breaks and reduced expenditure on our medicals bill. Since the time these measures are initiated, the breeding of rare and endangered animals like tigers, leopards, and hyenas has gone up. The survival rate of the animals was also on the rise. In the year 2010-11 the mortality rate was 4% of the total animals. Thus we hope that the bio-security measures adopted in the stores helped in *ex situ* conservation of the zoological park.

Some of the diseases of wild animals and the causative organisms are as follows –

I. Bacterial Diseases:

- **Anthrax:** Caused by ***Bacillus anthracis*** is of three types 1- Cutaneous anthrax, inhalation anthrax, gastro intestinal anthrax. Animals likely to become infected are Spotted deer, gaur, hog deer, sambar, leopard, primates, rhinos, etc. The blood smear of infested animals shows short chains of rods with truncated ends.
- **Clostridial infections:** caused by
  - *Clostridium perfringens* type D-enterotoxaemia in deer, sloth bear.
  - *Clostridium chauvoei*-black quarter in black buck.
  - *Clostridium tetani*-tetanus in elephants, rhinos etc.

  Symptoms: In enterotoxaemia infections the affected animals present a ballooned up intestine, congestion in other organs and black quarter affected animals show symptoms of gangrenous myositis.
- **Leptospirosis**: Leptospirosis is an infectious disease caused by bacteria called a spirochete. Leptospirosis can be transmitted by many animals such as rats, foxes etc. It is transmitted through infected soil, water, urine and tissues of infected animal. The disease strikes tigers, deer, elephants, lions, sambars, nilgai, black buck and other animals. The important symptoms are stillbirth and abortion in the infested animals.
- **Paratuberculosis** is caused by *Mycobacterium paratuberculosis* in spotted deer and in swamp deer. The disease spreads from ingestion of food and water contaminated by feces of infected animals. The main signs of the disease are diarrhoea and severe emaciation
- **Pasteurellosis** is caused by *Pasteurella multocida, P. haemolytica* in sambars, nilgai, spotted deer, black buck, hippos, lion, tiger, wolf etc. animals, causing congestion in their internal organs, haemorrhage, consolidation in lungs etc.
- **Plague** is caused by *Yersinia pestis* in baboons, rhesus monkeys etc. which show symptoms of fever, dullness early prostration, etc. The disease is spread by infected fleas and rodents.
- **Staphylococcosis** is caused by *Staphylococcus aureus* in tigers, lions, rhinos and zebras, causing arthritis and enteritis in them.
- **Salmonellosis:** This disease occurs in zoos due to the poor management of the animals; raw eggs and is frequently seen in sambars, black bucks, jackals, leopards, chimps, rhinos etc characterized by the symptoms like diarrhoea, dysentery etc
- **Tuberculosis** is a zoonotic disease caused by *Mycobacterium tuberculosis* in Rhinos, non-human primates, giraffes, deer-barking, hog, Manipur deer, spotted deer, sambar, nilgai, black buck, elephants, lions, tigers, leopards, bears, pythons, crocodiles, etc. It infests lungs, intestine, and viscera of these animals. The main route of infection is through the respiratory tract.
- **Shigellosis:** occurs in lions, tigers, primates, etc. with the infested animals showing symptoms like pyrexia, dysentery. The disease is characterized by severe in intestine, diarrhoea, mucus and blood in the stool.

II. Viral infections:

- **Aflatoxicosis:** is caused due to contaminated food in bears and deer. The kidneys become pale in colour, grayish white nodules can be seen on liver of infested animals
- **African horse sickness:** commonly occurs in horses, zebras, monkeys, etc. spreading disease spreads through *culicoides* bites, and from infected domestic equines.
- **Rabies:** occurs in tigers, Sloth bears, lions, civets, jackals, leopards, rhinos, etc. The disease spreads mainly among the residents of the zoo through stray animals which sneak through the barriers, such as dogs and free ranging animals like civets.
- **Foot and mouth disease:** caused by 'O' Asia-1 strain in Artiodactylans. The source of infection among the animals of zoo can be contaminated grasses brought from infested areas (outside the zoo).
- **Rinderpest:** seen among nilgai, sambar, chitals, etc. The infection among wild ruminants is mostly air-borne and by ingestion of contaminated food. The infested animals show symptoms of diarrheic feces containing blood. Oral and nasal mucosae-hemorrhages, abomasal mucosa-swollen and congested, caecal and colonic mucosae, mesenteric lymph nodes are some of the commonly occurring other symptoms of the disease.
- **Canine distemper:** caused by RNA paramyxovirus. It is caused in small pups. Canine distemper virus tends to orient its infection towards the lymphoid, epithelial, and nervous tissues.
- **Infectious hepatitis:** (jaundice) causes inflammation in the liver, loss of appetite, fever. The disease is caused by contaminated water and food.
- **Infectious feline enteritis:** occurs in felids with symptoms of pasty-watery diarrhoea and rapid emaciation and dehydration.
- **Mycotic diseases:**
  Intestinal candidiasis—in sambar, black buck.
  Nercotic dermatomycoses— in gharial
  Dermatomycoses —in chital, tiger, lion hyena etc.

III Some of the helminthic diseases are

Trematodiasis: Fasciolosis, Paragonimosis, Schistosomiasis, Paramphistomiasis.
Cestodiasis: Taeniasis, Dipylidiosis, Echinococcosis, Diphyllobothriosis.
Nematodiasis: Ascariasis, Oxyuriasis, Capillariasis.

IV Some of the protozoan diseases are:

Trypnasomiasis, Plasmodiasis, Toxoplasmosis, Sarcocystosis, Coccidiosis, Babesiosis, Entamoebiasis, Trichomoniasis, Leishmaniasis.

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