Impact of Free Living Macaques (*Macaca mulatta*) on the Health of Captive Animals at the Assam State Zoo

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Wildlife is an integral part of an ecosystem wherein its balance is maintained by nature. *ex-situ* and *in-situ* conservation methods are available for protection of wild flora and fauna, which would have otherwise gone towards the brink of extinction due to exploitation by man. The zoo is one such place that is ideal for the carrying out *ex-situ* conservation of endangered species.

As seen elsewhere in the world, the major threats to the *ex-situ* conservation of rare and endangered animals often comes from any communicable disease that can wipe out a population in no time. Many of such diseases occur due to unhealthy conditions, overcrowding, inbreeding and zoonoses. Various workers, (Jaswant *et al.,* 1951, Derick and Michael 1990, Rajkonwar 2003 and Chakraborty 2003) reported tuberculosis in free-living Rhesus macaques. The population of Rhesus macaques at the Assam state zoo has increased manifold as indicated by preliminary surveys conducted earlier (Chatterjee 1997) and it is quite possible that today they may be spreading the diseases to the cages that they enter in search of food. It is, therefore, felt essential to conduct a study to find out the correct picture with the following objectives.

• To assess the number and population structure of the free-living Rhesus macaques at the Assam state zoo.

• To investigate the presence of tuberculosis (*Mycobacterium Sp.)* or any other communicable disease in the free-living Rhesus macaques.

• To devise a strategy to check the possibility of transmission of the disease (T.B.) from free-living Rhesus macaques to captive animals.

Study Area

The Assam State Zoo was established in 1957, and presently it has a total area of 1.75 sq. km. It is one of the large zoos of the country with many rare and endangered exhibits. A total number of 523 animal exhibits belong to 85 species, are currently present in the zoo, out of which 19 mammalian species and 8 reptilian species belong to the Schedule-I of Wildlife (Protection) Act 1972.

Materials and Methods

The present study was completed under two main phases, viz: Population survey, Investigation for presence of tuberculosis

Population survey

The present population of the monkeys was studied considering both age and sex using the Total count method, a direct method of population estimation by visual count, to collect the required samples representing the entire population size. In this method, the persons who were involved in counting the monkeys had to move in parallel to each other at a distance of 100 meter apart. Each person was equipped with a diary and a pen to note down the number of monkeys he/she sees around him or her and also for recording the time, place as well as sex of the animal. The person while counting walked at constant speed. The number of animal(s) was/were subtracted from the all member's list, except one if recorded by all at the same time and same location. The counting was repeated for three times to reduce the error component. To arrive at an approximate population size, counting was done for four consecutive days at Hengrabari Reserve Forest by a group of eight members.

Investigation for presence of tuberculosis

Sputum and blood samples were collected after capturing the animals. Five per cent (5%) of the total monkey population i.e. seven numbers was captured by trapping in empty cages and then tranquilizing them with xylazine (lzine) and Ketamine (Aneket) in the ratio of 2:1, at the dose rate of 1 mg per kg body weight. The detection of Tuberculosis was done by the Throat swab culture method. In this method, two-throat swabs (one for smear preparation and another for culturing) from each animal were taken with the help of sterilized cotton. Then smears from the swabs were made and stained with the help of acid-fast stain (Zeihl Nielsen's method). Isolation and identification of the organisms were also done in Lowen Stein-Jensen media.

Result and Discussion

Population Survey

The average population of the free-living Rhesus macaques in Assam State Zoo was assessed on the basis of age and sex and has been presented in Table-1. The two groups of monkeys, each headed by an alpha male, were observed. These alpha males resemble each other in shape and size. One group was observed near the Sambar enclosure and other near the Rhino enclosure. The members of the groups were very active during the feeding time of the captive animals. During the rest of the daytime, they used to roam around the enclosures and sometimes take rest on the roadside trees.

Table1. Population of Rhesus macaques on the basis of age and sex

Group	Adult Male	Adult Female	Juvenile	Infant	Total
I	14	39	11	18	82
II	12	22	23	05	62
Total	26	61	34	23	144

The total population was found to be 144. During the study period it was observed that a few monkeys mostly confined themselves in and around the enclosures of birds, sambar

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and rhino. They were not healthy as suggested by the facts that these monkeys were weak, emaciated and preferred to keep themselves isolated from the main group. They were dependent on the captive animals' food for their survival. These monkeys ate the animal's food and in turn contaminated it (see web supplement).

Detection of tuberculosis

Out of 144 numbers of wild monkeys, 5% of the population was selected (7 number) randomly for the test. After tranquilizing with Xylazine and Ketamine @1 mg/Kg. Throat swabs were collected and send to laboratory for isolation and identification of the organism by Zeihl Nielsen's method and cultured in Lowen Stein Jensen media.

The result confirms two numbers of positive cases out of 7 samples sent for diagnosis. So, the prevalence of tuberculosis in monkey population is found to be 28.57 per cent.

Method of control

The enclosure must be properly designed and covered fully with fence to check the entry of any free-living animal to the cage.

The animal attendant must be present at his duty place and should not allow any wild or free-living animal to enter into the enclosure of the captive animal.

Periodic screening for tuberculosis of zoo animals must be done especially for animals living in herd by employing tuberculin test (single or double) or Montoux test. The positive animals should be isolated from the group and should be treated until completely cured. If possible should be kept in separate enclosure.

Periodic screening of zoo keepers for presence of tuberculosis should also be carried out and any attendant, if found positive, should not be allowed to attend the animals at any cost as tuberculosis is a zoonotic disease.

Zoo premises, especially the enclosure, should be regularly cleaned and disinfected with phenol/lizol/cresol/ Potassium permanganate solution etc.

The leftover feed in the enclosure must be removed regularly and disposed of in a proper manner as it may also attract the wild animals to the cages and zoo premises.

The meat for the carnivores should be procured from reliable sources. Ante-mortem and post mortem of the food animals should be done by the veterinarian.

The number of animals in a single enclosure should be minimized, if kept in group/ herd. Surplus animals should be shifted to new enclosures, if required, so that transmission of disease from one animal to another should be prevented.

Scientific carcass disposal facility (Incineration) should be created in the zoo so that carcass should be disposed of properly.

Feeding of animals by the visitors must be prohibited and visitors should not be allowed to bring any food materials in to the zoo premises as leftover food may also attract free-living monkeys. Creating awareness among visitors about zoonoses will help to a great extent in this regard.

Sterilization may also be done to control the population (Castration and hysterectomy).

Reference

Chakraborty, A. (2003). Etiopathology of mortality in wild and zoo animals of Assam with special reference to herbivores*. Final Report of an adhoc scheme Submitted to the ICAR, New Delhi.*

Chaterjee (1997). Population structures of Macaques at Hangrabari Forest Reserve. *A report submitted to Assam State Zoo.*

Derrick, C.D. and J.H. Michael (1990). Tuberculosis in a tuberculin negative Rhesus Monkey (*Macaca mulatta*) on Chemoprophylaxis. *Journal of Zoo Wildlife Medicine* 21: 480-484.

Jaswant, S., B. Singh, D.N. Gupta, C.P. Nair and S. Prakash (1951). A note on Tuberculosis in laboratory monkey colony. *Indian Journal Malanol edition* 5: 249-280.

Rajkonwar, S. (2003). Study on Tuberculosis in Non-Human primates and herbivores of Assam State Zoo and its impact of Human health. *A thesis submitted to Calcutta University.*

Sharma, D.K. (1989). A survey on the cause of mortality with special reference to tuberculosis in animals and birds of the Assam State Zoo. *A survey report submitted to Assam State Zoo.*

Saha, G.R., S.K. Sur, M. Mitra, N.C. Nag and A.K. Das (1996). Tuberculosis in monkey and its control at zoological garden at Alipore, West Bengal, India. *Indian Journal of Animal Health* 35: 153-156.