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Infectious Diseases Transmitted between Wild and Domestic Animals

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The impact of disease in free living wild life has been well known and documented. The effects of disease are incidental at individual level but may turn epizootic occasionally. Dr. C. M. Herman (1969) in his paper entitled "The impact of disease on wild life population", stated that "while there is limited documentation that disease, as an individual factor, can drastically affect population fluctuation, it is certainly evident that acting with other ecological phenomena, disease can have extensive impact in free living wild life"

The role of disease in free living wild life although of a complex nature, can not be overruled. Blaming captivity for high mortality as compared to free living is not fully justified.

Many of the infectious diseases have high degree of communicability and pathogenicity and they may infect various species of wild animals as well as domestic animals. Some wild animal species are particularly notorious as reservoirs of certain specific diseases.

Viral Infections

Rinderpest: A viral contagion of the cloven hoofed artiodactyles characterised by fever, erosive stomatitis and gastroenteritis. It commonly attacks domestic cattle and buffaloes. On occassion wild life suffers. In India it is reported from deer, wild buffaloes, wild boars, bison and free living blue bulls. Transmission is by close contact between

healthy and infected animals. Pigs may become infected through eating infected carcasses. Lipzootics in African wild life is largely blamed on buffaloes. Rinderpest was reported by Gujarat Vety. College from eland in Baroda Zoo.

Foot and Mouth Disease: It is an acute, febrile, highly contagious viral disease of ruminants and pigs. Numerous wild species including wild buffaloes, deer, antelope, peccaries and european hedgehogs are susceptible. In domestic animals, the disease is a problem of world wide concern.

In Europe, it was reported in free living fallow deer during an epizootic in cattle in the same area. In Great Britain, infected hedgehogs *(Erinaceus europaeus)* were found in the vicinity of outbreaks in cattle. Outbreaks of FMD are reported from Zoological gardens. In Africa, where in many territories, FFT is endemic and wild animals of many species share their habitat with domestic animals, there has long been interest in role played by wild animals in perpetuation & spread of FMD.

Rabies: It is an acute viral infection generally persist in nature as salivary gland infection of carnivores. It is usually transmitted from animal to animal and animal to men by biting. All warm blooded animals are susceptible. Epizootics of rabies in domestic dogs and such wild animals as foxes, skunks, coyotes, jackals and wolves occur when the population of such susceptible animals become dense enough to ensure easy animal to animal transmission of infection where rabies is present. Vampire bat act as asymptomatic carrier.

Rabies is reported in Jaguars, blue bulls in Kanpur Zoo in 1985 and in Indian Rhino in Lucknow Zoological Park in 1983 - 84.

Blue Tongue: The infection is found in sheep. Cattle are recognized long term carriers. Virus is transmitted by insect vectors. It affects wild ruminents and has been isolated from gazelle, kudu, bighorn sheep, deer, elk, antelope etc.

Distemper: It affects many species of carnivora. The main host is dog. The wild animals reported to be susceptible are wolf, Jackal, Coyote, Australian Dingo, Wild dogs, hyena, mink, ferrets, racoon, lessar panda, etc. It is transmitted by aerosol, direct contact or fomites.

Pseudorabies: Domestic swine are considered to be the principal reservoir of the disease. Infected swine may act as symptomless carriers, transmitting it to susceptible individuals of variety of species. Racoons, skunks, foxes, dogs are readily infected by ingestion of carcasses.

Bovine viral diarrhoea-mucosal disease It is a viral infection of cattle. It is also reported from white tailed deer, mule deer, antelope, eland, giraffe, gazelles etc.

Infectious Bovine Rhinotracheitis: It is caused by Bovine herpes virus in cattle. It also produces abortion in swine. Infection was frequently recorded from buffalo, eland, water buck, reed buck, kob and hippopotamus in form of pustular vulvovaginitis.

Parainfluenza - 3: It is widespread in many species of wild animals, by itself it is not a serious pathogen but together with other agents it may contribute to disease of respiratory tract.

Feline panleukopenia: It is an acute viral infection affecting most members of the family Felidae. It is highly infectious in susceptible cat population. It has been described in cheeta leopard, bobcat, tiger, jaguar, lion, wild cat etc. The most common route of infection is by inhalation or ingestion of virus from infected feces, urine or salvia by direct or indirect contact.

Contagious ecthyma: The infective agent is pox virus which affects mainly sheep and goats. It is transmitted by contact exposure from infected sheep or goat. It has been reported from wild life viz , bighorn sheep, chamois, tahr, mountain goats and musk oxen.

Bacterial Rickettsial and Mycotic Infections

Tuberculosis: For more than a century Tuberculosis has been recognised as a serious clinical entity in wild animals kept in captivity. TB has not been commonly reported in wild animals except where they have exposure to domestic animals or human being. Mycobacterium infection has been reported in deer, kudu, giraffe, elephants, monkey, llamas, antelope, bison, baboons, elk, eland' tapirs etc. Prevalence of TB is a most common feature in many Indian Zoos. In Kanpur Zoo, 27 mammals (7 primates, 9 bovides, 4 deer, 7 others) and 14 birds (5 duck, 7 fowl peasant, 2 stork) died due to TB in 3 years. Shah *et al* (1986) reported incidence of tuberculosis in black buck and white spotted deer in Gujarat. Tuberculosis in spotted deer is reported by Sood *et al.* (1989).

Paratuberculosis: Caused by *Myco paratuberculosis* resulting in high morbidity and mortality in variety of wild animals. It has been observed in deer, big horn sheep, antelope, mountain goats. The problem of this infection is magnified by lack of suitable procedure for control and elimination of disease from captive and wild species.

Brucellosis: It has been reported through out the world and has long been considered an important disease in human, cattle goat and swine. The infection has been reported in bison; elk, moose, Dall sheep, Caribou, reindeer, antelope, spotted, hyena, wild dogs, jackal, grizzly bears etc. Jhala (1971) reported brucellosis in Nilgai and Spotted deer in Gir forest.

Pasteurellosis: It is an infection of domestic and wild animals caused by *Pasteurella multocida*. Episzootics of this infection occasionally reported among wild mammals like bighorn sheep, bison, black tailed deer, elephant, elk, kangaroo, wild swine etc.

Anthrax : It is acute infection having sudden onset and rapidly fatal course characterised by exudation of tarry blood from body orifices, enlargement of spleen and gelotinous infiltration of subcuteneous tissue. It has been reported from wide variety of wild mammals like zebra, spring bok, baboons, carnivores, hippopotamus, lions, leopards, cheetah, elephants, hyena giraffe, impala etc. In Australia anthrax is prevalent amongst the kangaroos. The anthrax was reported with high mortality in kangaroos of Trivandrum Zoo.

Salmonellosis : It is common in wild animals of all species. Mortality in free living wild animals goes unnoticed because of acute course of disease. Enteric infections are exceedingly common in wild animals trapped and moved into captivity.

Heart water : It is a septicaemic; rickettsial disease of ruminants. It may cause an inapparent, transient reaction in some wild animals and be responsible for clinical disease and mortalities in others. It has been reported from eland, nilgai, blackbuck, Indian buffalo, Barbary sheep as well as domestic cattle, sheep and goats.

Eperythrozoonosis : It is non - contagious infectious disease of rodents, ruminants, swine. Also reported in blesbuck, deer, elk, muledeer etc.

Dermatophilosis : It is an exudative dermatitis of wild and domesticated animals caused by *Dermatophilus congolensis*. There have been several reports of occurrence of this infection in eland, giraffe, gazelle, deer, zebra, kudu, fox, monkey. antelope etc.

Histoplasmosis : It is a mycotic infection caused by *Histoplasma capsulatum*. Wild and domestic animals as well as humans are susceptible to this infection.

The other mycotic infections reported are Coccidioidomycosis, Adiaspiromycosis etc.

Control Measures

Preventive measures are of utmost importance in control of the infectious diseases. The following control measures are advocated.

1) Measures of proper housing, sanitation and cleanliness of the habitat should be provided.

2) Quarantine measures should be strictly followed.

3) Strict restriction of entry of all types of domestic animal / street dog should be observed.

4) The diseased animal should be segregated.

5) In case of outbreaks of any infectious disease in domestic mammals or birds of surrounding area, vaccination of susceptible wild animals should be carried out.

TABLE - 1 Infectious Disease of Animals

1) Wild Ruminants

1) *Bacterial Infections*:

Anthrax, Black Quarter, Enterotoxemia, Malignant edema, Erysepalas, Listeriosis, Streptococcosis, CBPP, Vibriosis, Salmonellosis, Brucellosis, Pasteurellosis, Actinomycosis, Actinobacillosis, Tuberculosis, Paratuberculosis, Leptospirosis

2) *Viral Infections*:

Rinderpest, Foot and Mouth Disease, Blue tongue, Vasicular Staomatitis, Mucosal disease, Infectious Bovine Rhinotracheitis, Parainfluenza, Hog Cholera, African Swine Fever, Contagious ecthyma, Maligment Cattarhal Fever, Rabies Virus, Pseudorabies

3) *Rickettsial infection*

Q fever, Tick borne fever, Anaplasmosis, Eperythrozoonosis

2) Equine

African horse sickness, Glanders, Borna disease

3) Felide

Salmonella, Anthrax, Tuberculosis, Feline Pan Lukopenia

4) Elephant

Anthrax, Salmonellosis, Tuberculosis, Pasteurellosis Clostridium, Colibacillosis, Diphtheria, Mycoplasma, Tetanus, Poxvirus, Herpesvirus

Haemoprotozoan Diseases of Wild Animals

Haemoprotozoan parasites occurring in wild animals are of two types. Those specific to the host either benign or pathogenic and those that utilise the wild animals as reservoir hosts and exhibit pathogenicity on transmission to man and his live-stock. The important protozoan diseases are: Leishmaniasis, Trypanosomiasis, Malaria, Babesiasis, Theileriasis, Toxoplasmosis, Anaplasmosis etc.

Occurrence of Haemoprotozoan Parasites in wild animals

Leishamaniasis: It is primarily, a disease of Man and dog. *L. donovani* is the causative agent of visceral leshamaniasis and *L. toopica* is responsible for cutaneous form. Both types are seen in Desert rodents, gerbil, ground squirrels. The third form: mucocuatneous due to *L. brazilienses* in S. America. An American rodent, Agouti, is incriminated as the reservoir.

Trypanosomiasis: Trypanosomes are universally distributed haemoprotozoans of vertebrates: Pisces, amphibians, reptiles and mammals. In wild animals it is usually benign form but pathogenic to man and his live-stock.

Antelopes carry African trypanosomes which are responsible for sleeping disease in man and nagana in livestock. These species are responsible for morbidity and mortality in Gazella, elephant, hynaena. The giraffe is also carrier of *T. vivax* and *T. congolense.*

T. evansi a causative agent of "SURRA" in live stock is also pathogenic to Elephants, tigers and mongoose. Deaths have been reported in tigers and jaguars in zoos.

The wild reservoir hosts of *T. cruzi* (Chaga's disease) in children include armadillo, opossum, ant-eaters, raccoon, wood-cat fox and ferret.

Malaria: Four species are responsible for human malaria. But number of species are found in animals: monkey, artiodactyles, rodents, bats and birds. Man is suceptible for some of these species, odf simian plasmodium.

Haemoproteus and *Leucocytozoon* spp. occur in variety of birds. Similarly, Haepatozoon canis is reported from jackal, hyaena, palmcat and musang.

Babesia parasites: Babesia parasites as such are host specific. *B. hippotragi* and *B. stordi* and few more have been reported from antilopes. Deer act as latent carrier of *B. bigemina, B. divergens* of cattle. Similarly, *B. canis* and *B. gibsoni* have been reported from wolf, jackal, fox etc. *B. felis* which is found in cat is reported from tiger, lion, puma, leopard and wild-cats.

There are reports of babesia parasites from African and Indian elephant, rhinocerus, giraffe, Rodents do have this species.

Theileriasis: A vary large numbers of Theileria spp. have been reported from artiodactyles (antilopes, deer giraffe), primates (monkeys) edentates (opossum), tubulidentates (African sloth, ant-bear). African buffalo is a natural host of *T. parava, Tlawrenci* and *T. mutans* of cattle. Theileria schizogony has been described in three species of antelopes (kudu, duikar & eland)

Toxoplasma: *T. gondii* first recorded from north african rodent: *(Ctenodactylus gondii)* had since been found in large number of species of mammals and birds. The disease may vary from acutely to a chronic form which is asymptomatic. Mortalities have been reported from in leopards, kangaroos and monkeys in zoos. Asymptomatic toxoplasmosis in an unlimited variety of animals is a public health hazard as it is of zoonotic importance.

Anaplasmosis: *A. marginale* is the cause of gall sickness in cattle has been reported from antelopes and other animals which act as carriers of the infection. Haemobartonellosis and epierythrozoonosisnow classified as rickettsial diseases affect a number of wild animals.

Questions, Comments, Discussion

Kapasi: Very little is known about the diseases that are spread in the wild and no concentrated efforts are being made in this direction. Whatever is known has been gathered from the zoo data, so it is very essential that more work is done in this area. For example, when an animal is found dead, we send it for post mortem more for the legal requirement than for any scientific opportunity. We should examine the body carefully from every viewpoint for furthering the knowledge in this subject.

Regarding prophilactic measures, I have noticed that during summer, when water supply is scarce and all the animals come to particular spots to drink, can we not mix broad spectrum medicine in the water as a preventative measure for certain general diseases. Has anyone done any work in this?

(Audience) It has been done in some places for preventing a variety of diseases, even t. b., helmenthic animals, etc.