Spillover of canine distemper virus from free-ranging dogs to Indian foxes (*Vulpes bengalensis*) in central India

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Introduction

- World's most common carnivore -**domestic dog**
- Known or suspected reservoir of epidemic-causing infectious pathogens of many wild carnivores (Fig. 1).
- In most developing countries, dog populations are large, un-owned, unvaccinated and often free-ranging.
- In India most wildlife reserves have large human settlements both within and on the periphery.
- Dog populations in these settlements travel long distances into wildlife habitat, increasing the potential for pathogen transmission to wildlife.
- Investigations into disease prevalence and risk of spill-over to wildlife so far not conducted in India.

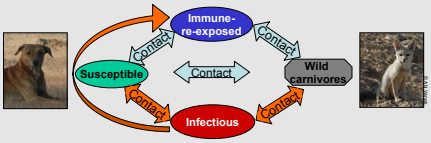
Figure 1: Examples of disease spill-over from dogs to wild carnivores

This study

Ecological study of domestic dogs and the most common wild canid of the dry central Indian plains, the Indian fox (*Vulpes bengalensis*).

Objectives: To determine movement patterns, contact rates, and disease prevalence of Indian foxes and free-ranging domestic dogs (Fig. 2).

Figure 2: Evaluating risk of disease transmission from domestic dogs to wild carnivores



Study area and Methods

- Tropical Dry grassland habitat - part of the Great Indian Bustard Sanctuary, Maharashtra - India.
- Study conducted in ca. 50 km^2 area consisting of a mosaic of grassland, agriculture fields, settlements, and industry (Fig. 3).
- Telemetry studies of foxes and free-ranging domestic dogs.
- Overlap of dog-fox home ranges based on 95% adaptive kernel estimates.
- Sero-survey of dogs and foxes for canine distemper virus (Fig. 4).
- Ready-to-use kits (Biogal Immunocomb, Galed, Israel) to detect IgG and IgM antibody response to CDV.
- Categorisation of disease status of each individual using combination of IgG and IgM (Table 1).

Figure 3: Map of study area showing overlap of home ranges between Indian foxes and domestic dogs

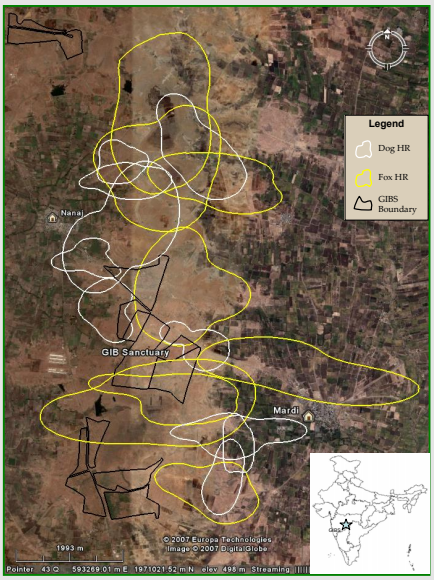
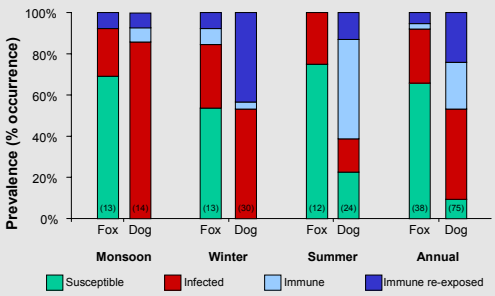


Table 1: Health status categorisation of animals based on a combination of IgG and IgM values.

Status	IgM values	IgG values	Animal status
Susceptible	No detectable Ig/M	Negative or low Ig/G	Zero or insufficient immunity and no recent exposure - Susceptible to disease
Active infection	Low to High Ig/M	Negative to medium Ig/G	Recently exposed to virus - either builds immunity or dies
Immune	Negative or low Ig/M	Medium to High Ig/G	Survived acute phase of infection - now immune
Immune re-exposed	Medium to High Ig/M	High Ig/G	Immune from previous exposure, but recently re-exposed to virus

Figure 4: Free-ranging dog and Indian fox being examined for pathogens

Figure 5: Prevalence of CDV in dogs and foxes (n)



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Results: Telemetry

- Mean Indian fox home ranges = 3.35 km^2 ± 1.28 SD (n=15)
- Mean domestic dog home ranges = 0.96 km^2 ± 0.79 SD (n=17)
- Mean percent overlap of dog HR with fox HR = 41.3% ± 27.19 SD (Fig. 3)
- Mean number of overlapping dogs / fox HR = 2.9 ± 1.03 SD
- Foxes and dogs also overlapped temporally - foxes were mainly crepuscular and nocturnal, but dogs were often found to be active during late evenings and nights as well.

Results: Disease survey of CDV in dogs

- 74 dogs tested - 90.7% showed evidence of past or recent exposure to CDV (Fig. 5)
- Maximum infections during the monsoons
- No disease related deaths recorded up to one month after testing

Disease survey of CDV in foxes

- 32 foxes tested (38 samples) - Evidence of recent or past exposure to CDV found in 34.2% samples (Fig. 5).
- All foxes with high CDV IgM values (n=4) died within one month of sampling (Fig. 6)

Figure 6: CDV positive fox with acute clinical symptoms

Discussion

- High prevalence of CDV, high morbidity, but low mortality in the adult dog population.
- Suggests CDV is enzootic in domestic dogs of this population.
- Evidence of CDV in foxes detected. High mortality among foxes diagnosed with CDV.
- Potential for transmission of CDV from dogs to foxes supported based on:
  - i) Spatial and temporal overlap between domestic dogs and Indian foxes.
  - ii) Differential mortality due to shared parasites.
- Results of this study have lead to a dog vaccination drive by the Maharashtra Forest Department.

Key References

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