

## Assessing Burden Of Rabies In India From A Veterinary Perspective: Results Of A National Multi-Centric Epidemiological Survey

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### Introduction

Though human rabies is endemic in India, a nation wide epidemiological study has never been done. A WHO-sponsored survey was conducted jointly by the Association for Prevention and Control of Rabies in India (APCRI), Kempegowda Institute of Medical Sciences (KIMS) and the Commonwealth Veterinary Association (CVA) to assess the burden of rabies in India. While the results of the medical survey have been published elsewhere, this paper deals with the veterinary aspects of the survey.

For animal rabies the data is very scarce. The dog population of India is estimated to be 25 million most of which are ownerless and are not immunized against rabies.

Canine or other animal rabies is believed to be distributed widely in India (1 & 2), but an analysis of data on animal rabies (mostly clinically diagnosed) for the period 1991-2000 reveals that it was reported in only 128 of the 507 districts of the country, and the number of districts reporting rabies cases was further reduced to 30 during 1998-2000. There are large geographical areas of the country where animal rabies has not been reported during the last 10 years.

Against this background, and in order to clarify the above situation of ignorance, conflict and confusion, APCRI, a registered scientific society with technical and financial assistance from World Health Organization and Commonwealth Veterinary Association undertook this multi-centric study with the following aim and objectives.

### Aim

To provide comprehensive data on rabies and its related aspects in the animal populations of India.

### Objectives

- To obtain a better and more realistic estimate of pet dog population and some aspects of their care.
- To recognize the common animal reservoirs of

rabies and know the time frame of the disease in animals.

- To make recommendations for future activities for rabies elimination from India.

The main objective of the present study was to survey recognised common animal reservoirs of rabies based on laboratory confirmation by collecting data for the last 10 years from the Departments of Pathology of veterinary colleges and other premier institutions of the country. The details of methods of laboratory examination were also obtained. A questionnaire was prepared and sent to all the institutions and data obtained and analysed. The results obtained showed that based on laboratory tests there was a high incidence of rabies in most of the domestic and wild animals.

### Methods

#### Medical Survey

A national multicentric survey was conducted with the help of 21 medical schools during March-August 2003 (3). This community-based survey covered a representative population of 10.8 million people on the mainland. Hospital based data was also obtained from the 22 infectious disease hospitals. A separate survey of the islands of Andaman, Nicobar and Lakshadweep, reportedly free from rabies was also undertaken.

#### Veterinary Survey

To obtain data on another objective of the survey viz. recognizing common animal reservoirs of rabies based on laboratory confirmation, it was considered adequate to obtain data on a pre-tested and structured format of the animal rabies data for the last 10+ years viz. 1992-2001/2002 from the Departments of Pathology of Veterinary Colleges and some other premier institutions such as Central Research Institute (CRI), Kasauli, National Institute of Communicable Diseases (NICD), Delhi, Indian Veterinary Research Institute (IVRI), Izatnagar, National Institute of Mental Health and

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Neurosciences (NIMHANS), Bangalore, Pasteur Institute, Coonoor, and others. The details of methods of laboratory examination viz. Seller's stain, biological test, Florescent Antibody Test (FAT) was also obtained. The schedules were mailed as a postal questionnaire by the Commonwealth Veterinary Association (Dr. S. Abdul Rahman, Secretary) to veterinary and other institutions and the data was obtained by mail after 1 to 2 reminders by mail/phone. In addition personal visits were also made to some institutions by the CVA/APCRI team members of the survey.

### Findings

The annual incidence of human rabies was estimated to be 17,137 (95% CI; 14,109 to 20,165). An additional 20% based on expert group advice to include paralytic/atypical forms of rabies provided an estimate of 20,565 or about 2 per 100,000 population. The majority of the victims were adult males, mostly from rural areas and unvaccinated. The main biting animal was the dog (96.2%), mostly stray dogs and the extremities were the common sites bitten. The incubation period ranged between two weeks and six months. Hydrophobia was the predominant clinical feature. Many of the victims had resorted to indigenous forms of treatment and only about half of them had sought hospital admission. About 10% of these patients had received a partial course of either Semple or a cell culture vaccine. The islands of Andaman, Nicobar and Lakshadweep were found to be free of rabies as expected

### Rabies in Animals

One of the objectives of this survey was to identify the common animal reservoirs of rabies and know the time trends of the disease in animals. For this it was considered adequate to obtain data from institutions viz., Veterinary Colleges, IVRI, CRI, NICD, NIMHANS Pasteur Institute, Coonoor and others, based on their records of laboratory diagnosis of rabies in animals.

The results showed a high degree of incidence among domestic animals viz. dogs, cattle, goats, cats, horses, pigs and among wild animals the reservoirs of rabies were the mongoose, jackal and deer (Table 1). The diagnosis was based mostly on demonstration of Negri bodies by Seller's stain and about 8-10 institutions confirmed it by FAT and biological test.

Incidentally, rabies was reported very rarely in rats,

rabbits and bandicoots. But as the number of specimens was too small and other relevant information was not available no definite conclusions could be drawn (Table 2).

As dog and cat bite accounted for most of the human rabies deaths (98%) from the medical survey, the veterinary survey over the decade, 1992-2002 clearly demonstrated the

**Table 1. Incidence of rabies during 1992-2002**

	Clinical			Laboratory		
	Exam.	Obs.	%	Exam.	Obs.	%
<b>A. Domestic Animals</b>						
1 Dog	14949	583	3.9	9963	3954	48.4
2 Cat	71	11	15.5	886	147	16.6
3 Cattle	44338	1414	3.2	1818	838	46.1
4 Sheep and Goat	30306	70	0.2	314	153	48.7
5 Horses	371	8	2.2	118	34	28.8
6 Pigs	385	2	0.5	14	7	50.0
7 Mongoose	www	www	www	17	1	5.9
8 Goats	4	4	100.0	6	5	83.3
9 Deer	www	www	www	1	0	www
<b>B. Wild Animals</b>						
1 Mongoose	www	www	www	112	98	87.5
2 Jackal	www	www	www	14	13	92.9
3 Bear	www	www	www	18	11	61.1
4 Deer	1	0	www	4	1	25.0
5 Wolf	1	1	100.0	0	4	50.0
6 Leopard	www	www	www	4	3	75.0
7 Fox	www	www	www	4	1	25.0
8 Tiger	www	www	www	4	0	www
9 Leopard	www	www	www	3	0	www
10 Rhino	1	1	100.0	2	1	50.0
11 Panther	www	www	www	1	1	100.0
12 Elephant	www	www	www	1	0	www
*None of these are from Andaman, Nicobar and Lakshadweep						

enzooticity of rabies in these animals (Table 3).

All these show that the reservoir of rabies is predominantly in dogs and cats and other domestic animals

**Table 2. Incidence of rabies among wild species of animals**

Animals	Laboratory		
	Diagnosed	Confirmed	%
Rat	11	1	9.1
Rabbit	16	1	6.3
Squirrel	18	www	www
Deer	2	0	www
Bandicoot	1	1	100.0

such as cattle, goats, horses and pigs; and rarely in wild animals such as the mongoose and jackal.

### ASSESSING A RABIES FREE AREA

It is common to see free roaming street dogs in the capital, Port Blair. About 80% of the dogs in Andaman and 20% in Nicobar are thought to be strays. Although rearing of pedigree dogs was limited to very few defence department officials in the past, with all the tourist influx

**Table 4.1: Country-wise source of rabies in dogs and cats**

Year	Andaman						Nicobar					
	Clinical			Laboratory			Clinical			Laboratory		
	Exam.	Obs.	%	Obs.	Pos.	%	Exam.	Obs.	%	Obs.	Pos.	%
1991	29	0	0.0	915	411	44.9	0	0	0	54	21	38.9
1992	56	12	21.4	948	461	48.6	3	0	0	79	14	17.7
1993	78	9	11.5	992	393	39.6	0	0	0	76	21	27.6
1994	60	11	18.3	863	376	43.6	0	0	0	78	19	24.4
1995	93	11	11.8	757	333	42.8	4	1	25.0	01	13	24.0
1996	259	188	41.7	778	417	54.2	18	0	0	68	14	20.3
1997	4001	109	2.7	751	420	55.8	10	0	0	00	14	21.2
1998	3992	102	2.5	719	322	44.8	7	4	57.1	71	9	12.7
2000	3149	107	3.4	669	302	45.0	13	3	23.1	74	13	17.5
2001	3240	100	3.1	679	283	41.8	13	4	30.8	01	7	11.3
Total	14949	323	2.1	7703	3734	48.4	72	12	16.7	020	149	21.9

Note: Exam. - Examined; Obs. - Observed; Pos. - Positive  
 Source: 1 & 2 Preliminary Clinics and 3 National Institutions

## 1. Andaman and Nicobar Islands

The union territory of the Andaman and Nicobar Islands is a group of 572 islands in the Bay of Bengal. Altogether these islands cover a geographical area of 8249 sq. kms, with 86% of tropical rain forest and a population of 0.36 million (2001 census) concentrated mainly on 38 large and small islands. The entire urban population of 100,186 (27.8%) lives in the capital town of Port Blair and its distance from the mainland is about 1200 kms. The medical and health services/status are fairly well developed.

The natural terrestrial fauna consists of the Andaman wild pig, civet, crab eating Nicobar monkey, deer, elephant (introduced), snake and centipede. The domestic animals include the cattle, buffalo, goats and dogs. There are no sheep in the islands. Estimated number of dogs in the islands is 29,568 (1997), according to the figures provided by the Directorate of Veterinary Services, Port Blair. Overall the veterinary facilities are well developed with about 82 veterinary institutions and 238 veterinary personnel. The islands are free of rabies, rinderpest, foot & mouth disease (FMD), blackquarter, anthrax and haemorrhagic septicemia (4).

### Natural Fauna, Animal Health and Veterinary Services

of late, many have started keeping pet pedigree dogs imported from the mainland. All this must be viewed as a cause for concern as the area is rabies free.

Till the year 2000, stray dog control in Port Blair was based on use of strychnine laced baits; but from 2001 an Animal Birth Control (ABC) programme was introduced (Table 4).

The progress of ABC is slow and an effective canine control programme is needed. Under the ABC programme sterilized dogs are not given Anti-Rabies Vaccination (ARV), a policy which needs to be reviewed.

There is also no established surveillance for rabies in dogs/cats and no laboratory examination for rabies viz. not even the Negri body examination despite available facilities

**Table 4.2: Administration of animal control programme in Port Blair**

Year	Number of dogs treated
2001 (August onwards)	54
2002	142
2003 (till July)	151
Total	347

Source: Preliminary Hospital, Single Health Post Blair

and this needs to be reviewed.

### Anti-Rabies Vaccination for animals in the Island

Anti-rabies vaccination of dogs, cats and other animals is not practised in the islands. At some time in the past, due to pressure from people migrating from the mainland, a small quantity of anti-rabies vaccine was procured by the Veterinary Services Department, but this had to be stopped later due to increasing demand. Currently, there is no practice of either pre- or post exposure rabies vaccination of animals by the Veterinary Services Department in the island. Hence, there is no stock of anti-rabies vaccine in the department. Even the veterinarians do not receive/take pre-exposure rabies vaccination, as they do not perceive any threat of rabies in their work.

### Entry/Import of dogs/cats and Quarantine

It was revealed at the seaport that during January 2002 to July 2003, a total of seven dogs were brought from the mainland and entered the island without any veterinary examination or documentation. Similarly, at the airport about ten dogs (since January 2003) were brought into the island without any veterinary examination or documentation. There is no system of monitoring entry of dogs or cats into the island. Likewise there is no facility or practice of quarantining dogs or cats for rabies in the island. All these factors need immediate attention by port health authorities and corrective measures.

## 2. Lakshadweep Islands

The union territory of the Lakshadweep Islands is a group of 11 inhabited islands in the Arabian Sea. The inhabited area is about 32 sq. kms and the population 62,000. The capital of the islands is Kavaratti, and its distance from the mainland (viz. from Cochin) is about 400 kms. The medical and veterinary infrastructures are fairly well developed. There are about 12 medical and 17 veterinary institutions. The natural fauna are predominantly marine viz. coral and fish. The terrestrial fauna are mostly domestic animals such as the goat, cow and cat. There are no dogs.

### Natural Fauna in the Lakshadweep Islands

A livestock census is currently being planned. Earlier data is included in Table 5 but does not include cats.

There are cats both pet and stray but numbers are unknown and there is currently no ABC programme for cats. There is no established surveillance for rabies in cats and currently no Laboratory examination for rabies in the Islands, all of which needs attention.

### Anti-Rabies Vaccination for animals in the Island

No anti-rabies vaccination of the cats or other animals is given. The import of dogs is prohibited but there have been instances in the past where cats were imported following vaccination on the mainland.

### Entry/Import of dogs/cats and Quarantine

Enquiries at the Cochin Airport with the Duty Manager and the Doctor attached to the Airport revealed that Indian

**TABLE 5. LIVESTOCK CENSUS OF LAKSHADWEEP**

	1972	1977	1982	1987	1992	1997	Growth Rate (p.a.%) over 1992	Annual Categorized
Cattle	1311	1148	1281	1718	1317	3377	34.73	68.77
Sheep	1000	1000	1000	1000	1000	1000	0.00	0.00
Goats	3817	4338	4883	13343	18888	13311	31.73	18.11
Other Livestock	2	8	1	52	---	---	---	---
<b>Total Livestock</b>	<b>5130</b>	<b>6078</b>	<b>12465</b>	<b>18123</b>	<b>19405</b>	<b>28976</b>	<b>49.03</b>	<b>69.88</b>

Airlines is the only operator flying to the Lakshadweep Islands, The airline does not transport any live animal there. The Assistant Port Master at Kavaratti mentioned that there was no instance of import of dogs into the Islands but there have been instances of cats imported. No system of monitoring the entry of animals exists other than registration at the port of embarkation. As there are no dogs on the island it is believed to be rabies-free.

## Burden of Rabies in India

Based on the results of this survey the following data are proposed for use in national rabies planning, assuming that the situation and related factors of dog population, bite incidence, rabies incidence, are the same in the country as in the populated areas surveyed in the study.

### A. Human Rabies Deaths

- Annual Incidence: 17,137 (14,109 to 20,165 with 95% confidence). An addition of 20% to include paralytic/atypical form of rabies provides an estimate of 20,565.
- Principal Animal Reservoir: Dog (96.3% of all

animals).

- Frequency of Human Rabies Deaths: 1 per 30 minutes approx.

As the population surveyed for animal bite incidence is a part of/closely linked to the population searched for human rabies incidence, consequently, a data linkage was also done to workout some rates/indices.

## B. Animal Bite Load

- pet dog : man ratio = 1 : 36
- pet/owned/household dog population: 28 million.
- annual animal bite incidence rate (per 1000 population) : 17.4.
- projected annual incidence (for 1 billion population) : 17.4 million.
- frequency of bite: 1 per 2 seconds.
- annual man-days lost due to animal bite: 38 million.
- annual medicinal (vaccines + other drugs) cost for animal bite treatment: Rs. 2 billion approx.

## Conclusions

1. Human Rabies is endemic throughout the Indian mainland and only the islands of Andaman & Nicobar and Lakshadweep are rabies free. The majority of the human rabies deaths occurred in adult, males and in the poor/low income group. The principal animal responsible for rabies transmission is the dog. The use of rabies vaccination is infrequent and that of rabies immunoglobulins negligible.

The majority of human rabies deaths occurred within six months of the dog bite. The limbs and hands were the most common site of the bite. About half of the human rabies cases sought hospitalization and about one-third died in hospital. Indigenous treatment was a popularly sought-after remedy. The diagnosis of human rabies was mostly on clinico-epidemiological basis and hence was mostly "probable cases" and none had laboratory confirmation of diagnosis.

The incidence of animal bite is high and is due to a high dog: man ratio. The presence and menace of stray dogs was high. Pet dog care and management practices are not satisfactory. The municipal licensing of pet dogs is inadequate. Overall the

situation is slightly better in urban areas compared to rural areas.

2. The most common animal reservoirs of rabies, based on laboratory evidence are dogs, cattle, goats, cats and pigs and among wild animals the mongoose and jackal.

## Recommendations

Based on the results of the survey and the final conclusions drawn, the following recommendations are made.

1. The coverage and usage of modern rabies vaccines and rabies immunoglobulins needs to be improved. There is an urgent need to phase out Nerve Tissue Vaccine (NTV) and phase in cost-effective intradermal Tissue Culture Vaccine (TCV) to prevent human rabies deaths.
2. A census of dogs or a scientific estimation of dog population is needed. There is an urgent need to tackle the menace of the stray dog population on a war footing. More effective municipal licensing of pet dogs and awareness campaigns for better and responsible dog care and management practices is needed.
3. Efforts are needed to improve hospital care and management of human rabies patients and a beginning made for laboratory confirmation of rabies in a few centres.
4. Similarly on the veterinary side there is a need to upgrade the facility of rabies diagnosis by FAT which is a more sensitive and specific test than Negri body examination.
5. There is an urgent need to introduce effective monitoring of entry of dogs/cats into the Andaman and Lakshadweep Islands at the airports and seaports and to ensure a proper surveillance of rabies in animals.

In order to initiate all the above measures with concerted and coordinated action a "National Rabies Elimination Programme" must be launched involving medical, veterinary and other related departments.

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### Call for resources to tackle avian influenza

'Avian flu might easily spread from Asia to other countries', Dr Bernard Vallat, Head of the World Organisation for Animal Health (OIE), warned during an international conference on avian influenza.

His comments were underlined by Dr Joseph Domenech, Chief Veterinary Officer of the Food and Agriculture Organisation (FAO): 'Recent studies have confirmed that the H5N1 virus is now enzootic in this region, and that there are many unrecognised asymptomatic carriers. This implies there is an urgent need for resources to improve the sanitary surveillance and veterinary services in the affected countries, to help prevent the risk of a pandemic spread of this virus'.

The meeting was organised jointly by the OIE and the FAO, and held at the OIE Paris Headquarters on 7 to 8 April, 2005.

Dr Samuel Jutzi, Director of Animal Production and Health Division of the FAO, described how the epidemiology of the H5N1 virus is linked to the



traditional farming system in the countries affected, "Ducks, an unusual host species for this kind of virus, seem to play an important role, and there are about 80 million ducks in Vietnam, which gives an idea of the task we are confronted with".

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