

# Report of the Brainstorming Meeting on Leptospirosis Prevention and Control

Mumbai, 16 – 17 February 2006



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## **Executive summary**

A brainstorming meeting of experts on various aspects relating to Leptospirosis was organized at Mumbai from 16-17<sup>th</sup> February 2006 to develop a comprehensive strategy for prevention and control. The meeting was convened by RMRC Port Blair with technical and financial support from WHO India.

Discussions were held on various issues related to prevention, control and diagnosis of Leptospirosis which included review of the current situation of leptospirosis in India, magnitude of the problem, epidemiology, transmission dynamics, recent changes in clinical presentations, issues in laboratory diagnosis and strategies for prevention and control. Deliberations were held on environmental management and animal surveillance strategies in prevention and control of Leptospirosis. Leptospirosis surveillance was debated from Integrated Disease Surveillance Project (IDSP) perspective.

Panel discussions and group work were held to finalize recommendations on strengthening preparedness and public health response to Leptospirosis including case definition for clinical and epidemiological surveillance and protocol for clinical case management including critical care for complicated cases. The importance of early diagnosis and case management was emphasized to reduce morbidity and mortality. The group made recommendations on strengthening of laboratory support to leptospirosis surveillance and diagnosis with special reference to laboratory strategy for outbreak investigation, routine surveillance and clinical diagnosis in endemic areas, sero-surveillance/ surveys, quality assurance for leptospirosis testing laboratories, evaluation of commercial assays and networking of human and veterinary sector laboratory within the IDSP framework.

Short-term and long term measures for reducing disease burden as well as preventing and/ or reducing the impact of outbreaks were outlined and linkages established with environmental management strategies including changes in irrigation and agricultural practices. Recommendations were made on media management & risk communication in outbreaks with special reference to Leptospirosis.

WHO's role was identified in facilitating international collaborations and providing technical support for improving coordination.

## **Brainstorming meeting on Leptospirosis prevention and control in India**

**National Institute for Research in Reproductive Health, Mumbai**

**7-8<sup>th</sup> April 2006**

### ***BACKGROUND***

Leptospirosis is a worldwide public health problem. In humid tropical and subtropical areas, where most developing countries are found, it is a greater problem than in those with a temperate climate. The magnitude of the problem in tropical and subtropical regions can be largely attributed to climatic and environmental conditions. There is also a greater likelihood of contact with a *Leptospira*-contaminated environment caused by, for example, local agricultural practices and poor housing and waste disposal, all of which give rise to many sources of infection

A potentially serious but treatable disease, symptoms of Leptospirosis may mimic those of a number of other unrelated infections such as influenza, meningitis, hepatitis, dengue or viral haemorrhagic fevers. Some of these infections, in particular dengue, may give rise to large epidemics, and cases of leptospirosis that occur during such epidemics may be overlooked. For this reason, it is important to distinguish leptospirosis from dengue and viral haemorrhagic fevers, etc. in patients acquiring infections in countries where these diseases are endemic.

In India the disease has been found more commonly associated with natural disasters especially during post-monsoon period and may assume epidemic potential. Certain occupational groups such as agricultural labourers, sewage workers, animal handlers etc. constitute high risk groups. First reported from Andamans in 1920s, reports have become more frequent since 1980s especially from the states of Tamil Nadu, Kerala, Karnataka and Maharashtra. Despite this knowledge, the information about the existing status of the disease in the country is lacking and we do not have an accurate estimate of disease burden in the country. Probably the disease is underreported in humans. All available evidence suggests that the disease is now emerging in India as an important public health problem. The disease has also been a diagnostic enigma for the microbiology laboratories across the country. Since isolation rate of the causative organism from clinical specimens is low due to prior indiscriminate use of antibiotics and also difficult and expensive isolation techniques, currently, serological techniques remain the cornerstone of diagnostics.

The protean manifestations of the disease with rapid clinical deterioration and unusually high mortality in recent outbreaks in the country have highlighted the need to develop a comprehensive strategy to combat this emerging public health threat.

### ***THE MEETING***

A meeting of experts on various aspects relating to Leptospirosis prevention and control was convened by RMRC Port Blair (WHO Collaborating Centre for Diagnosis, Research, Reference and Training in Leptospirosis) and supported by WHO to develop a comprehensive strategy. The specific meeting objectives were:

1. To review the overall situation and extent of Leptospirosis in India in terms of disease burden, surveillance mechanisms, epidemic & disaster preparedness, outbreak response capacity, prevention & control strategies, laboratory capacity & networking, recent clinical trends, veterinary surveillance and eco-epidemiology considerations.
2. To develop recommendations for resolving the identified public health issues for improved prevention and control
3. To develop a plan of action including inter-sectoral coordination.

The meeting was attended by officers from Dte. GHS (GoI), Dte. GHS (Maharashtra) and other officers from Directorate of Health Services (Maharashtra), Director National Institute for Research in Reproductive Health (NIRRH), Grant Medical College (Mumbai), KEM Hospital (Mumbai), Rajeev Gandhi Medical College (Thane), Kasturba Hospital for Infectious Diseases (Mumbai), Disease Surveillance (Maharashtra), Press Trust of India Limited, Kalyan Dombivalli Municipal Corporation (Kalyan, Mumbai) Mumbai Municipal Corporation (Mumbai), B.J. Medical College (Pune), Haffkine Institute (Mumbai), CMC Vellore, IVRI (Izzatnagar), Navsari Agriculture University, PGIMER (Chandigarh), NICD (Delhi), IDSP Delhi, state surveillance officers from Maharashtra, Gujarat & Karnataka, RMRC, Port Blair, WHO India and WHO SEARO. The list of participants is at annex 1

Discussions were held on various issues related to prevention, control and diagnosis of Leptospirosis and these included:

- ▶ Current situation of leptospirosis in India, magnitude of the problem, epidemiology, transmission dynamics and strategies for prevention and control
- ▶ Leptospirosis situation in endemic states
- ▶ Environmental management in prevention and control of Leptospirosis
- ▶ Recent changes in clinical presentations including Renal manifestations and medical management of cases of Leptospirosis
- ▶ Leptospirosis perspective of Integrated Disease Surveillance Project
- ▶ Surveillance strategies for animal Leptospirosis
- ▶ Laboratory Diagnosis of Leptospirosis during outbreak with special reference to the Mumbai experience

Panel discussions and group work were also held to finalize recommendations on the following important issues:

- ▶ strengthening preparedness and public health response to Leptospirosis including case management
- ▶ laboratory support to diagnosis and surveillance: Mechanisms for inter-laboratory and inter-sectoral networking and collaboration for lab support and standardization of diagnostic test procedures
- ▶ environmental management strategies for prevention & control of Leptospirosis
- ▶ media management & risk communication in outbreaks with special reference to Leptospirosis

The meeting was inaugurated by the honorable Minister of Health, Govt. of Maharashtra and the Minister of State for Health, Government of Maharashtra who appreciated the

efforts of RMRC and WHO for organizing the meeting. They felt that the meeting had been held at a very appropriate time, especially in the context of the recent outbreak following the Mumbai floods and the need to review the preparedness and response to such epidemiological situations.

## **Overview on Leptospirosis**

An overview on Leptospirosis was given by **Dr S C Sehgal, Director, Regional Medical Research Centre, Port Blair and WHO Collaborating Centre for Diagnosis, Research, Reference and Training in Leptospirosis**. Leptospirosis is a disease with high epidemic potential often associated with natural disasters. Its public health significance has not been recognized till recently. The disease has a multifactorial causation determined by various factors including presence of carrier animals, environmental conditions and human activities. Various occupational groups are at risk of acquiring leptospiral infection due to their propensity to get exposed to animal tissue or excreta or environmental vehicles of transmission. Leptospirosis is endemic in most of the South and Southeast Asian countries. In a survey conducted by the International Leptospirosis Society in 2000, information about 47,000 severe cases were obtained and the estimated annual occurrence of severe cases requiring hospitalization worldwide was 200,000 with Thailand, Reunion Islands, Hawaii and Brazil reporting high incidence. A large number of people of Asia with a workforce of more than 1.5 billion and 900 million agricultural labourers are at risk of acquiring infection. Several outbreaks have been reported recently from various states of India and other countries. Since mild forms do not exhibit any specific signs/symptoms, it can be easily confused with many other acute bacterial, viral or parasitic infections and hence laboratory support is essential for an accurate diagnosis in most cases. Because of the lack of laboratory support in diagnosis in most parts, particularly in peripheral areas, the disease is usually undiagnosed or misdiagnosed resulting in under-reporting. In recent years, four epidemiological patterns viz. rural form, urban form, recreational leptospirosis and leptospirosis associated with natural disasters, have become distinguishable. Although in principle, prevention and control of leptospirosis is possible by resorting to measures targeting different links in the transmission chain of leptospirosis, in practice, most of these measures are difficult to achieve either because of poor understanding of the specific role of different entities in the transmission cycle or the practical difficulties in implementing these. In the recent years there have been several initiatives to estimate the magnitude of the problem of leptospirosis, to understand the epidemiology, transmission cycle, developing better tools for diagnosis and case management. The present need is to have a strengthened surveillance, greater priority for leptospirosis in national health programmes, strengthened efforts to develop effective vaccines and networking of institutions.

## **SEARO Perspective of Leptospirosis**

**Dr Subhash S Salunke, Regional Advisor (Communicable Disease Surveillance & Response) WHO SEARO** provided the global and regional perspective of Leptospirosis. Disease burden in Southeast Asian region is given in table 1. Recognition of Leptospirosis as a public health problem only during outbreaks especially with natural disasters such as flooding along with the problems of underreporting, weak surveillance, non-specific clinical signs and symptoms and laboratory capacity and non-availability of reliable diagnostic tools was brought to notice of the expert group. WHO's continued support to member states in strengthening disease surveillance for Leptospirosis, providing technical assistance in outbreak situations and to reduce environmental and public health risks, support to establishing database through the International Leptospirosis Society Network and technical support to strengthen laboratory diagnostic facilities and networking was extended.

**Table 1: Disease burden in South East Asia region 2000**

Country	Region	Incidence per 100,000	Mortality (%)
India	Andaman	50.0	21.0
Thailand	-	23.1	2.5
India	Chennai (Tamil Nadu)	10.5	-
India	Kerala	5.6	10.0
Indonesia	Semarang	1.2	16.7
India	Mumbai	10.2	12.4

Source: ILS world wide survey 1998-2000

## Recent trends in clinical presentation of Leptospirosis

**Dr L.S Bichile Professor & Head, Chief, Rheumatology Division, Dept of Internal Medicine, Seth G.S. Medical College & KEM Hospital** shared past experiences on clinical presentations of Leptospirosis and the recent trends with special reference to the post-flood outbreak in Mumbai. The recent changes in clinical scenario have been studied and attributed to changing environmental factors like floods, cyclones, vectors, carriers, host susceptibility, prolonged exposures and the ever changing virulence of the organism.

A biphasic course is seen in both icteric and anicteric form of leptospirosis. Myalgia, conjunctival suffusion and haemorrhage, oliguria and history of contact with animals are pointers suggestive of leptospirosis. Pulmonary manifestations characterized by short course of illness, dyspnoea, chest pain, haemoptysis and ARDS is a severe complication, which worsens rapidly resulting in death. Other manifestations include those of cardiovascular involvement characterized by ECG abnormalities, arrhythmias and vasomotor collapse and CNS manifestations, particularly meningo-encephalitis. Myositis characterized by severe myalgia and raised CPK and SGOT is a common manifestation in leptospirosis. Neutrophilic leucocytosis, raised bilirubin, alkaline phosphatase and transaminases, pre-renal azotemia and hypokalemia are laboratory pointers of leptospirosis. A statistically significant reduction in platelet count is seen in fatal cases of leptospirosis. Hyperkalemia, meningism, oliguria, hemoptysis, hyperbilirubinemia above 15 mg%, disorientation, tachycardia, tachypnoea and muscle tenderness were found to be predictors of mortality. However, only pulmonary and CNS complications were the only independent predictors of mortality. Antibiotic therapy supported by other measures including platelet transfusion, haemodialysis, ventilatory support and pulse steroid therapy are the methods of case management. New therapies such as plasmapheresis, hemofiltration and anti-TNF- $\alpha$  therapy for ARDS are emerging methods.

Based on their vast experience, the importance of maintaining a very high level of clinical suspicion of Leptospirosis in patients from the endemic areas in the light of paucity of sensitive diagnostic tests in the early first week was emphasized for initiation of prompt case management and reduction in case fatality. Leptospirosis should be considered as an emerging infectious disease spreading from the rural to the urban centers. The incidence of Leptospirosis with hemorrhagic pneumonitis & ARDS has been found to be on the rise with an increasing number & case fatality rate in patients with multi-organ dysfunction syndrome (MODS).

Penicillin is the antibiotic of choice, does good & is indicated in all the clinical stages of illness. Doxycycline (200mg once a week) is recommended in all high risk individuals as a prophylaxis.

## **Renal manifestation and their management in Leptospirosis**

**Dr K.S. Chugh, Emeritus Professor of Nephrology, PGIMER, Chandigarh** made a brief presentation on “Renal manifestation and their management in Leptospirosis”. The presentation highlighted the worldwide distribution of Leptospirosis with majority of cases occurring in the tropics, and the role of rodents as the most important reservoir because of their alkaline urine.

The clinical spectrum of renal manifestations are determined by virulence of leptospire, bacterial load and the host defence and varies from subclinical to severe ARF. In the sub-clinical form patient would have mild proteinuria, sediment and mild tubular dysfunction. ARF occurs in 10-67 percent of the cases and are mainly nonoliguric. The investigation in leptospirosis, renal pathology and pathogenetic factors involved in renal injury was also presented. The prognosis of ARF in leptospirosis is favorable if treated well in time unless complicated by multi-organ failure. The bad prognostic signs are pulmonary complications, hyperbilirubinemia, oligoanuria and hyperkalemia, ARF with two or more organ systemic failure and association with pregnancy or other infections. Mortality varies from 12-36 percent.

The differential diagnosis of leptospirosis should include scrub typhus, dengue hemorrhagic fever, hanta virus infection, malarial ARF and bacterial sepsis with jaundice and ARF.

## **Environmental management in prevention and control of Leptospirosis with special reference to agro-climatic conditions.**

**Dr. R.P.S. Ahlawat, Vice Chancellor, Navsari Agricultural University, Navsari**, described the agro-climatic considerations in the prevention and control of Leptospirosis.

Dr Ahlawat brought out the role of Leptospirosis in severe economic losses in live stock due to abortion, still birth, infertility, decreased milk production and death. In humans variously known as mud fever, trench fever, rice field fever, cane cutter's fever, swamp fever, flood fever etc. – indicates its close association with rain, rodent and rice fields.

Survival of the leptospirae depends on variation in soil and water conditions in the contaminated area. They are susceptible to drying, lower pH than 6 or greater than 8, ambient temperatures lower than 7°C or higher than 34°C. They can survive for as long as 183 days in water saturated soil but survives for less than 30 minutes when soil is air dried. It can survive for very long periods in free surface water.

Based on extensive studies conducted in Gujarat, it was highlighted that the agro-climatic conditions for south Gujarat (Valsad, Navsari, Surat, Narmada, Bharuch) favour endemicity of leptospirosis. These include heavy rainfall (above 65 days of annual rainfall), clay soil (compared to loamy, medium black calcareous, sandy soil in other districts of Gujarat) and high water tables. **Water management** through proper land use planning through involvement of public health departments & agricultural universities, introduction of 'Varabandhi' (rotational water supply for timely, assured and equitable distribution) in irrigation, use of pressurize irrigation system – drips and sprinklers, **crop management** through periodic changes in cropping pattern, **soil management** through application of gypsum in sodic soils and provision of drainage in saline/sodic soils were

recommended as measures for environmental management in prevention and control of Leptospirosis.

### **Integrated Disease Surveillance Project: Leptospirosis perspective**

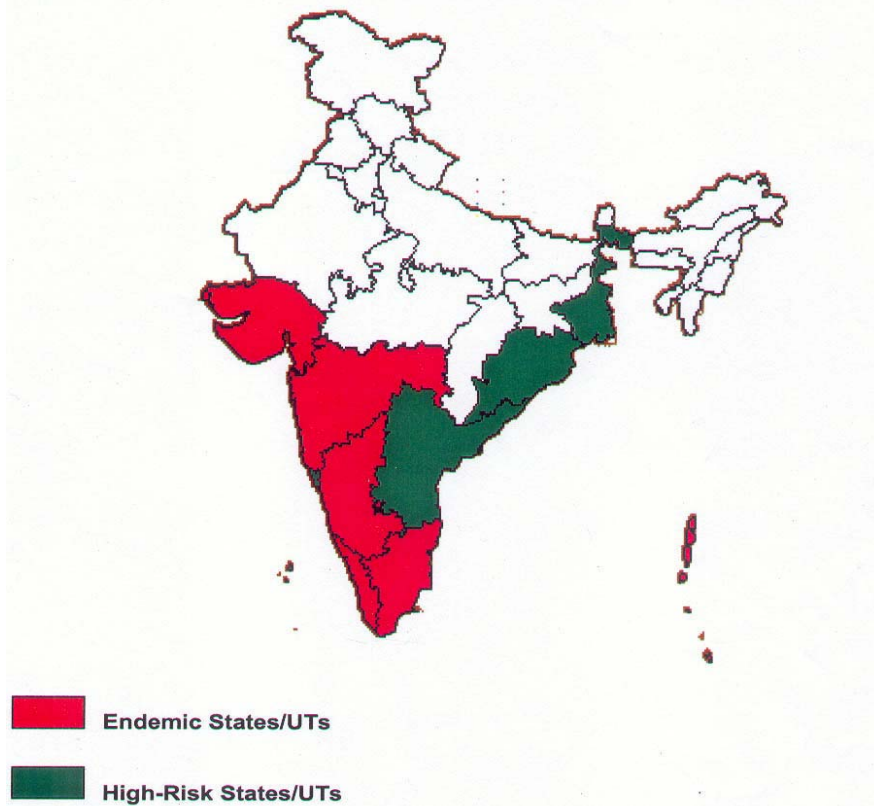
**Dr. Veena Mittal**, Joint Director and Health Zoonosis Division of NICD then presented the Leptospirosis perspective of the Integrated disease Surveillance Project. In the overview the present surveillance activities under NSPCD in 101 districts since 1997-98, the surveillance under the different National Health Programmes for Malaria, Tuberculosis, Polio, Leprosy, RCH and HIV/AIDS, and the limitations of the current surveillance due to overburdening of the health care workers at the grass root level, the lack of integration, the incomplete coverage by non-involvement of the private sector was explained. The poor quality of data transmission, data analysis, limited response, quality of reporting and non-inclusion of non-communicable diseases was also highlighted. The objective of the IDSP is to establish a decentralized system of disease surveillance for timely and effective public health action, and to improve the efficiency of disease surveillance for use in health planning, management and evaluating control strategies. The expected outcome is to develop capacity to detect early warning signals of impending disease outbreaks so as to prevent epidemics and for effective response. Increased capacity of laboratory diagnostics was also highlighted. The list of target diseases in IDSP do not include leptospirosis under the core diseases but many endemic states (Maharashtra, Karnataka, Kerala, Gujarat, Tamil Nadu) have included it under the 5 state specific list of diseases. Leptospirosis surveillance would be detected through reporting of suspect cases with symptoms of fever, jaundice, cough, altered sensorium, unusual symptoms/signs/death and epidemiologically linked cases. Use of rapid kits for provisional diagnosis would be available at district labs and confirmatory testing at state level labs.

### **Leptospirosis situation in India**

The Leptospirosis situation in India is a cause of concern. The endemicity of the disease is expanding to cover more and more states in the country. Geographic distribution of Leptospirosis in the country is depicted in figure 1.

**Figure 1:**

Map of India showing Leptospira Endemic and High-Risk States/UTs



The disease is presently endemic and deeply entrenched in Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu and Andaman & Nicobar Islands. High risk areas include Goa, Andhra Pradesh, Orissa and West Bengal. Table 2 clearly shows, the outbreak reported in different states/ UTs from 1984 to 2005.

Table2: **States reporting leptospirosis outbreaks**

<b>Year</b>	<b>State</b>
1984	Tamil Nadu
1988	Andaman & Nicobar
1994	Gujarat
1995	Gujarat
1997	Gujarat, A & N
1999	Gujarat, Tamil Nadu
2000	Maharashtra, Gujarat, Tamil Nadu, Kerala
2001	Maharashtra, Gujarat, Tamil Nadu, Kerala & Goa
2002	Kerala, Maharashtra, Gujarat, Tamil Nadu
2003	Kerala, Gujarat, Tamil Nadu, A & N
2004	Kerala, Gujarat, Andaman & Nicobar
2005	Maharashtra, Kerala, Gujarat, Tamil Nadu, A &

N

The disease is presenting a cycle of epidemics to increasing areas of endemicity resulting in further outbreaks. Epidemics are associated with changes in human behavior, animal and sewage contamination of water and changes in animal reservoir density. Another cause for concern is the increasing outbreaks of leptospirosis in post-disaster situations like following the Orissa super-cyclone and floods in 1999 and Mumbai flash floods in 2005.

Varying clinical presentations is again a cause for concern with presentations as varied as:

- hepato-renal involvement
- pulmonary involvement including hemoptysis
- acute respiratory distress syndrome
- disseminated intravascular coagulopathy (DIC)
- multi-organ failure

This bears significance in provision of critical care which includes requirements of dialysis units and ventilators

### **Status report of Leptospirosis in endemic states**

**Karnataka**

Leptospirosis outbreaks have been reported in 15 districts of Karnataka. The highest incidence of cases have occurred in Bangalore city, Uttara Kannada, Shimoga, Bidar, Gulbarga, Udupi, Dakshin Kannada districts. During the year 2004, 152 confirmed cases and 11 deaths were reported and during 2005, 224 cases and 19 deaths were reported. Majority of the patients presented with the history of fever with or without chills, myalgia and sometimes with antralgia. Patients responded well to treatment with anti-pyretic like paracetamol and antibiotics like amoxycillin with complete recovery within 5-10 days. Most of the affected cases were from households belonging to higher socio-economic strata and owned cattle also. Activities carried out during the control of the outbreak were coordinated inter-sectorally with health, animal husbandry, panchayats, municipalities, water supply and sanitation boards, under the chairmanship of the assistant commissioners of the district. The departments of agriculture and forests also supported the activities especially in rodent control activities. Intensive IEC activities were also carried out and covered neighbouring villages also.

**Table 1: Status report of Leptospirosis in Karnataka (2004-2005)**

SI No.	Name of the dist.	Year 2004		Year 2005	
		Attack	Death	Attack	Death
1	Bangalore City	37	-	-	-
2	Davangere	2	1	8	1
3	Kolar	2	-	-	-
4	Shimoga	23	-	25	-
5	Uttara kannada	44	3	11	-
6	Bidar	-	-	20	-
7	Gulbarga	-	-	37	-
8	Koppal	4	-	-	-
9	Chikmagalur	1	-	3	-
10.	Dakshina kannada	13	2	37	4
11	Udupi	28	5	49	10
12	Hassan	-	-	1	-
13	Mandya	4	-	2	1
14	Mysore	1	-	-	-
15	Chamarajnagar	-	-	2	-
	<b>Total</b>	152	11	224	19

Source: DHS Karnataka

### Andaman & Nicobar Islands

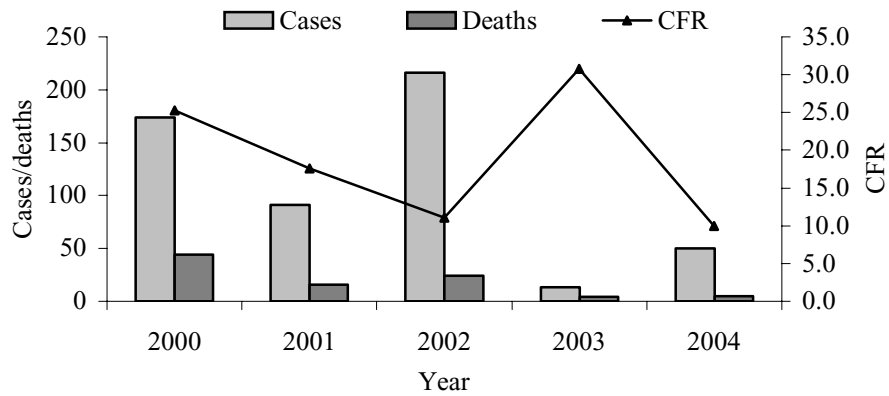
Andaman & Nicobar Islands have been known to be endemic since early part of 20<sup>th</sup> century. Outbreaks of Andaman Haemorrhagic Fever (AHF) were reported in 1988. This was proved to be leptospirosis in 1994.

A total of 80 suspects were admitted to GB Pant Hospital, Port Blair in the last year. 58 cases were confirmed and 14 deaths occurred giving a CFR of 24.1%. Majority of the deaths were due to pulmonary hemorrhage and occurred within 48 hrs. All ages were affected. The seasonal trend of the disease with the monsoon was obvious with two

peaks in July and October-November. Rural urban ratio was 46:12 with exposure to agriculture being 69%, and history of contact with animals being 72.4%.

During 2000-2004, 544 cases were reported in Andaman by the disease surveillance system. No cases were reported from Nicobar district. There were a total of 93 deaths. High incidence was reported in 2002. (Year wise cases and deaths and CFR). Occasional cases were reported from neighbouring islands also.

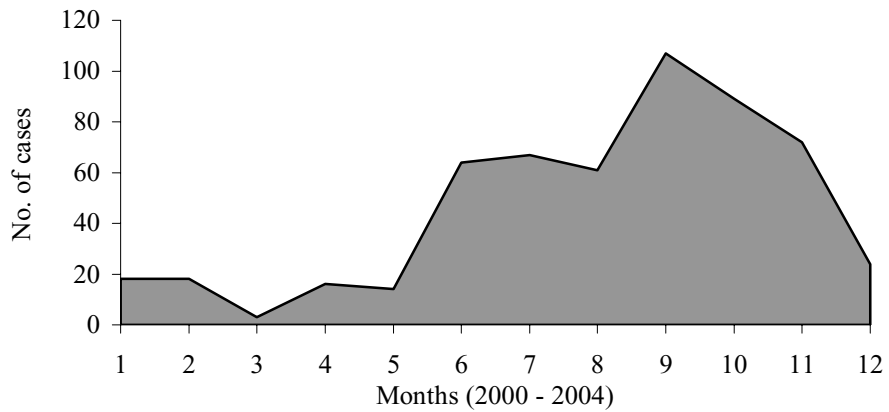
**Figure 1: Year-wise Leptospirosis cases, deaths and CFR\* in Andaman & Nicobar Islands (2000-2004)**



*\*data missing for some months*

Source: DHS Andaman & Nicobar Islands

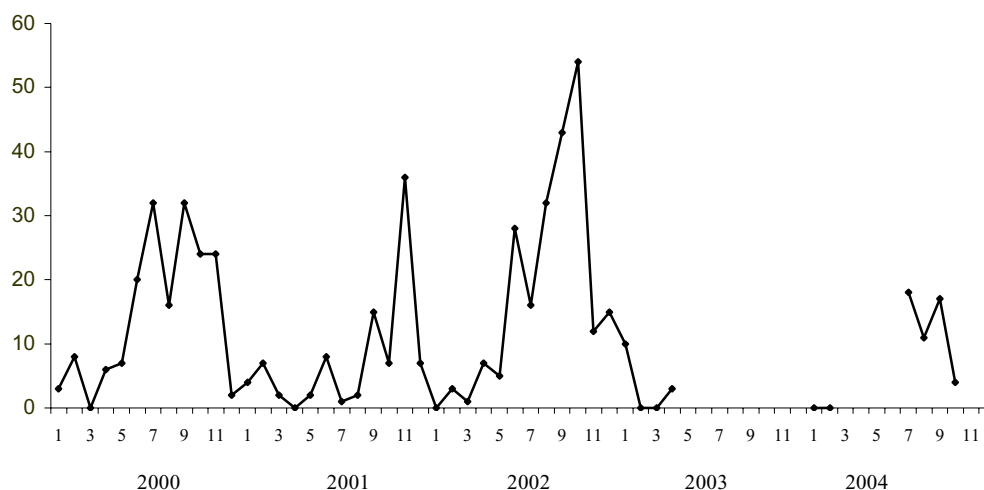
**Figure 2: Seasonal trend of Leptospirosis cases \* in Andaman & Nicobar Islands (2000-2004)**



*\*data missing for some months*

Source: DHS Andaman & Nicobar Islands

**Figure 4: Monthly reported cases in Andaman & Nicobar Islands (2000-2004)**



*\*data missing for some months*

Source: DHS Andaman & Nicobar Islands

## Gujarat

The disease is endemic in Surat, Navasari, Dangs and Valsad districts of Gujarat with highest endemicity in Valsad district (Table 2). Occurrence of cases in Gujarat follows a seasonal pattern between July to October i.e. during the monsoon season.

**Table 2: Year wise Leptospirosis cases reported from Southern region of Gujarat**

Sr. No.	Year	Valsad			Navsari			Surat			Total		
		No. of affected Village	No. of Cases	Deaths	No. of affected Village	No. of Cases	Deaths	No. of affected Village	No. of Cases	Deaths	No. of affected Village	No. of Cases	Deaths
1	1994	74	158	12	0	0	0	0	0	0	74	158	12
2	1995	13	14	2	0	0	0	0	0	0	13	14	0
3	1996	38	40	9	0	0	0	0	0	0	38	40	9
4	1997	226	448	53	0	0	0	117	209	23	343	657	76
5	1998	235	463	37	0	0	0	60	74	5	295	537	42
6	1999	50	100	6	56	100	10	123	165	15	229	365	31
7	2000	27	28	4	39	50	2	56	78	10	122	156	16
8	2001	0	0	0	2	2	0	2	2	0	4	4	0
9	2002	7	9	1	20	13	2	14	15	3	41	37	6
10	2003	49	72	9	91	145	27	97	156	23	237	373	59
11	2004	68	98	15	130	246	43	163	285	34	362	630	92
12	2005	58	88	11	70	114	26	123	185	43	251	392	81

Source: DHS Gujarat



In the year 2005, 392 cases and 81 deaths due to Leptospirosis were reported from endemic areas of south Gujarat (Table 3).

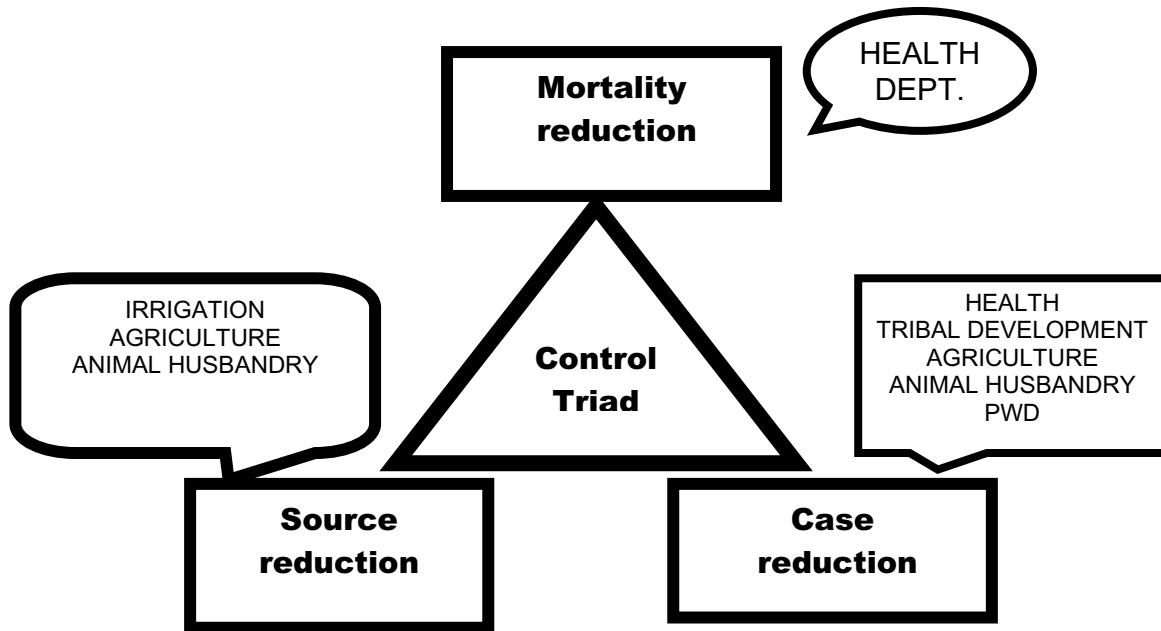
**Table 3: Block-wise Leptospirosis cases & deaths reported in Southern Gujarat**

District	Sr. No.	Name of Taluka	No. of affected Village	Case	Death
Surat	1	Olpad	6	7	1
	2	Mahuva	28	50	13
	3	Bardoli	19	27	7
	4	Palsana	10	13	4
	5	Valod	12	26	2
	6	Vyara	29	38	7
	7	Songadh	8	9	5
	8	Mandvi	9	9	4
	9	Kamrej	1	1	0
	10	Choryasi	0	0	0
	11	Mangrol	1	1	0
	12	Uchhchhal	0	0	0
	13	Muni.Corpo.Surat	0	4	0
	<b>Total ...</b>			<b>123</b>	<b>185</b>
Navsari	1	Navsari	11	23	5
	2	Chikhali	29	45	12
	3	Gandevi	13	21	1
	4	Jalalpor	11	16	6
	5	Vansada	6	9	2
	<b>Total ...</b>			<b>70</b>	<b>114</b>
Valsad	1	Umargam	6	6	2
	2	Valsad	22	45	5
	3	Pardi	22	28	2
	4	Dharampur	6	7	2
	5	Kaparada	2	2	0
	<b>Total</b>			<b>58</b>	<b>88</b>
Bharuch	Valiya & Hansot		2	2	0
Gandhinagar	Kalol & Mansa		2	2	1
Others Maharashtra	-		1	1	0
<b>Grand Total ... ..</b>			<b>256</b>	<b>392</b>	<b>81</b>

Source: DHS Gujarat

Public health control measures have been directed towards source reduction to begin with followed by case reduction and then subsequent reduction in case mortality-CONTROL TRIAD (Figure 4). This is achieved through a multi-sectoral approach involving collaborative work between the departments of health, irrigation, agriculture, animal husbandry, tribal development and public works.

**Figure 4: Control triad for prevention and control of Leptospirosis in Gujarat**



### Maharashtra

Leptospirosis has been reported regularly since 1998 in Maharashtra. High risk areas include the coastal districts of Maharashtra. Outbreaks occur in association with flooding. There is significant underreporting due to unawareness of the disease, protean manifestations like fever, hepato-renal syndrome and pulmonary syndrome cases. Laboratory diagnostic facilities are not adequate to diagnose cases.

The number of districts in Maharashtra reporting Leptospirosis cases has expanded from 2 in 1998 to 10 districts in 2005. The coastal urban districts Mumbai and Thane report outbreaks during monsoon whereas Kolhapur and Sangli districts reported cases for the first time in 2005 post floods. The coastal districts of Sindhudurg also reports outbreaks in rice field farmers during the monsoon. Table 4 shows the year-wise cases and deaths from 1988 to 2005. 2355 cases and 167 deaths were reported in 2005 mainly due to a large outbreak during the post-floods.

The serovars isolated are mainly *L. icterohemorrhagiae* (rats), *L. canicola* (canines) and *L. australis* (cattle).

**Table 4: Year wise Cases & Deaths Due to Leptospirosis: 1998 To 2005 in Maharashtra State (Sporadic + Outbreaks)**

Sr. No	Year	Total		
		No. of affected Districts	No. of Cases	Deaths
1	1998	2	197	7
2	1999	2	120	3
3	2000	3	324	59
4	2001	7	860	111
5	2002	6	53	5
6	2003	3	350	24
7	2004	7	225	18
8	2005	10	2355	167

Source: DHS Maharashtra

Experience with recent outbreaks of Leptospirosis has highlighted the need for strengthening Leptospirosis surveillance through improved and proper use of case definitions, systematic outbreak investigations, fortnightly reporting system, health education & community participation and improved laboratory support in the form of field use of rapid diagnostic tests, strengthened laboratory capacity and quality control and training of laboratory personnel in the diagnosis of Leptospirosis.

### **Control of leptospirosis through reduction in source of infection**

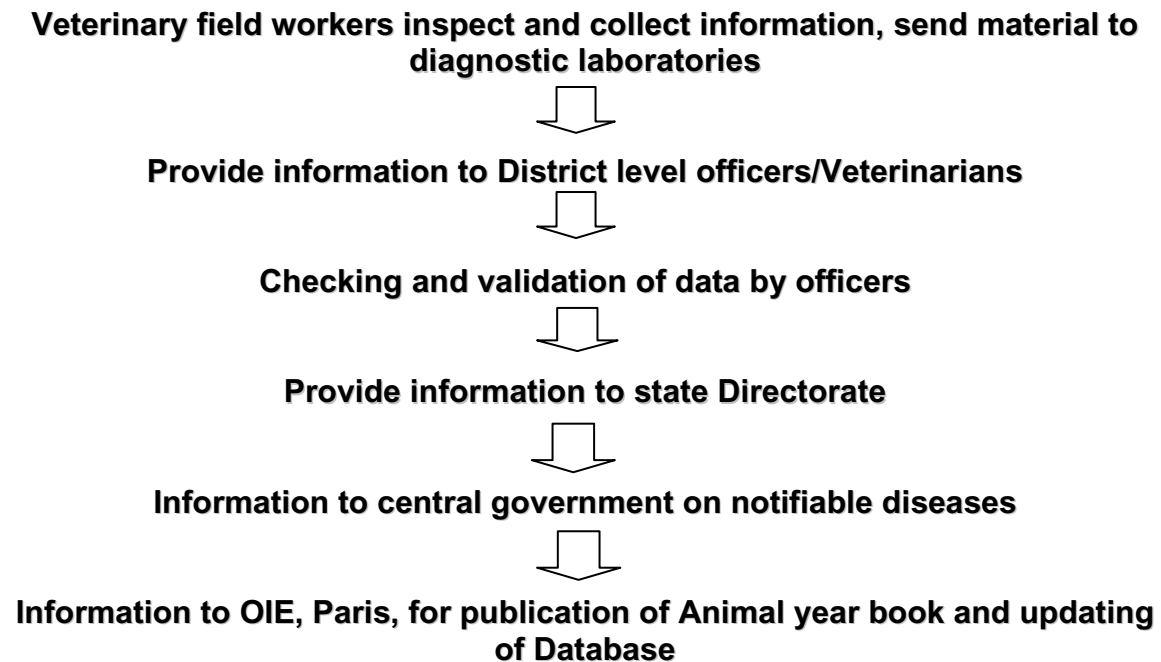
Dr Veena Mittal, described how an inter-sectoral approach can reduce the source of the infection and can help in eventual control of Leptospirosis. The role of public health engineering in assessing the need of developmental projects for public health impact along with environmental impact, the need to change the current irrigation, agricultural , and animal husbandry practices and targeted health education was highlighted.

### **Surveillance strategies for animal Leptospirosis**

Dr. S.K.Srivastava, Joint Director, Indian Veterinary Research Institute then informed the expert group on the current surveillance system for Leptospirosis in the veterinary sector which included routine surveillance (for sero-prevalence and investigation of cases), event specific surveillance (for outbreak investigation and to assess utility of interventions) in domestic animals, wild animals and natural carriers. The **Central and state level institutions related to Animal husbandry /Agriculture and involved in**

**Leptospirosis surveillance** include the animal science division under Indian Council for Agricultural Research (ICAR) of Ministry of Agriculture, Central Disease Diagnostic Laboratory (IVRI Izatnagar), State research councils (UPCAR), State Agricultural Universities, Veterinary Colleges, NGOs, PSUs and Private Sector.

**Figure 5: Information in flow in animal Leptospirosis Surveillance system**



Prevalence studies being carried out by IVRI during last 35 years have shown Overall prevalence during **1975-90** as 10.1%, being highest in sheep (20.6%). The common serovars identified in animals during the period were *Leptospira pomona*, *patoc*, *australis*, *grippotyposa*, *hardjo*, *autumnalis*, and *RGA*. During 1991-2000 the overall sero-positivity marginally increased to 13.4% which was due to an increase in cases of Leptospirosis in cattle (15.8%) and dogs (19.1%) and the common serovars were *RGA*, *patoc*, *australis*, *autumnalis*, *grippotyposa*, *pyrogens*, *ballum*, *hardjo*, *pomona* and *canicola*. During next 5 years (2000-2005) the disease status has remained as approx 12% with most prevalent serovars being *canicola*, *pyrogens*, *pomona*, *sejroe*, *grippotyposa*, *ballum*, *tarassovi*, *hardjo* and *RGA*.

Based on the prevalence studies and distribution of *Leptospira* in animals in different states, the states have been classified as high prevalence, moderate prevalence and rarely reporting states (Table 5).

A national coordination network in the form of a Central Leptospirosis Surveillance and Monitoring Unit was also proposed. The aim is to bring convergence in human and veterinary Leptospirosis surveillance for prevention and control measures by information exchange between the Ministry of Health and the Ministry of Agriculture.



**Table 5: Distribution of *Leptospira* serovars in India**

<u>STATE</u>	<u>ANIMAL SPECIES</u>	<u>SEROVARs</u>
<b>HIGH PREVALENCE</b>		
<b>Tamil Nadu, Kerala, Andaman</b>	cattle, buff., sheep, goats, pig	pyrogenes, pomona, icterohaemorrhagiae, australis, autumnalis, hebdomadis, hardjo
<b>MODERATE PREVALENCE</b>		
<b>Maharashtra, U.P., M.P., Gujarat, Karnataka</b>	cattle, buff, goats, sheep, pigs, dogs, horse	pomona, hardjo, canicola, icterohaemorrhagiae, pyrogenes, javanica
<b>RARELY REPORTED</b>		
<b>Punjab, J&amp;K, Rajasthan, North-Eastern Hills, Himachal Pradesh</b>	cattle, sheep	icterohaemorrhagiae, pyrogenes, canicola

*\*Based on isolation and serology*

Source: IVRI Izatnagar

### **Outbreak of Leptospirosis in Mumbai and Thane, August 2005**

Dr A P Sugunan, RMRC Port Blair described the findings of the large Leptospirosis outbreak in Western Maharashtra in August 2005, particularly Mumbai and Thane districts, with special reference to the performance of various available diagnostic tools. The outbreak followed heavy rainfall in the last week of July 2005. A large number of people were exposed to flood waters in Mumbai and Thane.

A total of 720 patients with suspected leptospirosis were admitted to Municipal Hospitals after the onset of rains till 23 August. Out of the 212 deaths in Mumbai Municipal Hospitals during the period 28 July to 23 August 2005, 62 (29.2%) were due to Leptospirosis. Another 118 cases and 14 deaths were reported by three major private hospitals. A total of 591 cases and 36 deaths were reported by Government/ Municipal hospitals in Thane district.

The flooded roads and overflowing sewage canals created an ideal condition for the transmission of *Leptospira* infection resulting in the outbreak. It was found that during the one month period following the floods, Leptospirosis was a major cause of mortality amongst all infectious diseases under surveillance

Various commercially available rapid screening tests were used by different hospitals for diagnosis. One of these tests, was found to have good sensitivity, but low specificity.

Indigenous IgM ELISA and Latex Agglutination Test developed by RMRC showed good sensitivity and acceptable specificity. The investigations also showed the usefulness of PCR in detecting outbreaks. The experience, however, reiterated the need to systematically evaluate the commercially available test kits before being adopted for routine use.

***Recommendations:***

**Strengthening preparedness & public health response to Leptospirosis including clinical case management and environmental management:**

- ▶ In view of the high case fatality in complicated cases and availability of easy case management options, there is a need to have **separate case definition for epidemiological surveillance and clinical case management as suggested below**. The latter could be based on a scoring system (such as those defined by Faine in 1982 and modified by a number of workers) **for rapid clinical assessment, prompt case management and reduction in CFR**.

- ▶ **Case definition for epidemiological surveillance:**

The importance of having simple, practical and effective case definitions cannot be over-emphasized. Since one cannot have an exclusive surveillance for leptospirosis, this has to be incorporated in the existing integrated disease surveillance project (IDSP) of the country. In IDSP there are three surveillance case definitions:

- **“suspect”** case definitions – for peripheral health workers
- **“probable”** case definition – for medical officers
- **“confirmed”** case definition – after laboratory diagnosis

The health care workers could report suspect cases based on the following criteria for a “Suspect” case:

- acute febrile illness (>39 C )with
  - myalgia
  - Conjunctival suffusion, and
  - history of exposure to leptospira-contaminated environment

The medical officers in PHCs/CHCs could report “Probable” case as per the following criteria:

- acute febrile illness(39 C) with
  - myalgia &
  - sub-conjunctival suffusion with/without haemorrhageand one of the following
- meningeal irritation
- anuria/oliguria and /or proteinuria
- jaundice
- hemorrhagic manifestations
- cough with or without hemoptysis
- breathlessness
- calf tenderness

- cardiac arrhythmias
- skin rashes

▶ **Clinical case definition:**

For better clinical management of admitted cases a clinical case definition based on the modified Faine's criteria could be adapted and used at district level hospitals and above. Examples of clinical case definitions are at annex 2.

▶ **Outbreak prevention** would require clear case definitions for surveillance, surveillance standards, capacity building, standard case management guidelines supported by strong IEC and backed up by good network of laboratories and applied research (such as sero-surveillance studies) for continuous improvement of prevention and control strategies. Inter-sectoral coordination between health, animal husbandry, agriculture, environment (water supply and sewage boards), urban development etc. is vital for outbreak prevention and control.

▶ Prevention and control strategies including those involving environmental measures can be planned as short-term and long term measures.

▶ Short-term measures for reducing disease burden as well as preventing and/ or reducing the impact of outbreaks would include:

- **At-risk group population (farmers, sewage workers, canal workers, dairy workers etc.) should be encouraged to use personal protection equipments such as** gloves, boots, masks, protective goggles (while milking cows) etc. Some **safe practices** in these high risk groups such as wearing protective clothing in hazardous tasks like clearing of drains, de-weeding/de-silting operations, working in sewers or during flood relief activities, washing or showering after exposure to contaminated soil or water, hygienic practices while handling pets and domestic animals and washing of hands after each contact can reduce risk of exposure.

Use of PPE should be promoted and made available at subsidized rates through cooperative societies/ agriculture departments/ municipal corporations etc. Necessary legislations/ enforcement may be enacted to facilitate use of PPE by high risk groups.

- Health care workers should be trained in **early identification of suspected cases** to reduce avoidable morbidity and mortality due to Leptospirosis.
- **Scientific rodent control measures** such as use of selected rodenticides, trapping of rats, denial of access by rodent proofing of buildings and cattle sheds, building of rodent proof large food storage facilities, clean sanitary practices in domestic kitchens by clearing all food waste and safe storage of food in rat proof containers
- **IEC campaigns in endemic areas and during outbreaks are an important adjunct to ensure community participation and for prevention**

and control. Use of AV aids developed by different endemic states (e.g. Kerala) can be used as excellent resource.

- **Guidelines on chemoprophylaxis** and clinical case management could also be important short-term measures to reduce morbidity and mortality. Chemoprophylaxis (200 mg doxycycline weekly for 6 – 8 weeks) for high risk groups) could be considered for a limited period only, during outbreaks. However, further epidemiological studies are required to establish the safety and efficacy of such measures.
- ▶ **Long-term** measures would be more effective in controlling Leptospirosis but are difficult to implement and would require sustained efforts. These include:
  - **Changes in lifestyle such as** proper storage of food, proper disposal of kitchen waste would result in denial of food & shelter for rodents
  - Innovative **housing design construction** for rodent proofing
  - Minimization **of animal-human contact** through better animal husbandry management practices (such as shifting of all organized cattle rearing outside the vicinity of human habitation, segregation of domestic animals & pets from human dwellings, construction of impervious RCC flooring in dairy farms)
  - Better solid **waste management** of human and animal waste
  - **Change in agriculture practices** to prevent water logging and changes in soil pH
  - Activation of **National/ state Zoonosis Committees** with inter-sectoral representation. These committees should review the disease status, suggest action plans, and meet pre and post monsoon to review the effectiveness of the intervention strategies.

**Strengthening laboratory support to diagnosis and surveillance: Mechanisms for inter-laboratory and inter-sectoral networking and collaboration for lab support and standardization of diagnostic test procedures:**

*LABORATORY IN SURVEILLANCE:*

- ▶ Based on availability of laboratory facilities a **probable case of Leptospirosis** for is a suspect case with a positive rapid IgM test

**AND/OR**

supportive serologic findings (i.e., a MAT titer\* of greater than or equal to 200 more in a single sample)

**AND/OR**

any three of the following:

- Urinary findings: proteinuria, pus cells, blood
  - relative neutrophilia (>80%) with lymphopenia
  - platelet < 100,000
  - elevated serum bilirubin >2mg%; liver enzymes moderately raised (Serum Alkaline Phosphatase, S amylase, CPK)
- ▶ Single MAT titer should be interpreted in the light of baseline/ cut-off titers established for the geographic area
- ▶ Clinical decision for treatment initiation may be made on the basis of clinical and epidemiological findings alone
- ▶ Microbiologically, a **confirmed case of Leptospirosis\*** is a suspect or probable case with any one of the following:
- Isolation of leptospire from clinical specimens
  - Positive PCR result
  - Seroconversion from a negative to positive or four-fold rise in titer by MAT

**\*It is recommended that role of two rapid tests of high specificity needs to be evaluated to confirm cases of leptospirosis in relation to the above mentioned criteria (to be undertaken by the National Reference Laboratory)**

#### *OUTBREAK INVESTIGATION:*

- Commercial rapid kits can help establish probable diagnosis as per epidemiological case definition and help initiate prompt treatment and control
- For rapid laboratory confirmation of the causative agent of the outbreak, **PCR is the best suited confirmatory diagnostic tool available** and should be performed on at least 20 well selected cases of which at least 5 should be positive; subsequently, to monitor the progress of the outbreak, a representative 5-10% (or more if the resources permit) well selected cases need to be confirmed on an ongoing basis during the outbreak. Of the currently available PCR protocols will report confirmatory results in a minimum of 72 hours.
- Other cases with epidemiological linkage should be considered as indicative of leptospiral infection
- At least 1 state level lab should be identified in each state to carry out culture and/ or PCR (as per the standard guidelines laid down by the national reference laboratory)

#### *ROUTINE SURVEILLANCE and CLINICAL DIAGNOSIS IN ENDEMIC AREAS:*

- For routine surveillance and clinical diagnosis, all suspect cases should be screened using a rapid test (validated by the national reference laboratory); representative samples should be considered for confirmatory diagnosis (preferably isolation/ PCR) for additional information

#### *SEROSURVEILLANCE/ SURVEYS:*

- Baseline surveys should be carried out by regional laboratories (L4) initially and on a periodic basis with MAT for sero-surveillance in endemic areas based on a sound statistical design

#### *QUALITY ASSURANCE FOR LEPTOSPIROSIS TESTING LABORATORIES AND EVALUATION OF COMMERCIAL ASSAYS:*

- The problems with establishing the laboratory diagnosis due to the inherent nature of the pathogen is further complicated by quality issues in testing laboratories. RMRC Port Blair (WHO Collaborating Centre for Diagnosis, Research, Reference and Training in Leptospirosis) along with the regional laboratories will take the lead in designing and supporting a practical and feasible quality assurance programme for testing laboratories. Efforts will be made to strengthen quality assurance for Leptospirosis diagnosis within the framework of IDSP. WHO can provide technical support for the same.
- Studies to evaluate the performance of commercial assays and establish the value of one rapid test vs. two rapid test system in establishing a confirmatory diagnosis will be carried out with RMRC as the lead agency along with regional and state level laboratories in endemic states; WHO can provide support to such multi-centric efforts

#### *LABORATORY NETWORKING:*

- ▶ Laboratory network for Leptospirosis diagnosis should be based on the framework of Integrated Disease Surveillance Project (IDSP)
- ▶ The network should have the following designated roles and responsibilities:

<b>National reference centre (L5)</b>
---------------------------------------

<ul style="list-style-type: none"> <li>• Quality assurance support to the rest of the network</li> <li>• Evaluation of kits and reagents</li> <li>• Production &amp; supply of reagents and biologicals including Latex kits and ELISA developed by RMRC</li> <li>• Maintenance of reference repositories/ strain banks followed by in-depth molecular analysis and characterization of submitted isolates; link it to development of indigenous diagnostics</li> <li>• Vaccine development</li> <li>• Capacity building</li> <li>• Organize and maintain international collaborations and networks such as with WHO CCs</li> </ul>
<b>Regional laboratories (L4)</b>
<ul style="list-style-type: none"> <li>• Culture, MAT, PCR: NICD (north and east), Kolenchery Institute (south), Haffkine Institute Mumbai (west) are a suggested list</li> <li>• Quality assurance for state labs</li> <li>• Serosurveillance studies</li> <li>• Training</li> </ul>
<b>State laboratories (L3)</b>
<ul style="list-style-type: none"> <li>• Training</li> <li>• Isolation, PCR, MAT (wherever feasible)</li> </ul>
<b>District laboratories (L2)</b>
<ul style="list-style-type: none"> <li>• Rapid test</li> <li>• Biochemical tests</li> </ul>
<b>Peripheral laboratories (L1)</b>
<ul style="list-style-type: none"> <li>• Specimen collection and transportation</li> </ul>

- ▶ **RMRC Port Blair can provide the services of a National Reference Center (L5 laboratory) with suitable additional inputs from IDSP;** Regional reference laboratories can be identified based on an inclusion criteria and following signing of an MoU with the IDSP. WHO can assist in outlining the TORs and inclusion criteria for regional laboratories
- ▶ **RMRC will coordinate with the veterinary laboratories and outline mechanisms** for such collaboration including information exchange at the all lower levels.
- ▶ **National reference center and designated regional laboratories will investigate all outbreaks and document the findings**
- ▶ **National Reference Centre should regularly organize workshops for hands-on training in laboratory methods in leptospirosis**

#### **Role of WHO:**

- ▶ Providing **technical support for improving coordination** between stake holders and development of strategies, protocols, guidelines and manpower, especially to cater to the priority issues as identified.

- ▶ **Facilitating international collaborations** through provision and exchange of samples and reference materials and exchange of expertise through visits of scientists

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### Clinical case definition for Leptospirosis

#### Faine's criteria and Modified Faine's criteria (Chennai group):

A score of 26 or more when using PART A, PART A+B or 25 or more using PART A+B+C can be considered as current Leptospirosis.

<b>Faine's Criteria</b>		<b>Modified Faine's criteria</b>	
<b>Part A: Clinical data</b>		<b>Part A: Clinical data</b>	
Question	Score	Question	Score
Headache	2	Headache	2
Fever	2	Fever	2
Temp > 39°C	2	Temp > 39°C	2
Conjunctival Suffusion	4	Conjunctival Suffusion	4
Meningism	4	Meningism	4
Muscle pain	4	Muscle pain	4
Conjunctival suffusion + Meningism + muscle pain	10	Conjunctival suffusion + Meningism + muscle pain	10
Jaundice	1	Jaundice	1
Albuminuria/Nitrogen retention	2	Albuminuria/Nitrogen retention	2
<b>Part B Epidemiological factors</b>		<b>Part B Epidemiological factors</b>	
Contact with animals or contact with known contaminated water	10	Rainfall	5
		Contact with cont environment	4
		Animal contact	1
Total		Total	
<b>Part C Bacteriological and lab findings</b>		<b>Part C Bacteriological and lab findings</b>	
Isolation of leptospirosis in culture - diagnosis certain		Isolation of leptospirosis in culture - diagnosis certain	
<b>Positive serology(MAT)</b>		<b>Positive serology</b>	
<b>Leptospirosis endemic</b>			
Single positive low titre	2	ELISA IgM positive*	15
Single positive high titre	10	SAT positive*	15
<b>Leptospirosis non-endemic</b>			
Single low titre	5	MAT single high titre*	15
Single positive high titre	15	Rising titre (paired sera)	25
Rising titer (paired sera)	25		
<b>Total Score</b>		<b>Total Score</b>	

\*Any one of the test only should be scored

**Modified Faine's criteria (RMRC Port Blair):**

To use the list, note the main clinical features listed, make the answer column Yes or No and write the appropriate score. A presumptive diagnosis of Leptospirosis may be made if part A or part A & B together score 26 or more or part A, B & C total score 25 or more. A score between 20 and 25 suggest Leptospirosis as a possible but unconfirmed diagnosis.

<b>Part A</b>	<b>Score for answers</b>	
	<b>Yes</b>	<b>No</b>
<b>Has the patient:</b>		
Headache of sudden onset?	2	0
Fever	2	0
If, Yes is the temp. 39 C or more?	2	0
Conjunctival suffusion?	4	0
Muscle pains?	4	0
Meningism?	4	0
Are all features (Q. No. 4, 5 & 6 ) present together?	10	0
Jaundice?	1	0
Albuminuria or Nitrogen retention?	2	0
<b>Total for Part A</b>		
<b>Part B</b>		
Has there been contact with animals at home, work, leisure or in travel, or contact with known contaminated water ?	10	0
<b>Part C</b>		
Isolation of leptospire in culture	Diagnosis confirmed	
Positive serology (leptospirosis endemic)		
Single positive - low titre	2	0
Single positive – high titre	10	0
Paired sera, raising titre	25	0
Positive serology (leptospirosis non-endemic)		
Single positive - low titre	5	0
Single positive – high titre	15	0
Paired sera, raising titre	25	0
<b>Total for Part C</b>		
<b>Total Score (Part A+Part B+Part C)</b>		