World Organisation for Animal Health

Vinayagamurthy Balamurugan - - INDIA

WOAH Reference Laboratory Reports Activities 2025

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LABORATORY INFORMATION

***Name of disease (or topic) for which you are a designated WOAH Reference Laboratory:**	Leptospirosis
***Address of laboratory:**	ICAR-NIVEDI, Yelahanka, Bengaluru, India
***Tel:**	+9108023093136
***E-mail address:**	b.vinayagamurthy@icar.org.in
Website:	https://www.nivedi.res.in/
***Name (including Title) of Head of Laboratory (Responsible Official):**	Dr. BALAMURUGAN VINAYAGAMURTHY
***Name (including Title and Position) of WOAH Reference Expert:**	Dr BALAMURUGAN VINAYAGAMURTHY, PRINCIPAL SCIENTIST
***Which of the following defines your laboratory? Check all that apply:**	Governmental

TOR1: DIAGNOSTIC METHODS

1. Did your laboratory perform diagnostic tests for the specified disease/topic for purposes such as disease diagnosis, screening of animals for export, surveillance, etc.? (Not for quality control, proficiency testing or staff training)

Yes

Diagnostic Test	Indicated in WOAH Manual (Yes/No)	Total number of test performed last year	
Indirect diagnostic tests		Nationally	Internationally
Microscopic Agglutination Test (MAT) for Diagnosis	Yes	263	0
Microscopic Agglutination Test (MAT) for Surveillance	Yes	1274	0
Direct diagnostic tests		Nationally	Internationally
PCR (LipL32) for Diagnosis	Yes	112	0
PCR (LipL32) for Surveillance	Yes	31	0
Real Time qPCR (LipL32) for Diagnosis	Yes	23	0

TOR2: REFERENCE MATERIAL

2. Did your laboratory produce or supply imported standard reference reagents officially recognised by WOAH?

No

3. Did your laboratory supply standard reference reagents (nonWOAH-approved) and/or other diagnostic reagents to WOAH Members?

Yes

Type of reagent available	Related diagnostic test	Produced/ provide	Amount supplied nationally (ml, mg)	Amount supplied internationally (ml, mg)	No. of recipient WOAH Member Countries	Country of recipients
Leptospira serovars	MAT	Provided	1ml of Culture each for 7 laboratories (a total of	NA	1	INDIA,

			23 serovars supplied)			
Leptospira staining kit	Identification of Leptospira through silver staining	Produced and Supplied	4 kits (each capacity to test of 100 samples) supplied to 4 Laboratories	NA	1	INDIA,
BovineLeptoLAT KIT (in house developed)	Rapid Test -Latex Agglutination Test	Produced and Supplied	23 kits (each capacity to test of 100 samples) supplied to 13 Laboratories	NA	1	INDIA,
Leptospira reference serovar DNA	PCR	Provided	50µl of DNA each for 12 Laboratories	NA	1	INDIA,

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to WOAH Members?

TOR3: NEW PROCEDURES

6. Did your laboratory develop new diagnostic methods for the designated pathogen or disease?

No

7. Did your laboratory validate diagnostic methods according to WOAH Standards for the designated pathogen or disease?

No

8. Did your laboratory develop new vaccines for the designated pathogen or disease?

9. Did your laboratory validate vaccines according to WOAH Standards for the designated pathogen or disease?

TOR4: DIAGNOSTIC TESTING FACILITIES

10. Did your laboratory carry out diagnostic testing for other WOAH Members?

No

11. Did your laboratory provide expert advice in technical consultancies on the request of an WOAH Member?

Yes

Name of the WOAH Member Country receiving a technical consultancy	Purpose	How the advice was provided
NEPAL	Leptospirosis Diagnostic Support: Provided technical advice and support for screening samples for leptospirosis using the Microscopic Agglutination Test (MAT). Additionally, shared guidelines for the safe transport of biological materials to facilitate effective testing and international collaboration.	Correspondence for Collaboration: Communication was conducted via email with the concerned officer, Dr. Binod Lekhak, Professor and Head, Central Department of Microbiology, Tribhuvan University, Nepal, to facilitate coordination and information exchange.
JAPAN	For Integrated surveillance in Leptospirosis to Dr. Kinzang Dukpa, Regional One Health Coordinator, WOAH- Regional representation for Asia and the Pacific, Japan.	Provided PPT slides and document /publication materials- on integrated surveillance for control and management of Leptospirosis to WOAH
ERITREA	Establishment of Leptospirosis diagnostic Laboratory	Provided One month hands on training on Leptospira laboratory training sponsored through IAEA , Austria Fellowship programme.

TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES

12. Did your laboratory participate in international scientific studies in collaboration with WOAH Members other than the own?

No

13. In exercising your activities, have you identified any regulatory research needs* relevant for WOAH?

No

TOR6: EPIZOOLOGICAL DATA

14. Did your Laboratory collect epidemiological data relevant to international disease control?

Yes

If the answer is yes, please provide details of the data collected:

1. Seroprevalence and Serogroup Mapping:
Epidemiological studies were conducted to collect data on host factors (species, age, sex, breed) and farm-level parameters, including population density, history of abortions or reproductive disorders, introduction of new animals, feed and fodder management, health status, breeding methods, hygiene practices, herd characteristics, presence of other animals (dogs, rodents, or other livestock), farm type (individual or mixed), farm location, and GPS-based geographic distribution. This information was used to assess serogroup prevalence and identify risk factors for leptospirosis.

2. Outbreak Investigation:
Collection of clinical samples from animals and fetuses, rodent samples, and environmental samples (water, soil) was carried out. Data on attack rate, morbidity, mortality,, susceptible population, vaccination records, feeding methods, source of feed/fodder, animal purchase sources, drainage and waste management, and breeding practices were recorded to investigate outbreaks and identify contributing factors.

3. Rodent and Environmental Surveillance:
Rodent trapping and identification were performed to capture target species, with subsequent screening of rodent samples. Rodent movements in farms and households were monitored. Environmental samples, including soil from burrowing areas, moist soil, water from drainage, stagnant water, household waste drainage, animal drinking troughs, and cleaning water, were collected and screened to understand environmental reservoirs and transmission pathways of leptospirosis.

15. Did your laboratory disseminate epidemiological data that had been processed and analysed?

Yes

If the answer is yes, please provide details of the data collected:

A. Publications in peer-reviewed journals
B. Institute Annual Reports
1. Active Environmental Transmission of Leptospira in a Coastal District of Dakshina Kannada, Karnataka, India.
2. Molecular Detection and Phylogenetic Characterization of Pathogenic and Intermediate Leptospira Species among Febrile Human Cases in Dakshina Kannada, India.
3. Outbreak Investigation Leptospirosis: ICAR-NIVEDI investigated unexplained livestock deaths (130 animals) at a Kanakapura farm on 27/03/2025. Epidemiological interviews, post-mortems, and testing of 165 samples indicated possible silage-associated exposure. MAT showed low-titer antibodies in 5/42 sera, while PCR confirmed active Leptospira infection in blood, vaginal swabs, tissues, and urine. Immediate control measures, biosecurity strengthening, and vaccination were advised to prevent recurrence.
4. Disease Outbreak Investigation in Pig farm, Mandya, Karnataka, India ; An abortion outbreak affecting pigs in Mandya, India, revealed co-detection of Leptospira interrogans and Brucella spp. in placental tissue and serum samples. This first confirmed swine abortion outbreak of its kind highlights environmental transmission risks and underscores the need for integrated pathogen diagnostics and surveillance in endemic, resource-limited livestock production settings.

16. What method of dissemination of information is most often used by your laboratory? (Indicate in the appropriate box the number by category and list the details in the box)

a) Articles published in peer-reviewed journals:

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1. Kumar KV, Bokade PP, Pal A, Mahadevappa S, Kumar CHB, Gulati BR & Balamurugan V (2025). One Health approach for understanding and managing animal leptospirosis in India. Epi-Dis-PHERE (Publication of Health Resilience), Quarterly e-Journal of National Centre for Disease Control, Vol. 1 issue 1, January 2025. Publisher: Sh. Prakash Doval, Assistant Director (Admin),PBA, NCDC, MoH&FW, GoI.
2. Veena RK, Jayashankar M, Kumar KV, Padma MR & Balamurugan V (2025). Geospatial distribution of Leptospira-specific antibodies in febrile illness cases from Dakshina Kannada, India (2022–2023). Trop Med Int Health, 30 (7), 737–748. https://doi.org/10.1111/tmi.14132
3. Kumar KV, Bokade PP, Pal A, Sowjanyakumari S, Bharath V, Shome BR & Balamurugan V (2025). Detection of anti-leptospiral antibodies in the serum of animals using recombinant Leptospira GroEL-based latex agglutination test. Microb Pathog, 205, 107658. https://doi.org/10.1016/j.micpath.2025.107658
4. Hota A, Thankappan S, Biswal S, Sahoo N, Behera SK, Balamurugan V, Tma SK, Nagarajan M & Deneke Y (2025). Detection of ovine leptospirosis in various agro-climatic

zones of Odisha in the aftermath of cyclone Hudhud using a multi-faceted approach. Indian J Anim Sci, 95 (5), 387–395. https://doi.org/10.56093/ijans.v95i5.167456
5. Nazar M, Ramesh PT, Lathamani VS, Balamurugan V, Rathnamma D & Murthy KMS (2025). Seroprevalence and molecular identification of canine leptospirosis in and around Bangalore. Int J Adv Biochem Res, 9 (7S), 901–908. https://doi.org/10.33545/26174693.2025.v9.i7Sl.5026
6. Murag S, Rathnamma D, Koppad S, Choudapur MK, Suresh KP, Balamurugan V & Patil SS (2025). Seroprevalence and determination of serogroup-specific antibodies of Leptospira in cattle and buffaloes in Karnataka, India. Indian J Anim Sci, 95 (7), 580–587.
7. Vinod Kumar K, Bokade PP, Lakshman R, Deenadayalan O, Sowjanyakumari S, Nayak A, Pal A, Suresh KP, Dharmashekar C, Shivamallu C, Balamurugan V. Meta-analysis of bovine leptospirosis prevalence in India. Arch Razi Inst. 2025 May 31. [Online published].

b) International conferences:

7
1. Thushar H. C., Arun Y. P., Swathi M., K. Vinod Kumar, V. Balamurugan (2025).
Standardization of multiplex PCR (mPCR) for detection and differentiation of Leptospira. Poster presented at the International Symposium on "Advancing One Health: Concept to Action for Promoting Human, Animal and Environmental Health" and the XXI Annual Conference of the Indian Association of Veterinary Public Health Specialists (IAVPHS), College of Veterinary Science, GADVASU, Ludhiana, Punjab, India, 11–12 December 2025 (P61).
2. K. Vinod Kumar, Arun Y. P., Prajakta P. Bokade, Archana Pal, Abhilasha K., Veena R. K., Chethan Kumar H. B., B. R. Gulati, V. Balamurugan (2025).
Molecular detection and phylogenetic characterization of pathogenic and intermediate Leptospira species from febrile human cases in Dakshina Kannada, India. Poster presented at the International Symposium on Advancing One Health..., GADVASU, Ludhiana, Punjab, India, 11–12 December 2025 (P65).
3. Archana Pal, K. Vinod Kumar, Arun Y. P., Prajakta P. Bokade, R. K. Veena, Shilpa Devraj, Chethan Kumar H. B., Baldev R. Gulati, V. Balamurugan (2025).
Active environmental transmission of Leptospira in a coastal Dakshina Kannada district of Karnataka, India. Poster presented at the International Symposium on Advancing One Health..., GADVASU, Ludhiana, Punjab, India, 11–12 December 2025 (P126).
4. Prajakta P. Bokade, K. Vinod Kumar, M. Sreevidhya, Archana Pal, Arun Y. P., Shweta Priya, Archudhan L., V. Balamurugan (2025). Pathogenicity study of a virulent Leptospira isolate from Bandicoot rat in a golden Syrian hamster model: Toward identification of diagnostic and immunogenic biomarkers. Poster presented at the International Symposium on Advancing One Health..., GADVASU, Ludhiana, Punjab, India, 11–12 December 2025 (P128).
5. K. Vinod Kumar, Arun Y. P., Prajakta P. Bokade, Archana Pal, Rakshit Ojha, Swathi M., Baldev R. Gulati, V. Balamurugan (2025). Comparative metabolomics reveals antagonistic metabolic networks underpinning the transition between planktonic and biofilm states of Leptospira. Poster presented at the International Symposium on Advancing One Health..., GADVASU, Ludhiana, Punjab, India, 11–12 December 2025 (P140).
6. Archana Pal, K. Vinod Kumar, Prajakta P. Bokade, Arun Y. P., Sreevidhya M., Rakshit Ojha, Swathi M., Abhilasha K., R. K. Veena, Satyamitra Shekhar, Anita Chauhan, Amrutlal Patel, Baldev R. Gulati, V. Balamurugan (2025). Characterization of a virulent Leptospira interrogans strain: Advancing challenge models for vaccine development in India. Poster presented at VIBCON 2025 – XXX Annual Convention of ISVIB and the International Conference on "Envisioning Livestock Production and Protection under the One Health Landscape", ICAR–IVRI, Mukteswar Campus, Nainital, Uttarakhand, India, 6–8 November 2025 (P13–14).
7. V. Balamurugan, K. Vinod Kumar, Y. P. Arun, B. R. Gulati (2025). Bridging boundaries: Integrated One Health approach to the control and management of leptospirosis. Poster presented at VIBCON 2025 – XXX Annual Convention of ISVIB and the International Conference on "Envisioning Livestock Production and Protection under the One Health Landscape", ICAR–IVRI, Mukteswar Campus, Nainital, Uttarakhand, India, 6–8 November 2025 (P06).

c) National conferences:

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1. Dr. V. Balamurugan delivered Expert Lecture on title "Veterinary Role in Leptospirosis Control: Diagnosis, Management, and Prevention" at 4th One Health e-Learning Round Leptospirosis "Clinical Management, Diagnosis, Control and Its Public Health Impact" Organized by Centre for One Health National Centre for Disease Control, Ministry of Health & Family Welfare, Directorate General of Health Services GoI on 18th February 2025 (Virtual mode)
2. Dr. V. Balamurugan participated and delivered guest lecture on One Health strategy to control Leptospirosis in India, in Zoonotic Diseases webinar Series (online) conducted by CAHO, New Delhi on 6th September 2025. Over 100 participants attended the lecture and benefited.
3. Dr. V. Balamurugan delivered an expert talk on topic "Leptospirosis at the Human–Animal–Environment Interface: Advancing One Health Strategies" at VIBCON-2025 (XXX Annual Convention of ISVIB and International Conference) organized by ICAR-IVRI, Mukteswar on 5 November,2025.

d) Other (Provide website address or link to appropriate information):

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1. Dr. Arun Y.P participated and awarded for best poster presentation on title "Molecular detection and phylogenetic characterization of Pathogenic and intermediate Leptospira species from Febrile Illness Human cases in Dakshina Kannada, India" at the XXI Annual conference of Indian Association of Veterinary Public Health Specialists (IAVPHS) held at Ludhiana, Punjab, from 11th -12th December 2025.
2. Ms. Prajakta participated and awarded for best oral presentation on title "Pathogenicity study of a virulent Leptospira isolate from Bandicoot rat in a Golden Syrian Hamster model: Towards identification of diagnostic and immunogenic biomarkers" at the XXI Annual conference of Indian Association of Veterinary Public Health Specialists (IAVPHS) held at Ludhiana, Punjab, from 11th -12th December 2025.
3. Chethan Kumar H.B, Vinod Kumar K, Arun Y.P, M. Nagalingam, Siju Susan Jacob, and Balamurugan V (2025). Training Manual : Training on Techniques for Zoonotic Disease Diagnosis, Surveillance and Mapping. First Edition, Pages xviii+124, ICAR-National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI), Bengaluru, India.
4. V. Balamurugan, Vinod Kumar, Arun Y P, Swathi M,, Prajakta P. Bokade, M. Nagalingam, H. B. Chethan Kumar, K. (2025). Training Manual: Laboratory Diagnosis of

Leptospirosis. First Edition, Pages 105, Publisher- ICAR-National Institute of Veterinary Epidemiology and Disease Informatics, Bengaluru-560064, India. ISBN: 9789-360-131-067

5. Balamurugan V, Vinod Kumar K, SreeVidhya M, Arun YP, Chethan Kumar HB, Nagalingam M. FAQs on Leptospirosis. ICAR-National Institute of Veterinary Epidemiology and Disease Informatics; Bengaluru: 2025. Pp 1-36 ISBN: 978-93-343-7669-2

6. Dr. Arun Y.P participated in 2-day training programme on Inter-Laboratory Comparison, Proficiency Testing, and Evaluation of Scores (ILCPT), held from 25–26 June 2025 at NITS, BIS, Noida, under the NCDC project, focused on enhancing participants' understanding of quality assurance in laboratory practices. Key topics covered included the principles and objectives of inter-laboratory comparisons, design and implementation of proficiency testing (PT) schemes, statistical analysis and interpretation of PT results using Z-scores, and compliance with ISO/IEC 17043 standards. The training enabled participants to evaluate laboratory performance, ensure test result reliability, and strengthen competency in conducting and participating in national and international PT programmes.

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

17. Did your laboratory provide scientific and technical training to laboratory personnel from other WOAH Members?

Yes

a) Technical visit : 0

b) Seminars : 0

c) Hands-on training courses: 1

d) Internships (>1 month) 0

Type of technical training provided (a, b, c or d)	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
C	ERITREA	1

TOR8: QUALITY ASSURANCE

18. Does your laboratory have a Quality Management System?

Yes

Quality management system adopted	Certificate scan (PDF, JPG, PNG format)	
ISO 17025:2017	PDF	NABL Accreditation certificates NIVEDI.pdf
ISO 9001:2015	PDF	ISO9001 CERTIFICATE NIVEDI.pdf

19. Is your quality management system accredited?

Yes

Test for which your laboratory is accredited	Accreditation body
Detection of Leptospira antibodies by MAT (Microscopic Agglutination Test)	National Accreditation Board for Testing and Calibration Laboratories (NABL), India
Detection of Leptospira genomic DNA by PCR	National Accreditation Board for Testing and Calibration Laboratories (NABL), India
Detection of Leptospira genomic DNA by Real time qPCR	National Accreditation Board for Testing and Calibration Laboratories (NABL), India

20. Does your laboratory maintain a "biorisk management system" for the pathogen and the disease concerned?

Yes

ICAR–NIVEDI's facilities are NABL-accredited for the storage and handling of selected agents, including Leptospira. All laboratory activities are conducted under Biosafety Level 2 (BSL-2) biocontainment conditions.

TOR9: SCIENTIFIC MEETINGS

21. Did your laboratory organise scientific meetings related to the pathogen in question on behalf of WOAH?

No

22. Did your laboratory participate in scientific meetings related to the pathogen in question on behalf of WOAH?

No

TOR10: NETWORK WITH WOAH REFERENCE LABORATORIES

23. Did your laboratory exchange information with other WOAH Reference Laboratories designated for the same pathogen or disease?

Not applicable (only WOAH Reference Laboratory designated for the disease

24. Are you a member of a network of WOAH Reference Laboratories designated for the same pathogen?

Not applicable (only WOAH Reference Laboratory designated for the disease

25. Did you organise or participate in inter-laboratory proficiency tests with WOAH Reference Laboratories designated for the same pathogen during the past 2 years?

Yes

Purpose of the proficiency test:	Role of your Reference Laboratory (organiser/ participant)	No. participating Laboratories	Participating WOAH Ref. Labs/ organising WOAH Ref Lab
Performance of MAT (Reference Serovars) and Leptospirosis diagnosis by MAT	Participant	77	International Proficiency Testing Scheme organized by ILS for the Leptospirosis MAT

26. Did your laboratory collaborate with other WOAH Reference Laboratories for the same disease on scientific research projects for the diagnosis or control of the pathogen of interest?

No

TOR11: OTHER INTERLABORATORY PROFICIENCY TESTING

27. Did your laboratory organise or participate in inter-laboratory proficiency tests with laboratories other than WOAH Reference Laboratories for the same pathogen during the past 2 years?

Yes

Purpose for inter-laboratory test comparisons1	Role of your reference laboratory (organizer/participant)	No. participating laboratories	Name of the test	WOAH Member Countries
Performance of Leptospirosis diagnosis by PCR (Name of the test : Leptospirosis molecular LEPN 435)	Participant (certificate received in January 2025)	50	PCR and qPCR	AUSTRALIA,

TOR12: EXPERT CONSULTANTS

28. Did your laboratory place expert consultants at the disposal of WOAH?

No

29. Additional comments regarding your report:

Yes

1. As a designated WOAH Reference Laboratory for Leptospirosis, ICAR–NIVEDI is fully equipped to undertake sample screening for both WOAH member and non-member countries. Assistance from WOAH and/or FAO is requested to streamline the receipt of samples from Asian, SAARC, or other regional countries.

2. ICAR–NIVEDI has received official permission from the Department of Animal Husbandry and Dairying (DAHD), Government of India, to receive samples from WOAH member countries, in accordance with the prescribed guidelines, for Leptospirosis diagnostic testing.

3. Laboratory Information Management System (LIMS): The offline, customized LIMS has been developed according to the existing framework for the testing and diagnosis of samples for Leptospirosis.

4. ICAR–NIVEDI plans to organize international training programs—both virtual and hands-on—for WOAH member and non-member countries in the upcoming reporting year (2026). Support is requested from WOAH and/or FAO in terms of organization and funding for these trainings.

5. ICAR–NIVEDI's WOAH Reference Laboratories actively participate in online meetings, seminars, and conferences organized by FAO, WOAH, and the PPR Secretariat, as required, to enhance expertise, facilitate global collaboration, and share technical knowledge.

6. ICAR-NIVEDI's WOAH Reference Laboratory actively participates in online meetings, seminars, and conferences organized by FAO and WOAH at various times, as and when required, to acquire knowledge, enhance expertise, collaborate effectively, and share our expertise with global communities.

7. A hands-on training program on laboratory diagnosis of leptospirosis was conducted at ICAR–NIVEDI, Bengaluru, from 11–14 August 2025. The program provided practical exposure to serological, molecular diagnostic techniques and biosafety practices.A total of 34 participants from 11 Indian states, representing veterinary, medical, and public health sectors, attended the training.

8. ICAR–NIVEDI expresses its interest in initiating a WOAH Reference Laboratory Network for Leptospirosis, aimed at linking the WOAH Leptospira Working Group and reference laboratories worldwide. This initiative would strengthen global collaboration, promote harmonization of protocols, facilitate genomic data sharing and analysis, and enhance collective expertise.

9. A training program titled "Techniques for Zoonotic Disease Diagnosis, Surveillance and Mapping" was conducted at ICAR–NIVEDI, Bengaluru, from 03–07 March 2025. The training focused on integrated laboratory and field-based approaches for zoonotic disease surveillance. Thirty-two participants from nine Indian states representing veterinary, medical, and public health departments participated.

10. An international one-month training program on "Isolation and Identification of Leptospira using Microbiological and Molecular Biology Tools" was organized at ICAR–NIVEDI, Bengaluru, from 04 August to 03 September 2025. The program emphasized advanced culture techniques, molecular diagnostics, and confirmation methods.

11.Laboratory developed a New Virulent Leptospira Strain as a Challenge Hamster Model for Vaccine Efficacy and Quality Control Evaluation of Leptospirosis Vaccines to Boost Vaccine Development.