

Rabies Beyond Borders: Unraveling the Wildlife–Domestic Interface



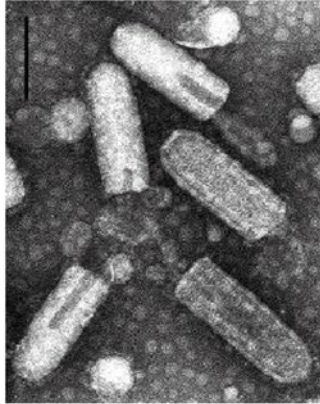
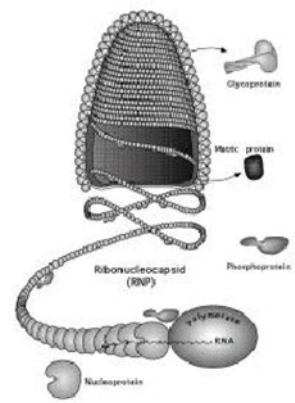
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WOAH (Founded as OIE) Reference Laboratory for Rabies

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South Asia endemic for dog mediated rabies.....



Global scenario

- Various wild animal species act as the reservoirs of rabies
 - Understanding precise prevalence is a **Herculean task !!**
-
- Rabies in wildlife: **A challenge**
 - A threat for domesticated animals, livestock
 - Mostly clinical reports in the past
 - Recent reports based on laboratory evidence



Wildlife–Dog Interface

- Free-roaming dogs frequently interact with wildlife at:
 - Forest fringes
 - Garbage disposal sites
 - Water sources
 - Grazing lands
- Transmission from domestic dogs to wildlife (spill-over)
- Dogs may acquire infection from wildlife and further spread it to humans and animals (Spill-back)
- Encroachment into forests enhances contact rates

Wildlife Rabies in Asia

Increasing reports in jackals, wolves and foxes

Wildlife rabies often underreported

Spill-over from dog-mediated rabies common



Possible / Suspected Sylvatic Rabies Cycles in South Asia ?

Jackals (*Canis aureus*)

Most important suspected wildlife reservoir in South Asia

Rabies frequently reported in jackals in:

- India
 - Sri Lanka
 - Nepal
 - Bangladesh
-
- Molecular studies in Sri Lanka showed close genetic relatedness among rabies viruses from jackals, dogs and other hosts
 - Evidence suggests:
 - Spill-over from dogs to jackals is common
 - In some ecological settings, jackal-to-jackal transmission may sustain
 - However, definitive proof of a completely independent long-term sylvatic cycle is still limited

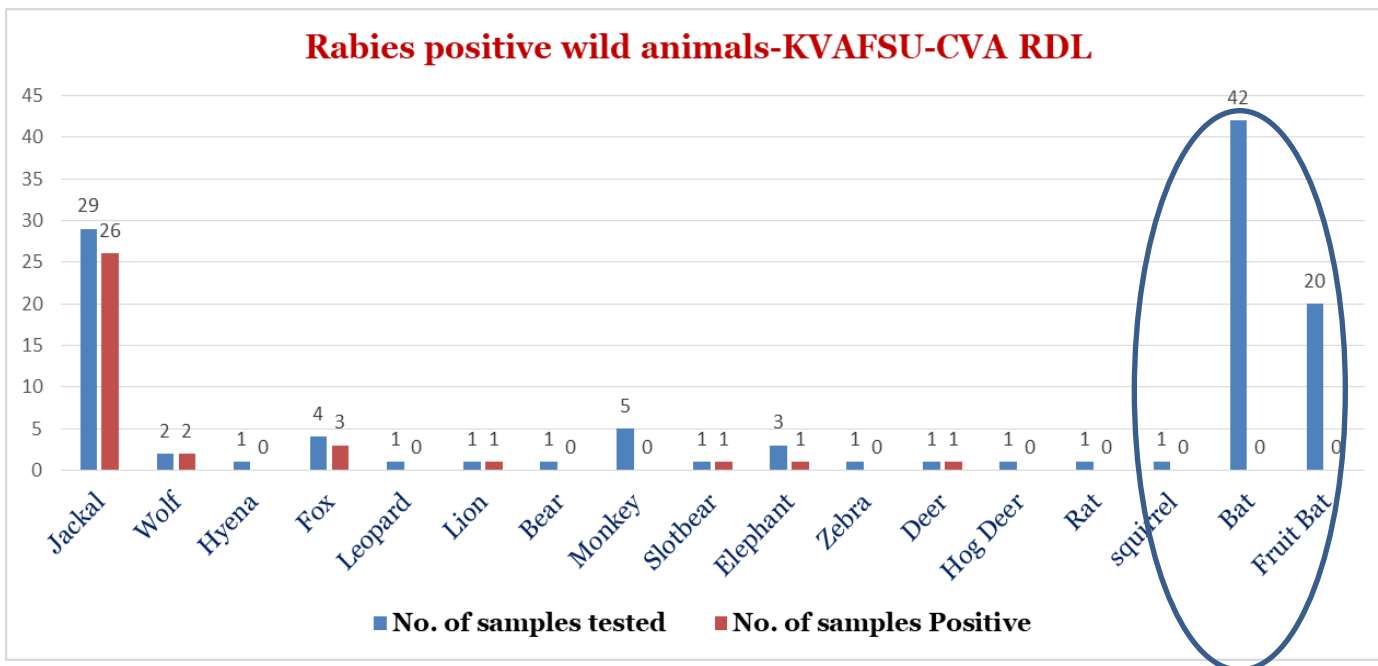


Ecological Factors Favoring Transmission

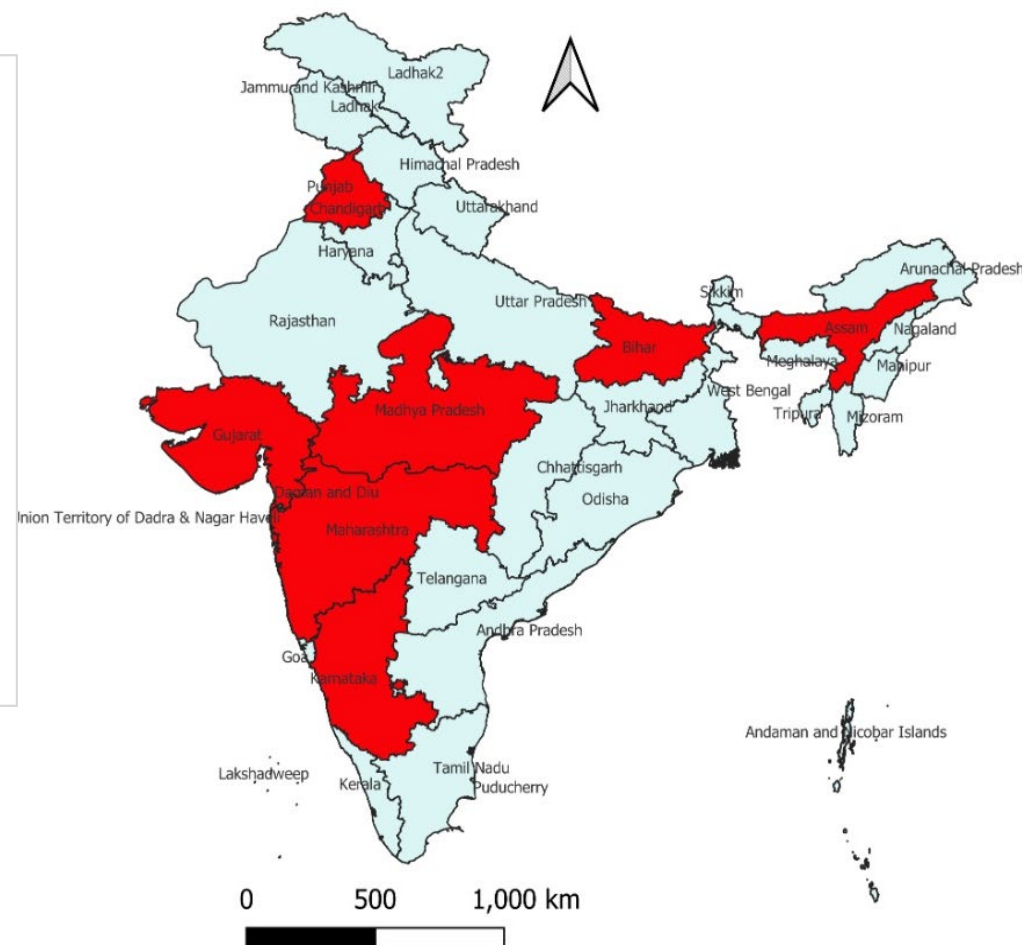
- Habitat destruction increases wildlife-domestic animal contact
- Urbanization forces wildlife into peri-urban environments
- Food scarcity drives wild animals toward human settlements
- Seasonal breeding and migration affect transmission dynamics

WILD ANIMAL RABIES- KVAFSU-CVA RDL (2013-2025)

Rabies positive wild animals-KVAFSU-CVA RDL



Total no of samples tested: 127
No. of samples Positive: 45



First Case Report of Rabies in a Wolf (*Canis Lupus Pallipes*) from India

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Abstract
 This is the first documented evidence of rabies in the Indian wolf (*Canis lupus pallipes*) to date. The study describes the laboratory confirmation of rabies in wolf from the southern Indian state of Karnataka by the direct fluorescent antibody (DFA) test and a direct rapid immunohistochemistry test (dRIT). The PCR amplified products of nucleoc N and G genes of the wolf RABV were sequenced and analyzed. The RABV results and phylogenetic analysis revealed high homology and genetic relationships of this RABV isolates with those from nearby geographic locations such as in India (Bansin, Sahibgaj), Pakistan (wolf, cattle) and Nepal (goat).
 Analysis of the deduced amino acid sequences of the complete N and G proteins revealed that wolf RABV isolates measured in this study belonged to the Arctic-like lineage, which is wide spread throughout the Indian subcontinent, and the region. These findings emphasize the necessity of zoonological surveillance to characterize regional zoonoses to ascertain if wolves (and other wild species) serve as a significant population for RABV zoonotic re-emergence in India.

INTRODUCTION
 Rabies has been reported in multiple species of wildlife in India, but there is no documented evidence of rabies in the Indian wolf (*Canis lupus pallipes*) to date. On 29 June 2013, a wolf entered two villages (2 km away from each other). The wolf bit 15 cattle in the first village, and then ran into a nearby village and bit 10 other cattle, 2 calves, one woman, and two men. The wolf was later trapped by the villagers and was killed. The head was transported to the Rabies Diagnostic Laboratory of the Veterinary College, Bangalore for laboratory diagnostic confirmation and RABV characterization (Figure 1). This paper describes the laboratory confirmation of rabies in this wolf from the southern Indian state of Karnataka and subsequent identification of the rabies virus (RABV) species by both N and G gene phylogenetic analysis.

MATERIALS AND METHODS
Laboratory confirmation by the direct fluorescent antibody (DFA) test and a direct rapid immunohistochemistry test (dRIT)
 Different sections of the brain, including the cerebrum, cerebellum, hippocampus, brain stem, as well as the salivary gland, were subjected to the Direct Fluorescent Antibody (DFA)

test, as suggested by the manufacturer (Light Diagnostics). In brief, the DFA was conducted by making three impression slides, dried at room temperature, fixed for 2 hr at -20 °C in acetone, and air dried at room temperature. The anti-N protein monoclonal antibody (Mab) - fluorescein isothiocyanate (FITC) conjugate (Light Diagnostics TM, Rabies DFA kit, # 4500), with Tris-Male (0.00125%) as the counter-stain, was added. Control slides using a Rabies Negative Control FITC conjugate (Light Diagnostics TM, # 5102) and Normal Goat FITC conjugate (Light Diagnostics TM, # 5102) were also prepared. The slides were incubated for 30 min at 27 °C in a humidity chamber. After rinsing, excess conjugate was removed and the slides were given a brief rinse under a stream of PBS, mounted and sealed in PBS for 3 min. Impression slides were blotted, air dried, mounted and read. In addition, a direct rapid immunohistochemistry (dRIT) technique was applied, as described [1].

Polymerase Chain Reaction (PCR) and phylogenetic analysis of N and G genes
 The RNA was extracted from the brain stem by the Trizol® method, according to the manufacturer's recommendations (Invitrogen®). The cDNA was prepared by using a high capacity cDNA synthesis kit (Invitrogen®) and gene-specific primers, designated Lys 001 (for the complete N gene), NF 321 (for the

EPISODE 1: WOLF IN KARNATAKA, 2013

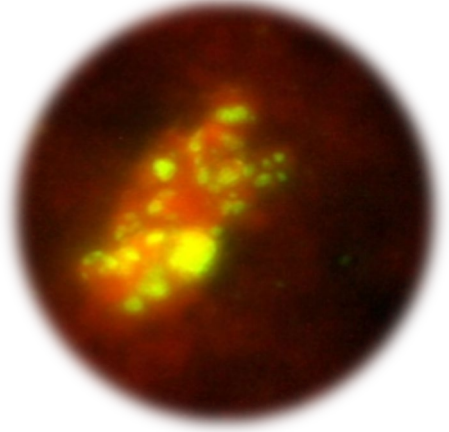
- Wolf (*Canis lupus pallipes*)
- entered two villages
- ❖ In one village bit 15 cattle ,
- ❖ Another village bit 10 cattle,
- ❖ 2 calves, one woman, and two men.



- ❖ Trapped by the villagers and killed.
- ❖ Laboratory confirmed : DFA, dRIT and PCR
- ❖ Arctic like lineage

EPISODE 2: JACKAL IN KARNATAKA (HAVERI), 2016

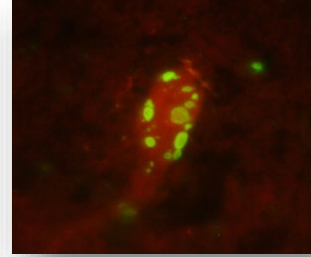
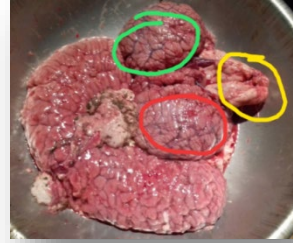
- Bitten 1 cattle, Jackal couldn't be traced.
- Bitten cattle died of Rabies.
- Laboratory confirmed (DFA) 400X



(KVAFSU-CVA RDL report, 2016)



EPISODE 3: ELEPHANT IN BIHAR, 2018



Brain sample positive by DFA, LFA and PCR



(KVAFSU-CVA RDL report, 2018)

EPISODE 4: JACKAL, KARNATAKA (HAVERI), 2021



✓ A Jackal entered two villages

- In one village bit 9 cattle / bullock , 3 dogs,
- Another village bit 4 cattle / bullock, 2 dogs
- Trapped by the villagers and killed.

✓ Brain sample positive by DFA, LFA and PCR

✓ Arctic like lineage

PEP in human and animal bite victims

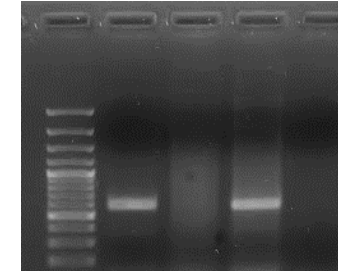




EPISODE 5: TWO WOLVES IN MAHARASHTRA (AMARAVATI), 2021

Two wolves attacking people in different villages
in Dharni Subdivision

- Suspected for Rabies
- Decapitated head submitted
- Both brain samples positive by LFA , DFA and PCR
- Arctic like lineage

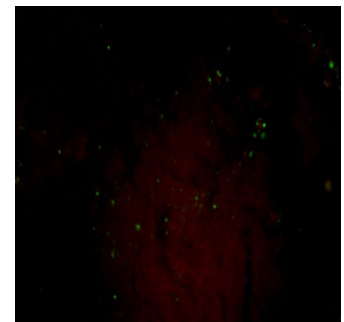
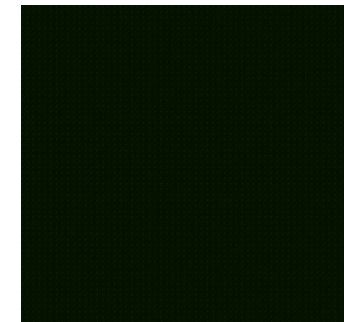


(KVAFSU-CVA RDL report, 2021)

EPISODE 6: JACKAL IN KARNATAKA (HARIHARA), 2022

A Jackal entered into an Human habitation

- Attacked and bitten 6 to 8 people
- Found dead at near by acacia bush
- Local Vets suspected for rabies
- Brain sample positive by DFA, LFA and PCR



(KVAFSU-CVA RDL report, 2022)



COUNSELLING FOR FOREST OFFICIALS FROM MAHARASHTRA (AMARAVATI), 2021



- PrEP for Dogs, cattle in the near by villages
- Look out for wild animal carcasses in forest and submission of brain samples
- PEP for all bite victims
- Training health officials on IDRV and RIG administration
- Organize awareness programs on Dos and Dents for public

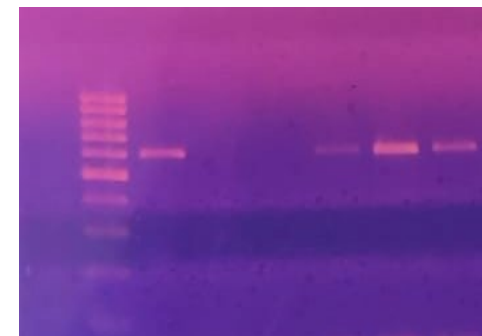


EPISODE 7: LION IN GUJARAT, 2022

History: Rescued from Jesar wild life range, Gir

Symptoms:

- Hind quarter, paralysis, anxiety, biting, salivation, natural death in 24 hrs
- Brain sample of a lioness (8 yrs) LFA Positive at College of Veterinary science and Animal Husbandry, Anand (Gujarat)
- Positive by DFA and PCR



(KVAFSU-CVA RDL report, 2022)



EPISODE-8: JACKAL IN KARNATAKA (SHIVAMOGA) 2023

- A Jackal entered into an Human habitation (Thogarsi Forest)
 - Attacked, 2 Cows, 1 dog and 1 man
 - Trapped by the villagers, killed.
 - Local Vets suspected for rabies
- Brain sample positive by LFA , DFA and PCR



(KVAFSU-CVA RDL report, 2023)

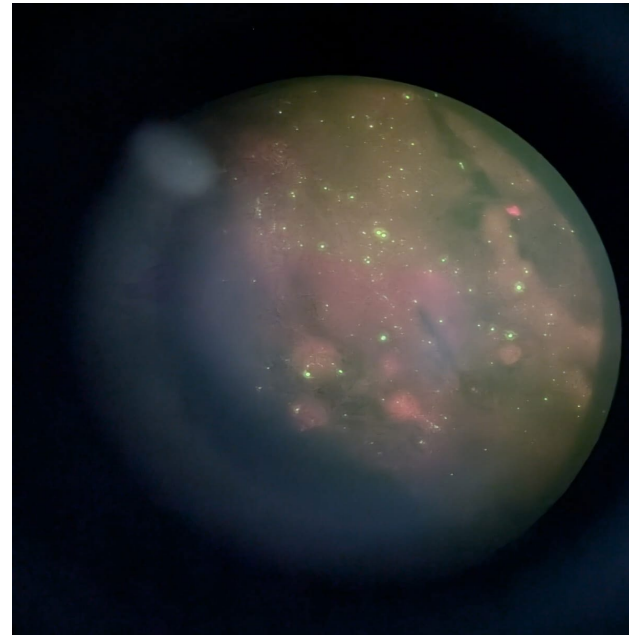
EPISODE-9: FOX IN KARNATAKA (RAICHUR) 2025

A Fox in Raichur attacked and bitten 6 people

➤ Local Vets suspected for rabies



Brain sample collection from Fox



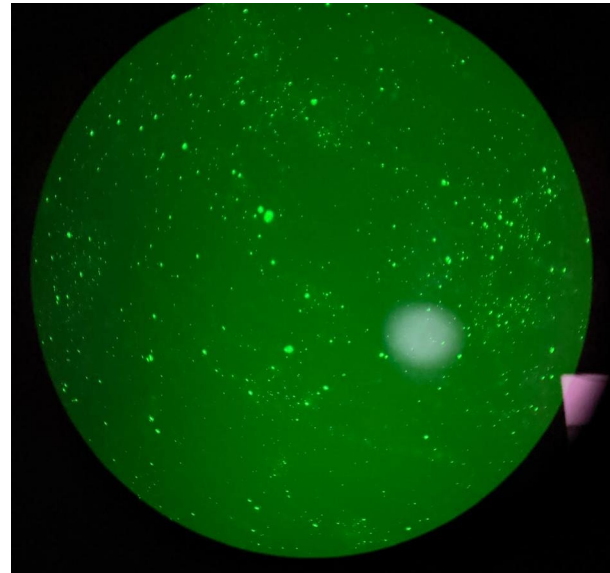
DFA of Fox brain

5th SA RABNET_13.05.2026

(KVAFSU-CVA RDL report, 2025)

EPISODE-10 & 11 : SLOTH BEAR IN KARNATAKA (BENGALURU & TUMKUR) 2026

A sloth bear in Bengaluru attacked a group of youths and damaged their bike.



DFA of sloth bear brain

5th SA RABNET_13.05.2026



(KVAFSU-CVA RDL report, 2026)

SEROLOGICAL EVIDENCE OF *LYSSAVIRUS* INFECTION AMONG BATS IN NAGALAND



Surveillance for rabies virus (RABV) infection in bats in Nagaland, a north-eastern state in India at sites with intense human–bat interfaces during traditional bat harvests.



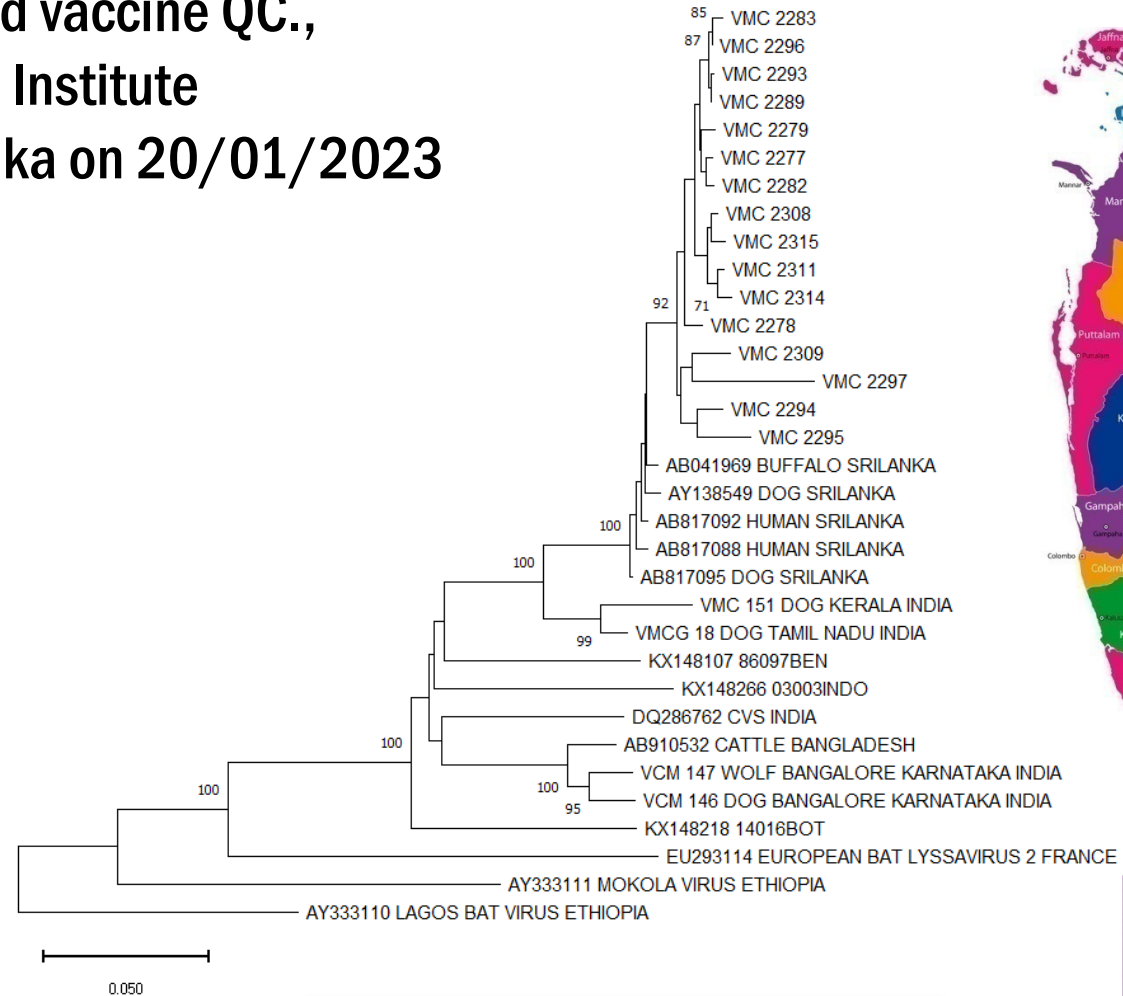
Rabies neutralizing antibodies were detected in 4/78 (5.1%) bat sera tested, suggesting prior exposure to RABV or related lyssaviruses

Molecular characterization of RABV from Sri Lanka

Samples received from: Dept. of rabies and vaccine QC.,
Medical Research Institute
Colombo 8, Srilanka on 20/01/2023



Samples list	No. of samples
Jackal	21
Cow	10
Dog	4
Goat	4
Cat	1
Deer	1
Total no.	41



Indian subcontinent lineage

5th SA RABNET_13.05.2026



National Level Hands-on Training Program In Srilanka

“WOAH National Training of Trainers on Animal Rabies”

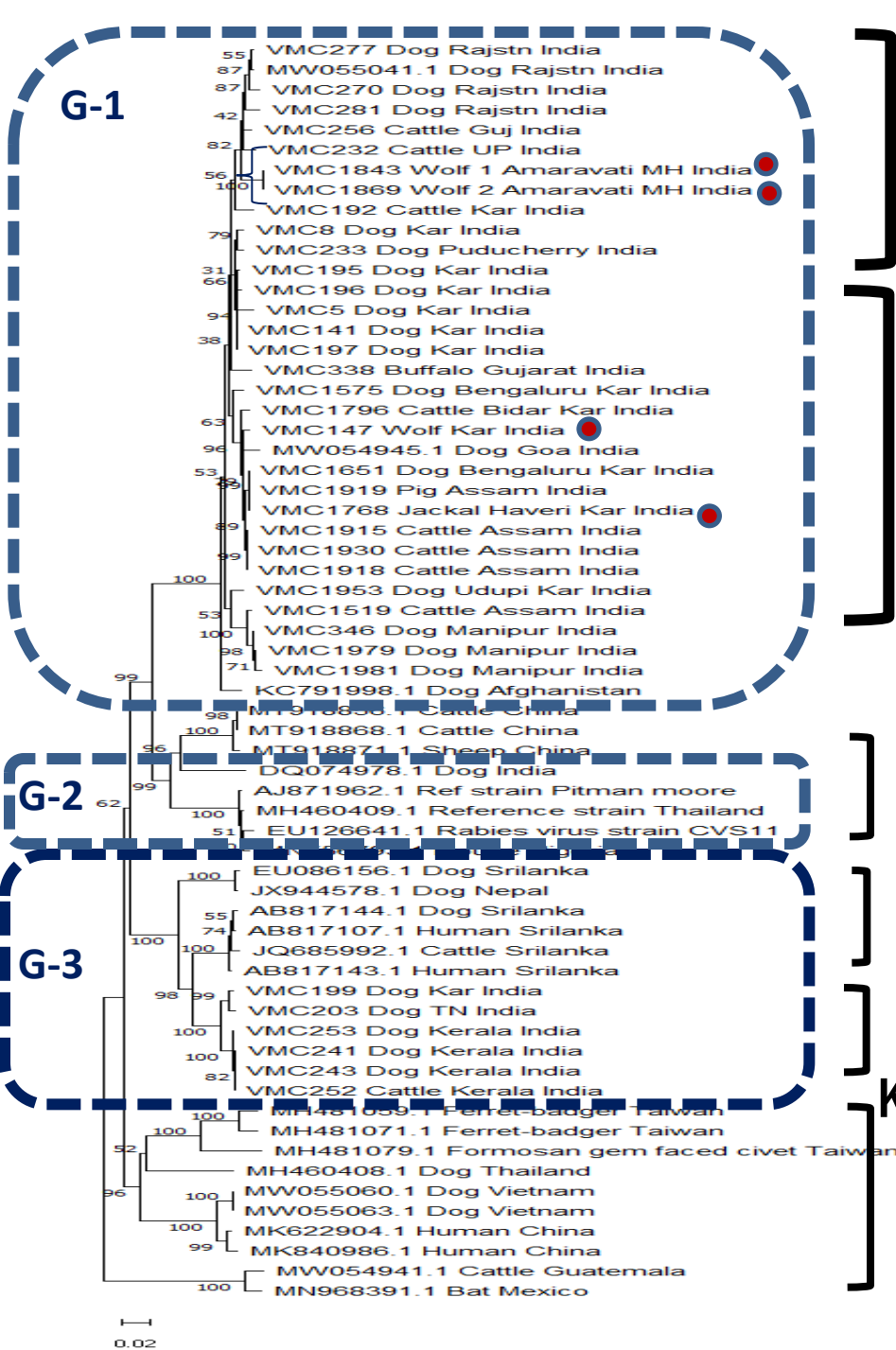
from 07th – 13th February, 2026

at Veterinary Investigation Centres (VICs) Kandy, Srilanka

Participants : 25



KVAFSU-CVA RDL STUDY ON COMPLETE G GENE of WILD CARNIVORES RABV



MANIPUR, ASSAM,
MAHARASHTRA

KARNATAKA

ARCTIC 1a-like lineage

REF CVS11

SRI LANKA

INDIAN-SUBCONTINENT lineage

KERALA AND TAMIL NADU

ASIAN CLADE (SEA5 SUBCLADE)

Public Health Implications

- Wildlife-mediated rabies increases human exposure risk
- Domestic dogs infected from wildlife remain major source of human rabies in Asia and Africa
- Wildlife reservoirs threaten progress toward “Zero by 30” rabies elimination goals

Challenges in Control

- Difficult surveillance in wildlife populations
- Limited oral rabies vaccination programs in many countries
- Inaccessibility of forest and wildlife habitats
- Underreporting of wildlife rabies cases

Control Measures

- Mass vaccination of dogs
- Wildlife rabies surveillance
- **Oral rabies vaccination (ORV) in wildlife reservoirs**
- Restriction of wildlife access to waste and food sources
- One Health collaboration among veterinary, wildlife and public health sectors

Oral rabies vaccination (ORV) always remained as a foundational tool to reduce the toll of rabies virus in wildlife species across the globe

Conclusion

- Wildlife plays a critical role in rabies ecology through:
 - ✓ Maintenance of sylvatic cycles
 - ✓ **Spill-over / back transmission to domestic animals**
 - ✓ Reintroduction of infection into controlled populations
- Effective rabies control requires simultaneous management of:
 - ✓ Domestic dog rabies
 - ✓ Wildlife reservoirs
 - ✓ Human exposure risks



Thank you

