INGSA Project Report

Addressing Emerging Zoonoses in India: A One Health Policy Review and Action Plan

Submitted by

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Executive Summary

The project titled *"Addressing Emerging Zoonoses in India: A One Health Policy Review and Action Plan"* was conceptualized and implemented under INGSA-Asia Grassroots Science Advice Promotion Award 2023. The project was executed by Dr. Pankaj Dhaka, Assistant Professor at the Centre for One Health, Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), and mentored by Dr. Jasbir Singh Bedi, Director, Centre for One Health, GADVASU and Dr. J.P.S. Gill, Vice Chancellor, GADVASU. This initiative aimed to develop actionable, evidence-informed policy guidance and to strengthen science advice mechanisms for managing zoonotic threats through a One Health approach, with a particular focus on empowering early-career researchers and young academicians to contribute to interdisciplinary policy discourse and research translation.

Zoonotic diseases, which are transmissible from animals to humans, represent a significant and growing threat to public health, the livestock economy, and environmental sustainability in India. The increasing incidence of zoonotic spillovers is driven by a convergence of factors, including intensification of livestock production systems, unregulated urban expansion, weak biosecurity practices, and systemic gaps in disease surveillance framework. In response to this complex challenge, the present initiative was designed to advance an integrated One Health policy framework that aligns with both national needs and global standards. The project aimed to facilitate inter-sectoral dialogue among professionals to generate policy-relevant knowledge on emerging zoonoses and their socio-ecological drivers; and especially, to strengthen the capacity of early-career researchers and young faculty members. This was achieved through targeted hands-on training in diagnostic techniques, field surveillance methods, and science-policy communication, complemented by thematic workshops focused on developing interdisciplinary approaches to foster academic collaboration and translational research in zoonoses containment. By equipping the next generation of One Health professionals with both technical and policy-oriented skills, the project fostered interdisciplinary collaboration and contributed to a more resilient zoonotic disease preparedness landscape. The outputs of this initiative culminated as evidence-informed action points, emphasizing the role of science advice in shaping proactive, multisectoral strategies for zoonoses prevention and control.

Two major workshops were organized as part of the project. The first workshop (January 27, 2025) targeted veterinary faculty from various disciplines and researchers across three veterinary colleges in Punjab and focused on evidence-building and interdisciplinary collaboration. The second workshop (March 12, 2025) engaged postgraduate scholars from

veterinary and fisheries sciences, equipping them with tools for molecular diagnostics and policy dialogue. Both events recorded appreciable levels of engagement, feedback, and collaborative exchange, contributing significantly to capacity building in zoonoses management.

The initiative resulted in several key outcomes that contribute meaningfully to the advancement of zoonoses management under a One Health framework. These efforts strengthened the understanding of zoonotic diseases and the relevance of the One Health paradigm among participants, particularly early-career researchers and stakeholders across sectors. Also, the initiative facilitated a critical assessment of existing disease surveillance and response mechanisms in India, leading to the identification of notable policy and implementation gaps. Finally, through collaborative stakeholder consultations, the project developed a draft plan aimed at enhancing zoonoses preparedness. This plan emphasized improvements in surveillance and diagnostic capacities, strategies for effective community engagement, and mechanisms for interdepartmental coordination, laying the foundation for a more integrated and proactive response to emerging zoonotic threats.

This report presents a comprehensive account of the project's journey, from conceptualization and strategic planning to implementation and key outputs. The insights and findings detailed herein are intended to inform and support emerging scientists, veterinarians, public health professionals, and One Health researchers who are engaged in strengthening future preparedness and response frameworks for emerging zoonotic diseases.

Introduction

Emerging zoonotic diseases represent one of the pressing global health challenges of the 21st century. In India, where over 65% of the population is rural and directly or indirectly dependent on agriculture and animal husbandry, the risk of zoonotic spillovers is particularly high (Bedi et al., 2022). Rapid urbanization, biodiversity loss, intensified livestock production, and increasing human-animal-environment interactions are collectively heightening the risk of emergence and spread of novel zoonotic pathogens in the country (Sakshi et al., 2023).

India has witnessed the emergence and re-emergence of several zoonotic pathogens in recent decades, ranging from Nipah virus, Crimean-Congo haemorrhagic fever (CCHF) and avian influenza to brucellosis, leptospirosis, and rabies. These outbreaks often result in negative public health consequences, economic disruption, and livestock productivity losses. Brucellosis alone affects an estimated 10-20% of livestock in certain endemic areas and is a major occupational hazard for dairy farmers and animal health professionals (Jaismon et al., 2023). Rabies continues to cause over 20,000 human deaths annually in India, accounting for more than one-third of global rabies mortality (Goel et al., 2023).

Despite these challenges, India has made commendable progress in advancing One Health principles. Notably, the Government of India established the National Institute for One Health (NIOH) in Nagpur under the Indian Council of Medical Research (ICMR) to promote interdisciplinary research on zoonoses, AMR, and food safety. India's National Action Plan on AMR (2017-2021) and revised frameworks under the National Rabies Control Programme and Livestock Health and Disease Control Programme underscore increasing institutional recognition of the One Health paradigm. However, the operationalization of One Health in India remains partially fragmented. Challenges persist in ensuring convergence between ministries (health, agriculture, environment), developing robust integrated surveillance platforms, and ensuring that grassroots stakeholders, farmers, para-veterinarians, field officers, are equipped and engaged. Strategic plans often lack strong field-level mechanisms for implementation, data-sharing, and capacity-building, particularly in tier-2 and rural areas.

To bridge this gap, the present project was envisioned under the INGSA-Asia Grassroots Science Advice Promotion framework. By focusing on the grassroots implementation of science advice mechanisms and knowledge translation, this initiative aimed to foster collaborative dialogue among early-career researchers and academicians. The two key workshops conducted under the project brought together veterinary professionals and public health researchers to examine emerging zoonotic threats and collaboratively develop a contextualized action plan.

Methodology

A combination of literature review, expert consultations, stakeholder engagement, and interactive capacity-building workshops formed the core methodological pillars of this initiative.

Literature review approach: A structured literature review was undertaken to assess global and national trends related to emerging zoonotic diseases, One Health implementation, and science–policy interface mechanisms. Systematic searches were conducted across major scientific databases, including PubMed, Scopus, Google Scholar, and Web of Science, using a comprehensive set of keywords such as "zoonoses," "One Health," "India," and specific zoonotic diseases including *rabies*, *brucellosis*, *Nipah virus*, *leptospirosis*, *avian influenza*, *zoonotic tuberculosis*, *scrub typhus*, *Japanese encephalitis*, *Q fever*, *CCHF*, and "zoonoses policy". The search strategy was designed to capture the scope of zoonotic disease challenges in India and to track the evolving discourse around integrated health governance under the One Health framework. In addition, relevant Indian government reports, WHO/FAO/WOAH publications, and institutional action plans were reviewed. Insights from this review informed the development of course content and thematic discussions for the workshops.

Workshop planning and participant selection: Two capacity-building workshops were organized under this project:

a) **Workshop 1 (27 January 2025):** Focused on veterinary faculty and researchers from College of Veterinary Science (Ludhiana), Khalsa College of Veterinary and Animal Sciences (Amritsar), and College of Veterinary Science (Rampura Phul).
b) **Workshop 2 (12 March 2025):** Targeted postgraduate scholars from veterinary and fisheries disciplines from GADVASU.

Participants were selected through direct institutional nominations to ensure disciplinary diversity. Invitations and consent forms were sent in advance, and all participants were briefed on the goals and agenda of the workshops.

Data collection and interactive components: Each workshop was designed to include a mix of expert lectures, practical demonstrations, group discussions, and plenary sessions. Key tools and strategies included:

a) **Focused group discussions (FGDs)** on themes such as policy gaps, diagnostic challenges, zoonoses surveillance, and interdisciplinary coordination.
b) **Hands-on molecular diagnostics training** (PCR-based detection of foodborne pathogens) during Workshop 2.

c) **Stakeholder mapping exercises** to identify actors, influence pathways, and institutional barriers during workshop 1.

Stakeholder consultation and synthesis: Feedback and insights from workshop participants, facilitators, and invited experts were consolidated using thematic analysis. These findings informed the formulation of the action plan and dissemination strategy, which integrates scientific recommendations with on-ground stakeholder realities.

Workshop descriptions and outputs

This section presents a detailed overview of the two capacity-building workshops conducted as part of the project. These events served as the core platform for grassroots engagement, knowledge sharing, and science-policy dialogue on emerging zoonoses within a One Health framework.

Workshop 1: Faculty Workshop (27 January 2025)

This one-day workshop was held at the Centre for One Health, GADVASU, Ludhiana. It brought together 20 faculty members and researchers from three veterinary colleges: College of Veterinary Science (Ludhiana), Khalsa College of Veterinary and Animal Sciences (Amritsar), and College of Veterinary Science (Rampura Phul).

Objectives:

- Introduce the One Health approach to veterinary educators and researchers.
- Identify gaps in research, education, and extension services related to zoonotic diseases.
- Foster cross-institutional collaboration and policy feedback mechanisms.

Key Sessions:

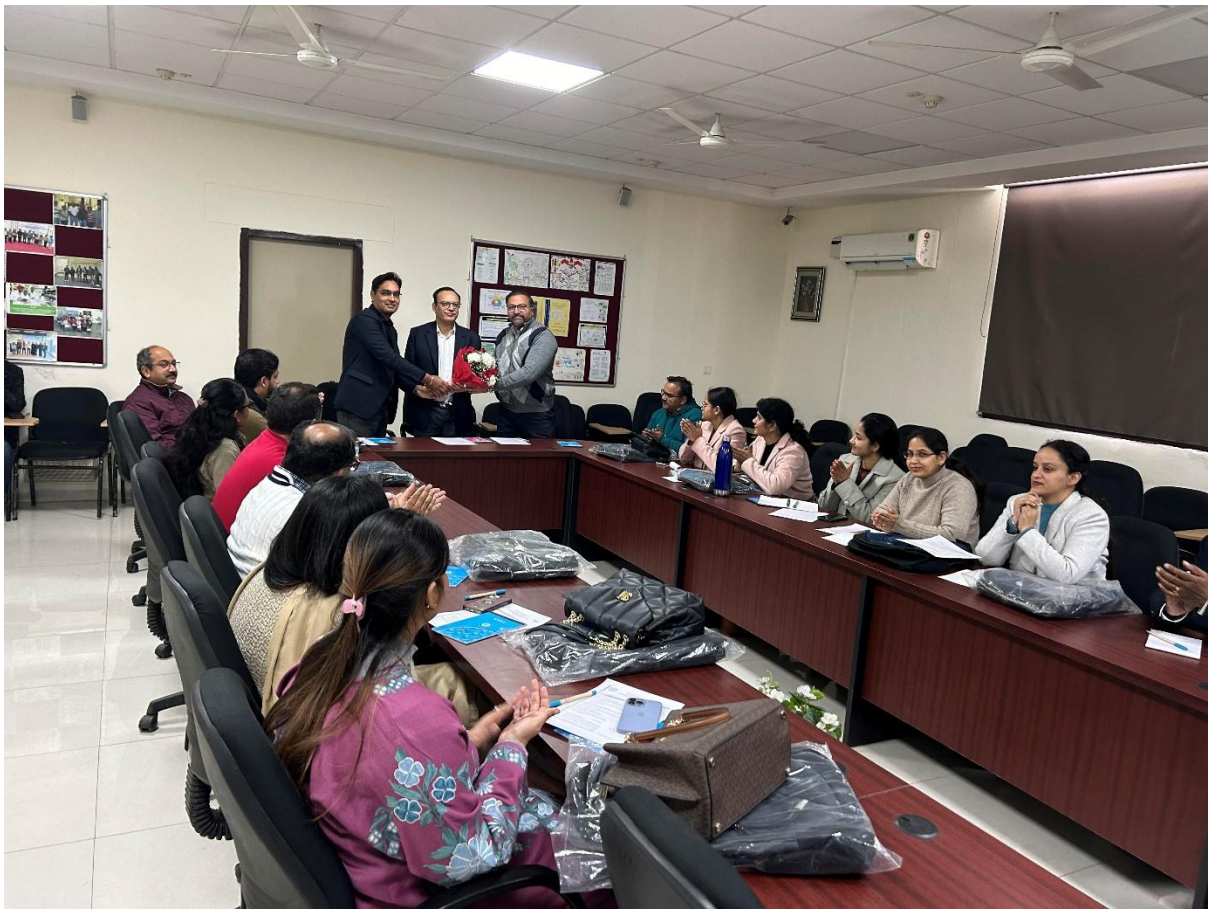
- ***Inaugural address****:* Delivered by Dr. Anil Kumar Arora, Director of Research, GADVASU, emphasizing the university's commitment to interdisciplinary zoonoses research and translational outreach.
- ***Keynote lecture****:* Dr. Jasbir Singh Bedi provided an integrative overview of the One Health paradigm, mapping its alignment with India's current public health and animal health frameworks.
- ***Thematic presentation***: Dr. Pankaj Dhaka presented the regional and national burden of zoonotic diseases such as brucellosis, rabies, and bovine tuberculosis, highlighting socio-economic costs and data gaps in surveillance systems.
- **Focused group activities**: Participants worked in clusters to identify region-specific zoonotic threats (emerging and endemic) and design model inter-departmental

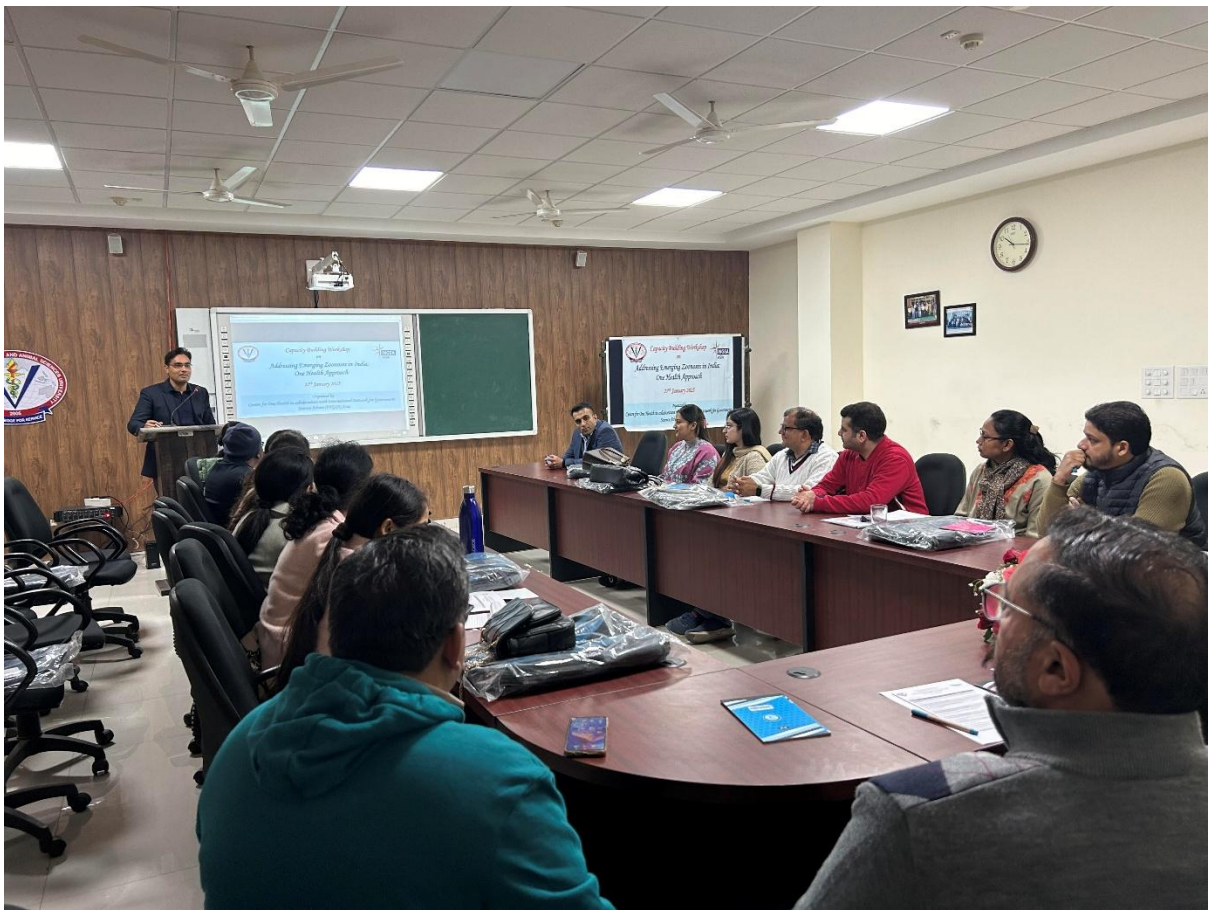
coordination frameworks adaptable for veterinary colleges and local governance systems.

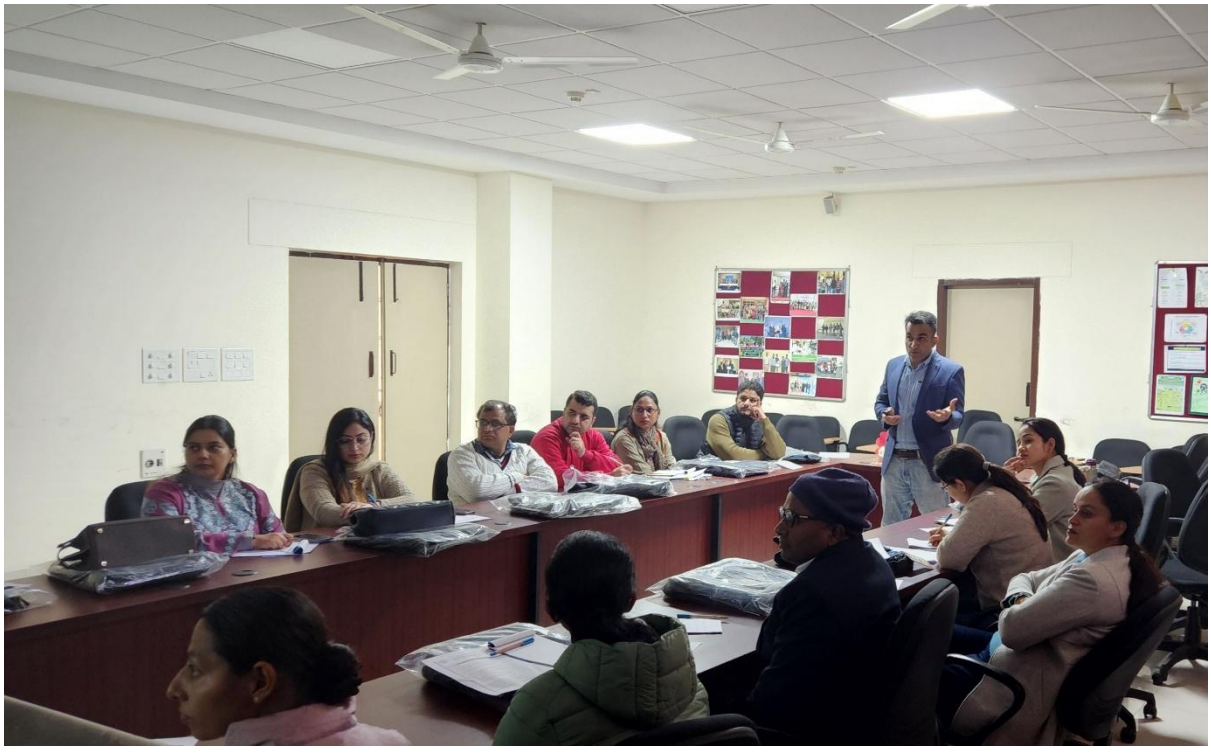
Outputs:

- A consolidated list of priority zoonoses affecting Punjab, including brucellosis, leptospirosis, salmonellosis, bovine tuberculosis, and Q fever.
- Recommendations for curriculum integration of One Health content within undergraduate and postgraduate veterinary syllabi.
- Draft framework for an inter-college collaborative research task force on zoonoses.
- Participant recommendations for establishing local One Health cells at academic institutions to support community-based zoonotic surveillance.

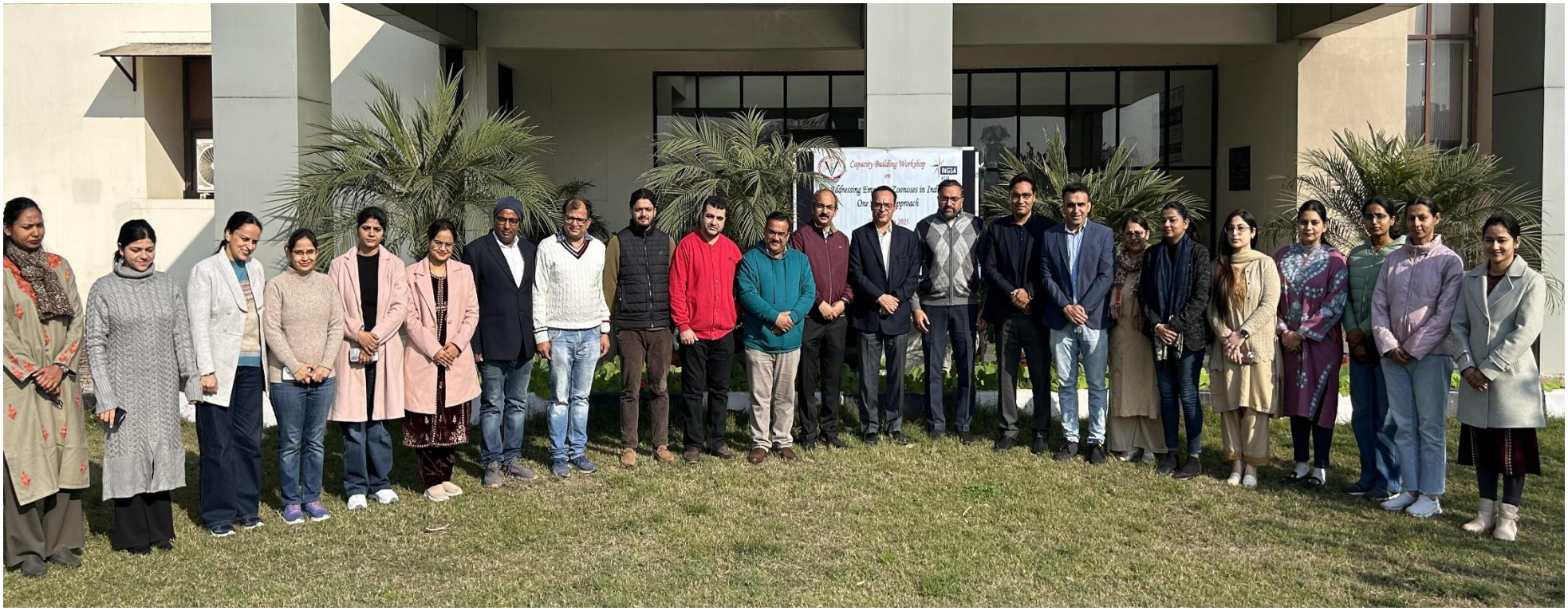
Representative photographs from Workshop 1 featuring faculty members and researchers from three participating veterinary colleges.




Capacity Building Workshop
on
Addressing Emerging Zoonoses in India:
One Health Approach



Group photograph of participants from Workshop 1, including expert members, researchers, and academicians from three veterinary colleges, taken at the conclusion of the inaugural session.



Workshop 2: Scholar Workshop (12 March 2025)

This workshop targeted 20 early-career researchers and postgraduate scholars from the College of Veterinary Science and the College of Fisheries of GADVASU. The event emphasized applied skills development and policy-oriented learning.

Objectives:

- To strengthen diagnostic and epidemiological competencies related to zoonotic disease detection.
- To promote evidence-based policy translation by young researchers.
- To foster a culture of science advice for public health preparedness at the grassroots level.

Key Sessions:

- **Overview of Emerging Zoonoses in India**: Dr. Jasbir Singh Bedi, Director, Centre for One Health provided a comprehensive overview of India's national One Health initiatives. His lecture covered key institutional frameworks such as the National One Health Mission, inter-sectoral coordination through the National Centre for Disease Control (NCDC), and multisectoral strategies under programs like IDSP, NABARD One Health pilots, and FAO-WHO collaborations. He emphasized the growing convergence between animal, human, and environmental health surveillance systems, and highlighted recent policy efforts to operationalize One Health at both national and sub-national levels through integrated data platforms and workforce training.
- In continuation, Dr. Pankaj Dhaka delivered a session on the trends and drivers of emerging and re-emerging zoonotic diseases in India. Using recent examples such as the avian influenza outbreaks and Nipah virus resurgence in Kerala. Dr. Dhaka discussed how anthropogenic pressures, wildlife-human interfaces, antimicrobial resistance, and climate change are reshaping the landscape of zoonotic threats. He presented data-driven insights from national and international surveillance reports, peer-reviewed studies, and media coverage to underscore the importance of risk mapping, early warning systems, and community-level biosurveillance. Dr. Dhaka also emphasized the urgent need for cross-sectoral capacity building, improved diagnostic preparedness, and targeted policy actions to mitigate future spillover risks.
- **Introduction to PCR diagnostics**: Dr. Deepali Kalambhe delivered hands-on training in nucleic acid extraction and PCR-based detection for pathogens such as

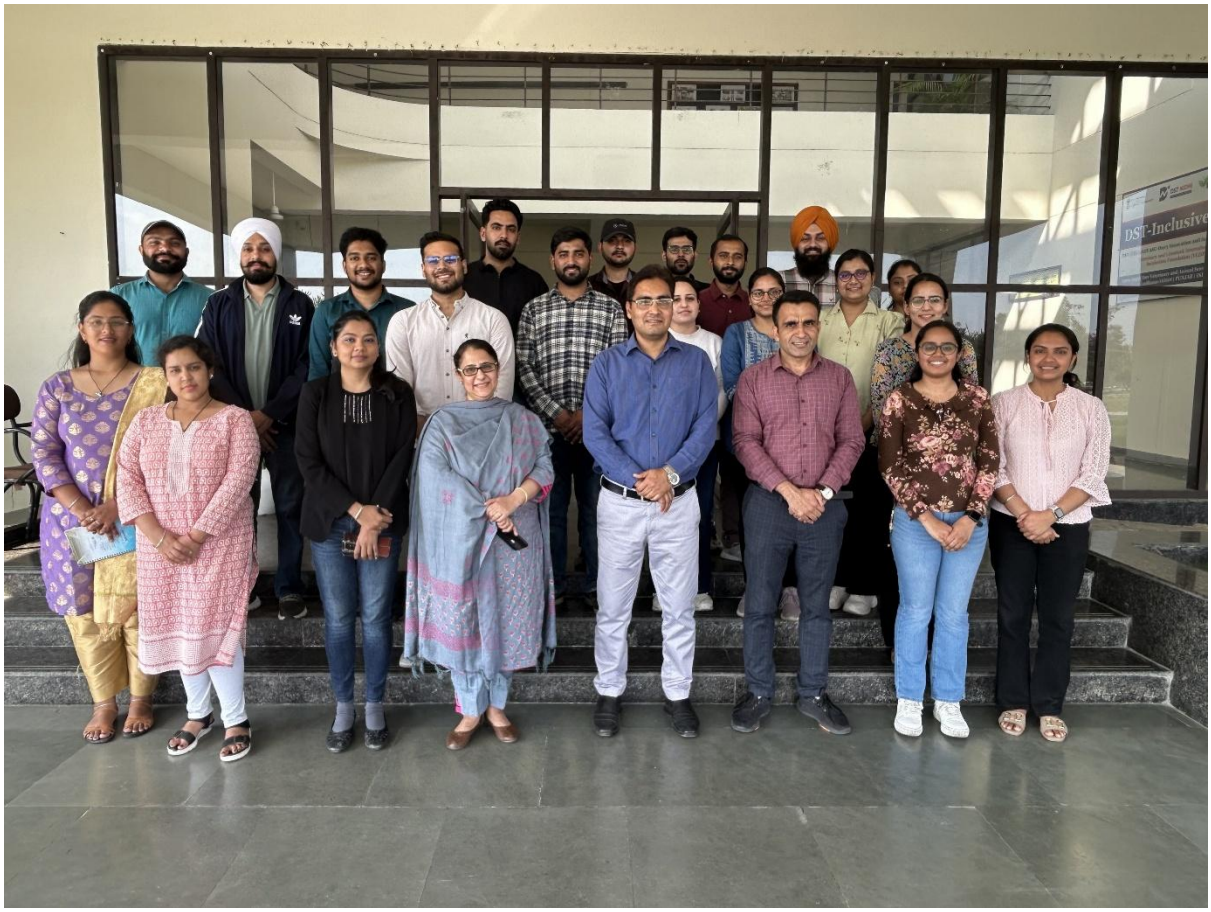
Staphylococcus aureus, diarrheagenic *Escherichia coli* (DEC), *Salmonella* spp. and Brucella spp., using food and fecal samples.

- **Science advice and policy brief writing**: The research scholars were introduced to policy communication tools, including theory of change, stakeholder mapping, and executive summary drafting techniques.

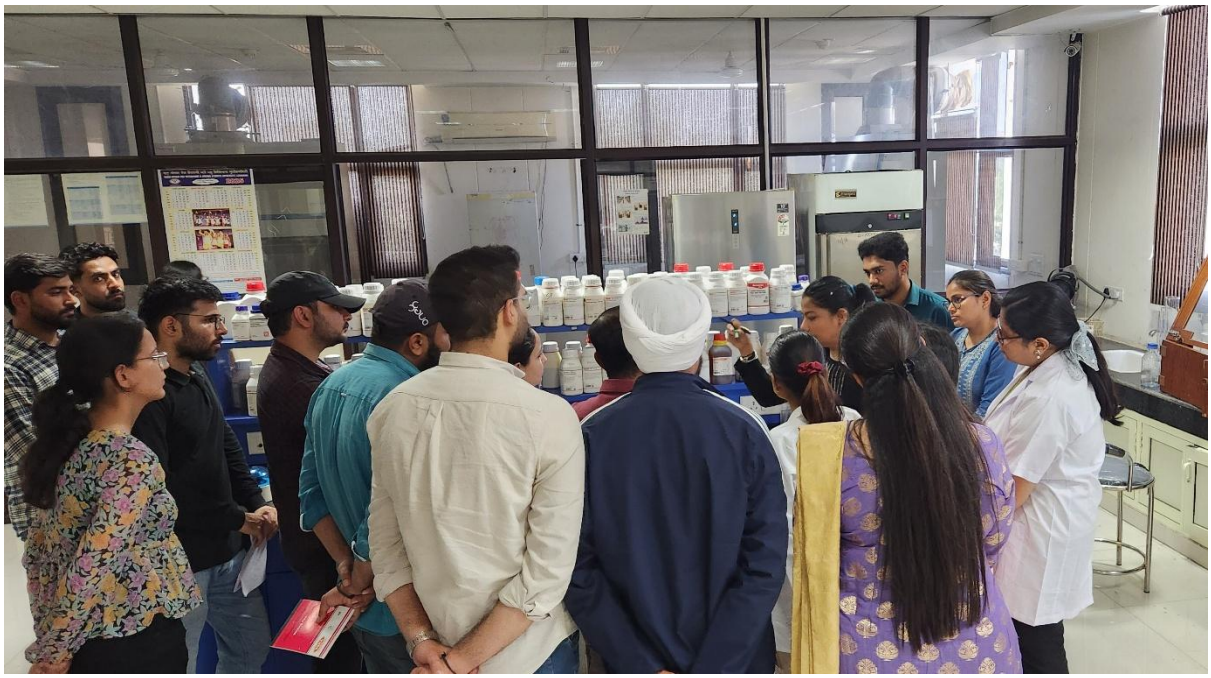
Workshop Outputs:

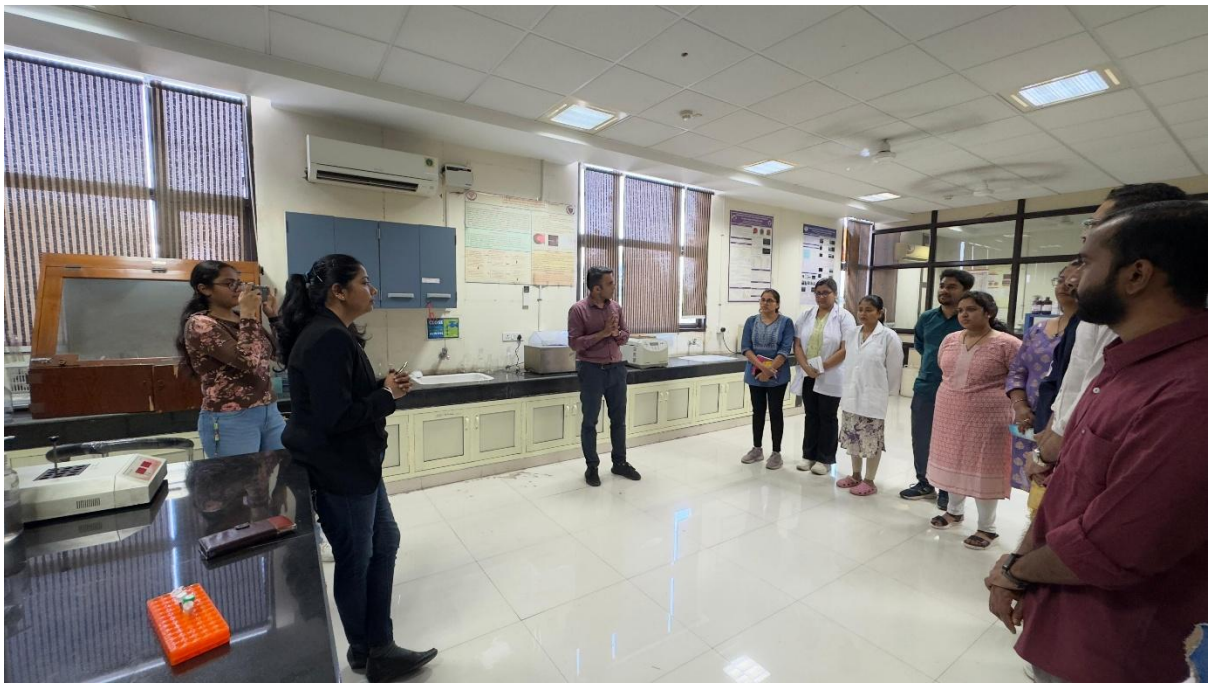
- Participants acquired practical experience in nucleic acid extraction and PCR-based pathogen detection (e.g., *S. aureus*, *E. coli*, *Salmonella* etc.) enhancing their laboratory readiness for zoonotic disease surveillance in both veterinary and food safety contexts.
- A practical concept note on a regionally relevant zoonotic disease was discussed, incorporating tools such as stakeholder mapping and theory of change to propose actionable strategies for integration into state-level One Health frameworks.

Group photo of Workshop 2 participants, including early-career researchers and postgraduate scholars from the College of Veterinary Science and College of Fisheries, GADVASU.

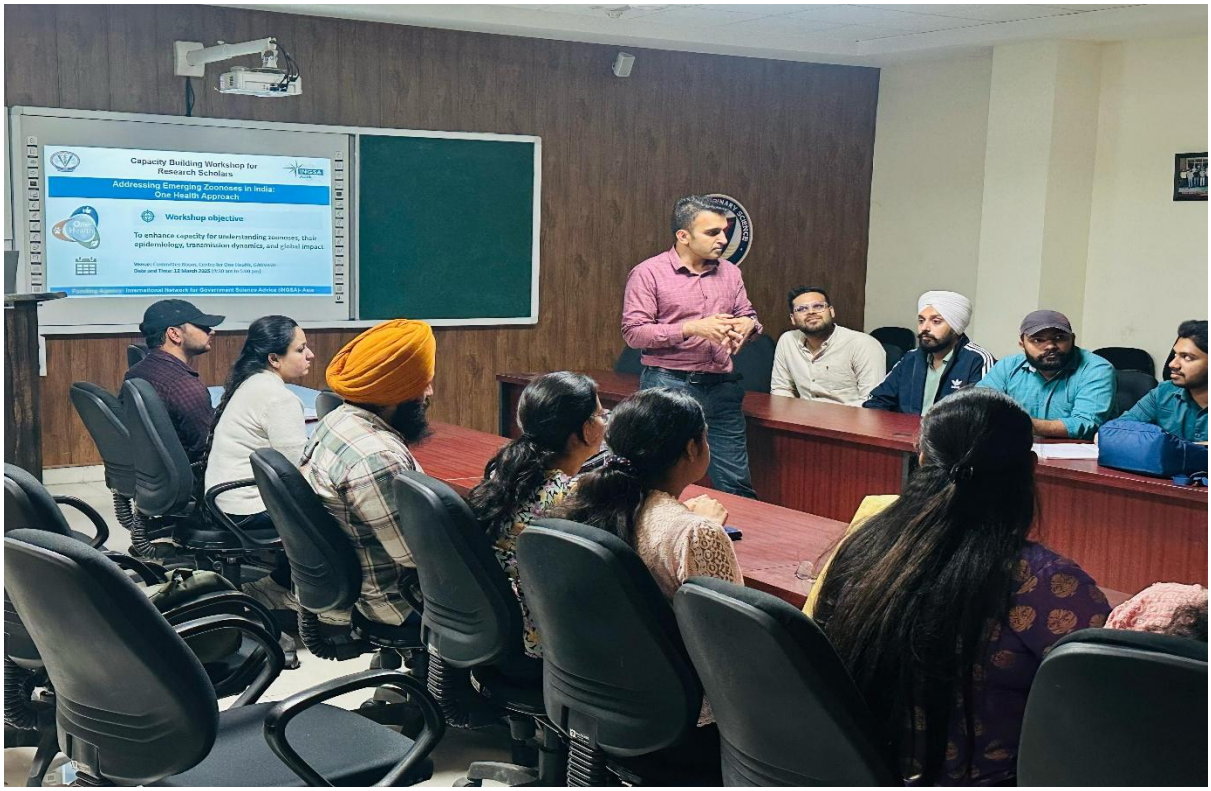


Hands-on training session on laboratory diagnostics, where participants practiced sample handling, biosafety procedures, and molecular techniques relevant to zoonotic disease detection.

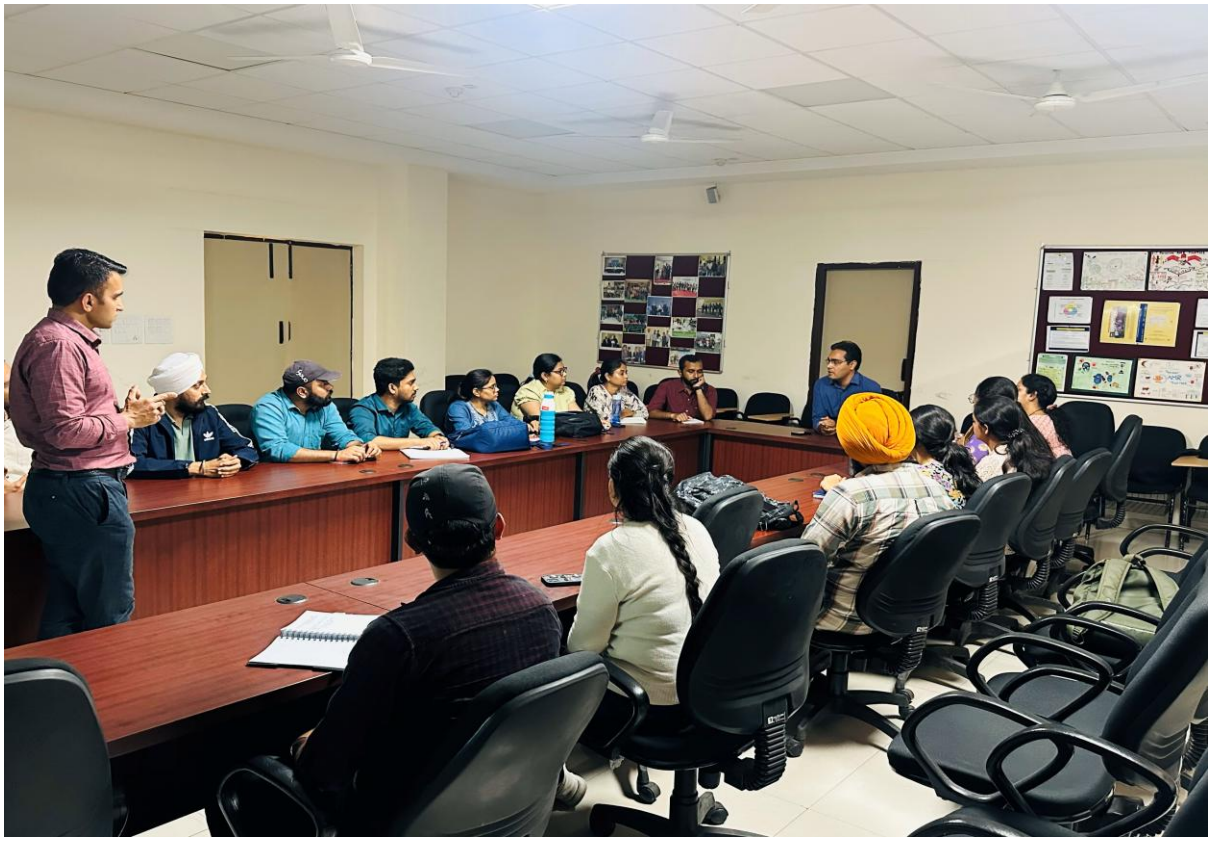




Faculty experts engaging with scholars on interdisciplinary research opportunities and collaborative project development.



Interactive session in progress, focusing on applied research skills and policy-oriented discussions under the One Health framework.



Common achievements and reflections

Across both workshops, participants and facilitators highlighted numerous transformative impacts:

a) The discussions deepened appreciation of the operational dimensions of One Health and how it intersects with institutional roles.
b) It enhanced awareness about India's national and state-level zoonoses programs (e.g., RCZI, NAP-AMR, Livestock Health and Disease Control Programme).
c) Recognition of the role of INGSA and other global platforms in promoting grassroots science-policy linkages.
d) Expression of interest from faculty to establish long-term cross-disciplinary One Health Working Groups within their institutions.

Additionally, workshop feedback captured strong endorsements for:

a) Continued technical training modules in diagnostics, epidemiological modelling, and data communication.
b) More localized workshops involving district veterinary officers, community health workers, and animal husbandry departments.
c) Bilingual resources and One Health toolkits for stakeholder awareness and outreach in rural areas.

Analysis of current policies and identified gaps

India has demonstrated commendable progress in institutionalizing the One Health approach to address zoonoses, antimicrobial resistance (AMR), food safety, and environmental threats. Prominent developments include the establishment of the National Institute for One Health (NIOH), Nagpur, under ICMR; the Integrated Disease Surveillance Programme (IDSP); the National Action Plan on AMR (NAP-AMR); the National Rabies Control Programme (NRCP); and the Roadmap to Combat Zoonoses in India (RCZI). The launch of One Health Consortium (2021), Animal Health System Support for One Health (AHSSOH), and the various Centres for One Health at academic level further underscore India's growing institutional commitment. Despite these advancements, policy and implementation gaps persist across multiple levels:

a) **Fragmentation in intersectoral coordination:** The health governance landscape remains fragmented, with ministries and departments operating in silos. While the Standing Committee on Zoonoses includes representatives from Ministry of Health and Family

Welfare (MoHFW), Department of Animal Husbandry and Dairying (DAHD), Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR), and Wildlife Institute of India (WII), operational coordination during non-emergency periods is often weak. Field-level coordination between medical officers, veterinarians, and forest officials remains informal, lacking dedicated One Health nodes or regional convergence platforms. Inter-ministerial task forces activated during emergencies (e.g., avian influenza, Nipah virus) have proven effective but are not sustained as routine mechanisms.

b) **Surveillance system limitations:** While the Integrated Disease Surveillance Programme (IDSP) tracks human diseases through the IHIP digital platform, integration with animal health systems such as NADRS/NADRES remains minimal. NADRES_v2 developed by ICAR-NIVEDI, despite its AI-based early warning capability, is not interoperable with IHIP or wildlife surveillance systems. Surveillance of wildlife diseases is further underdeveloped, with the absence of formal reporting frameworks from the forest and biodiversity sector, despite their critical role in zoonotic spillovers.

c) **Underdeveloped diagnostic infrastructure:** Only a handful of regional veterinary and medical labs (e.g., National Institute of High Security Animal Diseases (NIHSAD), Indian Veterinary Research Institute (IVRI), National Institute of Virology (NIV), etc.) have the capacity to handle BSL-3+ pathogens. Field-level institutions often rely on symptomatic diagnosis or basic microscopy. Lack of biosafety infrastructure, trained lab technicians, and inter-lab sample referral systems impedes early detection. The absence of joint diagnostics protocols between human and veterinary labs limits collaborative outbreak investigation and surveillance.

d) **Limited community engagement and awareness** Most health extension models focus either on human or animal health independently. Community-level health workers like Accredited Social Health Activists (ASHAs), Auxiliary Nurse Midwives (ANMs), and para-veterinary staff operate without cross-training on zoonoses or biosecurity. Awareness campaigns under NRCP, Brucellosis Control Programme, and National action plan on AMR are often short-term, poorly resourced, and seldom co-developed with community leaders or adapted for linguistic and cultural relevance. There is a notable absence of materials tailored to smallholder farmers, slaughterhouse workers, poultry traders, or animal waste handlers.

e) **Gaps in academic curricula and capacity building** Although ICAR has included One Health concepts in BVSc and MVSc curricula, there is no mandate for cross-enrollment of

medical, veterinary, and environmental students in integrated modules. Capacity building through interdisciplinary simulation exercises, joint field epidemiology training, and co-authored student projects remains rare. The project workshops under INGSA-Asia highlighted strong interest among scholars in multidisciplinary learning.

f) **Policy implementation disparities at the state level:** Many states still lack state specific One Health action plans or nodal units. There are disparities in technical manpower, diagnostic infrastructure, outbreak response funds, and access to central data platforms like IHIP or NADRES. Intra-state variation is also observed; some districts excel in livestock disease notification and vaccination, while others lack even basic zoonoses awareness among field staff.

g) **Funding and resource constraints** Most One Health actions are embedded within disease control or development schemes, lacking ring-fenced budgets for cross-sectoral initiatives. ICAR, DBT, and MoHFW grant projects (e.g., One Health Consortium, zoonoses modeling) have short timelines and are largely research-centric. There is a need for operational and programmatic funding to establish One Health coordination cells, mobile labs, local outbreak investigation teams, and integrated IEC campaigns. Funds allocated under G20 Pandemic Fund (2024) and Pradhan Mantri–Ayushman Bharat Health Infrastructure Mission (PM-ABHIM) should be earmarked for intersectoral One Health goals.

h) **Absence of a unified National One Health policy:** While One Health principles are embedded in India's G20 Health Declaration (2023), National One Health Mission (2021), and draft consultations by Prime Minister's Science, Technology and Innovation Advisory Council (PM-STIAC), no consolidated policy document exists that legally binds stakeholders to shared responsibilities, intersectoral information sharing, and joint monitoring. The absence of enforceable standards, indicators, or reporting structures hampers accountability.

i) **Conclusion of policy gap analysis:** Despite India's leadership in piloting and adopting various One Health initiatives, their effectiveness remains constrained by fragmentation, uneven implementation, limited decentralization, and absence of an overarching policy framework. A formal National One Health Policy supported by multi-tier governance, real-time digital integration, field-level diagnostics and surveillance, curriculum integration, community involvement, and sustainable financing is urgently needed.

Stakeholder perspectives and grassroots science advice

The success and sustainability of the One Health approach fundamentally depend on inclusive stakeholder engagement and localized science advice mechanisms. This project emphasized listening to, learning from, and collaborating with key actors at the grassroots level, researchers, veterinary and public health faculty, postgraduate scholars, extension workers, and academic professionals, whose insights shape context-specific, implementable solutions.

Mapping of stakeholders and roles: During both workshops, participants collaboratively mapped stakeholders involved in zoonoses prevention and response in India. Key categories included:

a) **Government departments:** DAHD, MoHFW, ICAR, ICMR, NCDC, State Animal Husbandry Departments, Public Health Directorates.
b) **Academic institutions:** Veterinary colleges, medical universities, environmental science departments, and research institutes.
c) **Diagnostic and surveillance networks:** NADRS, NADRES, IDSP, State Disease Diagnostic Labs, and laboratories under IVRI and NCDC.
d) **Frontline workers:** Veterinarians, para-vets, ASHAs, Aanganwadi workers, ANMs, sanitary inspectors.
e) **Community and civil society:** Farmer associations, butchers, poultry traders, dairy co-operatives, NGOs.

This mapping exercise enabled participants to recognize overlapping responsibilities, communication bottlenecks, and leverage points for collaboration.

Key insights from faculty participants: Veterinary faculty across the three participating institutions highlighted:

a) The need to embed One Health more explicitly in research design and curriculum.
b) Gaps in collaboration with public health counterparts on joint zoonoses studies.
c) Desire to develop institutional-level One Health cells for coordinated research, outreach, and student engagement.
d) Limitations in field-level data access and challenges in linking laboratory surveillance with community-based reporting.

Faculty supported the idea of national and state-level One Health resource centers to anchor training and implementation.

Scholar perspectives: Postgraduate scholars expressed high levels of motivation to pursue careers in One Health and highlighted:

a) Lack of integrated coursework and field exposure across disciplines.
b) Need for training in science-policy communication, stakeholder engagement, and diagnostic technologies.
c) Suggestions for establishing student-led zoonotic awareness clubs and participation in outbreak simulation exercises.
d) Emphasis on molecular diagnostic training, particularly for foodborne zoonoses, in both veterinary and fisheries contexts.

Several students proposed incorporating One Health fieldwork into their research dissertations and welcomed INGSA mentorship for future policy fellowships.

Feedback from diagnostic and surveillance experts:

a) The need for SOP harmonization across sectors for outbreak investigation.
b) Limitations in rapid sample transport and biosafety infrastructure.
c) Opportunities for AI/ICT-enabled zoonotic forecasting if grassroots data are made interoperable.
d) Need for data-sharing protocols between IHIP and NADRES/NIV to enhance intersectoral outbreak detection.

Enabling Grassroots Science Advice: The project adopted INGSA's core principles of evidence-informed policymaking, inclusivity, capacity development, and contextual relevance. Specific activities aligned with these included:

a) Training sessions on how to draft policy briefs and present scientific evidence for decision-making.
b) Group exercises to simulate district-level responses to zoonotic outbreaks.
c) Discussion of past science-policy failures and how to overcome political, technical, or institutional barriers.
d) Bilingual discussions and participatory feedback methods to democratize workshop learning.

Participants appreciated the role of INGSA-Asia in creating space for grassroots perspectives to be heard and in encouraging young scientists to act as science advisors within their local contexts.

Reflections and recommendations: Stakeholders recommended the following to enhance grassroots engagement in One Health policy:

a) Establish One Health liaison officers at district level to coordinate human-animal-environmental health actors.
b) Develop bilingual IEC toolkits on zoonotic diseases tailored for farmers, poultry handlers, and sanitation staff.
c) Introduce credit-based interprofessional modules in veterinary, medical, and allied science curricula.
d) Create state-level One Health networks with academic institutions, labs, and community platforms.

In conclusion, the workshops demonstrated the transformative potential of listening to local actors and empowering them as key contributors to India's One Health movement.

References:

Bedi, J.S., Vijay, D. and Dhaka, P., 2022. *Textbook of zoonoses*. John Wiley & Sons.

Goel, K., Sen, A., Satapathy, P., Kumar, P., Aggarwal, A.K., Sah, R. and Padhi, B.K., 2023. Emergence of rabies among vaccinated humans in India: a public health concern. *The Lancet Regional Health-Southeast Asia*, *9*.

Jaismon, P.A., AP, S., Verma, M.R., Singh, Y.P., Borthakur, U., Kumar, S., Sharun, K. and Dhama, K., 2023. Prevalence of bovine brucellosis in India: a meta-analysis. *Veterinary Quarterly*, *43*(1), pp.1-9.

Sakshi, Dhaka, P., Bedi, J.S., Aulakh, R.S., Singh, R. and Gill, J.P.S., 2023. Assessing and prioritizing zoonotic diseases in Punjab, India: a one health approach. *EcoHealth*, *20*(3), pp.300-322.