

TECHNICAL GUIDANCE ON

PREVENTION, PREVENTION, PREPAREDNESS AND RESPONSE

USING ONE HEALTH APPROACH



NATIONAL CENTRE FOR DISEASE CONTROL DIRECTORATE GENERAL OF HEALTH SERVICES, Ministry of Health & Family Welfare, Government of India





सत्यमय जयत स्वास्थ्य एवं परिवार कल्याण मंत्रालय MINISTRY OF HEALTH & FAMILY WELFARE GOVERNMENT OF INDIA

TECHNICAL GUIDANCE ON ZOONOTIC DISEASE **PREVENTION, PREVENTION, PREPAREDNESS AND RESPONSE** USING ONE HEALTH APPROACH



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Technical Guidance on Zoonotic Disease - Prevention, Preparedness and Response using One Health approach

Jointly Published by: NCDC, India and WHO Country Office for India

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🕨 HUMAN HEALTH 🔂 ANIMAL HEALTH 🔂 ENVIRONMENTAL HEALTH

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TECHNICAL GUIDANCE ON ZOONOTIC DISEASE

ABBREVIATIONS

AAR	After Action Report
ADB	Asian Development Bank
ANM	Auxiliary Nurse Midwife
АН	Animal Health
AHD	Animal Husbandry Department
AMR	Anti-Microbial Resistance
AIIMS	All India Institute of Medical Science
API	Application Programming Interface
ARDS	Acute Respiratory Distress Syndrome
ASHA	Accredited Social Health Activist
BHO	Block Health Officer
BMO	Block Medical Officer
CCHF	Crimean Congo Hemorrhagic Fever
CDC	Centers for Disease Control and Prevention
CFR	Case Fatality Rate
CME	Continuing Medical Education
СМНО	Chief Medical Health officer
CVE	Continuing Veterinary Education
DAHD	Department of Animal Husbandry and Dairying
DAHO	District Animal Husbandry Officer
DDMA	District Disaster Management Authority
DHS	Directorate of Health Service
DLZC	District Level Zoonoses Committee
DMO	District Medical Officer
DSO	District Surveillance Officer
ELISA	Enzyme-Linked Immunosorbent Assay
EMR	Electronic Medical Records
EMR	Emergency Medical Responder
EQAS	External Quality Assurance Service
FAO	Food and Agriculture Organization
FETP	Field Epidemiology Training Program
FSSAI	Food Safety and Standard Authority of India
GADVASU	Guru Angad Dev Veterinary and Animal Sciences University
HEPR	Health Emergencies Preparedness, Response and Resilience
ICAR	Indian Council of Agriculture Research

ICMR	Indian Council of Medical Research
ICU	Intensive Care Unit
IDSP	Integrated Disease Surveillance Programme
IEC	Information, Education and Communication
IHR	International Health Regulations
IHIP	Integrated Health Information Platform
IPC	Infection Prevention and Control
IVRI	Indian Veterinary Research Institute
IVA	Indian Veterinary Association
JEE	Joint External Evaluation
JRA-OT	Joint Risk Assessment Operational Tool
KVK	Krishi Vigyan Kendra
KFD	Kyasanur Forest Disease
KVASU	Kerala Veterinary and Animal Sciences University
MCM	Multi sectoral Co-ordination Mechanism
MERS	Middle East Respiratory Syndrome
M&E	Monitoring and Evaluation
MoAFW	Ministry of Agriculture and Farmers Welfare
MoEFCC	Ministry of Environment, Forest and Climate Change
MoFAHD	Ministry of Fishery, Animal Husbandry & Dairying
MoHFW	Ministry of Health & Family Welfare
MO	Medical Officer
NABL	National Accreditation Board for Testing and Calibration Laboratories
NADRES	National Animal Disease Referral Expert System
NBW	National IHR-PVS Bridging Workshops
NDLM	National Digital Livestock Mission
NIHSAD	National Institute of High Security Animal Diseases
NCDC	National Centre for Disease Control
NGO	Non-Governmental Organization
NIVEDI	National Institute of Veterinary Epidemiology and Disease Informatics
NIV	National Institute of Virology
NiV	Nipah Virus
NOHP-PCZ	National One Health Programme for Prevention and Control of Zoonoses
ОН	One Health
OR	Operational Research
OIE	World Organization for Animal Health
OHHLEP	One Health High-Level Expert Panel

OH JPA	One Health Joint Plan of Action
OHZDP	One Health Zoonotic Disease Prioritization
PCR	Polymerase Chain Reaction
PCCF	Principal Chief Conservator of Forest
PHEIC	Public Health Emergency of International Concern
PPE	Personal Protective Equipment.
PPR	Prevention, Preparedness and Response
PM-STIAC	Prime Minister's Science, Technology, and Innovation Advisory Council
PVS	Performance of Veterinary Services
R and D	Research and Development
RCC	Regional Coordinating Centre
RCCE	Risk Communication and Community Engagement
RKVY	Rashtriya Krishi Vikas Yojna
RRL	Regional Referral Laboratories
RRT	Rapid Response Team
RT-PCR	Reverse Transcription Polymerase Chain Reaction
SDG	Sustainable Development Goal
SDMA	State Disaster Management Authority
SLZC	State Level Zoonoses Committee
SPAR	State Party Self Assessment Annual Report
SSSZ	Sentinel Surveillance Sites for Zoonoses
SSO-IDSP	State Surveillance Officer- IDSP
ToR	Terms of Reference
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
VBD	Vector Borne Diseases
VCI	Veterinary Council of India
WASH	Water, Sanitation and Hygiene
WII	Wildlife Institute of India
WHO	World Health Organization
WHE	WHO Health Emergencies
WOAH	World Organization for Animal Health

TECHNICAL GUIDANCE ON ZOONOTIC DISEASE

The world remains extremely vulnerable to major public health emergencies largely emerging at the animal-human-wildlife interface. It is clear that only reactive approaches will not work, and focus needs to be also on prevention and preparedness for response.

Taking on from some of the learnings from the COVID-19 pandemic and in line with global One Health momentum, the Centre for One Health (COH), National Centre for Disease Control (NCDC) actively collaborated with WHO Country office for India, to evolve a technical guidance document that would provide a blueprint to states/UTs to operationalize timely and effective multisectoral, multidisciplinary mechanisms to prevent, prepare and respond to zoonotic diseases, with a One Health approach.

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The purpose of the document is to empower stakeholders with the information and tools they need to effectively address the challenges posed by zoonotic diseases and to know the respond rapidly in case of outbreaks. The document builds on the draft Standard Operative Procedures for Zoonoses as formulated during a national consultation organized by COH in collaboration with Department of Animal Husbandry and Dairying (DAHD) and CDC India, where a diverse group- human, animal health and wildlife experts of more than eleven states participated.

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The "Technical Guidance on Zoonotic Diseases for Prevention, Preparedness and Response" is thus a product of the collective efforts of implementing agencies and partners who contribute to the prevention, preparedness and response for combatting Zoonotic Diseases in India and in line with the vision of the Government of India to promote global health security through a One Health approach.

BACKGROUND

One Health approach has been strongly advocated globally by the World Health Organization (WHO), Food and Agriculture Organization (FAO) and the World Organization for Animal Health (WOAH) as the way forward to address health challenges at Human-Animal-Environment interfaces. These challanges include zoonotic diseases, antimicrobial resistance (AMR), food borne illness, environmental health hazards and issues related to climate change, food security, biodiversity loss etc.

This approach can be adopted for designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes.

Although human-animal interaction has lots of beneficial effects, it may create an enabling and conducive environment for the occurrence and spread of zoonotic diseases and AMR. As well exemplified by the COVID-19 pandemic, the spillover events of other high threat pathogens (such as influenza A, Nipah virus, MERS-CoV, CCHF etc.) are becoming increasingly common nowadays. Unless detected and contained during early phase, a small outbreak can progress into an epidemic or even public health emergency of international concern (PHEIC), finally culminating into a pandemic.

Several zoonotic diseases are endemic in India that cause significant health and economic losses. This includes Influenza A viruses, Anthrax, Japanese Encephalitis, Leptospirosis, Brucellosis, Rabies, Scrub typhus, Plague, CCHF, KFD and parasitic diseases like Cysticercosis, Hydatid disease and toxoplasmosis.

Foodborne diseases of animal origin also cause a substantial burden of diarrhoeal disease in India and can best be tackled with a One Health approach. Not to mention, there is significant burden of vector borne diseases propagating in India, like the expanding profile of Zika virus into states like Kerala, Uttar Pradesh, and Maharashtra.

In addition to existing zoonoses, India faces potential threats of new and exotic zoonotic infection *viz.*, Yellow Fever, MERS, Hanta virus infection, Rift Valley fever, Ebola and Marburg disease.

To protect people and economies from the effects of zoonotic disease and other public health emergencies necessitates cooperation, mutual accountability, and concerted actions between various sectors, policymakers, local governments, academia, professional associations, and civil society organisations. The cost of economic and social disruption during outbreak far exceeds the cost of preparedness and early response.

As per the IHR core capacity requirements for addressing zoonotic infections, sectors need to assess, notify, and report events, and respond to public health risks and emergencies of national and international concern. Recently, the review of the IHR

(2005) on the COVID-19 pandemic highlighted countries to strengthen a One Health approach to preparedness and response and a new pandemic treaty is being drafted. There is an enhanced focus on the need for collaborative multi source surveillance for generating the intelligence needed to prevent and detect outbreaks early.

Considering the COVID-19 pandemic's experiences, nations must strengthen their functional capacities, particularly related to emergency coordination, collaborative surveillance, clinical care, and risk communications and communication engagement, all of which was highlighted in the 15th meeting of the IHR (2005) held recently on 4th May 2023.

While the need for a One Health approach is becoming more widely acknowledged in the country, there is need for a greater momentum at the field level for its operationalization, including instituting robust governance and administrative mechanisms for collaboration. More often than not, sectors largely come together on an ad hoc basis for responding to zoonotic disease outbreak but not so much for the prevention and preparedness that are needed to address the issue of zoonoses.

Because zoonotic diseases are unpredictable, and diseases do not respect boundaries, all countries must be prepared for the unexpected. If states and districts in India sets up a well-established multi-coordination mechanism for responding to zoonotic threats, it will be able to quickly return to normal after an emergency, meet the spike in demand for services during outbreaks, and support continuity of essential services to the affected population.

The key principles of One Health within the Tripartite Zoonoses guide are that taking a multisectoral One Health approach means that all relevant sectors and disciplines across human-animal- environment interface are involved to address health in a way that is more effective, efficient, or sustainable than might be achieved if not all relevant sectors were engaged. Taking a multisectoral, One Health approach includes ensuring balance and equity among all partners.

Thus, the country needs a technical guidance document that provides a blue print for states to operationalize timely and effective multisectoral, multidisciplinary mechanisms to prevent and respond to zoonotic diseases. It empowers stakeholders with the information and tools they need to effectively address the challenges posed by these diseases and to respond rapidly in case of outbreaks.

PURPOSE AND SCOPE OF THE DOCUMENT

This document provides a guide for timely and effective multisectoral, multidisciplinary One Health mechanism to prevent, prepare and respond to zoonotic disease at all levels with a particular focus on state and district levels.

It guides states and districts in developing or updating their integrated approach to zoonotic pathogen preparedness for equitable and robust response.

The document focusses on operationalizing One Health approach across sectors and agencies while also describing actions for health emergency preparedness and response. Such a multisectoral approach can be extended beyond zoonotic diseases to addressing AMR, food safety, environmental health hazards, biodiversity management and other issues in line with One Health Joint Plan of Action.

The document also provides pragmatic steps with examples on how to develop linkages and establish multi sectoral co-ordination mechanism for addressing existing and emerging zoonotic disease at state and district levels.

The guideline was developed in accordance with several national and international frameworks, ensuring that it is relevant to India's circumstances, contexts, and dynamics.

Target audience





ANIMAL HUSBANDRY AND ALLIED DEPARTMENTS



STATE/DISTRICT LEVEL ZOONOSES COMMITTEE MEMBERS



MEDICAL/ VETERINARY COLLEGES AND TERTIARY HOSPITALS/ PRIVATE SECTORS



FOREST AND WILDLIFE HEALTH DEPARTMENTS



DISTRICT ADMINISTRATOR



PARTNERS/ PROFESSIONALS AND STUDENTS IN PUBLIC HEALTH SECTORS

TECHNICAL GUIDANCE ON ZOONOTIC DISEASE

CHAPTER 1

ONE HEALTH APPROACH AND IMPLEMENTATION TOOLS

While the notion of One Health is not new, it has gained momentum because of global experiences with high-threat pathogens that have evolved at the human-animal interface, such as the COVID-19 caused by SARS Cov 2. It has provided fresh impetus to strengthen health systems, revitalize the essential public health functions and enhance emergency preparedness and response capacities.

WHO is working together with member states and other global organizations such as FAO, WOAH, UNEP to promote a clear understanding of One Health and provide tools and resources for an integrated approach of implementation at field levels. The four Organizations have signed a groundbreaking agreement to strengthen cooperation to sustainably balance and optimize the health of humans, animals, plants and the environment (Photo 1).



Photo 1: Quadripartite Memorandum of Understanding (MoU) for a new era of One Health collaboration (3) On 17 March 2022, the heads of the four organizations – QU Dongyu, the Director-General of FAO, Monique Eloit, the Director-General of OIE, Inger Anderson, the Executive Director of UNEP, and Tedros Adhanom Ghebreyesus, the Director-General of WHO -signed a Memorandum of Understanding (MoU) for joint One Health works, by which UNEP joined the former Tripartite (FAO, OIE & WHO) as an equal partner to form a new Quadripartite Collaboration for One Health (3).

The One Health High-Level Expert Panel (OHHLEP), an advisory body to the Quadripartite group (FAO-WHO-WOAH-UNEP), has defined One Health (see Box 1a) to promote a clear understanding across sectors.

Box 1a: The One Health Definition

One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems.

It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent. The approach mobilizes multiple sectors, disciplines, and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems (1).

Broadly, One Health approach is particularly relevant for addressing food and water safety, the control of zoonoses and infectious diseases, climate change, disaster management, and combatting antimicrobial resistance. To address issues related to

environment, there has been several talks on Planetary Health which is a trans-disciplinary field that calls for efforts to simultaneously safeguard human health and the natural systems that underpin it (as per the issue brief of UNDP)(2).

While sectors collaborate more frequently during outbreaks, management of zoonotic diseases necessitate substantial investment during prevention phase. Successful implementation of One Health will require 3 Cs - improved coordination, communication, and collaboration between sectors (Fig. 1).

Taking a One Health approach support the progress in achieving the SDGs. The approach mobilizes multiple sectors,



Fig 1: One Health approach focuses on multi sectoral coordination, communication and collaboration

disciplines, and communities at varying levels of society to work together. This way, new and better ideas are developed that address root causes and create long-term, sustainable solutions.

Documenting best practices of One Health models at field levels (State/ District) and disseminating the success stories would be important with regard to Zoonotic disease prevention and control.

Global recognition of One Health has led to development of newer tools that helps in the implementation as well as to better assess the functionality of OH capacity and strengthen OH approaches. Notable to mention, the operational tools in the Tripartite Zoonoses Guide that provides detailed technical guidance and step-by-step instructions to operationalize collaboration across sectors for better health outcomes (4). Similarly, the National Bridging workshop that utilizes the IHR and PVS pathways to identify bridging opportunities between the two sectors, as well as next steps and activities needed to strengthen capacities relevant to the animal-human interface (5). Based on experiences of acute public health events (such as – Ebola in West Africa, influenza A/H1N1(2009), MERS-CoV outbreaks in Middle East; COVID-19 pandemic; Multicountry outbreak of monkeypox), the newer approaches such as the PRET- respiratory pathogens are being considered for supporting country planning (6). Furthermore, based on distilling the lessons learnt from COVID-19 pandemic, WHO SE Asia developed a Regional Strategic Roadmap for Health Security and Health System Resilience for Emergencies 2023–2027 (7). Most recently, WHO and partners have recommended countries to develop a OH Joint Plan of actions using the guidance provided by the quadripartite (8). The OH JPA provides comprehensive technical guidance to countries and provides a framework for collective and coordinated action to mainstream the One Health approach at all levels. It is built around six interdependent action tracks (see Box 1b) that collectively contribute to achieving sustainable health and food systems, reduced global health threats and improved ecosystem management:

Box 1b: Action tracks under One Health joint plan of action

Action track 1: Enhancing One Health capacities to strengthen health systems

- **Action track 2:** Reducing the risks from emerging and re-emerging zoonotic epidemics and pandemics
- Action track 3: Controlling and eliminating endemic zoonotic, neglected tropical and vector-borne diseases
- Action track 4: Strengthening the assessment, management and communication of food safety risks

Action track 5: Curbing the silent pandemic of AMR

Action track 6: Integrating the environment into One Health

Using examples and case studies several activities connected to six action tracks have been highlighted in the document. All these tools have helped countries to move forward in terms of actionable steps and resource mobilization.



Refer to Annexure I for other tools for implementing One Health approach.

Annexure I enlist the various tools for One Health Implementation and their corresponding access links.

CHAPTER 2

KEY INITIATIVES OF ONE HEALTH IN INDIA

2. 1. One Health Initiatives in India

The Government of India has always placed health high on its political agenda and has been progressively investing and strengthening the One Health approach. Currently there are two national programmes that are supporting states for accelerating the pace at which One Health related threats can be tackled.

- 1. The National programme on containment of AMR and
- 2. The National One Health Programme for Prevention and control of Zoonosis

One Health is being viewed at the highest level with India's G20 Presidency theme of *"Vasudhaiva Kutumbakam,"* or *"World is One Family,"*. By leveraging its presidency, India is fostering collaborative solutions that not only benefit its own population but contribute to the broader global well-being, reinforcing the theme' (9).

India's primary health priorities during its G20 presidency are to track health emergencies, prepare for them, and respond to them with a focus on One Health. G20 New Delhi Leaders' Declaration (9-10 September 2023) emphasized strengthening global health and implementing One Health approach by promoting Quadripartite's One Health Joint Plan of Action (2022-2026) (10).

A cross-ministerial National One Health Mission has been established with the approval of the Prime Minister's Science, Technology, and Innovation Advisory Council (PM-STIAC). With early warning systems based on integrated surveillance systems, the mission intends to cooperate across accomplishing overall pandemic preparedness and integrated disease control against priority diseases affecting both human and animal health sectors (9).

The National Centre for Disease Control is coordinating the implementation of the National One Health Programme for Prevention and control of Zoonosis (NOHP-PCZ). One of the key components under the program is strengthening the surveillance capacity on Zoonoses at National, State and District Level. The Department of Health and Family Welfare also had undertaken a scheme on 'Strengthening of Inter-sesctoral Coordination for Prevention and Control of Zoonotic Diseases' during 2012 [12th five-year plan (2012-2017)] to strengthen inter-sectoral coordination between the sectors for prevention and control of zoonotic diseases of public health importance (12).

Under the auspices of the National OH Mission, the Department of Animal Husbandry and Dairying had created two initiatives: the World Bank funded Animal Health System Support for One Health (AHSSOH) and Animal Pandemic Preparedness Initiative (APPI) (13). These initiatives aim to improve disease surveillance capabilities, early detection, and community outreach (13). Additionally, One Health Support Unit has also been established by the department in the two selected states of India (Karnataka and Uttarakhand).

Other initiatives include, establishment of National Institute of One Health at Nagpur, Maharashtra (joint initiative of ICMR and ICAR), development of One Health Road map (Department of Biotechnology, Ministry of Science and Technology and other ministries), National Action Plan for Dog Mediated Rabies Elimination (14), National Action Plan for Avian Influenza (15), National Action Plan for AMR (16), all of which focusses on One Health approach.

Various institutions in India had developed One Health academic courses (Pioneered by KVASU, Kerala in 2014 (17); followed by GADVASU Punjab in 2020, IIT Kharagpur in 2023 and IVRI, Uttar Pradesh in 2023) to create a critical mass of One Health workforce for propagating and supporting research and capacity building on One Health approach. Recently, NCDC and Department of Animal Husbandry and Dairying (DAHD) have piloted a novel field epidemiology training in One Health called "SectorConnect: Enhancing Preparedness for Integrated Response" for building a network and enhancing the capacity of professionals across the human, animal, environmental health and other sectors. These courses make a real impact in combating disease outbreaks and public health emergencies by building workforce capacity in India.

Apart from this, several conferences, workshops, training, and research activities in the One Health arena have taken place in the country over the last ten years.

Based on experiences on Zoonotic disease outbreak management various states have formulated guidelines involving multiple sectors. For example, to prevent Nipah virus outbreak in Kerala, the Department of Health Service has developed guidelines with actions and recommendations for intersectoral actions (18). Similarly, an operational manual on Kyasanur forest disease was released by the Directorate of Health and Family Welfare Services, Government of Karnataka, where the focus was on One Health co-ordination mechanism (19).

2. 2. Institutional mechanism on One Health (under NOHP-PCZ)

The quadripartite organizations (WHO-WOAH-UNEP and FAO) provides top level leadership on Global Health matters and has established an advisory body called OHHLEP to take forward One Health approach from concept to operationalization. At the National level, there are various ministries such as MoH & FW, MFAHD, MoEF & CC and MoA & FW to steer One Health coordination mechanism. India has a Standing Committee on Zoonoses which is the highest technical advisory group under DGHS with representation of multi-stakeholders viz., Health, Veterinary, Environment, and Wildlife.

The National Centre for Disease control is coordinating and implementing National One Health Programme for Prevention and control of Zoonoses (NOHP-PCZ). In addition, ICMR, DAHD, ICAR Wildlife institute of India, and other partners provides technical support to the program and provides leadership in their domains to facilitate disease control measures using One Health approach. At regional level, the NOHP-PCZ identified 15 Regional Coordinators to enhance Zoonotic disease surveillance and outbreak response in various states and to support multi sectoral activities (20). To begin with, 32 Sentinel Surveillance Sites have been selected to study the burden of zoonoses and epidemiological risk factors associated with diseases (See Annexure II).

Annexure II details the Regional Coordinator and Sentinel Surveillance Sites under NOHP-PCZ

Additionally, to facilitate Multisectoral One Health mechanism for zoonoses control, the NOHP-PCZ had constituted various state and district level zoonoses committee (SLZC/ DLZC). All states have now constituted these committees. The ToR of SLZC/ DLZC are shown in Annexure III. Upgrading the existing State level Zoonoses Committees to State/District One Health Committees will be a strategic move that can have several benefits, particularly in enhancing the coordinated approach to address AMR, food safety, environmental hazards and further to improve overall public health. The programme also provides technical assistance to states and partner agencies in developing state action plans based on the One Health concept. The programme is leading a number of national initiatives to integrate all relevant sectors and partner organisations.

Annexure III details the composition and ToR of SLZC/ DLZC

At the State Level, Directorate of Health Service (DHS), state IDSP, State Animal Husbandry and Forest Departments (along with SLZC) coordinates the Zoonoses control activities.

At district level, Chief Medical Health Officer, District Animal Husbandry officer, District Surveillance Officer, Forest Officer (along with DLZC) coordinates the activities of zoonoses control at district (and below district) level with guidance from District Administrator.

Block level field functionaries includes Medical officers, Veterinary Officers and other frontline workers

Village level field functionaries includes ASHA/ ANM/ Paravets.

The program also involves communities and target population including farmers, animal handlers, forest workers etc. through Integrated community outreach programme and involvement of Krishi Vigyan Kendra's, private organizations/ NGOs, Universities for disease control activities.

The above mechanism is summarized in Fig. 2



SLZC: State Level Zoonotic Committee *DIZC: District Level Zoonotic Committee

***DIZC: District Level Zoonotic Committee

Fig. 2: Institutional Mechanism on One Health (under NOHP-PCZ)

CHAPTER 3

KEY STAKEHOLDERS OF ONE HEALTH IN INDIA

By its very nature, sector coordination for One Health approach necessitates considering and involving a variety of stakeholders from the public and private sectors on a global, regional, and national level. Knowing the key stakeholders or conducting stakeholder analyses specific to the threats being addressed is an essential first step towards ensuring One Health especially with regards to coordination and communication between relevant sectors, sharing knowledge and resources, building synergies, and identifying gaps.

One Health needs to include a range of partners drawn not only from the health sector but also from the animal health and production, agriculture and environmental, as well as those working in other fields such as the social determinants of health. It is crucial to identify and include these pertinent stakeholders towards the control of zoonotic diseases in order to ensure that all viewpoints are considered.

States are expected to maintain updated list of concerned stakeholders for One Health for various activities linked to zoonoses prevention and control. Each sector brings its own specific resources and responsibilities and contributes to a shared accountability.

Box 2 provides a template of stakeholders for states to maintain an updated list for stakeholder involvement based on the types of hazards to be addressed.

BOX 2: Stakeholders involved in One Health				
STAKEHOLDER	BROAD ONE HEALTH ROLES			
Development Partners (Intern	ational)			
WHO, FAO, WOAH, UNEP	To provide global leadership to engage and coordinate key stakeholders and provide advocacy			
Other technical agencies viz., ADB, CDC, World Bank, USAID etc	for a One Health approach to be integrated into formal work programmes			
Government sectors (National, State and District)				
Human Health related authorities				
Central and state health ministries (MoHFW)	To provide leadership on health matters including prevention, preparedness and response to diseases at animal-human-environment interface			
Central Institutes and Technical agencies (NCDC, ICMR, AIIMS and other national agencies)	To provide technical guidance to states, support outbreak investigation (as needed), undertake research, risk assessment, disease monitoring, capacity building, epidemiology and laboratory surveillance			

Health department (allied health dept.) Medical Universities and	For all matters related to human health in the state. Provides advisory services, patient care and treatment, steer control operations, developing/ adapting guidelines, public awareness, media engagement, etc. To conduct research, education and knowledge			
Academic institutes	sharing on public health aspects. Also to provide treatment and care of patients, providing consultancy/ advisory services etc.			
Food Safety and Standard Authority of India (FSSAI)	To develop science based standards and guidelines for food safety, support food borne outbreak investigation, traceback and recall as needed, import- export requirements etc.			
Animal Health related authori	ties			
Central and state ministries (DAHD)	To provide leadership on animal health matters including prevention, preparedness and response to diseases at animal-human-environment interface			
Central Institutes and Technical agencies (ICAR, IVRI and other national agencies)	To provide technical guidance to states, support outbreak investigation (as needed), undertake animal health research, risk assessment, disease monitoring, capacity building, epidemiology, and laboratory surveillance in animals			
Animal Husbandry Department	For all matters related to animal health in the state. Provides advisory services for livestock farmers, animal care and treatment, steer control operations, developing/ adapting guidelines, public awareness, media engagement, wet market surveillance, risk reduction at organized farms, fairs, and conducting community outreach activities			
Veterinary Universities and Academic institutes	To conduct research, impart education and knowledge sharing. Treatment and care of affected animals, providing consultancy/ advisory services			
Environment related authorit	es			
Environment (Ministries and associated departments in state)	Role related to environmental safety in context of One health, Food safety and Zoonoses control			
Forests and wildlife department (including Zoo authorities)	Role related to wild animal surveillance of pathogen and is specific to the threats identified. Surveillance in zoo, wildlife etc.			
Others Government Departm	ents			
Finance Department	Resource allocation and providing logistics during health emergencies			
District administrators	To promote intersectoral collaboration and co- ordination at district level			
Directorate of Technical Education (Schools, colleges, institutes)	For awareness generations among school, colleges and academic institutions. Develop, adapt educational materials and undertake IEC activities in the state and districts			

PREVENTION, PREPAREDNESS AND RESPONSE USING ONE HEALTH APPROACH

Local Self Governments	For coordinating One Health activities and conducting short OH projects at village/ panchayat level.			
Laboratories				
NCDC, NIV, NIHSAD, Labs of Animal husbandry department, Universities and other state laboratories	To facilitate detection of pathogens in human and animals and to confirm the outbreak and source tracking, including routine surveillance			
Non-Governmental Organizat	ion and other Sectors			
Tertiary (private) hospitals and college	Treatment and care of patients, advisory services, research, etc.			
Food processing industry	For manufacturing (hygiene and safe) food products			
Private sector associated with human health	Support as per their mandates. May include disease control activities to safeguard human health, epidemiological investigation, outbreak tracking, etc.			
Private sector associated with animal health	Support as per their mandates. May include disease control activities in animals, epidemiological investigation, outbreak tracking etc.			
Professionals Associations- Medical	Conducting CME programmes on public health matters, Advocate and build awareness on the benefit and applications of a One Health approach			
Professionals Associations- Veterinary	Conducting CVE programmes on animal health matters. Advocate and build awareness on the benefit and applications of a One Health approach			
Media	For disseminating accurate information and controlling disease infodemics			
Research and Development	For development of new drugs and medicines and other research activities			
Other sectors, like welfare organizations, slaughter houses, private sectos etc.	To play an advisory function and contribute to policy and development of response plans			

Disease wise stakeholders' examples

In the context of specific zoonotic diseases, the example of "One Health" stakeholders are given in Box 3.

Box 3: Mapping of stakeholders and their broad roles for the control of Zoonoses				
AVIAN INFLUENZA				
Veterinary Sector	Securing & culling affected birds, setting up of 24 hour control rooms, prompt prophylaxis, awareness camps, dead bird disposals, biosecurity measures in farm, implementing national action plans for control operations			
Health Sector	Prophylaxis (flu drug), Health checkup, Biosecurity, Provision of PPE's, Health Advisory Services			
Environment and forest	Reporting unusual deaths of wild birds, facilitating postmortem of wild birds, assisting bird sampling.			

Laboratories	Pathogen detection and genomic surveillance			
District Administration	Co-ordinating control measures, facilitating farmers compensation for culling their birds (with government)			
Media	Communicating disease status in consultation with veterinary or health sector			
Food Safety Dept	Meat Advisory and safety; Managing infodemics			
Police Dept	Enforcing law and order during outbreak situation			
Others: WHO-WOAH- FAO-National Institutes	Advisory services, Support investigation and guidance, Provides open-access, high quality, reliable data			
KYASANUR FOREST DISEASE				
Veterinary Sector	Tick control in animals, education & awareness class, epidemiological surveillance, vector control			
Health Sector	Disease diagnosis, disease management in humans, door to door fever surveillance, vaccination, treatment guidelines, epidemiological study and convening inter sectoral meeting			
Environment and forest	Reporting monkey deaths, control burning at disease hotspot area (in forest zone)			
Laboratories	Pathogen detection and genomic surveillance			
District Administration	Co-ordinate KFD control activities, review meetings and follow up actions			
Media	Communicating Disease Status in consultation with Govt. Dept's			
Entomologist	Tick identification			
State Government	Compensation for bereaved families			
Others: WHO-WOAH- FAO-National Institutes	Advisory services, Support investigation and guidance, Provides open-access, high quality, reliable data			

Note: Tripartite zoonoses guide has defined One Health "Stakeholder and Stakeholder analysis" as follows (11).

Stakeholder: Any individual or group that is or should be involved in preventing or managing a health threat at the human-animal-environment interface, or impacts, is impacted by, or perceives themselves to be affected by a such a health threat, including those that may be impacted by any associated risk management measures.

Stakeholder analysis: A consultative process whereby all relevant stakeholders to the health threat at the human animal environment interface are identified and the relationships and networks among them mapped.

A more comprehensive understanding of One Health is described in the One Health Wheel - A pictorial overview (Fig. 3).



Fig. 3: The One Health Wheel- A pictorial overview of One Health approach

CHAPTER 4

EMERGENCE OF DISEASES AT ANIMAL-HUMAN- ENVIRONMENT INTERFACE AND THE BASIS OF ITS CONTROL

4.1. Co-existence of human and animals

One Health is a concept rooted in the philosophy of "co-existence" in which every other living being (as well as non-living things such as air, water, and soil) effects the health of the fellow being. Human beings are inextricably linked to the natural environment and animals.

Humans rely on ecosystems and their biodiversity for their survival and well-being. They have domesticated certain animal species for their benefits such as for food, milk, eggs, fiber, including companionship. Livestock provides important sources of sustenance and economic livelihood for many communities throughout history.

The proximity between humans and animals has led to the transmission of zoonoses (term coined by Rudolph Virchow- Box 4) which are the diseases that transmitted naturally between vertebrate animals and man and vice versa. Today, over 75% of emerging pathogens are of zoonotic nature (21). While such zoonotic diseases are inevitable, it is crucial to focus on proactive measures to minimize the risks associated with zoonotic diseases.



Box 4:

Between animal and human medicines there are no dividing lines – nor should there be. The object is different, but the experience obtained constitutes the basis of all medicine'. Health and disease in humans and animals differed only in detail and not in kind (22).

> **Rudolf Virchow** A German physician who coined the term 'zoonosis'

Shifting away from a human dominated mindset (ego-centric) to eco-centric thinking opens the door to collaboration with diverse stakeholders, including indigenous communities, local populations, scientists, and policymakers.

The protection of the health of people, animals, and the environment is eventually achieved by sectors cooperating under the One Health vision to better understand, prevent, and respond to zoonotic diseases.

4.2. Risk Factors for zoonotic disease emergence

Zoonotic disease emergence is influenced by various risk factors that increase the likelihood of transmission from animals to humans. This includes encroachment of human population into natural habitats, wildlife trade, intensive livestock farming practices and increasing human demand for animal protein including bushmeat consumption.

Population growth, unplanned urbanization, deforestation, and forest encroachment have blurred the boundaries between the human and animal populations, together with the globalization of travel and trade, affecting the whole ecosystem.

Additionally, environmental changes (such as climate change), unsustainable agricultural intensification, socioeconomic factors such as poverty, lack of access to healthcare, and inadequate sanitation leads to disease emergence.

Other factors include changes in human behavior and demographics, genetic changes in pathogens such as mutations or recombination, weak surveillance systems, inadequate healthcare and laboratory facilities. The various factors for disease emergence are depicted in Fig. 4



Fig. 4. Factors responsible for disease emergence

4.3. Spillover of zoonotic agents

A spillover event, in the context of disease transmission, refers to the cross-species transmission of a pathogen from its natural reservoir host (usually wildlife) to a new host species, which could include humans or domestic animals. Spillover of pathogens across the animal- human interface can sometimes remain silent and go undetected if the surveillance in the animal host is sub optimal.

The spillover of infection in humans occurs when pathogen in wild animal moves to livestock to cause an outbreak (Fig. 5). Domestic animals usually act as intermediate hosts for spill over events between wildlife and humans. Forecasting readiness and early detection of disease in wild animals and rapid response in control of disease in domestic animals, can control the incidence of disease in humans.



Fig. 5: Spillover of Zoonotic agents leading to pandemic

As shown in Fig. 5, the stages are highlighted for representative purpose (as adapted from ref. 44, 45)

Stage 1 is a pre-emergence state, in which naturally occurring microbes are transmitted between their animal reservoirs. Disturbances to the ecology of these populations (eg, due to changes in land use) change the dynamics of microbial transmission and can lead to a heightened risk of pathogen spillover to other non-human wildlife or livestock hosts (but not people).

Stage 2 is localized emergence, either through self-limiting spillover or large- scale spillover, that leads to person-to-person transmission for a few pathogen generations.

Stage 3 shows spillover events leading to indefinitely sustained person-to-person outbreaks, international or global spread, and the emergence of a true pandemic.

The cost of pandemics and epidemics can become extremely high when contagion grows exponentially while detection and control measures are delayed because of weak public health systems (Fig. 6), suggesting high expected benefits from prevention or effective control of disease (23). Early control of zoonotic disease is both cost-effective and prevents human disease. The curves represent a hypothetical scenario; patterns may vary based on specific disease. The cost of disease control increases once the cases spread occur in humans.



Fig. 6: Pathogen exposure and rising cost of outbreak control. One Health approach can help in disease detection and early response. Source: World Bank (23)

Detection of spillover event requires a robust surveillance system, linked with Geographic Information Systems (GIS) and remote sensing technologies, for both human and animal (including wildlife) populations in areas where spillover is likely. Confirmation of spillover event requires genetic sequencing of the pathogen that provides insights into their origins, transmission patterns, and evolution.

4.4. Priority Zoonotic Diseases

Zoonoses can have a considerable impact on health, social, and economic aspects of daily life. Disease prioritization is an important task for countries and states to plan multisectoral collaborations and is motivated by the need to ensure that limited resources are targeted at the most crucial disease problems to achieve the greatest benefit in improving and maintaining human and animal health. Globally there are various tools that uses a multisectoral One Health approach to prioritize zoonotic diseases of greatest concern, for example the One Health Zoonotic Disease Prioritization tool (24).

Since fiscal, diagnostic or surveillance capacities including health workforce are limited in a country like India, the prioritization of zoonotic diseases is required for efficient resource allocation. It would help in effective policy making, implementation of disease control strategies, strengthening of laboratory capacities, identification of integrated research areas and building efficient surveillance and early warning disease detection systems.

NOHP-PCZ along with multiple other stakeholders had prioritized several diseases based on country level prioritization exercise and top 10 diseases are enlisted in Box 5 (25).

3ox 5: Top 10	prioritized	zoonotic	diseases	in India (as per	2020)
---------------	-------------	----------	----------	------------	--------	-------

- 1. Zoonotic Influenza (Zoonotic Influenza A viruses)
- 2. Anthrax
- 3. Japanese Encephalitis
- 4. Leptospirosis
- 5. Brucellosis
- 6. Dengue
- 7. Rabies
- 8. Scrub typhus
- 9. Plague
- 10. Crimean-Congo Haemorrhagic Fever

However, states may consider conducting similar exercise and add/ remove disease to the list based on the local epidemiology of Zoonotic diseases. For example, the state of Haryana conducted the prioritization exercise and had prioritized eight diseases viz., Rabies, Japanese Encephalitis, Bovine Tuberculosis, Leptospirosis, Avian Influenza (H5N1), Brucellosis, Glanders and Influenza A (H1N1) (26). Similarly, Karnataka may consider KFD as a priority zoonotic disease, whereas Kerala may consider Nipah virus based on their past experiences.

4.5. Need for early cross-reporting of zoonotic diseases

Cross-reporting of zoonotic disease is essential for early action by concerned sectors and cooperative planning for event mitigation as these diseases have major impacts on health, livelihoods, and economies. Lack of shared preparedness and established procedures for collaboration in zoonotic disease outbreaks can result in delayed responses, leading to poor health outcomes.

Cross-reporting provides sectors with all the information they require to understand their individual roles and responsibilities in the partnership. Joint, cross-reporting initiatives will identify zoonotic disease outbreaks sooner, resulting in fewer number of cases, a smaller geographical region impacted, and less time to recover from the epidemic. Fig. 7 provides ideal mechanism for cross reporting of zoonotic disease

It is clear that no one discipline or sector of society has enough knowledge and resources to address the emergence or resurgence of zoonotic diseases. This was seen during country's experiences with Avian influenza, KFD, Nipah and COVID-19, wherein the need for cross reporting of threats at human- animal interface was reinforced.

State/district needs to identify all the relevant agencies, stakeholders and organizations that are involved, or need to be involved, in a OH working group to establish or strengthen coordinated surveillance for zoonotic diseases in the country.

This facilitates in the efficient use of resources, particularly, resources in terms of technical support as well as people, and finances.

CROSS REPORTING OF ZOONOTIC DISEASE

ZOONOTIC DISEASE OUTBREAK



Fig 7: Cross Reporting Mechanism for Zoonotic diseases
4.6. Reporting for potential zoonotic public health threats under the IHR (2005)

Some zoonotic diseases may require a more urgent communication as per the International Health Regulations, IHR (2005)(27).

There are 4 diseases that always need to be reported under the IHR (2005)

- o Smallpox
- Poliomyelitis due to wild type poliovirus
- Human influenza caused by a new subtype, and
- Severe Acute Respiratory Syndrome (SARS).

In addition, as per the Annex 2 of the IHR document, any disease that is sudden, serious, unexpected, with implications to travel/trade needs also to be assessed for the risk and reported using the IHR decision instrument (27). Here, the local surveillance authority should report to concern department at district and state level and states are required to notify to their national focal point for IHR. The national focal point serves as the primary contact and coordination point between the state and the WHO.

In the scenario that a new/unknown pathogen is detected (disease X scenario) there may be need for risk assessment and urgent notification under the IHR (2005).

Example: The SARS-CoV-2 virus emerged in China in 2019, and ended up becoming a very severe global pandemic, rather quickly with vast public health and economic impacts.

4.7. Prevention, preparedness, and response (P-P-R) for Zoonoses

Prevention, preparing for and responding to Zoonotic disease requires a wholeof-government and whole-of-society approach. As exemplified by COVID-19, Avian Influenza, Nipah and other global outbreaks, investments in prevention, preparedness, and response (P-P-R) are key components for Zoonotic disease management. The triad is also highly relevant in the field of managing emerging infectious disease (28).

The One Health High-Level Expert Panel (OHHLEP), an advisory body to the Quadripartite group (FAO-WHO-WOAH-UNEP), has defined P-P-R in context of Pandemic as,

- **Prevention** means "Preventing pathogen spillover to humans (primary prevention/ upstream or deep prevention) and
- **Preparedness, and response** means "Preventing pathogen spread in humans (secondary or downstream prevention)

The Pandemic Fund, which is hosted by the World Bank uses the following definition of Pandemic Prevention, Preparedness and Response (PPR) in their white paper (29).

• **Prevention** encompasses the systems, policies, and procedures to determine, assess, avoid, mitigate, and reduce public health threats and risks. This definition captures interventions needed to mitigate risk and reduce the likelihood or consequences of spillover events at the human, animal, or ecosystem interfaces.

- Preparedness refers to ex-ante actions that help mitigate losses when a disease outbreak occurs. It includes strengthening the capacities and capabilities at community, country, regional, and global levels to prevent, detect, contain, and respond to the spread of disease, mitigating economic and social impacts.
- **Response refers** to ex-post actions taken in response to a disease outbreak to reduce its economic, social and health impacts.

The strategies for prevention and control of Zoonotic disease (given in chapters 5-7) integrates the Global Architecture for Health Emergencies Preparedness, Response, and Resilience (HEPR) and various other guidelines available at WHO and other partners. Broadly the strategies are classified as shown in Fig. 8. The focus of HEPR is to respond effectively to the ever-increasing scale of health emergencies with a focus on strengthening five core health emergency components: Collaborative surveillance; Community protection; Safe and scalable care; Access to countermeasures; and Emergency coordination (30). By incorporating these existing global health mechanisms, the document provides key recommended actions relevant for zoonotic diseases.



Fig. 8: Strategies for Prevention, Preparedness and Response to Zoonotic Diseases

CHAPTER 5

PREVENTION OF ZOONOTIC DISEASES

Most of the One Health initiatives to combat zoonotic disease have been articulated around outbreak identification and its response. Nevertheless, the One Health strategy gives measures of disease prevention an equal priority (31). Understanding the risk factors of disease emergence can help in preventing further spillover events.

Aim:

Define plans for the state and districts to prevent zoonotic diseases by studying infection dynamics and disease risk factors by focusing on One Health co-ordination mechanism

Objectives:

- To understand the dynamics of infection in natural hosts and address the drivers of disease emergence
- To provide guidelines on implementation of risk reduction activities and promoting multi-sectoral One Health coordination

Strategies:

Effective prevention of the emerging zoonoses hinges on developing the capabilities to deliver four key objectives:

- 5.1. Understanding infection dynamics in natural host and action strategies
- 5.2. Addressing drivers of disease emergence
- 5.3. Risk Reduction activities
- 5.4. Multi sectoral One Health co-ordination

5.1. Understanding infection dynamics in natural host and action strategies

Understand the factors such as host population density, behavior, and ecological factors, is essential for assessing the infection dynamics and risk of spillovers. The general preventive measures for major zoonotic diseases are shown in Annexure IV. Following are the key measures to understand infection dynamics in natural host;

Annexure IV details the general preventive measures of major zoonotic diseases

5.1.1. States/ Districts can identify labs and provide resources to them to track the exposure and prevalence of disease agents from natural host to humans and domestic animals by detecting presence of antibodies (sero-monitoring) in humans and animals from high-risk zones.

5.1.2. States can be prepared to handle disease scenarios that arise due the influence of prevailing ecological and environmental factors. This includes changes due to deforestation, pollution, urbanization, flooding etc that can disrupt ecosystems and lead to the emergence of new diseases or the spread of existing disease. Tree cutting/ deforestation (if necessary) may be done after considering the habitats of bats and other birds and the likelihood that they could be relocated. An example of environmental conditions influencing infection dynamics is given in Box 6.

Box 6: Local ecological influence in disease emergence

The rain continued relentlessly in a small village and was soon found submerged in water. The flood waters rose rapidly, engulfing homes, streets, and even the local hospitals. During the chaos, the floodwaters became a breeding ground for various pathogens and bacteria. As the floodwaters receded, the inhabitants of the town returned to their homes, unaware of the lurking danger. They began cleaning up the aftermath, but little did they know that the flood had left behind a silent threat.

The stagnant water in the streets, houses, and public areas became a breeding ground for the leptospira bacteria. Soon enough, people began falling ill. They experienced symptoms such as high fever, severe headaches, muscle pain, and fatigue. The local hospital, already damaged by the flood, struggled to cope with the sudden influx of patients. Efforts were made to ensure the cleanliness of water sources, disinfect contaminated areas, and promote personal hygiene practices such as handwashing.

The story of how the flood led to a leptospira outbreak taught the town valuable lessons about resilience, community cooperation, and the significance of proactive health measures.



Photo 2: Leptospirosis preparedness following heavy rains in the village

5.1.3. States may establish robust surveillance system to monitor potential outbreak post-disasters. Natural disaster such as earthquake, floods, hurricanes, or wildfires, can disrupt ecosystems and force natural reservoir host such as rodents and wildlife species to migrate or seek shelter in new areas. This can bring humans and animals

into closer contact, increasing the potential for disease transmission. Example see Box 7.

Box 7: Impact of disasters on disease emergence

On January 26, 1994, a devastating earthquake struck the city of Surat in the state of Gujarat, India. The earthquake, measuring 6.9 on the Richter scale, caused widespread destruction, resulting in the displacement of thousands of people and the collapse of infrastructure. Amidst the chaos and aftermath of the earthquake, another crisis emerged—the plague outbreak.

The earthquake led to the disruption of rat habitats (natural reservoirs of the bacteria Yersinia pestis), forcing them to seek alternative shelters which increased the risk of human exposure with rat flea and agent. Plague bacteria are most often transmitted by the bite of an infected flea. People and animals that visit places where rodents have recently died from plague are at risk of being infected from flea bites. This lead to spread of plague.



5.1.4. Research institutes can focus on monitoring reservoir host that harbor pathogen without showing severe disease symptoms as they play a significant role in the maintenance and transmission of the disease. For example, pigs are considered as amplifying host and a natural reservoir of Japanese encephalitis virus. Infected mosquitoes can then spread the virus from pigs to other animals, including humans, through their bites. Regular surveillance of pig populations for evidence of the virus can help identify areas where Japanese encephalitis may pose a higher risk. Box 8 provides information on mode of transmission and potential risk of spread of zoonotic disease in humans from animals.

5.1.5. Prioritize research to study the infection dynamics in natural host and its transmission. Exercises have been conducted to systematically identify and prioritize researchable areas to control zoonoses in India. Examples include (but not limited to) identifying the directionality, timing, and location of wildlife-human-domestic animal transmission, evaluating disease morbidity, mortality, and economic impact in people and animals, developing field diagnostics and medical counter measures for zoonoses, and conducting cost-benefit, cost-effectiveness, and affordability analyses of zoonoses intervention.

		Agent			Ţ	ansmission	E		Potent	ial Risk	Catego	ory of an	mals
Zoonotic Disease									alde lo				
	Bacteria	Virus	Parasite	Direct Contact	Food- borne	Anthropod Vector	Aerosol	Faecal- oral	Animal to Human	Human to Human	Livestock	Pet	Wild Animals
Rabies													
Leptospirosis													
Brucellosis													
Chikungunya									>	>			
CCHF									>				
KFD									>				
Taeniasis													
Echinococcosis													
Scrub Typhus									>				
Anthrax													
Zika									>	>			
Avian Influenza													
COVID 19													
									V Spi	read through	'n vector ca	irrying the	organism

Box 8: Agent, transmission and potential risk of spread of zoonoses from Animals st

* The information above are only for reference and is liable to vary depending on the pathogen cycle

5.2. Addressing drivers of disease emergence

The emergence of diseases is influenced by a combination of factors, and these drivers can vary depending on the specific disease and its context. Following are the key measures to address the drivers of disease emergence,

5.2.1. States can analyze the drivers of disease spillover events based on route of transmission and local conditions.

- For example, crowded living conditions facilitate close contact between individuals, thereby transmitting influenza. Sign boards depicting people wearing masks can be placed in such locations, such as bus stand, railway station, hospitals etc.
- Improper disposal of sewage and wastewater, leading to contamination of water bodies can result in outbreak of Leptospirosis. Action must be initiated at municipal levels for prompt sewage treatment during such outbreaks.

5.2.2. Addressing environmental factors requires the involvement of the state environmental sectors for implementing sustainable practices for reducing pollution, protecting natural habitats, and monitoring environmental changes. For example, the incidence of KFD can be minimized by preserving forests and intact ecosystems, thereby, minimizing the contact between humans and monkeys.

5.2.3. Forest departments can revisit strategies to closely monitor Illegal wildlife trading from their own experiences or those obtained from other states or countries. This is because Illegal capturing of exotic animals, including rare and endangered species, and selling to eager buyers in the black market can transmit emerging zoonotic diseases (32).

5.2.5. State Animal Husbandry department can promote and monitor good slaughtering standards including modernization of slaughterhouse. Ideally, slaughterhouse and processing plants may also support E-traceability system to ensure food safety.

5.2.6. States can strengthen surveillance networks within state boundaries to facilitate control and monitoring of disease outbreaks as and when neighboring states reports incidence of new disease. See example in Box 9. Through SLZC and local IDSP, the state can organize inter- state and inter sectoral workshop for information sharing and streamlining surveillance and response protocols.

5.2.7. Addressing human-wild animal conflicts can be one of the priority areas for collaboration between public health and forest sectors. In many parts of India, monkeys can be found in urban and rural areas. These animals, due to their proximity to human populations, may increase the risk of transmitting zoonotic diseases through bites or scratches. Ensuring that wildlife has access to sufficient natural habitats is essential for reducing conflicts. Proper land-use planning and habitat restoration efforts can help maintain wildlife corridors and prevent animals from encroaching on human settlements.

Box 9: Addressing drivers of Nipah virus based on transmission from natural host

To prevent spillover of Nipah virus from natural host i.e., bats to humans and its further spread from the neighboring states of Kerala (to Karnataka and Tamil nadu) during 2018 outbreak led to sero-surveillance in bats by scientist of ICMR

Although, presence of anti-Nipah IgG antibodies was found in bats (20%), the presence of virus couldn't be detected in any of the specimens (33).

The presence of antibodies is an indicator for the states to strengthen preparedness for Nipah virus. Inter- state and inter sectoral workshop with experts from Kerala will help the states to be prepared for future outbreaks.



Photo 3: Fruit Bats as a natural host of Nipah virus

5.2.8. Health and other sectors can collaborate and conduct activities to promote improved water, sanitation, and hygiene (WASH), such as safe disposal of human waste, and safe water storage. Initiate campaigns on disease reduction measures such as hand hygiene, dry days for vector control and respiratory hygiene for aerosol transmitted pathogens.

5.2.9. State animal husbandry department can invest or provide subsidy for sustainable livestock production focusing on farm hygiene, immunization and disease management. The growing population creates a pressure on the livestock industry due to growing meat (protein) demand resulting in increased production, and the fragmentation of land holdings. These conditions lead to increased contact with food animals leading to emerging zoonotic diseases.

5.2.10.Microbial adaptation and change including mutations can lead to development of resistant pathogens. Understanding the AMR as well as mutations in pathogens is facilitated by research conducted by state health or veterinary universities. Such research findings should be promptly communicated to the relevant authorities.

5.3. Risk Reduction Activities

Understanding the modes of transmission and quantifying the risk of transmission associated with a zoonotic pathogen is necessary to inform risk reduction measures. Reducing the risk of disease transmission and emergence involves a combination of individual, community, and governmental efforts. These activities should be tailored to specific diseases and their modes of transmission. Following are the key measures for reducing the risks associated with zoonotic diseases,

5.3.1. The states should determine the risk posed by Zoonotic disease based on documented evidence on prevalence, severity, transmission, and population vulnerability. Based on the risk identified, the health sector should prioritize preventive measures and healthcare access for at-risk and vulnerable groups. Taking such groups into account is critical to maximize and ensure a robust response. Example of groups vulnerable to respiratory zoonotic pathogens are shown in Box 10.

Box 10: Groups that may be vulnerable for respiratory pathogen

- **People with a weak immune system:** Children, elderly individuals, People with immuno suppression, Pregnant women
- **People with underlying medical conditions:** Cardiovascular diseases, Diabetes etc
- **People living/working in crowded, confined places:** Prisons, refugees, migrants etc
- Vulnerable groups needing special support during crisis: People with disabilities, People living in informal settlements or slums, People without access to health services or who cannot afford health services, People with language limitations or other barriers to information, People with mental health conditions and/or in need of psychosocial support, Indigenous communities
- People with greater exposure to sick people: Health workers, Home care givers

5.3.2. Health, allied health and non-health sectors should come together and conduct Joint Risk Assessment (JRA), which is crucial to ensure a proportionate response to a risk and to prioritize and mobilize resources. The JRA operational tool was developed by FAO, WHO, and WOAH and involves data collection, risk identification and analysis, risk ranking and prioritization, and the development of risk management plans. Additionally, states can conduct simulation exercises to understand the potential consequences of different risk scenarios. This allows decision-makers to build and implement science-based risk management measures and communication messages aligned between sectors or implemented jointly. Joint Risk Assessment consists of 10 steps and is detailed in JRA Operational Tool (4).

5.3.3. In livestock and poultry farms, implement farm biosecurity measures such as restricting access to visitors, quarantine and isolation facilities, animal health monitoring, waste management, vaccination and controlled animal movements. A veterinary officer should monitor the implementation of biosecurity measures on regular basis.

5.3.4. Implement strategies for living safe with companion/ pet animals. For example, Pet owners need to follow registration/ licensing of their dogs and adopt full course of Rabies vaccination (including booster dose). Communities may be sensitized about

community dog behaviour and risk of Rabies. Animal husbandry department can focus action on mass dog vaccination and control of stray dog population.

5.3.5. To reduce the risk associated with food borne diseases, the Food safety department can organize activities to promote proper food handling, storage, and processing, as well as monitoring and regulating food production and distribution chains. To reduce the risk associated with contaminated food consumption, five keys to safer food message was developed by WHO (Fig. 10).





5.3.6. For disease in which effective vaccinations are available (For eg. Rabies in Humans and Brucella in animals) states can establish an effective vaccine delivery and coordination mechanism. This also includes guaranteeing vaccine accessibility, encouraging vaccine acceptance, and sustaining immunization coverage rates. In addition, implement vaccination programmes of vulnerable populations in humanitarian settings.

5.3.7. Forest Department can associate with veterinary universities and institutes to conduct surveillance of wild animal/birds in order to understand emergence of new diseases. See example in Box 11.

5.3.8. The states should conduct capacity building and joint training of medical and veterinary professionals on understanding the risk associated with handling high threat pathogens. Joint training helps to dismantle siloes, build relationships, and increase equality between sectors.

5.3.9. The states can conduct CME and CVE among professionals, intensive educational

campaign for school students and distribution of risk communication IECs for vulnerable groups like butchers, animal handlers, zoo workers etc.

5.3.10. In healthcare settings, the health sector can monitor infection control practices such as adequate hand hygiene, the use of personal protective equipment, isolation, safe burials of suspects, and disinfection processes.

5.3.11. Animal Husbandry Department in association with food safety department can monitor the wet markets for hygiene and biosecurity measures and advocate to follow preventive practices such as weekly dry days to prevent pathogen entry.

Box 11: Surveillance of migratory birds to predict emergence of zoonoses

Once a flock of migratory birds arrived in a coastal village as part of their annual migratory journey. These vibrant birds with their long, graceful necks and vibrant feathers had always captivated the locals and visitors alike. Little did they know that these birds would play a significant role in carrying a dangerous disease - bird flu. The region had a dedicated team of wildlife researchers and conservationists who closely monitored the migratory patterns of birds.

One day, as the researchers were observing the birds gracefully wading in the shallow waters, they noticed something amiss. Some of the birds appeared weak and disoriented. Alarmed by this unusual behavior, the team quickly mobilized to investigate further. The researchers contacted the veterinarians who carefully collected samples from the affected birds, including swabs from their beaks and feathers. The samples were swiftly transported to a specialized laboratory equipped to analyze avian diseases. They discovered the presence of avian influenza virus, commonly known as bird flu.

Public health officials were immediately alerted, and measures were taken to prevent the spread of the virus to domestic/ backyard poultry and humans. The incident also underscored the interconnectedness of ecosystems and the importance of monitoring migratory birds as potential disease carriers.



Photo 4: Migratory birds and risk of Avian Influenza

5.3.12. States should regularly conduct IEC campaigns to raise awareness about the disease, its symptoms, transmission, and preventive measures such as hand sanitizing, wearing masks, and physical distancing to empower individuals to make informed decisions about their health, and collectively work towards disease prevention and control.

5.3.13. Public Health authorities should focus attention on prompt chemoprophylaxis for those people who are under risk of potential exposures. See example in Box 12.

Box 12: Chemoprophylaxis for Leptospirosis - An example

Nestled between sprawling paddy fields and the gentle rumble of passing trains, there was a close-knit community of farmers. These hardworking farmers relied on the fertile land to sustain their families and livelihoods. Rumors began to circulate about an illness affecting the farmers who worked near the railway tracks. It was understood that the illness was caused by a bacterium called Leptospira, which thrived in the stagnant water near the tracks and from where clustering of cases has been reported.

Upon confirmation of the leptospirosis outbreak in their village, public health authorities and healthcare providers took prompt action by chemoprophylaxis. As this was a peak transmission season, Doxycycline 200 mg, once a week, was given to agricultural workers. The chemoprophylaxis was advised as per NCDC guidelines (34).



Photo 5: Risk zones of Leptospirosis

5.4. Multi sectoral One Health co-ordination

5.4.1. All states have established a multi sectoral One Health co-ordination mechanism (MCM) by constituting a State/ District level Zoonoses Committee (SLZC/ DLSC) under NOHP-PCZ that involve stakeholders from different sectors. However, some of these MCM are often only active during a response rather than working in an ongoing mode, and their functionality needs improvement. Further they can define the terms of reference and operating procedures for networking and joint planning between various sectors *viz.* medical, veterinary and allied departments /institutions.

5.4.2. By integrating human, animal, and environmental surveillance systems, states can enhance their ability to prevent zoonotic diseases effectively. Strong governance play a critical role to promote collaborative approach across the systems, sectors and administrative levels for effective and efficient information sharing systems.

5.4.3. States can have an agreed list of priority zoonotic diseases to make the preventive measures strong. For this they can review the burden of zoonotic disease and conduct a prioritization exercise involving different stakeholders and may prioritize 6-10 zoonotic diseases.

5.4.4. Involve decision-makers and stakeholders to build state-specific action plans for preventing zoonotic diseases that are prioritized. Also consult environmental health and wildlife sectors while developing action plans.

5.4.5. Map the capacity and resources both in human health and animal health sectors for preventing zoonotic diseases. It can cover projects, laboratory strengths, existing disease SoPs or plans, and strategies relating to zoonotic diseases created by sectors or collaboratively among sectors. Available National/ International guidelines can be referred.

5.4.6. Designate one or more subgroups as needed to specifically focus on a particular activity or function. Subgroups may be needed during emerging zoonotic disease event that requires highly specialized skills or knowledge. For example, various subgroups were formed by Kerala government as a preventive step towards Monkey pox following country alert (35).

5.4.7. Implement joint surveillance (involving multiple sectors) by sharing and integration of data and information from different sources. This includes epidemiological data, laboratory results, environmental monitoring data, and other relevant information.

5.4.8. Invest time, resources, and efforts for conducting collaborative activities for zoonotic disease prevention. For example, on the ocassion of World Zoonoses day (6th July), the stakeholders can conduct community outreach activities, school awareness program, webinars etc (Photo 6, 7 & 8). The proposed list of activities to be conducted at state/ districts are shown in Annexure V.

Annexure V details the list of activities to be conducted at state/ districts for advocacy for zoonoses – Including guidance from NCDC for World Zoonoses Day



Photo 6: One Health awareness tableau of Kerala Health department for public sensitization of One Health



Photo 7: School awareness program on Zoonoses Day (July 6th)



Photo 8: School awareness program on One Health Day (November 3rd)

5.4.9. Promote access to and use of digital health solutions and emerging technologies for public health interventions including artificial intelligence, disease modelling, and collaborative surveillance. Efforts are ongoing for data integration between sectors using IHIP and NADRES/ National Digital Livestock Mission.

5.4.10. SLZC/ DLSC may plan to meet periodically to review the progress and plans for collaborative activities as well as evaluate the effectiveness of multisectoral communication, coordination, and information-sharing. They can comprehensively address gaps or priorities in policy, legislation, infrastructure, or technical capacity for sustainable investment (Photo 9).



Photo 9: Periodical review meeting of priority zoonoses (SLZC Andhra Pradesh)

CHAPTER 6

PREPAREDNESS FOR ZOONOTIC DISEASE

Zoonotic diseases are challenging to manage and is difficult to completely eradicate. State/ District level preparedness for zoonoses should focus on how to stop small, localized disease outbreaks from spreading and developing into an epidemic or pandemic. It involves being ready and equipped to respond effectively to a disease outbreak or emergency.

Aim:

To define strategies for the states to be prepared for addressing zoonotic disease challenges thereby preventing the spread of disease as well as the potential of it to become an epidemic or pandemic

Objectives:

- To establish preparedness plans for preventing spillover and spread of zoonotic pathogens to the human population
- To strengthen leadership on One Health domains through collaborative surveillance and promoting operational research focusing on One Health approach
- To implement measures for early warning signals, work force development, hospital and laboratory preparedness

Annexure VI details the check list of activities for Zoonoses Preparedness

Annexure VII details the action points for Zoonoses Preparedness

Effective preparedness for zoonotic disease hinges on developing the capabilities to deliver following key objectives:

- 6.1. Strategic planning, financing, leadership and governance
- 6.2. Collaborative surveillance focusing on One Health approach
- 6.3. Early warning systems
- 6.4. Work force development
- 6.5. Laboratory preparedness
- 6.6. Hospital Preparedness and managing surge capacity
- 6.7. Operational Research

6.1. Strategic planning, financing, leadership and governance

Sectors need to converge to plan effectively for zoonoses control, including looking at options of resource pooling and best utilization of available resources (including HR) to address zoonoses preparedness. For this planning, financing, leadership, and governance forms part of the One Health mechanism at State and District levels. Following are some of the measures that can be taken:

6.1.1. Understand the health and economic burden of the prioritized zoonotic disease in the state by inviting inputs from all relevant sectors and experts so that sector specific planning can be more efficient. The state government (SLZC) can hold multi-stakeholder meetings for the purpose.

6.1.2. States and districts can maintain a calendar of readiness activities for zoonoses preparedness, in which relevant stakeholders can contribute their inputs with available resources (including money, man and materials) for the activities to be undertaken for preparedness. For example, by taking proactive steps before the monsoon season (like improving drainage infrastructure, rodent control etc) it is possible to reduce the incidence of leptospirosis. Similarly, implementing vector monitoring program can control VBDs like Zika, Chikungunya before the seasonal-rains.

6.1.3. States and districts can develop emergency preparedness plans for priority zoonotic diseases including defined responsibilities for shared action, communication, and reporting. Other complementary reference documents such as the State level zoonoses action plan can be referred. This would also include advanced planning for logistic requirements, plans for stockpiling medical counter measures (including emergency medications, personal protective equipment, diagnostic kits) and earmarking labs and health facilities.

6.1.4. Ensure sustainable and equitable financing among all relevant sectors for continuity of programmes in order to decrease risks from zoonotic diseases (25). Focus on redirecting from a response-driven to a generic preparedness-driven approach, along with establishing emergency contingency funds to ensure that appropriate finances are immediately accessible for reacting to outbreak circumstances. Funds available for the national programs, contingency funds with SDMA, DDMA resources etc. can be utilized.

6.1.5. States may explore partnerships with the private sector, health care facilities, civil society organizations, industry, academic institutions, pharmaceuticals to promote activities related to zoonotic disease control. Collaborative efforts can leverage financial resources, expertise, and technology. An officer may be designated as the nodal officer for leading and coordinating sector specific One Health activities at Directorate of Animal Health, Human Health, Medical or Veterinary University and other institutes.

6.1.6. Mainstream One Health into existing programs and plans of Health and Veterinary sectors to make the necessary resources available for addressing zoonotic disease. Health, Animal Husbandry and other allied sectors should co-own the plans developed at State and district levels and may take turns to chair key intersectoral discussion meeting, especially, when the risks are perceived or already identified, as this will help in early recognition of any increase in disease occurrence to intervene appropriately.

6.1.7. Regularly review and update the strategic plan, financing strategies, and coordination mechanisms based on emerging threats, scientific advancements, and lessons learned from previous outbreaks and after-action reviews. The State and District level zoonoses committees should meet periodically to discuss and take actions on emerging zoonotic disease threats.

6.1.8. For the fund to be used transparently and efficiently, the allotted budget has to be monitored, outputs, and impacts quantified, and accountability procedures need to be in place at every level.

6.2. Collaborative surveillance focusing on One Health approach

The states can prioritize collaborative surveillance (defined in Box 13) by establishing partnership across departments and agencies.

Box 13: Collaborative surveillance is the systematic strengthening of capacity and collaboration among diverse stakeholders, both within and beyond the health sector, with the ultimate goal of enhancing public health intelligence and improving evidence for decision-making (31).

6.2.1. The State/District Health department with support from medical colleges, public health institutes, and sentinel surveillance sites in collaboration with Animal husbandry department, veterinary university and other institutes (including wildlife) is responsible for the surveillance of Zoonotic diseases.

6.2.2. The states must integrate data from additional sources, including as veterinary clinics, labs, wildlife sector, and environmental sectors, in order to make greater use of the present system for collecting data utilizing IHIP portal.

6.2.3. Using existing IT platforms (like IDSP/IHIP/NADRES) and suitable statistical software (like Epi-Info), data may be quickly gathered and delivered for analysis. This will help in finding patterns of disease in individuals, generate heat maps and identify its origin as well as explain the One Health elements that affect transmission.

6.2.4. Data sharing and cross notification (Fig. 7) between sectors should take place on real time basis at all levels. For example, at the District Level, the DSO in Health or District Epidemiologist/Veterinary officer may be responsible for sharing surveillance data in the district w.r.t human and animal disease events, respectively, and at the State Level the SSO and State Epidemiologist/Veterinary Officer may be responsible for notifying to central authorities via their respective Directorates.

6.2.5. Disease data dissemination can be established through Health/ Animal Husbandry department website, newsletters, annual reports, Surveillance summaries and reports/ Medical and epidemiologic journal articles or Press releases.

6.2.6. There should be periodical review of surveillance activities by the intersectoral coordination committees namely, SLZC/DLZC. List of monitoring indicators is essential to ensure that One Health approach meets its expected aims and objectives, and that challenges and bottlenecks are identified and corrected as soon as possible. For

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further enhancing cross sectoral surveillance, reporting, and information sharing, the state/ district can develop (or use existing) tools for tracking and evaluating its own performance. Promoting joint risk assessment and dissemination of the risk assessment results to a larger audience may also be considered as a priority by SLZC/DLZC.

6.2.7. Giving communities the knowledge and tools that focusses on participatory community-based event surveillance system to monitor the health of their environment, animals, and themselves could be a most effective approach of preventing spillovers before it's too late.

6.3. Early warning signals

6.3.1. The possible sources of signals indicating zoonotic disease outbreak can come from various sources as indicated in Fig. 11 below. The format for reporting early warning signals is shown in Annexure VIII.

Annexure VIII details the format for reporting early warning signals



MONITORING OF ROUTINE SURVEILLANCE DATA (animal / wildlife / human)



A PUBLIC HEALTH / ANIMAL HEALTH LABORATORY (including research findings)



LIVESTOCK & POULTRY FARMERS, ANIMAL HANDLERS AT WET MARKETS /FAIRS



A CLINICIAN/ VETERINARIAN IN A HOSPITAL/ PRIVATE CLINIC/ ZOO



SENTINEL EVENTS OF DISEASE/DEATH IN ANIMALS



POINTS OF ENTRY (ports, airports, ground crossings)





COMMUNITY

Fig. 11: Possible sources of signals indicating zoonotic disease

6.3.2. It is therefore important that the above functionaries should be sensitized on the risks of zoonotic disease emergence, and their roles in early reporting and response to potential zoonotic threats, for further action. An example of how a veterinarian identified a novel pathogen is illustrated in Box 14.

6.3.3. Routine monitoring of surveillance data from multiple sources on priority zoonotic

Box 14: How a veterinarian identified a new emerging disease (36)

In the year 1999, Dr. Tracey McNamara, a veterinarian at the Bronx Zoo could observe dead crows on the ground near the zoo. Soon she found death of three flamingoes and few other birds in the zoo. Meanwhile, physicians in the city were observing significant number of cases of encephalitis in Humans. Initial tests pointed to a viral disease called St. Louis encephalitis, but later tests failed to match the results.

Dr. McNamara wondered if both humans and birds were succumbing to the same pathogen. So she tested the bird samples to identify that they were succumbed to a new pathogen called West Nile virus, which was later confirmed to be the same causative agent for human outbreak.

Dr. McNamara contribution in identifying the West Nile virus in the United States in the year 1999 played a crucial role in raising awareness about the virus and initiating necessary control measures of West Nile in human patients.



disease can help to identify outbreaks earlier before they become epidemics as well as guide public health decision-making. Information from all relevant sectors (animal health, human health, environmental health) needs to be gathered for generating the necessary intelligence for early warning and readiness for acute public health events. The careful analysis of surveillance data based on time, place, person at state/district level can lead to early warning signals thereby helping in a faster response for outbreak mitigation.

6.3.4. Tracking and analyzing trends in human illness, especially those with potential animal origins or exposure can also be an early warning signal. The data from national health (IDSP/IHIP) and veterinary sectors (NADRES/NADRS) will be useful.

6.3.6. Focus on sentinel monitoring for unusual diseases/ deaths in animals for early indications of zoonotic diseases in Humans. For example, in the case of KFD, dead monkeys may be monitored for the virus to establish a sentinel event. If these sentinel animals tested positive, it alerts health authorities to the potential presence of the disease in the area, triggering further investigations and response activities by public health sector.

6.3.7. Monitoring vector populations, their distribution, and infection rates can help to provide early signs. For example, if research conducted by medical or veterinary university highlights high infection rates in vector populations, it gives an early warning signal for vector borne disease transmission to humans or animals. Such research findings should be communicated to concerned authorities promptly.

6.3.8. Public health/Animal heath laboratories (including private labs) may notice an increase in cases of a particular disease or detect unusual disease patterns. In such cases they can alert public health officials on early warning of outbreaks.

6.3.9. Sometimes when a new disease emerges the media can act as the initial source of information. Similarly, detecting new cases at various points of entry and also from proactive communities who are more likely to report symptoms promptly to local healthcare facilities are other sources for early warning.

6.4. One Health workforce development

6.4.1. The state needs to address gaps in recruitment of staff in health, veterinary and other allied sectors and must initiate filling up of any vacancies. For example, filling up of post of entomologist is important for the control of VBDs.

6.4.2. Sensitize or orient all the key One Health stakeholders on why multi sectoral coordination is needed through scenario-based/simulation/tabletop exercises.

6.4.3. Conduct One Health joint training and continuing education programmes (CME/ CVE) for human, animal and environmental health workforces to improve capabilities for staff safety, IPC practices for high threat pathogens, prevent, detect, control and respond to zoonotic disease threats (Photo 10). Establish few model training centers for conducting such joint trainings.

6.4.4. Conduct joint workshop to provide opportunities for healthcare professionals, veterinary, and other stakeholders to interact and enhance their knowledge and skills related to disease control. Training sessions can cover topics such as joint disease surveillance, diagnostic requirements, treatment, prevention, and outbreak response.

6.4.5. Conduct training for frontline workers viz., ASHA, Health workers, Para-veterinary, Veterinary Staff, Forest staff, MO for providing support for Surveillance. States can also enhance skilled frontline workers through the One Health Field Epidemiology Training Programme (FETP), such as, Sector connect initiatives of NCDC.

6.4.6. In the case of handling a novel/ unknown pathogen, capacity building program are required. For example during Nipah, the frontline workers needed to be oriented/trained on managing cases in the community and adopt public health and social measures.

6.4.7. Apart from zoonotic diseases, capacity building efforts should also focus on AMR, including training healthcare workers in proper antimicrobial use, developing laboratory capabilities for antimicrobial susceptibility testing, establishing surveillance systems for tracking AMR trends, promoting infection prevention and control measures, and creating awareness campaigns to educate the public about responsible antimicrobial use.

6.4.8. Capacity building of hospital staff responding to a zoonotic outbreak should be part of hospital management plan. Several courses are available on Open WHO course platform (37).

Note: For Building the workforce, tripartite zoonoses guide has defined four steps (11),

STEP 1: Convening stakeholders identification and analysis

STEP 2: Reviewing available information of workforce analyses to create a baseline of existing sector-specific, and where possible, multisectoral workforce capacities and needs across sectors

STEP 3: Uncovering workforce gaps

STEP 4: Developing education and training programmes to address workforce gaps

STEP 5: Developing a national workforce strategy to address zoonotic diseases



Photo 10- Example of One Health Workforce development training

6.5. Laboratory Preparedness

Laboratory preparedness is an important strategy for health emergency preparedness that requires continuous evaluation and improvement to maintain high standards of safety and quality. Following are the measures that state can follow for laboratory preparedness for zoonotic diseases.

6.5.1. States can allocate resources and strengthen laboratory infrastructure for disease surveillance, monitoring, and early detection of disease at various levels of health and veterinary service. Provide laboratories with the necessary equipment's for zoonotic disease diagnostics. Designate areas within the laboratory for the secure storage and archiving of diagnostic samples.

6.5.2. State should have the agreed list of priority pathogens and based on which the demands for diagnostics, reagents, consumables etc should be calibrated. Laboratories should be provided with diagnostic kits, materials and supplies ahead of response phase and sample referrals needs to be planned in case required. The quality control and assurance of diagnostic reagents and test kits that are locally produced or imported must be ensured. Standardized testing protocol needs to be used and should be linked to referral laboratories for confirmation and quality control.

6.5.3. Implementing laboratory quality management systems and accreditation from National Accreditation Board for Testing and Calibration Laboratories (NABL) program/ other EQAS programs should be promoted. Public health and animal health laboratories may establish process for accurate and timely reporting as well as sharing of laboratory reports or alerts on regular basis via respective parent department.

6.5.4. The laboratory staff, epidemiologists, and frontline workers from each sector must be trained in handling (or testing) high threat pathogens, including sample collection and transportation using established protocols. States should ensure that logistics and appropriate resources (including cold chain facilities) are available for the transport of samples for disease diagnosis as required.

6.5.5. Efforts should be made to strengthen laboratory biosafety and biosecurity to prevent the accidental exposure, misuse, or inadvertent laboratory release of pathogens. A contingency plan during emergency must be in place.

6.5.6. Networking of laboratory in animal husbandry and health sectors are crucial. The guidelines for Integrated Public Health laboratories to establish multi-level linkages from blocks to districts, to state and finally to Zonal/regional and National level laboratories for providing a comprehensive set of lab services which can also aid in timely prediction of outbreak and supporting policy decisions is published by the government (38).

6.5.7. States needs to have an established protocol for initiating rapid surge in testing during emergency. Veterinary laboratory can support human sample analyses for zoonotic disease diagnosis and vice versa. For example, during COVID crises, the laboratory in veterinary sector equipped with real time PCR tested human samples (abiding ICMR guidelines, Photo 11). Similarly, mobile BSL-3 laboratory facility and point of care test kits may be established for early identification of pathogens (Example, NIV-Pune has instituted mobile diagnostic labs during Nipah virus outbreak in Kerala).



Photo 11: Veterinary Laboratory testing Human samples for COVID 19

6.6. Hospital Preparedness and managing surge capacity

Hospitals need to be well-prepared to handle unexpected surges in patient numbers during public health emergencies. By preparedness measures the hospitals can provide effective care during public health emergencies, ultimately helping to save lives and protecting public health. Following strategies are important for hospital preparedness.

6.6.1. Hospitals need the ability to rapidly expand their bed capacity, staff numbers, and resources to handle an influx of patients. This may involve mobilizing retired healthcare workers, utilizing volunteers, and collaborating with other healthcare facilities. This may also involve setting up temporary treatment areas and utilizing non-clinical spaces. Additionally, the facility should have clear triage protocols for quickly assessing and prioritizing patients based on the severity of their condition.

6.6.2. COVID-19 pandemic highlighted the need for augmenting intensive care units, oxygen supplies and ventilators to strengthen critical care especially at or below district level. Critical care blocks was made possible under PM-ABHIM to augment the capacity of the district for assured treatment and management of patients with infectious diseases or critical illnesses to ensure health system preparedness for future outbreaks. The Government of India had also released operational guidelines for designing Critical care blocks (39). It covers parameters such as location, minimum covered area, flow and process, design principles, cost and legal requirements. Such a facility helped to manage Acute Respiratory Distress Syndrome, that is seen due to sequelae of certain zoonotic disease like COVID 19.

6.6.3. As per the guidelines, the Critical Care block should ideally be integrated as a part of the existing hospital in order to ensure optimum utilization of resources. However, it must be ensured that there are separate entry and exit for the critical care block. It should be constructed in such a manner that as & when necessary it is possible to isolate and use it as a dedicated facility for management of infectious diseases. Detail guidelines in Ref. (39).

6.6.3. The states can establish clear protocols for surge response, quarantine and isolation. Regular drills and exercises help to evaluate the hospital's readiness for emergencies, identify gaps, and improve response times. Telemedicine can be a beneficial tool that allows skilled critical care physicians to prevent patient overload (Box 15).

Box 15: Examples of telemedicine and consultation tools to manage surge

- All India Institute of Medical Sciences (AIIMS) in New Delhi along with the Centres of Excellence in the States/ UTs bolstered e-ICU video consultation programme for the clinical treatment and critical care of patients in their intensive care units (ICU), thereby managing to keep the case fatality rate (CFR) low in the country.
- Doctor-to-doctor tele-medicine platform called eSanjeevani led to massive improvement in access to specialized health services, particularly in rural areas

6.6.4. Agreement on prepositioning supplies and defining supply chains is an essential preparedness action. Aspects of the supply chain to be defined include agreements with suppliers, procedures for release of emergency funds, including the plan for surge stocks placed at strategic location.

6.6.5. Maintain stock of materials and supplies, including drugs and vaccines, supplies for laboratory chemicals and items for field investigations, sample collection and transport, communication, and personal protection.

6.6.6. Careful and ethical management and disposal of dead bodies should be ensured, including due respect for religious and cultural sensitivities. Teams handling dead bodies suspected to be of zoonotic diseases should wear protective equipment (heavy-duty gloves and boots) and wash their hands with soap and water after handling dead bodies. To boost the trust of all healthcare professionals (including those involved in dead body disposal), the safety must be guaranteed and closely monitored.

6.6.7. Sensitization of hospital preparedness and IPC for clinicians, nurses and health workers to ensure that they receive regular updates on new protocols, guidelines, and best practices including the use of technology and digital tools that can aid in communication, patient monitoring, and data management during emergencies. These trained healthcare workers can act as a "back up team" to ensure that the system runs smoothly. Furthermore, the health system should cover preparedness for clinical trials because outbreak will be transient and needs to be ready with protocols, actions, and methods.

6.7. Operational Research

The fundamental purpose of focusing on operational research (OR) in states is to provide decision-makers with insights and solutions on managing zoonoses to help them make better decisions when planning and managing their resources and operations. Research teams with diverse experience and disciplinary backgrounds will provide a broader perspective and allow the human-animal-environment interaction to be studied as a cohesive whole. The measures for OR are detailed below,

6.7.1. State should build a research policy for zoonotic disease by involving health, veterinary and environment sectors and publish research digest on zoonotic disease annually.

6.7.2. States can set aside resources to address knowledge gaps, understanding of epidemiology, and incidence/prevalence of emerging zoonotic diseases. Medical/ Veterinary colleges, academia, other think tank groups can be brought together to address issues around operational research.

6.7.3. Operational Research with multi sectoral collaborations can be planned in consultation with national research centres/ referral labs like NCDC, ICMR, ICAR, IVRI, NIV, NIHSAD etc.

6.7.4. Research can be aimed at developing accurate, standardized, and validated diagnostics; safe and effective treatments aimed primarily at preventing zoonotic infection; and safe and effective vaccines to prevent disease, disability, and death.

6.7.5. Partners should identify sources of private- and public-sector funding and develop appropriate incentives to promote R & D on drugs and vaccines for zoonotic disease with further development of industrial scale production.

6.7.6. States can allocate resources to monitor the geographic distribution of known and potential vectors over time, which may influence outbreak forecasting efforts and identify areas of potential risk.

6.7.7. By researching the genomic sequences of pathogens sampled from different individuals, animals or vectors from different geographic regions, scientists can identify and track the transmission pathways of the pathogen. While conducting joint risk assessment such genomic surveillance data from humans, animals, and the environment can be used and examined across sectors.

6.7.8. Strengthening state level preparedness capacities can address the potential dangers of zoonotic disease before they become a major problem. Beyond boosting surveillance capacities at state level, the health system must also transform to utilise non-epidemiological data, integrate data analytics, and explore more innovative and collaborative ways of working to strengthen preparedness and understand risks and vulnerabilities more fully. Furthermore, optimizing monitoring for zoonoses by environmental sampling is crucial for establishing evidence-based policies that can improve zoonotic disease identification, prevention, and control (See examples of environmental sampling-Photo 12, 13).



Photo 12: Environmental Sampling during Anthrax outbreak (Animal bone and soil sample collection)



Photo 13: Tick flagging for KFD Surveillance

CHAPTER 7

RESPONSE FOR ZOONOTIC DISEASE OUTBREAK

Response refers to the actions to be taken during and immediately after a disease outbreak is confirmed inorder to control and mitigate its impact. For appropriate and optimal response, it is ideal to identify the trigger points for outbreak based on endemicity of the Zoonotic disease in the geographical areas. Further, It is also essential to develop linkages and lines of communications both intra – and inter sectoral (including media and community) and to explicitly define their roles and responsibilities.

Aim:

To define strategies for states to effectively respond to zoonotic disease outbreaks using One Health approach by involving multidisciplinary team of professionals with relevant expertise thereby protecting people, animal, and economies of state

Objectives:

- To detect disease outbreaks as early as possible and implement antecedent as well as long-term disease prevention and control strategies for minimizing the spread and magnitude of the outbreak
- $\circ~$ To develop linkages and lines of communication with other relevant agencies in managing the outbreaks
- To engage with communities to build trust, address concerns, and encourage compliance with public health measures
- To conduct post-outbreak evaluations (after action reviews) in order to assess the effectiveness of response efforts, identify strengths and weaknesses, and apply lessons learned for future improvements.

Annexure IX details the check list of activities for Zoonotic disease outbreak Response

Annexure X details the action points for Zoonotic disease outbreak Response

Effective response to zoonotic diseases hinges on developing the capabilities to deliver following key tasks:

- 7.1. Integrated outbreak investigation
- 7.2. Implementing joint control measures, recovery and rehabilitation
- 7.3. Risk Communication and Community Engagement
- 7.4. After action report and impact assessment

7.1. Integrated outbreak investigation

The steps in outbreak investigation as per WHO guidelines (40) (Box 16) are adapted to One Health approach in country context and described below:

Box 16: Principles and steps of an outbreak investigation (40)

- o Detect and confirm the outbreak and agent
- Rapid Response Team (RRT)
- o Define cases
- o Identify cases and obtain information
- Descriptive epidemiological investigation (time, place, person)
- o Additional studies (Environmental , Risk Assessments, Laboratory)
- Interview cases and generate hypotheses
- Evaluate the hypotheses
- o Inform risk managers and implement control measures
- o Communicate findings, make recommendations, and evaluate the outbreak response

7.1.1. Detection, confirmation, and reporting of the outbreak

7.1.1.1. The first step is to identify and validate the source of information to avoid false alarm. Every information should be taken seriously, verified, and analyzed. The trigger points of outbreak for zoonotic diseases are given in Box 17.

Box 17: Trigger points of Outbreak calling for a One Health approach

- \circ $\;$ Increase in the number of clusters of unexplained illnesses in humans reported by
- health facility/medical practitioners, local leaders, or via rumor/ media report
- Abnormal disease patterns or unusual symptoms in livestock herds reported by farmers, animal health and veterinary workers, private veterinarians, livestock traders
- Unexplained mass die-offs or sudden death in wildlife populations reported by forest authorities
- \circ $\,$ Changes in the distribution or abundance of disease vectors leading to reports of vector borne diseases
- $\circ~$ Human cases of infections typically associated with animals, such as leptospirosis, brucellosis, or anthrax
- Detection of zoonotic pathogens or specific antibodies in human or animal populations during routine surveillance studies
- IDSP/IHIP Media scanning reports that systematically track and analyze media content from various sources
- Family or hospital clusters of disease patterns like encephalitis, ARDS etc including disease in young patients with known co-morbidities

7.1.1.2. As patients may seek healthcare facility in the government/ private sector, the physicians/ veterinarians could be sensitized on the emerging risk of zoonotic diseases and their need for early notification. The possibility of a new disease/ unknown agent must be explored if the laboratory indicates no known pathogens. In case of such incidence, the sample can be send by health/ veterinary authorities to the state referral laboratories followed by confirmation at the apex labs such as NCDC/NIV or NIHSAD, respectively.

7.1.1.3. Tertiary/private hospitals can play a crucial role in identifying atypical disease outbreaks (Box 18). While they can be a source of outbreak identification, in certain situations they also have the necessary resources, expertise, and infrastructure to effectively respond to and control outbreaks. The district surveillance officer has an important role in involving the private sector in outbreak response.

Box 18:Story of primary case of Nipah virus in Kerala (based on media report) (41)

In the year 2018, Physicians from a private hospital at Kozhikode (Kerala) attended a young patient X (Age 26) with perplexing symptoms. The patient had a high fever, severe headache, and displayed signs of neurological impairment. His B.P increased and was unable to breathe.

Sensing that something was amiss, the doctors delved deeper into the case, gathered information about the patient's recent activities and possible exposure to infectious agents. Soon a pattern began to emerge. They noticed that several family members and close contacts of the patient had also fallen ill with similar symptoms. His brother had similar symptoms (considered as Index case) and died few days ago.

Recognizing the urgency of the situation, they quickly alerted the hospital authorities. They realized that they might be dealing with an emerging infectious disease outbreak. They collected samples from the patients, taking precautions to ensure their safety and prevent further transmission. The samples were sent to the apex laboratories for testing and analysis. The samples was tested positive for the Nipah virus, a potentially fatal zoonotic virus. The doctor followed immediate action with State Health authorities to prevent further spread of the virus.

This was the first NiV outbreak in South India. A total of 23 cases were identified, including the index case with 18 laboratory-confirmed cases (42).



7.1.1.4. The presence of an outbreak can be confirmed by evaluating epidemiological statistics and trends, clinical assessment of cases, medical records review, and laboratory test results evaluation. Once confirmed, there should be systems for isolation of infectious disease patients and quarantine of contacts.

7.1.1.5. For Laboratory confirmation, collect the right biological specimens in the right way to confirm the suspected diagnoses. There is also a need to describe the clinical signs of the disease while sampling. Sample collection procedure can be followed as per requirement of respective zoonotic diseases. WHO has published guidelines for the collection of clinical specimens during field investigation of outbreaks (43). Standardization of diagnostic tests at the state and national levels, in addition to WHO recommendations, is essential to facilitate speedy confirmation.

7.1.1.6. Outbreak verification is a meticulous and data-driven process that involves collaboration between epidemiologists, laboratory experts, and various stakeholders. An example is provided in Box 19.

Box 19: Outbreak verification and action

For example, a densely populated city witnessed a sudden increase in gastrointestinal illness cases. The initial reports indicated a cluster of individuals experiencing symptoms such as vomiting, diarrhea, and abdominal pain after attending a marriage function.

The physician reviewed medical records, epidemiologist interviewed affected individuals, and laboratory workers conducted tests to confirm the presence of gastrointestinal illness. The outbreak was verified to be Salmonellosis. While interviewing the epidemiologist observed that all patients had egg curry.

This information was conveyed to the veterinary officer of the animal husbandry department, who could trace back the poultry farm that supplied egg to the vendor. An investigation of Salmonella was also conducted at poultry farm after outbreak was verified in humans.



7.1.1.7. Outbreak should be reported under the existing monitoring system [(IDSP-IHIP (for Human cases) and NDLM/ NADRES/others (for Animal cases)]. In IHIP, the health facility user can flag an event through event alert form. This will be visible to District Surveillance Officer (DSO) and State Surveillance Officer (SSO) and also to the nodal officers of Central Surveillance Unit (CSU)(Fig. 13). Whether a particular event requires detailed outbreak investigation will be decided by DSO based on the local epidemiology and/or disease specific guidelines for initiating outbreak investigation.



Fig. 13: Information flow of the surveillance system under IDSP and NOHP-PCZ

7.1.1.8. In the Animal Health sector, the Department of Animal Husbandry and Dairying, Government of India, governs the reporting of animal diseases in the country. The National Digital Livestock Mission/ National Animal Disease Reporting System (NADRS) is a web-based information technology system that allows states and union territories to report diseases in the field. On the similar lines, ICAR-NIVEDI, in its quest for achieving better livestock health, had developed an interactive web portal called "National Animal Disease Referral Expert System (NADRES v2)". Furthermore, developing an API to integrate zoonoses reporting from IDSP/IHIP and NADRS/NDRS/NDLM and to automate the sharing of zoonotic disease outbreak information from this source to State Zoonoses /OH committee using the digitalized cross-reporting form will help in better management of zoonotic diseases as well as cross-reporting of diseases.

7.1.1.9. In case when multiple states/ districts are involved, or there are IHR related issues with the outbreak (sudden, serious, unexpected, implications of travel/trade etc.) the states may seek guidance from NCDC, ICMR and other suitable technical agencies on human health/ animal health sectors who may decide to support investigation through a central support team as needed.

7.1.1.10. Notifiable zoonotic diseases and events can be reported by each sector to the appropriate international and regional authorities

- o for human health events: to WHO according to the IHR (2005)
- for domestic animal health and wildlife health events: to WOAH according to the WOAH Terrestrial and Aquatic Animal Health Codes

Box 20: Cross notification: Animal Health to Human health Sector

In a small rural community, the local animal husbandry sector could detect a potential outbreak of Avian Influenza. Realizing the potential risk to human health, the animal husbandry department swiftly shared this critical information with the local health service department.

They emphasized the importance of heightened fever surveillance, as avian influenza has the potential to transmit from birds to humans, causing severe illness. The health service department responded promptly, activating their surveillance systems to monitor individuals presenting with fever or flu-like symptoms in the outbreak area. They alerted healthcare facilities, physicians, and local clinics about the potential outbreak and provided them with specific guidelines for early detection, testing, and reporting of suspected cases. The AH sector followed the guidelines issued by DAHD for controlling Avian influenza.

The Human Health sector shared logistic including PPE kits for control operations and culling of birds.



7.1.1.11. *Cross notification 1:* If the animal health sector identifies a suspected zoonotic disease outbreak, the human health sector (and relevant environment health sectors) may be notified and shall be requested to visit the premises to check for zoonotic linkages. Example (Box 20)

Box 21: Cross notification: Human Health to Animal Health Sector

Cross notification and early information sharing between the two sectors could help to establish source tracking of the outbreak. An outbreak of Lymes disease was reported in a vilage adjoining forest areas. There were reports of two forest guards admitted to various hospitals with high fever, headache and muscle aches. History revealed reports of tick bite. Lymes disease was confirmed in both the cases.

Same day following confirmation, the health authorities notified to the Animal Husbandry and forest sector and asked to conduct investigation.

The Health, Animal Health and Forest officers visited the premises. The entomologist collected the ticks in that area and sent for lab testing.



7.1.1.12. Cross notification 2: If the human health sector has identified the disease first, the animal health sector (and relevant environmental sectors) may be notified and shall be requested to visit the premises to check for zoonotic linkages. Example (Box. 21)

7.1.2. Deployment of One Health Rapid Response Team (RRT)

7.1.2.1. RRTs at the state and district level should remain in a state of readiness through regular training programs, table top/Simulation exercises, so that they respond effectively during acute events. The task of the outbreak verification shall be performed at the level of CMHO/DHO, District Animal Husbandry Officer, District level wildlife representatives. The SLZC and DLZC needs to be sensitized and appraised about the regular scenario of the outbreaks. As soon as the information is received, the multi sector team of RRTs (as shown in photos 14 & 15) must be mobilized immediately (Under IDSP there is deployment of State RRT and District RRT). The deployment of central RRTs can be mobilized by relevant ministry (MoHFW and MFAHD) as and when it is required.

7.1.2.2. The additional members of RRT can be identified based on individual knowledge and experience and assembled by matching expertise and incident demands in order to provide rapid response for efficiently managing disease outbreaks. Engagement with professional bodies/private sector and civil society is encouraged, so that all

aspects of the outbreak response and containment measures are well addressed. Incorporating laboratory staff into RRTs creates a comprehensive and agile response to zoonotic disease outbreaks. They are well-versed in biosafety and biosecurity protocols, ensuring safe handling of potentially hazardous samples, thus helping to make informed decisions.

7.1.2.3. RRT can meet and describe the roles and responsibilities of human health and animal health (including wildlife) sectors for managing the outbreak, including communication with the general public and the media. DLZC can coordinate with RRT for activity on zoonoses control in the district.

7.1.2.4. The stakeholders needs to establish trust and decide how best to work as a One Health team. They will work together to develop a plan, involving all members, to investigate and respond to the outbreak of the new disease. The government or district administrator can devote dedicated funding for cross-sectoral work and can facilitate the response.

Annexure XI details the proforma for RRT for reporting emerging zoonoses

7.1.2.5. Directions can be issued to respective blocks under health and veterinary department and local government bodies for initiation and coordination with counterparts for containment measures of outbreak. This can be followed by provision of requisite logistic (Drugs, Diagnostics, PPE, etc.) to respective District authorities under relevant departments.



Photo 14: RRT in action for control of Bird flu outbreak

IHIP/IDSP OUTBREAK INVESTIGATIONS - DSO



Fig. 16: Action strategies for initiation of outbreak investigation and control activities in the District

Note: For coordinated investigation and response, tripartite zoonoses guide (11) has described the following four steps,

STEP 1: Clarifying each sector's roles and responsibilities

STEP 2: Determining whether a coordinated investigation is required

STEP 3: Developing a decision tool to determine initiation and scale of response

STEP 4: Developing protocols for implementing coordinated investigation and response

7.1.2.6. The summary of activities for initiating outbreak investigation is shown in Fig. 16 and Box 22. For cases on novel zoonotic diseases, the response can follow as depicted in Box 23.

Box 22: Initial activities during outbreak responses				
Activity	Person Responsible	Timeline		
Detection of possible outbreak through surveillance mechanisms and other sources including media	District Health or Animal Husbandry authorities	On-going		
Assemble outbreak Assessment Team	DSO/District Epidemiologist (Vet)	Immediate		
Outbreak verification and decision for outbreak investigation	DSO/District Epidemiologist (Vet)	Within 24 – 48 hours of alert		
Report outcome of verification exercise to DMO/ DAHO	DSO/District Epidemiologist (Vet)	As soon as verification is made		
Alert State Health/ Animal husbandry Office	District Health or Animal Husbandry authorities	Immediate		
Alert other relevant sectors if necessary (see cross notification)	District Health or Animal Husbandry authorities	Immediate		
Formation of Rapid Response Team to initiate investigation and control of outbreak activities (Photo 15)	Rapid Response Team	Within 24 hours of verification		
Action and continuous reporting of RRT activities to respective department heads	Rapid Response Team	As and when updates are available		



Photo 15: Formation of Multisectoral Rapid Response Team
Box 23: Mounting response to an Emerging zoonotic disease outbreak

A district X observed an alarming increase in unknow fever, myalgia, dizziness, neck pain and was a limelight news in media. Recognizing this emergency and the need for a coordinated and comprehensive response, the health department decided to convene a multi-stakeholder meeting on responding to disease outbreak.

The district health department took the lead and reached out to the District Magistrate for organizing the meeting. They identified representatives from various sectors, including public health agencies, healthcare facilities, animal husbandry department, vector control agencies, Forest/ Environment sector, laboratory networks, academia, research institutions, local communities, and NGOs.

The meeting introduced the importance of their collaboration in tackling the growing CCHF threat. A well-prepared agenda was presented, covering various aspects of CCHF preparedness. Experts in the field were invited to deliver informative presentations on CCHF epidemiology, surveillance and reporting mechanisms, diagnostic capabilities, vector control strategies, public health interventions, laboratory networks, risk communication, capacity building needs, and coordination mechanisms. The presentations were followed by interactive discussions, allowing stakeholders to share their insights, experiences, and concerns.



The stakeholders recognized the importance of joint surveillance to strengthen CCHF preparedness in the district. The District Magistrate ensured to review the outbreak preparedness measures and also to allocate resources.

The discussions resulted in the identification of specific actions, responsibilities, and timelines for implementation. Healthcare providers agreed to share data and enhance surveillance systems, while veterinary departments committed to improving animal husbandry practices and monitoring. Vector control agencies pledged to intensify their efforts, and laboratories offered to strengthen diagnostic capabilities. NGOs committed to support community engagement and public awareness campaigns.

7.1.3. Deriving a case definition

7.1.3.1. Case definition implies the standard criteria for categorizing an individual as a case of the outbreak. In the earliest stages, it might be broader and less specific in order to make sure to identify all of the potential cases ("suspected" cases), but later on, it might include more specific clinical or laboratory criteria that enables to categorize individuals as "probable" or "confirmed" cases

7.1.3.2. Typically, a case definition has criteria based on the person, place, and time. As new information about the outbreak arises constantly throughout the investigation, the case definition is subject to change. A model example: "A person (who?) living in town XXXX (where?), presenting with symptoms of (say abdominal pain, nausea and vomiting)-history of.... And One Health scenario- animal source/ environment transmission-vectors- date of onset of symptoms from (when?) and travel history (who?, where?)." An example is given in Box 24 (Reader may refer to case definitions under IDSP for outbreak response).

Box 24: Example of case definition suspected to be a zoonoses (Kyasanur Forest Disease)

A patient presenting with acute onset of high grade fever (Rule out common aetiologies of acute febrile illness prevalent in the area such as Dengue/DHF, typhoid, malaria etc.,) with Headache/ Myalgia/ Prostration/ Extreme weakness/ Nausea/ Vomiting/ Diarrhea/ Occasionally neurological/ haemorrhagic manifestations AND/ OR history of exposure to tick bite, travel and/ or living in and around forest area where laboratory confirmed KFD cases have been reported previously or an area where recent monkey deaths have been reported.

7.1.4. Identify cases and obtain information

7.1.4.1. Efforts should be undertaken to identify the index case, primary/secondary cases as well as its geographical distribution (Spatial and temporal). Details can also include the involvement of vectors such as tick, mite, mosquitoes and the mode of transmission (Human-Human; Animal to Human; Human to Animal).

7.1.4.2. The case investigations, and line listing should begin immediately in order to establish the cause of the outbreak and individuals who are at risk. Line listing of human cases and animal cases (if applicable) can be recorded by respective sectors and communicated.

7.1.4.3. Line listing of cases is essential to determine and estimate the extent and dispersion of the outbreak, identify the population at risk, enroll patients, and identify people who require treatment.

7.1.4.4. Provide appropriate medical care and treatment for affected individuals, including isolation and supportive therapies. Ensure healthcare providers follow evidence-based clinical guidelines for managing infectious diseases.'

7.1.4.5. Conduct systematic contact tracing to identify individuals who may have been exposed to the infectious disease. Monitor and follow up with contacts to prevent further transmission and provide necessary support and testing. For example, contact

ENVIRONMENTAL HEALTH НОМАМ НЕАLTH 🖸 АNIMAL НЕАLTH **ONE HEALTH**

tracing has been a critical tool in identifying and containing the spread of the COVID-19 disease. Once a positive case is identified, contact tracers work closely with the affected individual to identify and locate individuals who have been in close contact with them during the period when they were potentially infectious. Close contacts typically include household members, close friends, coworkers, and individuals with whom the infected person had prolonged interactions.

7.1.4.6. Due IPC precautions need to be followed by undertaking case identification/ contact tracing.

7.1.5. Descriptive epidemiology and joint monitoring of the outbreak

7.1.5.1. For descriptive epidemiology, the data must be collected on Time- When were they infected? Place- Where were they infected? Where do they live? Person- What are the symptoms and etiology? Who was infected?

7.1.5.2. By descriptive epidemiology, the RRT can analyze the characteristics of the outbreak, the exposures, the timing of symptoms and identify the source of the outbreak. For example, by analyzing the descriptive epidemiology data on anthrax cases and exposures, RRT can determine whether the cases are linked to occupational exposures like animal handlers, workers in leather industry etc. (Photo 16). This information is crucial for targeting control measures.



Photo 16: Investigation to identify cases

7.1.5.3. During investigation the One health stakeholders must monitor the trends in cases and deaths including stocks of vaccines and drugs, logistics etc.

7.1.5.4. The RRT can convene Joint meetings of stakeholders to address containment measures and relevant issues through consultation. Reports on containment measures can be shared with relevant stakeholders

7.1.5.5. Data summarization by key demographic factors gives a full picture of the outbreak, including trends over time, geographic distribution (place), and populations (people) afflicted by the disease. Describing the outbreak over time through an epidemic curve provides time trend of the disease. Example is illustrated in Box 25.



7.1.6. Descriptive Additional studies

7.1.6.1. For additional studies, pathogen can be screened from environmental sources. This involves monitoring the presence and persistence of pathogens in the environment. This can include sampling and testing of water from various sources, food from food production facilities, animal sample, vectors, and other environmental reservoirs.

7.1.6.2. Environmental surveillance helps in early detection of potential sources of infection and guides targeted control measures. For example, in waterborne outbreaks like *E. coli*, Salmonella spp. etc, studying the quality and safety of water sources can identify potential contamination points. Similarly, humans can acquire anthrax through direct contact with infected animals or their tissues. People who work in agriculture, animal husbandry, or industries handling animal products may encounter contaminated soil and spores. Hence, regularly testing soil samples for the presence of anthrax spores and implementing timely interventions helps to prevent outbreaks.

7.1.7. Interview cases and generate hypotheses

7.1.7.1. Interviewing cases enlightens more about outbreak scenario. For example, in a slum population crowded city, a sudden increase in severe skin disease caught the attention of the local health department. They visited hospitals, reached out to healthcare providers, and connected with patients who had recently sought medical attention for skin lesions with ulcers. They also reached out to the slum where they lived and interviewed the inhabitants who reported the presence of flies (typically sand flies) and excess rodents.

7.1.7.2. Through these interviews, they gathered detailed information about the onset of symptoms, risks (like open sewerage) possible exposures (of sand flies), and any commonalities among the cases, which was useful for generating hypothesis of the causative agent for skin disease (Cutaneous Leishmaniasis ?).

7.1.7.3. In the above example, hypothesis of Leishmaniasis could be generated, which is a disease caused by protozoan parasites transmitted by the bite of infected female phlebotomine sandflies. On interviewing, it could be inferred that poverty increases the risk for leishmaniasis. Poor housing and domestic sanitary conditions (lack of waste management or open sewerage) may increase sandfly breeding and resting sites, as well as their access to humans.

7.1.7.4. While generating hypotheses about potential causative exposure(s) that may be responsible for the illness, RRT should consider the One Health oriented exposures such as vectors, animals (including wild animals), environmental factors (hygiene/ sanitation) and high-risk potential exposure areas such as wet markets/ animal farms/ roosting areas of bats/ forest/associated food safety concerns etc.

7.1.8. Evaluate the hypotheses

7.1.8.1. Hypotheses can be evaluated using a combination of environmental evidence, laboratory science, and epidemiology. It may likewise request support from academia, the private sector, and other partners to focus on technical resources based on outbreak needs (Example in Box 26).

Box 26: Example of Hypotheses evaluation focusing on Zoonotic diseases

HYPOTHESIS: The disease outbreak in Village X is caused by an unknown pathogen

EVALUATION:

In a remote village X nestled amidst lush green hills, a mysterious illness began to spread among the villagers. People started experiencing high fever, severe headache, body aches, and fatigue. The local clinic was overwhelmed with patients suffering from acute febrile illness, but the cause of the outbreak remained unknown.

Among the affected villagers was a young girl. She fell ill with the same symptoms, and her worried parents rushed her to the clinic. The village doctor was determined to find the cause of the outbreak and provide the best care for his patients. The doctor and his team immediately began conducting various laboratory tests on the patients. Their hypothesis was "the disease outbreak in Village X is caused by an unknown pathogen". They performed routine blood tests, looking for signs of common infectious diseases such as malaria, dengue, and typhoid. However, all the initial tests came back negative, leaving them puzzled.

As the situation grew more complex, the doctor sought assistance from a neighboring city hospital. A team of expert doctors and scientists arrived at the village to help investigate the outbreak. The team decided to take a more comprehensive approach to diagnose the illness. They proposed conducting genomic sequencing to analyze the genetic material of the infectious agent. The goal was to identify the specific pathogen responsible for the outbreak.

The sample was carefully collected and sent to the city's advanced laboratory for analysis. While waiting for the results, the doctor and his team continued to provide supportive care to the patients. They implemented measures to prevent further transmission of the illness, such as isolating the sick individuals and promoting proper hygiene practices.

The genomic sequencing analysis revealed that the outbreak was caused by a previously unknown virus, belonging to a family of viruses known to cause febrile illnesses. With this newfound information, the medical team quickly devised a treatment plan and implemented appropriate measures to control the outbreak. They also initiated public health campaigns to raise awareness about the new virus and its mode of transmission. The successful use of genomic sequencing not only provided a definitive diagnosis but also helped the medical community better understand the new virus and its potential implications.

7.1.8.2. Hypotheses can be examined by comparing proven facts or by utilizing analytic epidemiology to quantify correlations and assess the impact of chance.

7.2. Implementing joint control measures, recovery, and rehabilitation

7.2.1. Joint control measures may vary depending on the zoonotic disease in question and the local context.

7.2.2. Implementing joint control measures for zoonoses involves collaborative efforts from various sectors, including human health, animal health, and environmental authorities. Examples of joint control measures for zoonotic diseases are shown in Box 27 and general control strategies are described in Annexure III.

Box 27: Examples of Joint Control Strategies				
Disease	Public Health authorities	Animal Health authorities	Environment & other authorities	
Leptospirosis	 Issue advisories for the concerned stakeholders to be ready for the outbreak response Raising awareness in both the general population and risk groups Establish laboratory diagnostic facilities in the district hospitals/ nearest research institutes for screening and surveillance of leptospirosis Providing prompt antibiotic prophylaxis Hospital preparedness to manage leptospira patients 	 Issue advisories for the concerned stakeholders to be ready for the outbreak response Communicate the measures of rodent control in livestock farm premises Check the transmission of disease in domestic animals by prompt diagnosis Identifying animal reservoirs Raising awareness in livestock farmers Immunization 	 Checking the environment for leptospires Rodent surveillance in community and sylvatic area setting in collaboration with agricultural department Finding pathogenic leptospires in the water by culture, or by PCR to confirm a risk of infection Proper waste disposal from residential area of village Conducting cleanliness drive in the entire village IEC regarding cleanliness and waste disposal for prevention and control of disease, among cattle handlers and staff engaged in control activity. 	

PREVENTION, PREPAREDNESS AND RESPONSE USING ONE HEALTH APPROACH

KFD	 Conduct fever surveillance Vaccination of risk groups Designing treatment protocols, Inpatient care and expert treatment Close surveillance to rule out relapsing cases Disease awareness Insecticide dusting at monkey death areas 	 Disease awareness Postmortem of monkey carcass Identification of tick vectors Epidemiological surveillance Vector control activities in domestic animals Epidemiological surveillance 	 The forest department to report cases of monkey death Referral laboratories to conduct testing of samples for diagnosis of KFD. Tribal development department distributes compensation for the bereaved families Media helps in spreading awareness messages Police dept. for law and order

7.2.3. Costs are reduced by avoiding duplication of activities and performance may improve by improving synergies – e.g. sharing of laboratory facilities by multiple sectors. An example of sharing logistics during control operations are given in Box 28.

Box 28: Optimal uses of logistics between sectors

Organizing a single combined effort rather than several campaigns will result in significant reduction in total programme expenses by sharing logistics (such as staff, transportation, and cold chain). For instance, a KFD affected District could organize integrated livestock health camps administering anti-tick preparations in cattle along with KFD immunization programmes thereby enhancing vaccine uptake and coverage for difficult-to-reach tribal populations and sharing logistics. Entomologist can also explore collecting ticks from animals for tick surveillance.

7.2.4. Implement preventive measures in animal populations to reduce the risk of zoonotic disease transmission from animals to humans. This may include vaccination, deworming, and vector control in animals

7.2.5. Conduct community outreach programmes to empower at-risk population and communities by implementing tailored interventions and holistic solutions to protect themselves and close contacts from acquiring the infection.

7.2.6. The state/district may assign a team to ensure that the zoonotic outbreak is well documented, including response across various sectors, challenges faced and action items.

7.2.7. Proper disposal of dead animals and waste helps prevent the spread of diseases. Dead animals can serve as sources of infection, attracting scavengers, insects, and other vectors that can carry pathogens and transmit them to healthy animals or humans. Swift disposal minimizes the risk of disease transmission and helps to maintain biosecurity.

7.2.8. Recovery and rehabilitation of zoonotic diseases involves providing comprehensive care and support to individuals affected by these diseases, as well as implementing measures to prevent further transmission and promote overall community health.

7.2.9. Provide rehabilitation services to individuals who may have suffered from long-term effects or complications of the zoonotic disease. This may include physical therapy, counseling, and social support.

7.2.10. By prioritizing recovery and rehabilitation measures, communities can build resilience and reduce the burden of zoonotic diseases on public health.

7.3. Risk Communication and Community Engagement

Risk communication is a core element of public health preparedness, response and recovery from health emergencies. During public health emergencies, people need to know what health risks they face, and what actions they can take to protect their lives, their health, their families and communities.

7.3.1. States needs to give top priority for risk communication in order to provide accurate and timely information in emergency settings. This gives people the information they need to make decisions that will protect their own health and the health of those they care about, as well as stop the disease from spreading. Prepare advance media messaging materials on zoonotic disease management and countermeasures.

7.3.2. Building community resilience to zoonotic disease emergencies requires ensuring that communities are given the appropriate information at the appropriate time (Photo 17) and are included in the formulation of multisectoral response plans. States can also involve community participation in decision-making, planning, and execution to ensure that public health initiatives are adapted to the community's unique needs and concerns and consider regional cultural practices.

7.3.3. The most important strategy for preventing and controlling zoonoses is the adoption of community behaviour that welcomes and supports the readiness to adhere to public health and social policies. For this, the communication team may be linked with community leaders or influencers or partners or professional associations and hard-to-reach people with which the multisectoral communications group is able to link (either directly or indirectly). For this, spokesperson from different sectors can be identified and trained. They can conduct public awareness programs (in communities, schools, colleges etc.)

7.3.4. An investigation is not complete until the results is communicated to those who need the information to act. Each department works on a daily reporting system. This reporting system can also be integrated with different department activities so that the activities can be viewed by all nodal officers in a single window. Use of any fastest and authorized mode of communication is promoted. There should also be a communication

between public health laboratories and animal health laboratories communicate.

7.3.5. Dispel rumors and misinformation (including those in social media), reduce anxiety, and increase understanding and acceptance of public health interventions, especially to the vulnerable and at-risk groups during outbreaks.

7.3.6. While working collaboratively, it is particularly important to determine who has primary responsibility and authority for communicating each aspect of the investigation to the media, and the public.

7.3.7. Once an outbreak has been effectively managed and the findings are ready to be communicated with the media, the communication officer can assemble a team of experts. They can review the key findings and develop a communication strategy to ensure accurate and timely dissemination of information. Effective communication during disease outbreaks requires a balance between providing accurate information and minimizing panic. Strategies for communicating with media are detailed in Box 29.

Box 29: Communication with media

- Communication officer can organize a media briefing, inviting journalists from local and national channels. The briefing provides an opportunity to present the findings, answer questions, and clarify any misconceptions. Following the media briefing, individual interviews may also be arranged with prominent journalists and news channels.
- The **key message should remain consistent**. Ensure that all official statements and sources are aligned and deliver the same information to maintain credibility.
- Emphasizes should be made on the **importance of accurate reporting to prevent misinformation.** The authorities should provide clear answers to frequently asked questions to help alleviate fears and minimize the spread of misinformation.
- In the case of new disease or event **an expert's voice is important.** These experts can provide accurate information, clarify misconceptions, and address public concerns, increasing the credibility of the messaging.
- **Regularly communicate the latest developments,** case counts, preventive measures, and any changes in recommendations or guidelines. This helps build trust and credibility with the public.
- Avoid technical jargon and use clear, plain language that is easily understandable by the public. Communicate key messages in a concise and straightforward manner to ensure the information is accessible to a wide audience. Additionally, visuals can enhance understanding and engagement, making complex information more digestible for the public.
- Simultaneously, the team may issue official press releases, carefully drafted to summarize the findings in a concise manner. These releases may be shared with local and national media outlets, as well as posted on the organization's website and social media platforms. The communication officer should also ensure to actively monitor social media channels and engaged with the public to address any concerns or questions.

Note: For Risk reduction, risk communication, and community engagement, the tripartite zoonoses guide have described the following (11),

- How risk reduction, communication strategies, and community engagement are related
- $\circ~$ How to identify and coordinate with stakeholders and affected populations
- $\circ~$ How to identify and analyse risk factors and establish strategies and plans for coordinated risk reduction
- How to develop a joint risk communication and community engagement strategy and plan
- How to Jointly develop key messages to ensure consistency



Photo 17: Community engagement

7.4. After (or Intra) Action Review and impact assessment

7.4.1. Conduct review of the actions taken in response to an actual public health event as a means of identifying and documenting best practices, gaps and lessons.

7.4.2. The response can be Early action review (EAR) for all events in real-time for rapid improvement, Intra-action review (IAR) for protracted responses requiring course correction (during the response) and After action review (AAR) for the response to all events, after official declaration of the end of the event.

7.4.3. AAR involves learning from the response to inform preparedness and health systems strengthening activities. It consist of:

- o a structured review of response activities
- o an exchange of ideas and an in-depth analysis of what happened
- o identification of what can be addressed immediately
- identification of what can be done in the longer term to improve responses to the next event

7.4.4. Review how the latest zoonotic events were managed, for example: How was the information shared between sectors, how often did they meet, were outbreak investigation jointly conducted, and response activities jointly defined etc. The review seeks to identify immediate and longer-term corrective actions for future responses. For further details, refer WHO tool After Action Review.

7.4.5. Active efforts should be made to also enlist what worked well, and what could be suitably improved, and the state/district may utilize the AAR methodology for this purpose. Also identify strengths and weaknesses, and apply lessons learned to improve future preparedness and response efforts.

7.4.5. States may assess how a particular zoonotic disease has impacted the affected communities and how it poses a threat to the economy as well as to the society, farming community, livestock and wildlife.

7.4.6. Conduct Impact assessment to know how this outbreak has caused life loss, the economic impact, other losses and what are the sectors affected.

7.4.7. Determine long-term action plans based on experience. This includes a preparedness plan to prevent the threat occurring in future and research plan which is generally looked on for research institutes to act.

7.4.8. States may identify the gap areas in coordination between the medical veterinary and wildlife officials.

7.4.9. Look back to the public health approaches, leadership tactics, and political dynamics factoring efficacy and level of success.

7.4.10. Submit recommendations that would have prevented the outbreak or that will control it. They should be guided by the results of the investigation.

CHAPTER 8

MONITORING AND EVALUATION OF RESPONSE AND OTHER ACTIVITIES

Ensuring ongoing monitoring and evaluation (M&E) of various strategies, programmes, and activities on P-P-R for zoonotic diseases provides information about what is working well and what can be done better. M&E generates evidence on whether planned activities are achieving their objectives and support decisions on what to do. Information on activities and targets can be collected on an agreed timetable, with analyses leading to revision and updating of the M&E Plan. As targets are either met or not met, technical activities and their objectives can also be revised.

The process indicators for Monitoring and evaluation are given in Annexure XII.

Globally there are tools for assessing overall preparation capability (JEE, SPAR, PVS), identifying risks and vulnerabilities (STAR, VRAM), evaluating real-world performance (AAR, SimExs) and identifying coordination barriers between animal and human health sectors (IHR-PVS bridging workshop).

Annexure XII details the process indicators for Monitoring P-P-R

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ANNEXURE I: TOOLS FOR ONE HEALTH IMPLEMENTATION AND ACCESS LINKS

S.No.	Name of the tool	Developed by	Link to access	Purpose
1	Joint Risk Assessment Operational Tool	Tripartite partners (FAO- WHO-WOAH)	<u>Joint Risk</u> <u>Assessment</u> <u>Operational Tool</u> (JRA OT)(who.int)	For applying a consistent and harmonized approach to assessing risks posed by zoonotic disease hazards
2	Multisectoral Coordination Mechanism Operational Tool	Tripartite partners (FAO- WHO-WOAH)	<u>Multisectoral</u> <u>Coordination</u> <u>Mechanism</u> <u>Operational Tool</u> (who.int)	To support national authorities to establish or strengthen their mechanism for multisectoral, One Health coordination to manage zoonotic diseases and other One Health threats
3	Surveillance and Information Sharing Operational Tool	Tripartite partners (FAO- WHO-WOAH)	Surveillance and Information Sharing Operational Tool (who.int)	To guide a stepwise process for countries to establish or strengthen their capacity for coordinated, multisectoral surveillance for zoonotic diseases
4	One Health Monitoring Tool (OHMT)	FAO and others	<u>One Health</u> <u>Monitoring Tool</u> (OHMT)	For policymakers to act strategically and target budget and other resources to increase the effectiveness and operational aspects of OH disease prevention and control
5	One Health Systems Mapping and Analysis Resource Toolkit (OH-SMART)	University of Minnesota and partners	Home OH-SMART (One Health Systems Mapping and Analysis Resource Toolkit) (umn.edu)	To support systematic evaluation and enhancement in multisectoral coordination and collaboration, and increase capacity for complex health concerns through an operational, stepwise, and practical One Health approach
6	One Health Information Assessment Tool (OHIAT) Maturity Model	USAID-JSI-Tufts	One Health Information Assessment Tool (OHIAT) Maturity Model – JSI	To facilitate and improve collaboration among practitioners in One Health and digital health communities.
7	One Health Risk Analysis System (OHRAS)	One Health European Joint Programme	<u>One Health Risk</u> <u>Analysis System</u> (<u>OHRAS</u>) – and <u>Home Cohesive</u> (<u>ohras.eu)</u>	To support countries to set up or strengthen their collaboration in the area of risk analysis of zoonoses and AMR using a One Health approach.
8	One Health Zoonotic Disease Prioritization	CDC	One Health Zoonotic Disease Prioritization (OHZDP) One Health CDC	To prioritize zoonotic diseases of greatest concern
9	One health joint plan of action	Quadripartite (FAO-WHO- WOAH-UNEP) partners	<u>One health joint</u> <u>plan of action</u> (2022-2026):	To guide and strengthen countries capacity to address complex multidimensional health risks with more resilient health systems

PREVENTION, PREPAREDNESS AND RESPONSE USING ONE HEALTH APPROACH

ANNEXURE II: NOHP-PCZ REGIONAL COORDINATORS & SENTINEL SURVEILLANCE SITES

List for Regional Coordinator

S. No.	Institute Name
1.	National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI)
2.	National Research Centre on Equines, Hisar
3.	SMS Jaipur
4.	Karnataka Veterinary College, Hebbal, Bangalore
5.	Regional medical research centre (RMRC), Port Blair
6.	Haffkine Institute for Training, Research and Testing, Mumbai
7.	Calcutta School of Tropical Medicine, Kolkata
8.	Regional Institute of Medical Science, Imphal (RIMS), Manipur
9.	College of Veterinary Science, Guwahati, Assam
10.	Sri Venkateswara Institute of Medical Sciences (SVIMS) Tirupati, Andhra Pradesh
11.	ICAR – Indian Veterinary Research Institute, Izatnagar
12.	All India Institute of Medical Sciences, Delhi
13.	All India Institute of Medical Sciences, Bathinda, Punjab
14.	All India Institute of Medical Sciences, Bibinagar, Hyderabad
15.	All India Institute of Medical Sciences, Rishikesh, Uttarakhand

S.No	Institutes/Medical Colleges
1	Agartala Govt. Medical College (ADMC), Agartala-Tripura
2	Byramjee Jeejeebhoy Medical College, Ahmedabad – Gujrat
3	Diamond Harbour Government Medical College & Hospital-West Bengal
4	Kurnool Medical College, Kurnool, Andhra Pradesh
5	Lala Lajpat Rai University of Vet. & Animal Sciences, Hisar-Haryana
6	Post Graduate Institute of Medical Sciences, Rohtak -Haryana
7	Silchar Medical College & Hospital, Silchar-Assam
8	Zoram Medical College, Falkawn Mizoram
9	Government Medical College, Amritsar-Punjab
10	Jawaharlal Nehru Institute of Medical Sciences, Imphal-Manipur
11	Indira Gandhi Medical College & Research Institute, Puducherry
12	Sir Thutob Namgyal Memorial Hospital, Sochakgang-Gangtok
13	Guwahati Medical College & Hospital, Guwahati-Assam
14	District Public Health Laboratory Gen. Hospital, Sawai Madhapur, Rajasthan
15	Assam Medical College & Hospital, Dibrugarh-Assam
16	Government Medical College, Thiruvananthapuram-Kerala
17	King George's Medical University, Lucknow-Uttar Pradesh
18	Rajendra Institute of Medical Sciences, Ranchi-Jharkhand
19	Rajmata Devendra Kumari Singhdeo Government Medical College, Chhattisgarh
20	Bangalore Medical College & Research Institute, Bangalore-Karnataka
21	Government Medical College, Kozhikode-Kerala
22	Government Medical College, Kota-Rajasthan
23	Guru Gobind Singh Medical College & Hospital, Faridkot-Punjab
24	North Bengal Medical College, Darjeeling-West Bengal
25	Institute of Post-Graduate Medical Education & Research and Seth Sukhlal Karnani Memorial Hospital, Kolkata-West Bengal
26	Hassan Institute of Medical Sciences, Hassan-Karnataka
27	Government T D Medical College, Alappuzha-Kerala
28	Naga Hospital Authority, Kohima-Nagaland
29	Sardar Patel Medical College, Bikaner-Rajasthan
30	Goa Medical College, Bambolim-Goa
31	Shimoga Institute of Medical Sciences (SIMS), Shivamogga-Karnataka
32	Mahatma Gandhi Memorial Medical College, Indore-Madhya Pradesh

List of Sentinel Surveillance Sites under NOHP-PCZ

ANNEXURE III: STATE & DISTRICT LEVEL ZOONOSES COMMITTEE-COMPOSITION & TOR

State Level Zoonotic Committee-Composition			
1	Secretary-Health Department	Chairperson	
2	Director General, Health Services	Member	
3	Director, Department of Animal Husbandry & Veterinary Services	Member	
4	In-charge, Regional Disease Diagnostic Laboratory (If any)	Member	
5	Director, State Veterinary Laboratory (If any)	Member	
6	State Drug Controller	Member	
7	Additional Principal Chief Conservator of Forests (C), Ministry of Environment, Forest and Climate Change Regional Office (If any)	Member	
8	Dean Govt. Medical college/ Director Medical Lab. Institute (If any)	Member	
9	Dean Veterinary College (If any)	Member	
10	HOD, Public Health,/Community medicine Govt. Medical College	Member	
11	HOD, Veterinary Public Health and other departments, Veterinary College	Member	
12	Director, Veterinary Institute under ICAR (If any)	Member	
13	Director, Institute under ICMR (If any)	Member	
14	Director, Pharmaceutical/ Biological Products (If any)	Member	
15	Director, Veterinary Biological Products/ Leading Pharmaceutical Co (If any)	Member	
16	State Surveillance Officer (SSO), Integrated Disease Surveillance Programme (IDSP), Health department	Member	
17	Additional Director (Livestock Health), National Animal Disease Reporting System (NADRS), Animal husbandry department	Member	
18	Nodal Officer, National Animal Disease Reporting System (NADS), Animal husbandry department	Member	
19	State Nodal Officer (SNO), Integrated Disease Surveillance Programme (IDSP), Health department	Member- Secretary	

Terms of Reference of the State Level Zoonotic Committee are as under:

- To advise to various facets of the work on Zoonoses prevalent in the State and list zoonoses infections/diseases according to priority and importance under the various heads like bacterial, viral, fungal, parasites and protocol to enable the scientists in the field to tackle the problem on a priority basis.
- 2. To formulate the terms of reference and modus-operandi for developing the networking between various sectors viz. medical, veterinary and allied departments /institutions.
- 3. To review the burden of priority zoonotic disease prevalent in the state and advice the respective state authorities on specific measures to be taken for prevention and control of zoonotic diseases.
- 4. To monitor the progress of efforts undertaken by respective state authorities for prevention and control of emerging and emerging zoonotic diseases.
- 5. To pursue the formation of Zoonosis Committee at the District level and provide guidance to district committees on specific issues arising out of zoonosis.
- 6. To advise the authorities for capacity building and joint training of medical & veterinary professionals.
- 7. To advise regarding the location and requirement of special laboratories at the State or regional level for diagnosis of selected zoonotic diseases.
- 8. To identify those involved in zoonotic disease research for potential collaboration.
- 9. The Committee will normally hold its meeting at Capital at least twice a year. In the meeting the committee to evaluate progress, and review the plans for collaborative activities.
- 10. The expenditure on TA/DA of the members of the Committee shall be met from the source from which their pay and allowances are drawn.

DIST	ict Level Zoonotic Committee-Composition	
1	District Magistrate	Chairperson
2	Chief Medical Health officer (CMHO J / Civil Surgeon / District Health officer	Member
3	District Veterinary officer	Member
4	Representative from Forest dept.	Member
5	Representative of Drug department	Member
6	Dean Govt. Medical college/ Director Medical Lab. Institute (If any)	Member
7	Dean Veterinary College (if any)	Member
8	HOD, Public Health,/Community medicine Govt. Medical College	Member
9	HOD, Veterinary Public Health & other departments, Veterinary College	Member
10	Representative from District Veterinary Laboratory (if any)	Member
11	District Surveillance Officer (S50)	Member
12	District Nodal Officer (Animal Disease Surveillance), Animal Husbandry department (if any)	Member
13	District Nodal Officer (DSO), Integrated Disease Surveillance Programme (IDSP), Health department	Member- Secretary

Terms of Reference of the District Level Zoonotic Committee are as under:

- To advise to various facts of the work on Zoonoses in the District and list zoonoses infections/diseases according to priority and importance under the various heads like bacterial, viral, fungal, paradise and protocol to enable the scientists in the field to tackle the problem on a priority basis.
- 2. To work in liaison with state level committee to formulate the terms of reference and modus-operandi for developing the networking between various sectors viz. medical, veterinary and allied departments /institutions.
- 3. To review the burden of priority zoonotic disease prevalent in the district and advice the respective district authorities on specific measures to be taken for prevention and control of zoonotic diseases.
- 4. To monitor the progress of efforts undertaken by respective authorities for prevention and control of emerging and remerging zoonotic diseases.
- 5. Coordination with the District Level Rapid Response Team (RT) for control of zoonotic diseases in the district.
- 6. To advise regarding the location and requirement of special laboratories at the State or regional level for diagnosis of selected zoonotic diseases.
- 7. To advise the respective authorities for capacity building and joint training of medical & veterinary professionals.
- 8. The Committee will normally hold its meeting at least twice a year.
- 9. The expenditure on TA/DA of the members of the Committee shall be met from the source from which their pay and allowances are drawn.

Proposed action plan for state /district committees:

- 1. Formation of state/district level Inter-sectoral committee.
- 2. Circulation of TORs with all members.
- 3. Ensure regular meeting of state /district level committee (twice a year).
- 4. Circulation of Action taken report of the meetings with all stakeholders and state / NCDC for information
- 5. In the Outbreak situation-time to time meetings of stakeholders
- 6. Constitution of Rapid Response Team in all state/ district/ block with participation of human health and veterinary department
- 7. Preparation of List of experts of zoonosis and list of zoonotic disease diagnostic laboratory- to be shared by block/ district/ state.
- 8. Organization of joint training for human health and veterinary department professionals

at state/ district/ block level (Once a vear).

- 9. Establishment of data sharing mechanism between Health department and Veterinary department.
- 10. Preparation of awareness material on prevention and control of zoonotic diseases.
- 11. Support to National programmes like Intersectoral coordination programme for prevention and control of zoonotic diseases ,National Rabies Control Programme, etc..
- 12. Formulation of Prevention and control guidelines of zoonotic diseases.
- 13. Joint Outbreak investigations of Zoonotic infections.
- 14. Encourage research related to Zoonosis diseases in concerned department.

ANNEXURE IV: PREVENTIVE MEASURES OF MAJOR ZOONOTIC DISEASES

Disease	Preventive measures	
	Vaccination of animals: Vaccination of animals is indicated in endemic areas having high incidence of leptospirosis. The vaccine must contain the dominant locally prevalent serovars. Vaccines consist of inactivated bacteria containing the leptospires Leptospira canicola and Leptospira icterohaemorrhagiae. Immunization of cattle will reduce the excretion of leptospires in their urine.	
	Personal protection: Workers in fields should be cautioned against direct contact with contaminated water or mud and should be advised to use rubber shoes and gloves. In case of any cuts or abrasion on the lower extremities of the body, the worker should apply an antiseptic ointment before entering the field and after exit. Those at risk should cover all cuts with waterproof plasters and wear protective clothing or other materials.	
	Health education: To create awareness about the disease and its prevention. Intensive educational campaign for risk groups.	
Leptospirosis	Chemoprophylaxis: Antimicrobial prevention is indicated for those people who are under risk of exposure except on epidemics – to leptospires (doxycycline 200mg/week) and for those ones with known exposure (doxycycline 100mg for 7 days) such as paddy field workers, canal cleaning workers in endemic areas from where clustering of cases has been reported.	
	Rodent control: Four species of rodents Rattus rattus (House rat), Rattus norvegicus (Norway rat), Bandicota bengalensis (Lesser bandicoot) and Bandicota indica (Larger bandicoot) are so far found to be reservoirs for this bacterium in India. Inspect the premises for any openings or gaps through which these rodents can enter. Seal cracks, holes, gaps, and openings in walls, floors, windows, and doors. Store food in sealed containers made of metal or thick plastic and keep garbage in tightly sealed bins. Good sanitation practices help discourage rodents from infesting an area. Place rodent traps in areas where rodents are commonly seen or suspected. In situations where trapping alone is insufficient, rodenticides may be considered.	
	Mapping of water bodies: The mapping of water bodies and human activities in waterlogged areas should be carried out. This will help to identify the high-risk population. Farmers may be educated to drain out the urine from the cattle shed into a pit, instead of letting it flow and mix with water bodies (rivers, ponds etc.)	

Disease	Preventive measures
	Occupational Safety: Brucellosis is common among occupational risk groups such farmers, shepherds, laboratory workers, abattoir workers, butchers, dairymen, artificial inseminators, veterinarians etc. and hence, risk groups should be sensitized on Brucellosis.
	Personal hygiene: The risk of infection is greatest when handling aborted animals. Farm workers and animal attendants should wear gloves or adequate protective clothing during contact with infected animals or if the environment is likely to have been contaminated by excreta, abortions, or parturition products from animals with brucellosis.
Brucellosis	Farm Biosecurity: Aborted foetuses, placentae and contaminated litter should be collected in leak-proof containers and disposed of, preferably by incineration. Deep burial in freshly slaked lime at sites away from water sources is an acceptable alternative. Farm instruments used for handling contaminated material should be disinfected after use by immersion in a suitable disinfectant (iodophor, phenolic soap or dilute caustic soda). Unauthorized sale or movement of animals from an infected area to other areas should be forbidden.
	Public health education: The community and risk groups need to be sensitized on brucellosis through health education in schools and the workplace.
	Vaccination: Prevention and control of brucellosis in animals is through vaccination. The attenuated strains of B. melitensis strain Rev.1 for sheep and goats and B. abortus strain 19 have proven to be superior.
	Laboratory safety: Brucellosis is one of the most easily acquired laboratory infections. The degree of risk varies, not only with the virulence of the organism, B. melitensis and B. suis being the most dangerous for humans, but also with the numbers of bacteria in the material being handled.
	Control of ticks: For an effective tick control in the hotspot, Malathion should be sprayed with 1g active ingredient in 1-sqmeter area. Apart from spraying, we can use manual dusting and Mist blowers dusting (dust blower). Insecticide application should be done under the supervision of Health Assistants of Hotspot Management team.
KFD	Personal protection measures: People should be advised not to venture into forest where monkey deaths are reported. Persons, who visit the forest / plantation / farms, should cover the body with full length thick cloth and high shoes. Prior to visiting forest / plantation/farms, tick repellents like DEET (N,N-diethyl-m-toluamide), DEPA (N,N-diethyl phenylacetamide), neem oil, eucalyptus oil, etc. should be applied on the exposed part of the body.
	KFD vaccine: KFD vaccine is currently manufactured at Institute of Animal Health and Veterinary Biologicals (IAH&VB), Hebbal, Bengaluru. After first dose of vaccination, immunity is attained around 30 days and this will boost when the second dose is administered. Booster dose to be given 6–9 months after the second dose and there after yearly for at least 5 years, depending on KFD activity in that area. The minimum period between two booster doses should be 9 months.

Disease	Preventive measures		
	Control of Mite: The mite vectors of scrub typhus can be eliminated by treating the ground with residual insecticides (lindane or chlordane) and addressing rodent menace. The resistance of rodents to various rodenticides needs also to be monitored.		
	Personal protective measure Persons who cannot avoid infested terrain should wear protective clothing, impregnate their clothing and bedding with a miticide (e.g., benzyl benzoate) and apply a mite repellent, diethyltoluamide, to exposed skin. Chemoprophylaxis should also be considered.		
Scrub Typhus	Health education Health education of the people on the modes of transmission and personal prophylaxis is of paramount importance and can go a long way in the prevention of the disease.		
	Rodent Control: Different control strategies such as trapping, poisoning and use of natural predators can be practiced. Habitat modification makes areas less attractive to rodents thereby preventing new populations from recolonizing the habitat. Good sanitation in and around buildings creates an environment that is less suited for rodent populations.		
	Vaccination There are no effective vaccines for scrub typhus. It is now known that there is enormous antigenic variation in Orientia tsutsugamushi strains, and immunity to one strain does not confer immunity to another. Any scrub typhus vaccine should give protection to all the strains present locally, in order to give an acceptable level of protection.		
	Mass dog vaccination: Target to cover administration of at least 70% Anti Rabies vaccination coverage among dogs in a defined geographical area annually for three consecutive years.		
	Human PEP: To prevent human deaths due to Rabies by ensuring timely access for post-exposure prophylaxis for all animal bite victims and creating well responsive public health system.		
	Dog population management: This is important to limit the man-dog conflict and to reduce the numbers of stray dogs to an acceptable level through Animal Birth Control (ABC).		
Rabies	Public Health laws: There are many important legislations, Public Health laws and provisions that are relevant to control and finally the elimination of Rabies. These legislations are implemented by different stakeholders.		
itables	Identification of Rabies risk zone: Identify High risk, medium risk and low-risk zones at the village, block and District's level based on the epidemiological data of Rabies (number of human and animal Rabies cases) and number of dog bites.		
	Promote responsible dog ownership: Promoting responsible dog ownership and encouraging neutering/sterilization of pet animals is important to make the community understand the cohabitation, behavior, ecology, basic needs of dogs. This should include advocacy and ensuring that pet dogs or community owned dogs are properly vaccinated and treated against diseases.		
	Solid waste management: Proper solid waste management is important as domestic garbage/waste attracts stray dogs leading to an increase in their population and incidences of dog bites. Environmental control of stray dogs is an effective strategy by ensuring proper food waste disposal.		

ANNEXURE V:

PROPOSED LIST OF ACTIVITIES FOR WORLD ZOONOSES DAY



भारत सरकार **राष्ट्रीय रोग नियंत्रण केन्द्र** (स्वास्थ्य सेवा मढानिवेशालय) स्वास्थ्य एवं परिवार कल्याण मंत्रालय, भारत सरकार 22, झाम नाथ मार्ग, दिल्ली - 110054

Government of India NATIONAL CENTRE FOR DISEASE CONTROL

[Formally Known as National Institute of Communicable Disease (NICD)] Directorate General of Health Services Ministry of Health & Family Welfare, Government of India 22, Sham Nath Marg, Delhi-110054



Direct: 00-91-11-23913148 23922132 Fax: 23922677 Email: dirnicd@nic.in Website: www.ncdc.gov.in www.idsp.nic.in

D. No.- ISCP/580101/07/2023/DZDP/NCDC

Date: 3rd July 2023

Subject: Observance of World Zoonoses Day on 6th July 2023.

Dear Sir/Madam,

As you are aware, World Zoonoses Day is held on 6th July annually to commemorate scientific achievements and raise awareness about the risk of zoonotic diseases among various stakeholders. Globally, zoonoses are said to account for 60% of all infectious disease pathogens and 75% of all emerging pathogens.

With the world's second largest human population, two biodiversity hotspots, and one of the world's greatest densities of tropical livestock, India possesses a favourable environment for the transmission of both known and novel diseases between animals and people.

In India, major zoonotic disease of public health significance0020is Rabies, Brucellosis, Toxoplasmosis, Cysticercosis, Echinococcosis, JE, Plague, Leptospirosis, Scrub typhus and KFD. In the recent years, new emerging disease such as Avian Influenza, Nipah, Trypanosomiasis, CCHF and H1N1 has stressed the importance of creating awareness about Zoonosis.

The purpose of this day is be to bring together Medical Officers, Veterinarians, Scientists, Environmentalist, Ecologists, Governmental Officials and people from different fields and create awareness among them.

Therefore, you are requested to direct respective official's and take necessary steps to observe "World Zoonosis Day" on 6th July, 2023 in all Villages, Districts, and Municipalities Blocks, involving a review with all stakeholders (i.e. Medical, Veterinary, Wildlife, Environment and Forest etc.). Report on activities conducted in the state may be shared with NCDC. List of proposed activities is attached for your reference (annexure-1).

Regards,

Yours Sincerely

Dr. Simmi Tiwari Joint Director and Head DZDP, NCDC, MoHFW, Gol

List of activities proposed in view of COVID19 to be undertaken at State / District level on World Zoonoses Day, 2021-

1. State level

- Conducting the meeting of State level Zoonosis committee (if formed already) or meeting with State Animal Health dept & State forest dept. to discuss the priority zoonosis in state and measures to be undertaken to contain the same
- Use of print and electronic media for increasing awareness on Zoonotic Disease such as Rabies, Brucellosis, Toxoplasmosis, Cysticercosis, Echinococcosis, JE. Plague, Leptospirosis, Scrub typhus, KFD, Avian Influenza, Nipah Virus Disease, Trypanosomiasis, CCHF and HINI. (Use social media campaigns, social media influencers, local celebrities to talk about Zoonotic Disease, involve local media, news agency in creating awareness about Zoonotic Disease. Distribute E-Posters, E-Hand out among social networking sites)
- Organize online Webinars / Trainings / Panel Discussion with stakeholders involved in Zoonotic Disease control such as Medical, veterinary, wildlife professionals, universities, research & education institutes, local governing bodies, NGOs. The topics of discussion could be:-
 - Issues of Zoonotic Disease control in the State/District
 - Future planning of mass canine vaccinations drives (e.g. Rabies)
 - Developing plan for organizing social media campaigns for Zoonotic Disease
 - Importance of Animal Health management, Importance of Zoonotic Disease awareness programs in school

2. District/Municipality

- Organizing meeting with stakeholders (i.e. Medical, Veterinary, Wildlife, Environment. Forest etc.) to discuss the priority zoonosis in the state and develop and joint action to address the issue Identify all the stakeholders to be involved and their role in a joint investigation.
- Communicating with local veterinary department and clinics for conducting Vaccination drive against animal Disease
- Medical / Vet. / Agriculture Colleges- Organizing a joint half/one day workshop/ symposium on priority zoonotic disease their prevention and control.
- Communications with veterinary department for organizing a Joint Awareness activity such as Farmer's Mela / Pashu Mela and generating awareness about various important zoonotic diseases endemic and neglected in the region such as Brucella, JE, Anthrax, KFD, cysticercisis, etc. This activity should be jointly organized by veterinarians, health workers among community.
- Vaccination would also form a part of this camps. Awareness camp among pet owners and animal handler on prevention and control of zoonotic diseases.
- Organizing online creative writing, or art contests for school children and college students. Organizing online sessions / talks in schools for children to learn about Zoonotic diseases, Rabies prevention, Dos and Don'ts, and responsible pet care.
- Poster making competition.

3. Block/village level

• Joint Awareness activity by organizing Farmer's Mela and generating awareness about various important zoonotic diseases endemic and neglected in the region such as Brucella, JE, Anthrax, KFD, cysticercosis, etc. This activity should be jointly organized by veterinarians, health workers among community. Vaccination would also form a part of this campaign

ANNEXURE VI: CHECK LIST OF ACTIVITIES FOR ZOONOSES PREPAREDNESS

S.No.	Activities to be followed	Level	Frequency
A1	Stakeholder consultation : Conduct joint meeting of stakeholders to discuss on strategic planning, financing, and coordination on zoonotic disease preparedness (including forecasting requirements for infrastructure and logistics)	National/ State/ District/ Block	Twice a year
A2	Collaborative surveillance:		
1	Periodical surveillance of zoonotic diseases, data analyses and recommendation to responsible stakeholder for action	National/ State/ District/ Block	Every week
2	Data Sharing	National/ State/	Real Time
	Sharing of Zoonotic Disease data among stakeholders		offline platform)
	Identifying the minimum information to be shared with stakeholders on zoonotic diseases	National	
3	Periodical Review : Review of activities of zoonoses control can be conducted by DLZC and SLZC	National/ State/ District/ Block	Every year
4	Communication : Identification of communication officer from medical, veterinary and wildlife sectors for regular communication and circulation of information on activities conducted between stakeholders	National/ State/ District/ Block	Every year And as and when required
	Communication on zoonotic outbreaks with community through standardized IEC material.	National/ State/ District/ Block	
	Regular updating and communication and dissemination of guidelines on zoonotic disease to relevant stakeholders.	National	
Α3	Identification of early warning signals and reporting to responsible counterparts	National/ State/ District/ Block	Real Time
Α4	One Health Workforce development		
	Capacity Building : Accessing the training needs and organizing a joint training workshop for master trainers at State/ District level for capacity building of medical, veterinary and wildlife professionals for prevention and control of zoonotic Diseases.	National/ State/ District/ Block	Every year
	Forecasting requirement of manpower for control of zoonotic diseases and taking appropriate measures to earmark the funds to address the issues.	National/ State/ District/ Block	Every year

S.No.	Activities to be followed	Level	Frequency
Α5	Laboratory Preparedness		
	Mapping of Laboratories and expert working in the field of zoonosis and sharing of information on integrated platform.	National/ State/ District/ Block	Every year
	Forecasting the requirement of laboratories (infrastructure, kits, re-agents, etc.) and addressing the issues.	State/ District	
	Identification and assigning the designated Laboratories for testing of Human and animal samples respectively, for diagnosis of Zoonotic diseases.	State/ District	
	Training of laboratory personnel's on handling High threat pathogens, sampling etc.	State/ District	
	Providing bioinformatics and sequence analysis training to laboratory personnel is essential for epidemiological and biomedical research to understand the spread of pathogens and developing vaccines or treatments.	State/ District	
	Sample collection and dispatch to labs at district level for confirmation of diagnosis.	Block	
A6	Hospital Preparedness		
	ICU with Ventilators, CCB, isolation units, managing surge capacity, tele-medicine, workforce etc	State/ District	Every year
A7	IHR aspects of Zoonosis		
	Identifying the issues pertaining to IHR aspects of emerging and re- emerging zoonosis and taking measures to address the issues through consultation with relevant stakeholders.	National	Every year
A 8	Environmental aspects of Zoonosis		
	Identifying the issues pertaining to climate change and its impact on emerging and re- emerging zoonosis and taking measures to address the issues through consultation with relevant stakeholders.	National/ State	Every year
A9	Operational research		
	Identifying researchable question in the field of zoonoses. Consultation with relevant stakeholders for undertaking joint research and circulation of final report with relevant stakeholders for improving the control measures for zoonosis.	National/ State	Every year
	Regular monitoring of the seroprevalence of disease in animals and communicating their results to relevant counterparts.		

ANNEXURE VII: ACTION POINTS FOR ZOONOTIC DISEASE PREPAREDNESS

	No. Action Point	Responsible Stakeholder at			
S.No.		BLOCK LEVEL	DISTRICT LEVEL	STATE LEVEL	NATIONAL LEVEL
Α1	Stakeholder consultation: Joint meeting of stakeholders to discuss on strategic planning, financing, and coordination	BHO/ BMO Block Veterinary Officer	DSO-IDSP, CMHO/DHO District Veterinary Officer District Agriculture Officer Chaired by District Magistrate	SSO-IDSP, DHS (member secretary of state zoonosis committee) Chaired by Principal Secretary (Health)	NCDC
A2 1	Collaborative Surveillance: Periodic analysis of Data of zoonoses in Humans and Animals & recommendation to responsible stakeholders for action	BHO/ BMO, Block Veterinary Officer	DSO- IDSP, Dist Vet officer	SSO- IDSP, Director, Animal Husbandry, Director, Agriculture Department	NCDC & DADH, ICAR
2	Disease data interpretation, sharing and dissemination : Sharing of Data of Zoonotic disease in Humans and Animal health sector	BHO/ BMO, Block Veterinary Officer	DSO-IDSP, CMHO/DHO, District Animal husb Department, District Agriculture, Representative of Medical & Veterinary institutes	SSO-IDSP , DHS, Director, Animal husbandry, Representative of Medical & Veterinary institutes, Representatives of Municipal Corporation	NCDC, DAHD, ICMR, ICAR, Agriculture Department
3	Periodical Review	Block level zoonosis committee comprising all concerned department	District level zoonosis committee comprising of DSO-IDSP, CMHO, District Vet Officer, chaired by DM	SSO-IDSP , DLZC/ SLZC, Chaired by Principal Secretary (Health)	NCDC, DADH, ICAR, Agriculture Department Central Level ZC

	Action Point	Responsible Stakeholder at			
S.No.		BLOCK LEVEL	DISTRICT LEVEL	STATE LEVEL	NATIONAL LEVEL
4	Communication and inter sectoral coordination and response: Identification of Comm- unication Officer responsible for communication under inter sectoral coordination and circulation of information on activities conducted in a year with all stakeholders.	Block Health Officer Block Veterinary Officer Block Agriculture Officer	CMHO/DHO, District Vet Officer	DHS, Director state animal husbandry	MoHFW
Α3	Early warning signals and preventive measures using joint strategies: Forecasting requirement of infrastructure, logistics, manpower etc. for control of Zoonotic disease.	Block Health Officer Block Veterinary Officer Block Agriculture Officer	DSO- IDSP, District Vet Officer Representative of Medical & Veterinary institutes	SSO- IDSP, State Vet Officer	CSO- IDSP, NCDC
Α4	One Health Workforce development Capacity Building: Capacity Building & Joint workshop of all stakeholders for Zoonotic disease Prevention & Control, Laboratory Investigation. Critical Care training to CHC & DH Medical Officer	Block Health Officer Block Veterinary Officer Block Agriculture Officer	CMHO/DHO, District Vet Officer Medical & Veterinary institutes	DHS, Director State Animal Husbandry, Medical & Veterinary Institute	NCDC, DADH, Agriculture, ICAR
Α5	Laboratory Preparedness and other infrastructure (including hospital): Forecasting the requirement of labs (infrastructure, kits, re-agents, etc.), training requirements. Equip ICU with Ventilators, isolation units, managing surge capacity, critical care blocks, tele-medicine, workforce etc.		CMHO/DHO, District Vet Officer Medical & Veterinary institutes	DHS, Director State Animal Husbandry, Medical & Veterinary Institute	NCDC, DADH, ICAR

S.No.	Action Point	Responsible Stakeholder at			
		BLOCK LEVEL	DISTRICT LEVEL	STATE LEVEL	NATIONAL LEVEL
A6	IHR aspects of Zoonosis: Identifying the issues pertaining to IHR aspects of emerging and re- emerging zoonosis and taking measures to address the issues through consultation with relevant stakeholders.				IHR Division of MoH&FW, NCDC, DAHD
Α7	Environmental aspects of Zoonosis: Identifying the issues pertaining to climate change and its impact on emerging and re- emerging zoonosis and taking measures to address the issues through consultation with relevant stakeholders.		CMHO/DHO, Director district animal husbandry, district level wild life representatives, Environmental ministry in the district	DHS, Director state animal husbandry, state level wild life representatives (Principal Chief Conservators of Forests (PCCF), Environmental ministry in the state	Ministry of Environment, MoH&FW, NCDC, DAHD
A8	Operational research: Identifying the areas in the field of zoonosis for research in consultation with relevant stakeholders (for undertaking collaborative research) and circulation of report with relevant stakeholders. Figure out diagnostic modalities (specify type of test to be done at block, district and state level) along with sharing of diagnostic centers list.		District level zoonoses committee, CMHO/DHO, District animal husbandry Officer District level Forest/ wild life representatives	State level committee, DHS, Director state animal husbandry, Wildlife representatives (Principal Chief Conservators of Forests (PCCF)	NCDC, DAHD, ICAR, IVRI, WLI

ANNEXURE VIII: FORMAT FOR REPORTING EARLY WARNING SIGNALS

 State:
 District:
 Date of Reporting:
 __/ __/

Source: _____ Name & Designation of the reporting person: _____

S.No.	Triggers for early warning signals	Please tick here
1	Monitoring of routine surveillance data	
2	From a clinician/ Veterinarian in a hospital/ private clinic setting/ zoo	
3	Public health/Animal Health- laboratories	
4	Sentinel events (diseases/deaths in wildlife)	
5	Livestock/ Poultry farmers/animal handlers at wet markets	
6	Media	
7	Points of Entry (ports, airports, ground crossings)	
8	Community	
9	Others	

Is there any unusual increase in Cases/Deaths or unusual event in any area? Yes/No If yes, provide the following information:

Disease/ Syndrome (Provisional/Confirmed)	
Area affected (Block, PHC, Sub-center, Village)	
No of cases	
No of deaths	
Date of start of the outbreak	
Total population of affected area (Village)	
Salient epidemiological observations	
Lab results (Type of sample, Number of samples collected and tested, What tests, where, results)	
Control measures undertaken (Investigated by RRT or not)	
Total population of affected area (Village)	
Present status	
Any other information	
ANNEXURE IX: CHECK LIST OF ACTIVITIES FOR ZOONOTIC DISEASE OUTBREAK RESPONSE

S.No.	Activities to be followed at all Levels	Level	Frequency	
A1	Identification of trigger points:		•	
	Based on the endemicity of zoonotic diseases in geographical areas trigger points are identified for all zoonotic diseases i.e., increase reports of zoonotic disease above particular threshold.	National/ State/ District/ Block	Every year/ Real time	
	Information on specific trigger points for all zoonotic diseases to be circulated to all relevant stakeholders.			
A2	Integrated Outbreak Investigation	1		
1	Outbreak detection and circulation of Information Outbreak has to be documented under existing surveillances system (IDSP, NADRS, NADRES, etc.) and once confirmed, information has to be circulated to relevant stakeholders.	National/ State/ District/ Block	Real Time	
2	Sample collection during outbreak. Stakeholders should collect the right sample in a right way to confirm suspected diagnoses. Samples can be collected by public health expert/ microbiologist/designated officer of animal husbandry dept/ FSSAI representative (for food borne disease)/ wild life sector. Procedure for sample collection should be as per requirement of respective zoonotic diseases suspected.	National/ State/ District/ Block	Real Time (as soon as outbreak detected)	
Δ3	Implement Joint outbreak control measures			
	Initiation of outbreak control measures requires formation of RRT. The team members should be specified. As soon as information is received, the responsible officer in the relevant sector needs to constitute joint team of experts (medical, veterinary, wildlife, entomologist, etc.) including state representatives for investigating outbreak.	National/ State/ District/ Block	Real Time	
	Directions to be issued to respective states/ districts under relevant ministries for coordination with counterparts for containment measures of outbreak.	National/ State/ District/ Block		
	Provision of requisite logistic (Drugs, Diagnostics, PPE, etc.) to respective state / District authorities under relevant ministries.	National/ State/ District/ Block		
	Sensitization to private practitioners and chemists to raise clinical suspicion of zoonotic disease.	Block		
	Conduct joint meetings of ministries/ stakeholders to be conducted for review of containment measures and relevant issues are addressed through consultation.	National/ State/ District/ Block	Weekly and Real time during Outbreak.	
	Reports on containment measures shared with relevant stakeholders.	National/ State/ District/ Block	Real Time	

PREVENTION, PREPAREDNESS AND RESPONSE USING ONE HEALTH APPROACH

S.No.	Activities to be followed at all Levels	Level	Frequency		
	Implement joint control measures (both human/ animals) including control of transmission from environment.	National/ State/ District/ Block	Real Time		
Α4	Risk Communication and Community Engagement				
	Sensitize Community and Risk associated with the zoonotic disease outbreak and ensure behavioural change in following good practices.	National/ State/ District/ Block	Weekly and Real time during Outbreak.		
	Dispel rumors and mis information promptly.				
A5	Outbreak impact assessment (community, livestock, v	vildlife)			
	After the outbreak relevant ministries/ sectors needs to assess the impact of outbreak in terms of socio- economic loss.	National/ State/ District/ Block	After every major outbreak in the country.		
	Circulation of information on impact to the relevant stakeholders.				
	Identifying the gap areas in coordination between the medical veterinary and wildlife officials.				
	Conduct after action reviews for immediate and long term corrective action.				

ANNEXURE X: ACTION POINTS FOR ZOONOTIC DISEASE OUTBREAK RESPONSE

		RESPONSIBL	E STAKEHOLDE	R AT	
S.No.	ACTION POINT	BLOCK LEVEL	DISTRICT LEVEL	STATE LEVEL	NATIONAL Level
B1	Identification of trigger points and st	art of outbreak	(
	Increase in Number of zoonotic disease cases (As compared to previous year data in same geographic area) (See Box 17)	Block Health Officer Block Veterinary Officer	DSO-IDSP	SSO- IDSP & DHS	CSO- IDSP, NCDC, EMR
B2	Integrated outbreak response				
1	Outbreak detection, notification and circulation of Information: As soon as the information of suspected Case or death is received, information has to be validated and shared with higher authority and all stakeholders	Block Health Officer	DSO-IDSP	SSO- IDSP & DHS	NCDC
2	Sample collection and lab confirmation:Sample collection of suspected case of zoonotic disease and laboratory confirmation from District/State labsAnimal Samples from affected area	Trained Laboratory Technicians from both Health & Animal Husbandry	Trained Laboratory Technicians from both Health & Animal Husbandry	DHS, Veterinary Clinician/ Officers	NCDC, DAHD
3	Outbreak verification and initiation of control measures Outbreak should be verified by visit to the affected village and simultaneously initiate the surveillance & containment measure in affected village including the provision of requisite logistic (RDT, Cap. Doxy, Inj CP, Other Drugs, etc.)	Block Health Officer Block Veterinary Officer R & B Department	DSO-IDSP Director District animal husbandry	SSO – IDSP, DHS, Director, Animal Husbandry, Medical and Veterinary Institutes	NCDC, EMR, DAHD
4	Joint monitoring and control measures: Implement joint control measures and Review & Monitor of outbreak reports and containment measures	Block Health Officer Block Veterinary Officer	CMHO/DHO, District Veterinary Officer	DHS, AHD	NCDC, EMR, DAHD

PREVENTION, PREPAREDNESS AND RESPONSE USING ONE HEALTH APPROACH

		RESPONSIBLE STAKEHOLDER AT								
S.No.	ACTION POINT	BLOCK LEVEL	DISTRICT LEVEL	STATE LEVEL	NATIONAL LEVEL					
B3	Risk communication and community engagement									
1	Sensitize community on the risk of zoonotic disease outbreak and corresponding practices to be adopted	Block Health Officer Block Veterinary Officer	CMHO/DHO, District Veterinary Officer	DHS, AHD	NCDC, EMR, DAHD					
B4	Conclusion and impact assessment									
	Assessment of Outbreak impact measures on community, livestock, wildlife in terms of Socio-economic loss, conducting gap analysis and after action reviews Sharing with all stakeholders		DLZC	SLZC	Central Level Zoonotic Committee					

ANNEXURE XI: ZOONOTIC DISEASE REPORTING FORMAT FOR RRT

For State use only					
Report No					

LOCAL HEALTH/ VETERINARY DEPARTMENT INFORMATION									
Name of Local Health/ Vet Department	Date of Report								
Name of Contact Person		Telephone Number							
Address		Mobile Number							
City Pin Code		Email Address							
PERSON REPORTING									
Name (First, Last)	Telephone Nu	umber							
Affiliation (Vet, etc.) Address									
Describe the Health condition and so	ource of infor	mation							

CASE SPECIFIC INFORMATION [Complete for index (first) case on premises or in outbreak; use Continuation Sheets for additional cases.]

HUMAN EXPOSURE / ILLNESS	ANIMAL EXPOSURE / ILLNESS
Name, Address and Telephone Number of Physician	Name, Address and Telephone Number of Veterinarian
Onset Date	Onset Date
Number of Persons with history of exposure to Animal	Animal Species affected
Number of Persons ill	Number of Animals affected (Surveillance data)
Number of positive cases	Number of positive cases
How many contacts are under surveillance Total contacts traced	How many farms are under surveillance
Containment Zones (if any)	Alert Zones (if any)
Control Room details (also describe calls received and self reporting of cases)	Control Room details
Formation of RRT	Formation of RRT

Details of RRT or sub committees formed										
Action points	Name, designation, and Phone number of reporting Officer									
Human Health (representatives for outbreak investigation viz., surveillance, contact tracing, sample testing, treatment, Media management, Infrastructure, expert visit, call center, psychosocial support etc)										
Animal & Environment:										

Case Manager	nent (Huma	n)	Case Management (Animal)					
Possible incuba	tion period		Possible incubation period					
Sign and Sympt	oms		Sign and Symptoms					
Current Admiss	ion status		Current status					
Clinical Status c	of Patient		Clinic	al Status of An	imals			
Case fatality rel	evant to o/b		Case	fatality relevan	t to o/b			
Treatment			Treati	ment				
Outcome			Outco	ome				
Survived	Died		Surviv	ved Eut	hanized Die	ed		
Advance investi	gation		Postn	nortem Perforr	ned? Yes No			
			lf Yes	, Date Perform	ed:			
Source tracking			Sourc	e tracking				
Possible contac	t with animal	/vectors	Proba	ble modes of t	ransmission			
Probable modes	s of transmiss	sion	Farm	Visits				
Other Investigat	ion findings		Traini	ng – Farm Bios	ecurity			
Media Activitie activity; Radio Local Channels; taken against fa	e s (Press rele Campaign; Vi False messad	eases; Social media ideo; Scroll News in ges detected; Action s)	Media Activities					
Sampling			Sampling					
LABORATORY	TEST RESU	LTS						
Name of Labo	ratory:							
Sample	Specimen	Type of Test		Lab Result	Date Obtained	Remarks		
details (Human/ animal)	Туре	Performed				(Cumulative +,		
ammary						Cumulative -)		
						Cumulative -)		
RRT update						Cumulative -)		
RRT update Event Informa linkage and fie	tion update Id level activ	(Describe new case vities under contain	e, cont iment/	act list mana 'alert zone)	gement, epidemi	cumulative -)		
RRT update Event Informa linkage and fie	tion update Id level activ	(Describe new case vities under contain	e, cont iment/	act list mana alert zone)	gement, epidemi	iological		
RRT update Event Informa linkage and fie Public Health I Visit, Materials	tion update Id level activ Response (E s and Logisti	(Describe new case vities under contain Describe current sce ics, Drug Manageme	e, cont iment/ enario, ent, Ps	act list mana 'alert zone) , Infrastructu sychological S	gement, epidemi re Management, upport etc)	iological Expert Team		
RRT update Event Informa linkage and fie Public Health I Visit, Materials	tion update Id level activ Response (E and Logisti	(Describe new case vities under contain Describe current sce ics, Drug Manageme	e, cont iment/ enario, ent, Ps	act list mana 'alert zone) , Infrastructu sychological S	gement, epidemi re Management, upport etc)	iological Expert Team		
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RRT update Event Informa linkage and fie Public Health Visit, Materials Animal Health Team Visit, Ma	tion update Id level activ Response (E and Logisti Response (I terials and L	(Describe new case vities under contain Describe current sce ics, Drug Manageme Describe current sc Logistics, Drug Man	e, cont iment/ enario, ent, Ps enario ageme	act list mana 'alert zone) , Infrastructur sychological S o, Infrastructu ent etc)	gement, epidemi re Management, upport etc) ire Management,	iological Expert Team Expert		
RRT update Event Informa linkage and fie Public Health Visit, Materials Animal Health Team Visit, Ma	tion update Id level activ Response (E and Logisti Response (I terials and L m Environme	(Describe new case vities under contain Describe current sce ics, Drug Manageme Describe current sc _ogistics, Drug Man	e, cont iment/ enario, ent, Ps enaric ageme	act list mana (alert zone) , Infrastructur sychological S o, Infrastructu ent etc)	gement, epidemi re Management, upport etc) ire Management,	iological Expert Team Expert		
RRT update Event Informa linkage and fie Public Health I Visit, Materials Animal Health Team Visit, Ma Response fror	tion update Id level activ Response (E and Logisti Response (I terials and L m Environme	(Describe new case vities under contain Describe current sce ics, Drug Manageme Describe current sc _ogistics, Drug Man	e, cont iment/ enario, ent, Ps enario ageme	act list mana (alert zone) , Infrastructur cychological S o, Infrastructur ent etc)	gement, epidemi re Management, upport etc) Ire Management,	Expert Team Expert		

Line listing of Affected cases														
SNo	Phone	Name	Age	Gender	₽	State	District	Address	Diagnosis	Date of onset	Type of sample	Test	Results	Pathogens

Line listing of Death cases														
SNo	Phone	Name	Age	Gender	₽	State	District	Address	Diagnosis	Date of onset	Type of sample	Test	Results	Pathogens

Line listing of Surveillace cases														
SNo	Phone	Name	Age	Gender	8	State	District	Address	Diagnosis	Date of onset	Type of sample	Test	Results	Pathogens

Anthrax		
Avian Influenza		
Brucellosis		
Campylobacteriosis		
Food Borne pathogen		
Leishmaniasis		
Leptospirosis		
Tuberculosis		
Plague		
Q Fever		
KFD		
Rabies		
Others:		
Check if appropriate: Outbreak:	Disease Agent is Unknown:	Number of Cases:

ANNEXURE XII: MONITORING INDICATORS FOR ZOONOSES P-P-R

S.No.	PARAMATERS	MONITORING INDICATORS FOR STATE
ZOONOSES - PREVENTION		
1	Understanding infection dynamics in natural host and action strategies	 New research projects on Zoonoses – that studies prevention and control and infection dynamics initiated or being undertaken.
2	Addressing drivers of disease emergence	 Number of sensitizing workshop/ awareness conducted on importance of air/ water pollution, protecting natural habitats/ promoting hand hygiene and monitoring environmental changes.
		 Number of Human - Animal conflicts reported and addressed, food safety issues identified and addressed with One Health approach.
3	Risk Reduction activities	 Risks assessed (jointly) and documented for priority zoonotic pathogens/ new disease in a multi-disciplinary approach.
		 Number of zoonotic disease prevention activities undertaken at state and district levels including reaching the vulnerable and marginalized populations.
		 Risk communication materials developed/ adapted for risk reduction of priority zoonoses/ new disease including promoting biosafety/ biosecurity at farm, community, wet markets etc
		 Number of Wet markets ensuring hygienic practice and following weekly dry days to prevent pathogen entry.
		• Number of Health education, CME, CVE/ awareness workshops conducted on zoonoses prevention.
4	Multi sectoral One Health co-ordination mechanism	 Functional zoonotic committee at state and district level that meets periodically for zoonoses prevention and control
		 Priority zoonotic diseases discussed and agreed among all relevant sectors
		 Mapping of capacity and resources on human health/ animal health and other sectors is updated routinely
ZOON	ZOONOSES- PREPAREDNESS	
1	Strategic planning, financing and governance	• Emergency preparedness plans for priority zoonotic diseases in place and updated periodically with activities, timelines and budgets.

S.No.	PARAMATERS	MONITORING INDICATORS FOR STATE
2	Collaborative surveillance focusing on One Health approach	• Mechanisms in place for regular intersectoral analysis and interpretation of surveillance data by a range of stakeholders including engagements with private sector.
3	Early warning signals	• Number of new events detected by early warning signals.
4	Workforce development	 Number of health workforce trainings conducted for ASHA, Health workers, Veterinary Staff, Forest staff, MO etc. Number of health professionals trained through One Health education or training programmes. Number of new recruitments made in health and veterinary sectors under existing vacancy that has role in public health or zoonoses.
5	Laboratory preparedness	 Number of new or renewed laboratory infrastructure created for disease surveillance, monitoring, and early detection for analyzing samples from humans, animals, and the environment. Laboratory personnel trained on handling high threat pathogens including sample collection, referral and biosafety/ biosecurity and EQAS. Protocols for initiating rapid surge in testing facilities in place and tested regularly. Daily testing capacity in Human and animal health state labs per priority pathogen
6	Hospital Preparedness and managing surge capacity	 Number of hospitals/ health care facilities that have structured IPC programmes Number of hospitals that has Protocol in place at hospitals to rapidly expand their capacity during emergencies, such as setting up temporary field hospitals or utilizing alternate care sites. Protocol for prepositioning supplies and defining supply chains including plan for surge stocks placed at strategic locations. Stock of Materials and supplies, including drugs and vaccines, supplies for laboratory chemicals etc.
7	Operational Research	• Number of research projects planned/ implemented in consultation with Research organization like NCDC, ICMR, ICAR, IVRI, NIV, NIHSAD etc and papers published on One Health and Zoonoses domain.
ZOON	OSES-RESPONSE	
1	Integrated outbreak investigation	• Proportion of multisectoral and multidisciplinary epidemiological investigation teams deployed with all identified relevant sectors and disciplines included as team members.

S.No.	PARAMATERS	MONITORING INDICATORS FOR STATE
2	Implementing joint control measures, recovery and rehabilitation	 Whether outbreak management was done jointly Was there regular communication between sectors.
3	Risk communication and community engagement	• Number of community leaders or influencers/ partners or professional associations and hard-to-reach people with which the multisectoral communications group is able to link (either directly or indirectly).
		 Number of spokespeople from different sectors identified and trained.
		• Number of community engagement specialists identified and trained.
		• Number of media outlets engaged with multisectoral communications groups.
		• Number of joint communication messages (especially those aimed at hard-to-reach populations) produced dealing with endemic zoonotic disease threats.
4	After action report and impact assessment	• Number of After-Action Review (AAR) under taken in response to an actual public health event.

ANNEXURE XIII: LIST OF EXPERTS WHO CONTRIBUTED TO THE TECHNICAL GUIDANCE DOCUMENT

(IN ALPHABETICAL ORDER)

S.No.	Name and Designation
1.	Dr. Aastha Singh, Research Officer, Centre for One Health, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
2.	Dr. Abhijit Mitra, Animal Husbandry Commissioner, Ministry of Fisheries, Animal Husbandry & Dairying, Gol
3.	Dr. Adhiraj Mishra, Assistant Commissioner, Department of Animal Husbandry, Ministry of Fisheries Animal Husbandry & Dairying, Gol
4.	Dr. Ajit Shewale, Deputy Director, Centre for One Health, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
5.	Dr. Aniket Sanyal, Director, National Institute of High Security Animal Diseases, Indian Council of Agricultural Research, Gol
6.	Dr. Aruna Sharma, Deputy Commissioner, Department of Animal Husbandry, Ministry of Fisheries, Animal Husbandry and Dairying, Gol
7.	Dr. Ashok Kumar, Additional Director General, Indian Council of Agricultural Research, Ministry of Agriculture and Farmers Welfare, Gol
8.	Dr. Atul Goel, Director NCDC and DGHS, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
9.	Dr. Chandni R, Professor & Head, Emergency Medicine, Government college, Kozhikode, Kerala
10.	Dr. Dipti Mishra, Consultant, Centre for One Health, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
11.	Dr. Gyanendra Gongal, Senior Public Health Officer, World Health Organization Regional Office for South East Asia
12.	Dr. Hanul Thukral, Epidemiologist, Centre for One Health, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
13.	Dr. Himanshu Chauhan, Joint Director & Head, Integrated Disease Surveillance Programme, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
14.	Dr. Indrani Roy, Public Health Specialist & Lab Advisor, U.S, Centre for Disease Control, India
15.	Dr. Jagdish Kakodkar, Head of Department, Community Medicine, Goa Medical College, Goa
16.	Dr. JPS Gill, Director Research, Guru Angad Dev Veterinary Animal Science University, Ludhiana, Punjab
17.	Dr. Jyoti Misri, Former-Principal Scientist (Animal Health Division), Indian Council of Agricultural Research, Ministry of Agriculture and Farmers Welfare, Gol
18.	Dr. Karikalan Mathesh, Scientist, Centre for Wildlife, Indian Veterinary Research Institute, Bareilly, Uttar Pradesh

S.No.	Name and Designation
19.	Dr. Kiran N Bhilegaonkar, Principal Scientist and Head, Division of Veterinary Public Health, Indian Veterinary Research Institute, Bareilly, Uttar Pradesh
20.	Dr. Mala Chhabra, Senior Consultant Microbiology, Dr. Atal Bihari Vajpayee Institute of Medical Sciences (ABVIMS) and Dr. Ram Manohar Lohia Hospital, New Delhi
21.	Dr. Manju Rahi, PI MERA-India & Scientist-'F, Indian Council of Medical Research, Gol
22.	Dr. Mayank Dwivedi, Public Health Specialist & Lab advisor U.S, Centre for Disease Control-India
23.	Dr. Meera Dhuria, Joint Director, Public Health Preparedness & NCD, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
24.	Dr. Monil Singhai, Joint Director, Centre for Arboviral & Zoonotic Disease, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
25.	Dr. Nandakumar S, Senior Veterinary Surgeon, Department of Animal Husbandry, Ministry of Fisheries, Animal Husbandry and Dairying, Gol
26.	Dr. Nidhi Khandelwal, Technical Officer, Centre for One Health, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
27.	Dr. Parag Nigam, Scientist 'G', Wildlife Institute of India-Dehradun, Ministry of Environment, Forest and Climate Change, Gol
28.	Dr. Prayas Sethi, Assistant Professor, Medicine, All India Institute of Medical Sciences, New Delhi
29.	Dr. Prejit, Technical Officer- One Health and Zoonoses, World Health Organization- India
30.	Dr. R. K. Singh, Former-Director, Indian Veterinary Research Institute, Indian Council of Agricultural Research, Izatnagar, Bareilly, Uttar Pradesh
31.	Dr. Rahul Narang, Dean and Professor & Head, Department of Microbiology, All India Institute of Medical Sciences, Bibinagar, Telangana
32.	Dr. Rajesh Bhatia, Former Director, Department of Communicable Diseases, Regional Office for South-East Asia, World Health Organization
33.	Dr. Ritu Singh Chauhan, National Professional Officer - IHR, World Health Organization - India
34.	Dr. Sandul Yasobant, Assistant Professor, Indian Institute of Public Health, Gandhinagar Centre for One Health Education, Research & Development, Gujarat
35.	Dr. Sanket Kulkarni, Joint Director, Integrated Disease Surveillance Programme, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
36.	Dr. Shubhangi, Deputy Director, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
37.	Dr. Simmi Tiwari, Joint Director & Head, Centre for One Health, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
38.	Dr. Sujeet K. Singh, Ex. Director, National Centre for Disease Control and Consultant, South-East Asia Region, World Health Organization
39.	Dr. Sunil Gupta, Principal Consultant, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol

S.No.	Name and Designation
40.	Dr. S. Balaji, Consultant- Microbiologist, Centre for One Health, National Centre for Disease Control, Ministry of Health & Family welfare, Gol
41.	Dr. S. Venkatesh, Principal Consultant, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
42.	Dr. Tushar N. Nale, Deputy Director, Centre for One health, National Centre for Disease Control, Ministry of Health and Family Welfare, Gol
43.	Dr. Upasana Agarwal, Professor and Head, Department of Internal Medicine, National Institute of Tuberculosis and Respiratory Diseases, New Delhi
44.	Dr. Vidya K. R, Deputy Director- Public Health, Directorate of Health Services, Kerala
45.	Dr. Vikram Saini, Assistant Professor, Department of Biotechnology, All India Institute of Medical Sciences, New Delhi

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