

One Health approach to Food Safety

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Presentation outline

- **One health: introduction**
- **A brief history**
- **Scope of One Health**
- **Food safety and One Health**
- **Food Safety areas requiring particular attention**
- **Economic imperatives of food safety in India**
- **Current scenario**
- **Way forward**
- **Epilogue**

The One Health Triad



Hippocrates, the famous ancient Greek physician, wrote **“Airs, Waters, and Places”** – the harbinger of One Health Concept

Health of humans, animals and environment: **Inextricably interconnected and interdependent**

Brief history

- The concept of unified approach was in existence for long
- In early 19th century **Dr Rudolf Virchow**, a German pathologist observed that *‘Between animal and human medicine there is no dividing line—nor should there be. The object is different but the experience obtained constitutes the basis of all medicine’*
- **Dr William Osler**, a Canadian Physician also studied the links between human and animal health

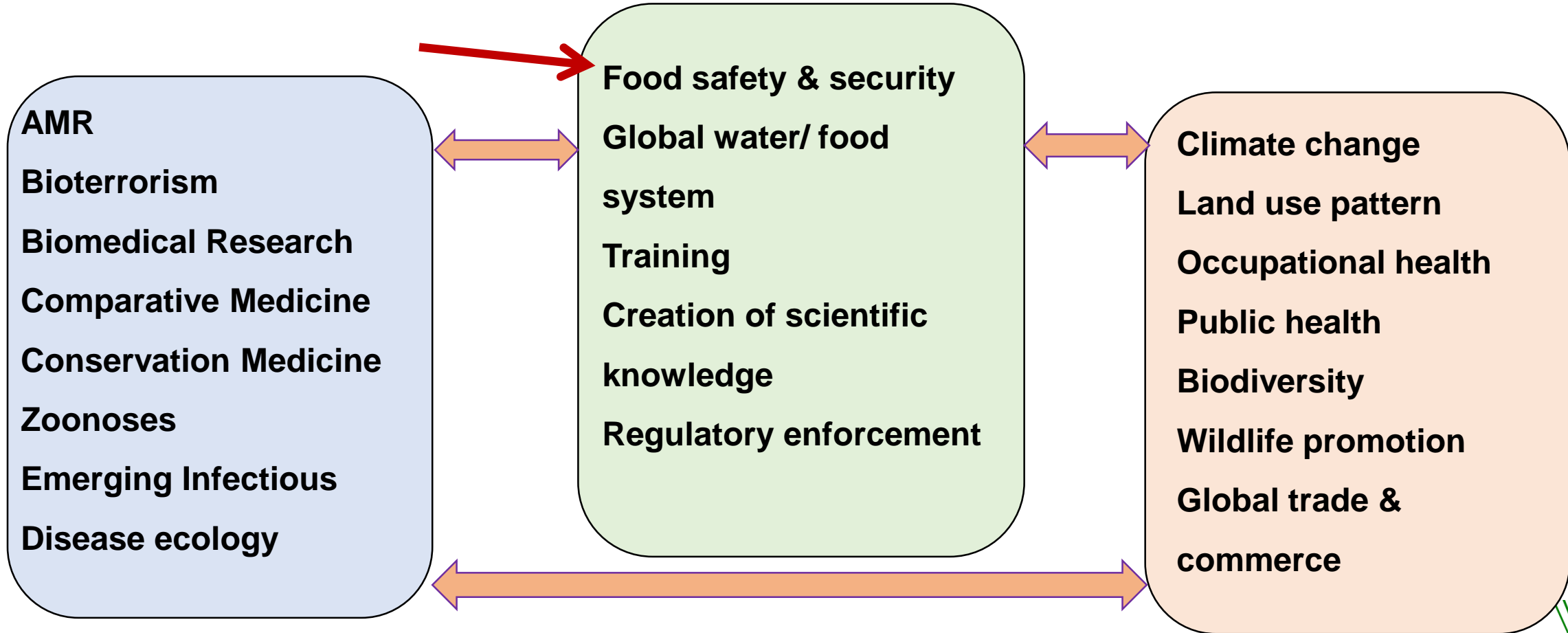
- Great '**Microbiological Revolution**' of 19th century: Biomedical scientists and the biomedical science became more **specialized**
- **Veterinary and medical education parted** their ways
- Separate organizational setup erected
- 20th century: Gaps in control programmes of zoonotic diseases noticed
- Principles of **Veterinary Public Health** were introduced
- 1964: **Dr Calvin Schwabe** in his book - 'Veterinary Medicine and Human Health' - introduced the term '**One Medicine**'
- 2004: Human and animal health experts at a symposium convened by Wildlife Conservation Society extends the concept of 'One Medicine' to '**One Health, One World**'

Scope for One Health

- **Broad consensus and global acknowledgement: 'One Health' approach as a rational way of solving complex health issues**
 - **Harnessing expertise**
 - **Optimizing resource use**
 - **Efficient delivery mechanisms**
- **Major areas**
 - **Control of zoonoses**
 - **Containment of antimicrobial resistance**
 - **Food safety**

(WHO, 2018)

Scope of One Health



One Health Initiative Task Force, AVMA, 2008

Food Safety and 'One Health'

- **Safe food- fundamental to existence**
- **With advent of modernization, food scenario has changed dramatically and became complex than ever**
- **Factors:**
 - **International trade**
 - **Changing demographics**
 - **Urbanization**
 - **Changing lifestyle- Evolving consumer preferences**
 - **Economic imperatives**
 - **Technological advancements**
 - **Climate change**
 - **Emergence and re-emergence of newer pathogens**

Food Safety: A global burning issue!

(WHO, 2016)

The burden of foodborne diseases is substantial



Every year foodborne diseases cause:

almost
in 10
people to fall ill

33 million
healthy life years lost

Foodborne diseases can be deadly, especially in children <5

420 000
deaths



Children account for
1/3
of deaths from
foodborne diseases

**FOODBORNE DISEASES ARE PREVENTABLE.
EVERYONE HAS A ROLE TO PLAY.**

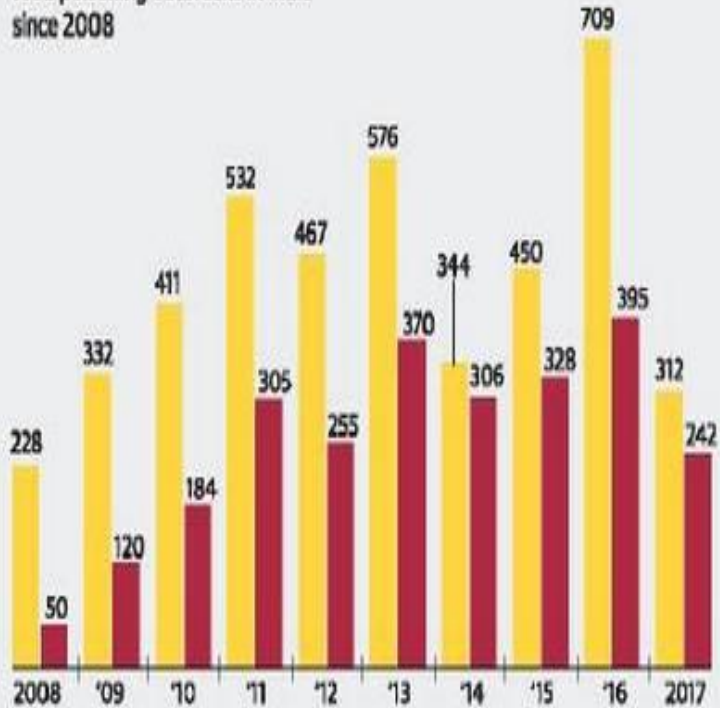
'India has not given due attention to food-borne infections'

(Down To Earth, 06.05.15)

A premium on hygiene

Acute diarrhoeal disease (ADD) and food poisoning outbreaks in India since 2008

● Acute diarrhoeal disease
● Food poisoning



- Food poisoning, also called food-borne illness, is caused by eating contaminated food
- Hand washing and food hygiene play important roles in preventing this condition, say doctors
- It is important to follow safety measures and maintain hygiene while handling food
- Incidence of ADD and food poisoning is high in areas that have bulk production of food such as canteens, hostels and wedding venues

After diarrhoeal diseases, food poisoning commonest reported outbreak in India

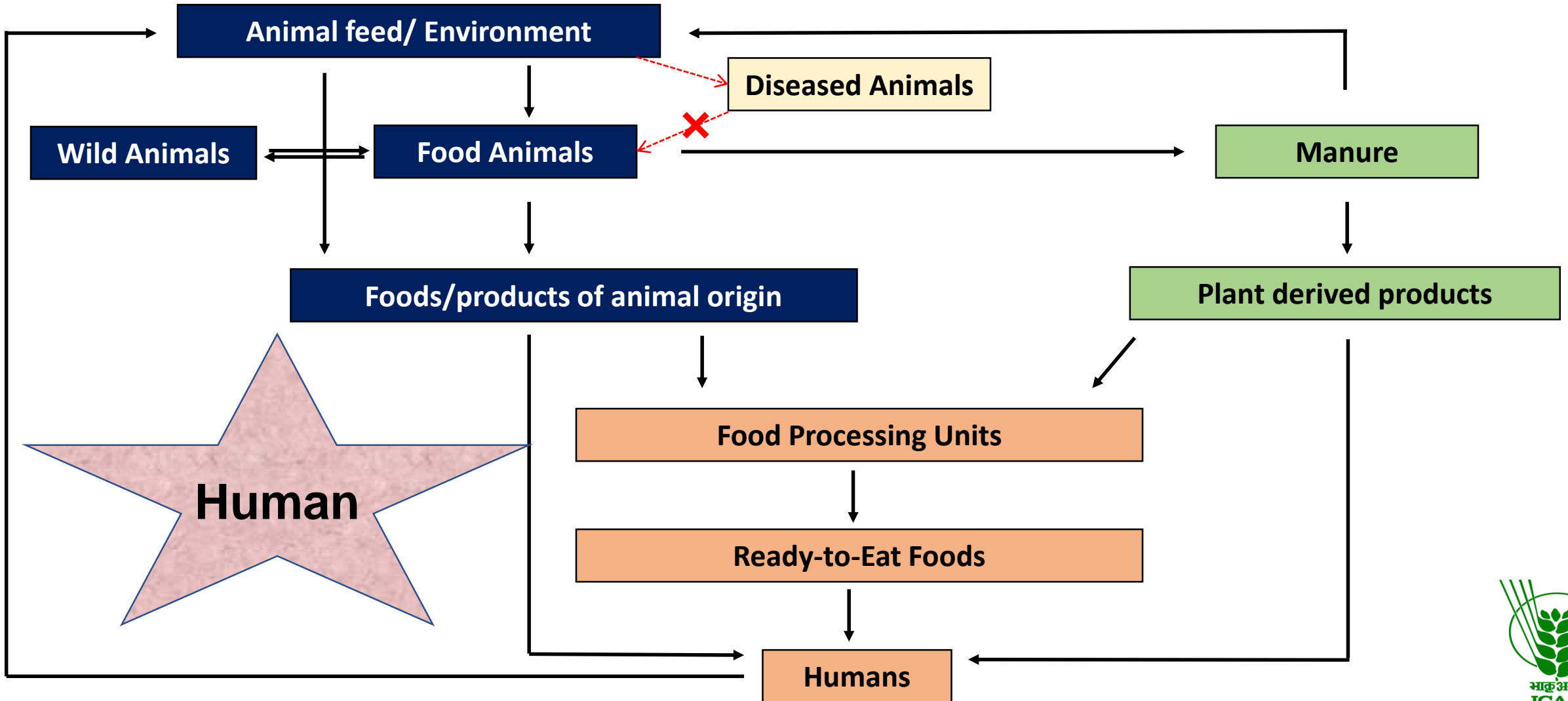
(Hindustan Times, 31.12.17)

Food-borne illnesses cost India \$28 billion a year: report

(The Hindu, 10.01.18)



Web of foodborne infection/disease transmission





Listeriosis

Tuberculosis

Q-Fever

Brucellosis

Foodborne Zoonoses



Campylobacteriosis

Toxoplasmosis

Cysticercosis

Trichinellosis

Echinococcosis

Bovine Spongiform
Encephalopathy

One Health initiative: A case study of Nipah virus outbreak

- **First identified in Kampung Sungai Nipah, Malaysia in 1998**
- **Capable of causing disease in pigs and other domestic animals**
- **Nipah virus infection in humans may exhibit asymptomatic infection to acute respiratory syndrome and fatal encephalitis**
- **NO VACCINE YET**
- **Primary treatment - intensive supportive care**

The West Bengal Outbreaks

THE HINDU

OTHER STATES

In 2001, doctors in Siliguri did not know it was a Nipah outbreak

Shiv Sahay Singh

KOLKATA, MAY 23, 2018 21:32 IST
UPDATED: MAY 24, 2018 09:25 IST

MORE-IN
Nipah Virus

Everyday we thought we will all die, says doctor who tackled 2011 epidemic

N.B. Debnath has vivid memories of January and February 2001, when **Siliguri** town in north Bengal recorded the first outbreak of Nipah virus in the country.

"We had no idea what the virus was and everyday we (the doctors) thought that we will all die," Dr. Debnath said. Of the 49 people who died during the viral epidemic, he recollects only one name, Ajit Maity.

The Indian EXPRESS

Home - India - Siliguri fever: When a town fled in fear

Siliguri fever: When a town fled in fear

Dr N B Debnath, who was posted at the North Bengal Medical College in Siliguri, where all the patients were later referred, says, "There was lack of any specific treatment as it was still a mystery. Doctors provided supporting therapy and waited for the patient's immune system to fight the virus."

THE TIMES OF INDIA
CITY

2007 Nipah spectre keeps haunting Nadia family

Ashis Poddar | TNN | May 28, 2018, 10:58 IST



Representative image

KALYANI (Nadia): When he first read about the Nipah virus outbreak in Kerala, Suri Sadar Hospital surgeon Tarun Majumdar called up his cousins back home in Nadia's Betal pleading them to be careful. "We lost four family members to this virus in April 2007," he said. Tarun and his family have been reliving the trauma every day since a fresh outbreak was reported in media recently.

Kerala outbreak - 2017

Nipah virus: Anatomy of an outbreak



The Kerala government's extraordinary response is no solace for Mohammed Salih's family who have lost four members in three weeks to the Nipah virus. The relatives of V. Moosa, Salih's father, offer prayers at his burial in Kozhikode. | Photo Credit: Special Arrangement

MORE-IN

Ground Zero

Nipah Virus

The way Kerala has handled the Nipah virus outbreak holds crucial lessons for the rest of India. Priyanka Pulla reports on how a deadly virus is being tackled by an alert administration

At around 2 a.m. on May 17 morning, a grievously sick Mohammed Salih, a 28-year-old architect from Kerala's Perambra town, was rushed by his family to Kozhikode's Baby Memorial Hospital. Salih was vomiting, had a high fever, and was in a mentally agitated state. The doctor on call, critical care physician A.S. Anoop Kumar, knew these symptoms meant encephalitis, an inflammation of brain tissue that kills hundreds in India every year. Kumar tried to stabilise

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How Kerala brought patients infected with Nipah virus back from death

Health experts hit a blind spot during the initial stages of the Nipah outbreak in north Kerala last month. But they fought back and contained its secondary infection.

INDIA ([HTTPS://WWW.HINDUSTANTIMES.COM/INDIA-NEWS/](https://www.hindustantimes.com/india-news/))
Updated: Jun 17, 2018 08:35 IST

ht
Ramesh Babu (<https://www.hindustantimes.com/columns/ramesh-babu>)

Hindustan Times, Kozhikode



Business Standard

Lessons for other states: How Kerala contained Nipah virus outbreak

The way the potentially deadly virus hit Kerala without warning and the intensive efforts made by the state health authorities to contain its spread, has lessons for other states

K P Aravindan | The Wire
Last Updated at June 8, 2018 10:05 IST

Nipah mystery deepens as lab rules out prime cause of infection

Officials had suspected the bats to be the primary source of infection and sent out to be negative.

INDIA Updated: May 25, 2018 23:00 IST

ht Ramash Babu Hindustan Times



Animal husbandry department and forest officials inspect a well to catch bats at Changanassery

f

The mystery over the source of the deadly Nipah (NIV) lives in north Kerala deepened after the blood and s... National Institute of High Security Animal Diseases the virus.

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Kerala's first NIV outbreak has killed 12 people and

Health officials will now examine the travel history to die in the Moosa family that lost four members to

NATION, CURRENT AFFAIRS

Nipah virus: Lab rules out insect-eating b

DECCAN CHRONICLE

Published: May 26, 2018, 1:13 am IST

Updated: May 26, 2018, 1:13 am IST



Tests were conducted at National Institute of High Security Animal Disease

Kozhikode: The Nipah virus that caused the epidemic in Kozhikode Malappuram was not spread by the insectivorous bats found in the Perambra, the epicentre of the outbreak. This has been confirmed conducted at the National Institute of High Security Animal Disease Bhopal, of the blood samples of bats caught from the well. The tes proved negative, were received by the health department on Friday confirm the earlier claims of a section of experts that the fruit-eat the natural hosts of Nipah virus.

Now the samples from the fruit-eating bats would be collected from sent for tests. Veterinary expert Dr Arun Zachariah who collected th told DC that the surveillance for fruit-eating bats in the area would Monday. "There were only two insectivorous bats in the well, of wh caught," he said. It was the experts from Kasturba Medical College who first identified the 'well' as the epicentre of the disease.

Bhopal scientists had warned of Nipah scare

Amarjeet Singh | TNN | May 23, 2018, 08:34 IST

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Representative image

BHOPAL: Two senior scientists from Bhopal's National Institute of High Security Animal Diseases (NIHSAD) have been rushed to Kerala to collect samples of patients infected by the Nipah virus.

Principal scientists Dr D D Kulkarni — who was in a team that warned of human-human Nipah transmission in 2013 — and Dr Rajukumar K left for

Kerala on Monday, said sources. They were asked for because even collection of samples from Nipah patients carries high risk of contamination. NIHSAD maintains a low profile but is at the cutting edge of technology, with its bio-containment lab being the first of its kind in Asia.

The containment

Government response

- A multi-disciplinary central team from the National Centre for Disease Control was sent to Kerala to investigate and respond. Contact tracing has been initiated. Infection prevention and control measures have been strengthened in health facilities.
- Acute fever and acute encephalitis syndrome (AES) surveillance have been enhanced across the state. Hospital and community surveillance have also been strengthened in Kerala.
- The Virus Research Diagnostic Laboratory at Manipal Hospital and the National Institute of Virology are conducting laboratory testing to confirm cases.
- The government is coordinating with all relevant sectors including zoonosis, wildlife, animal husbandry, human health, clinicians, pulmonologists, neurologists and private sector.
- Risk communication messages are being delivered to the community, public, stakeholders, and partners. The Ministry of Health and Family Welfare (MoHFW) has shared guidelines drafted by the National Centre for Disease Control with states and relevant stakeholders and also posted them on the MoHFW website.



FRONTLINE

Early detection of the virus and prompt action by the government contain the deadly outbreak in Kerala, but health officials stress the need for research and sound infection control policies to handle future emergencies.

Early detection

It was thus a major achievement for Anoop Kumar and his team in Kerala. Kozhikode. It was sheer luck that he who came to the hospital with "altered consciousness".

The patient was soon admitted. The first considered it a case of dengue as well, such as very high fever. "what we call myocarditis,"

"Irrespective of all the organs involved. When we asked for his history, Kozhikode Medical College. members in the family who had the condition, too, was bad and he but soon veered around to

Surveillance and containment measures



Animal
Husbandry
Department

24x7 helpline
0471 2732151


Nipah virus (NiV) Infection

- A newly emerging zoonosis that causes severe disease in both animals and humans
- A high-level team from National Centre for Disease Control in Kozhikode district
- Monitoring committees at State, district level

Commissionerate of Food Safety

- Special squads in Kozhikode, Malappuram
- Inspections at eateries and food outlets

TH Nipah virus: Anatomy of an outbreak



"The Kerala government's extraordinary response is no solace for Mohammed Salih's family who have lost four members in three weeks to the Nipah virus." The relatives of V. Moosa, Salih's father, offer prayers at his burial in Kozhikode. | Photo Credit: Special Arrangement

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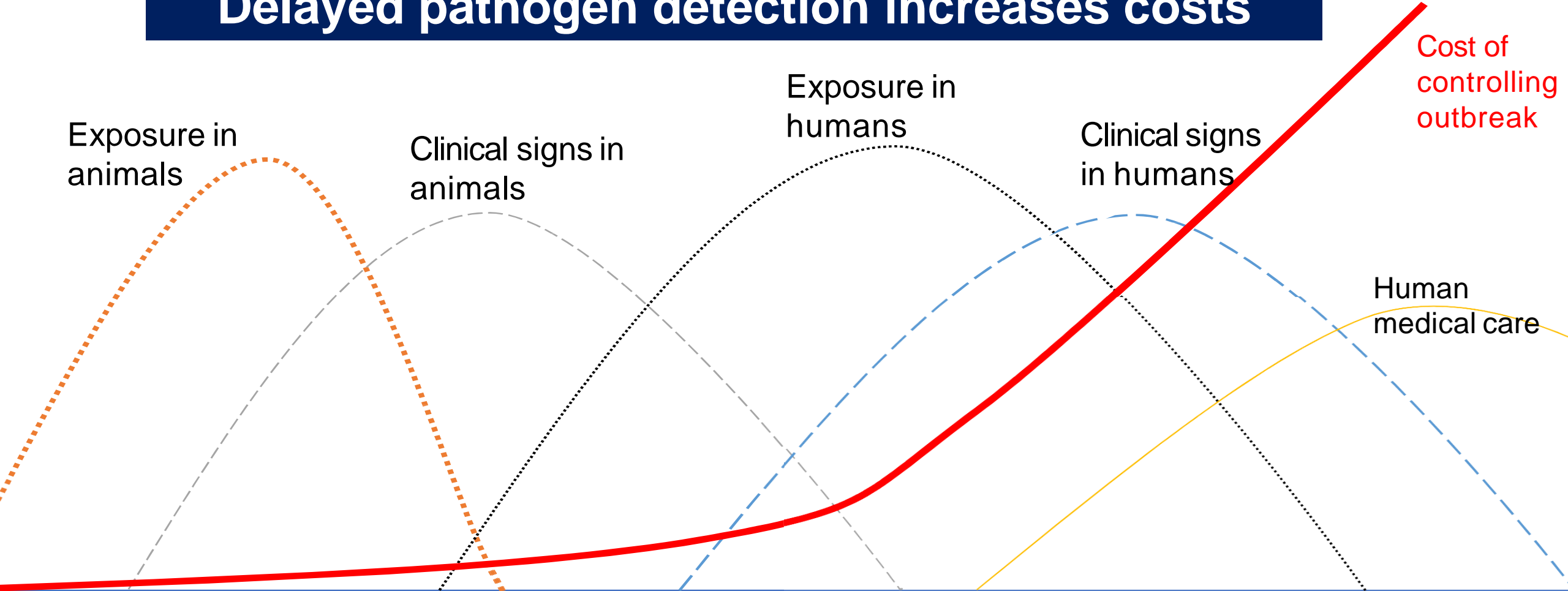
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Delayed pathogen detection increases costs



Adopted from IOM (2009)

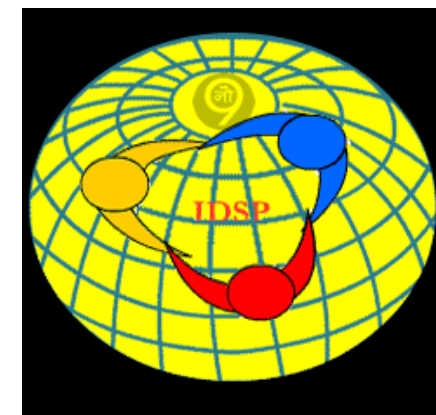
National Surveillance Programs

■ Medical Sector

- ❑ Integrated Disease Surveillance Project (IDSP)

■ Veterinary Sector

- ❑ National Animal Disease Reporting System (NADRS)
- ❑ National Animal Disease Referral Expert System (NADRES)



❖ Diseases surveillance by ICAR

1. IVRI ⇒ Zoonotic diseases (OPZD)
2. NIVEDI ⇒ Epidemic diseases
3. NIHSAD ⇒ Exotic diseases

ICAR funded Outreach Programme on Zoonotic Diseases

Coordinating unit: 1; Collaborating units: 18

Viral

Rabies

JE

AI

Parasitic

Hydatidosis

Cysticercosis

Toxoplasmosis

Toxocariasis

Cryptosporidiosis

Trichinellosis

Rickettsial

Scrub Typhus

Bacterial

Brucellosis

Leptospirosis

Anthrax

Tuberculosis

Johne's disease

Salmonellosis

Campylobacteriosis

Verotoxic *E. coli*

Listeriosis

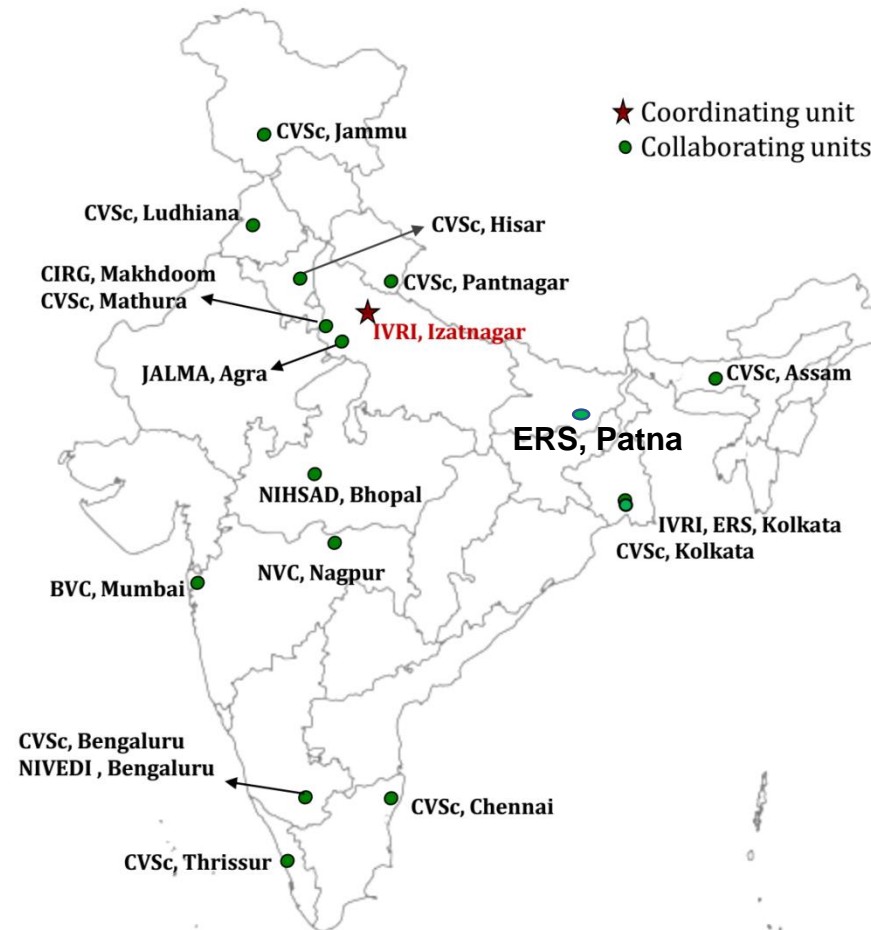
ESBL

Coxiellosis

Mycotic

Dermatophytosis

Cryptococcosis



However...

- **No single system exists** for monitoring and surveillance of foodborne illnesses!
- Although the systems mentioned before incorporate foodborne illnesses, the **number of 'missed outbreaks' seems huge!**
- Agencies responsible for quality control and safety at each step of food production and processing **face difficult task**
- Often **isolated** from one another
- The disconnect results in **compartmentalized approach to food safety**

Economic imperatives of food safety in India

- Not ensuring safety of foods can be costly

❖ **By 2030...**

- **Indian population** will touch approximately 1,527,657,988
- **Estimated GDP** nearing \$ 19.51 trillion

(<https://www.populationpyramid.net/india/2030>

<https://www.pwc.com/world2050>)

- Approximately **170 million** Indians are likely to suffer from foodborne illnesses
- Projected cost: Somewhere between **7.0 - 8.4 billion USD**

(Kristkova *et al.*, 2017)

Strengths

- **Food secure nation**
- **Increased consumer awareness and buying capacity**
- **Cooking habits**
- **Advent of FSSAI era – potential for one stop solution**
- **Increasing number of players in food industry who are willing to adopt and abide by guidelines**

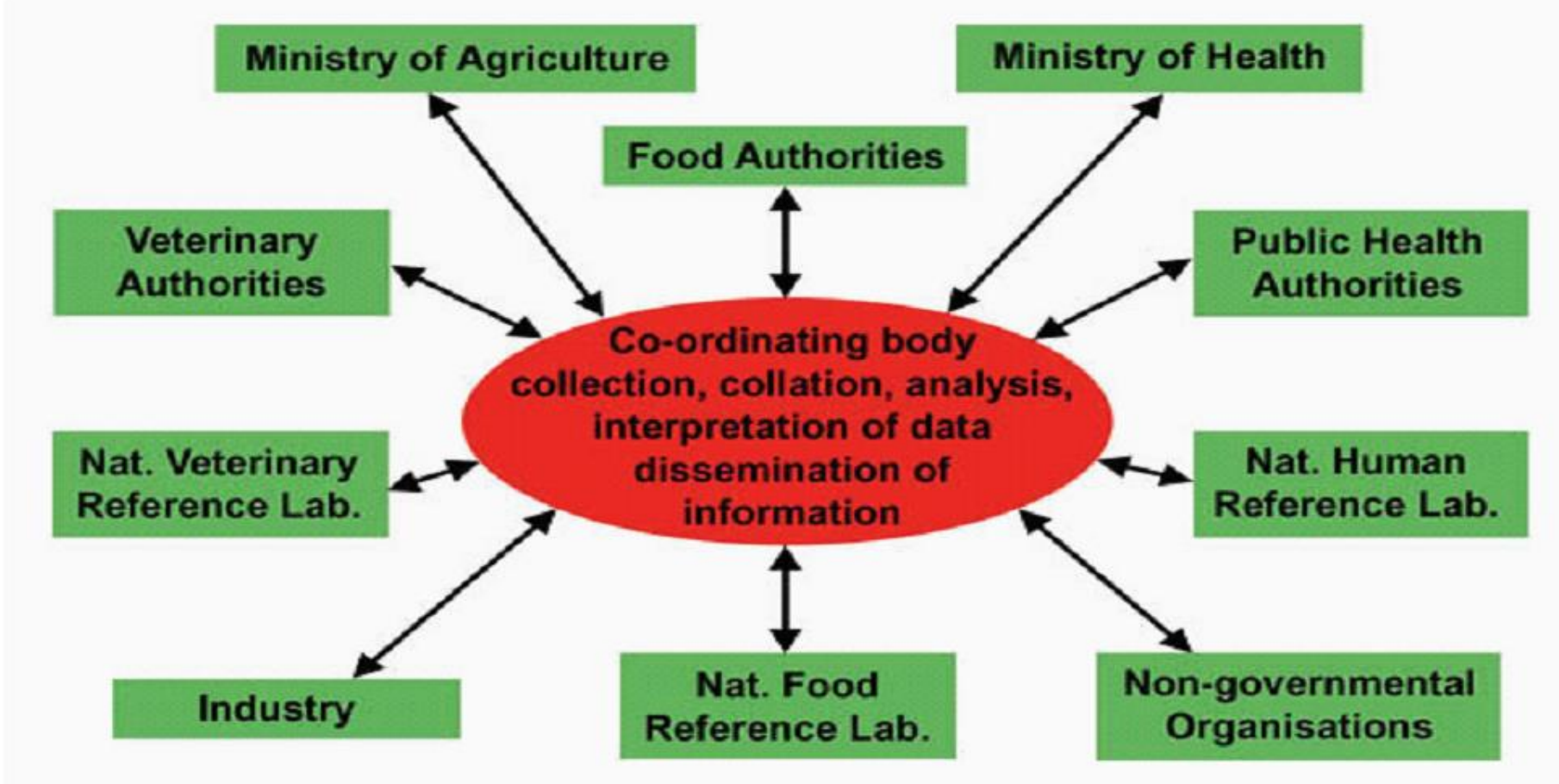
Weakness

- Majority of food sector: **Unorganized**
- **Underequipped and understaffed** food safety regulation system
- Unawareness of public on many issues
- **Insufficient implementation** of regulations

Emerging issues and gaps

- Threat of new and **re-emerging** foodborne illnesses
- **Changed scenario of globalization**
 - Commercialized mass food production
 - SPS and WTO agreements
- Emergence of **antimicrobial resistance**
- Climate change
- Change in food habits
- Inefficient **surveillance and monitoring systems**
- Non-availability of **authentic data** on foodborne infections
- **Limited awareness** and insufficient inter-sectoral collaboration

Getting together the major stakeholders of food safety



Currently no single organization responsible for coordinating surveillance data

Wong *et al.* (2004)

Way Forward

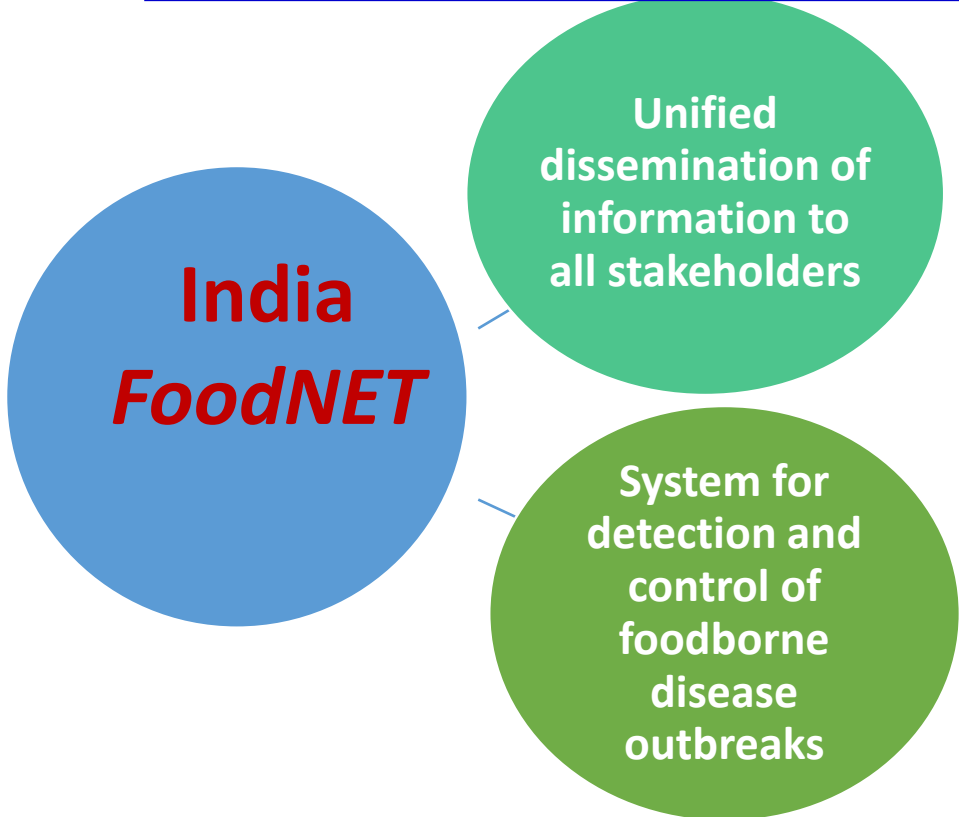
□ Disease detection, control & prevention

- Laboratory mapping & networking
- Capacity building
- Improved disease monitoring and surveillance
- Internet-based information technologies
- Use of Latest Technologies: Genomics & Proteomics
- **Early warning system** for reporting emerging diseases and mitigation of foodborne outbreaks
- Generating **authentic baseline data** on occurrence and burden of food borne diseases

Way Forward...

- **Policy Implantation and strict compliance** by statutory bodies
- **Essential reporting of all infectious diseases** in human, animal, wildlife and sea-life settings, by public & private organizations
- **Prioritization** of diseases
- **Early warning** and control response
- **Risk analysis**
- **Awareness** about Sanitation and Hygiene

Long term solution for surveillance of foodborne diseases



Network Programme on foodborne diseases

Link all existing infrastructure into a seamless surveillance mechanism:
Research organizations ICAR-CSIR-ICMR-SAUs-Others/FSSAI/Existing state
Central and Private Accredited labs

Epilogue

- **It's a globalized world...**
- **Understanding the drivers for putative and emergent risks, pooling the resources and expertise for containing the risks, and ensuring safe foods for the surging population and gaining the consumers' trust requires concerted and joint efforts with efficient inter-sectoral collaborations, proactive communications and information sharing can only bring about the desired change with One Health Approach**



Global Collaborative Multidisciplinary Effort Promote humans, animals and environment health



“Between animal and human medicine there is no dividing line nor should there be. The object is different but the experience obtained constitutes the basis of all medicine.”
- Rudolf Virchow (1958)