



# The Application of a National Laboratory Network in India for Foot and Mouth Disease

A. Sanyal, RP Tamil Selvan, S Saravanan, JK Mohapatra,  
R Venkataramanan, Lal krishna, KM Bujarbaruah,  
SK Bandyopadhyay, B Pattnaik



# Project Directorate on Foot and Mouth Disease (PD on FMD)

- An institute within Indian Council of Agricultural Research (DARE, Ministry of Agriculture, GOI)
- Director General-Head of ICAR
- Deputy Director General (AS) is the supreme authority of all the Animal Science related research activities in ICAR
- Assistant Director General (AH) assists DDG in Animal Health related matters
- Project Director is the head of PD on FMD



# Location of the Institution



Mukteswar, Nainital, Uttarakhand

7500 ft. above mean sea level

in Northern India

Nearest Airport –New Delhi

Nearest Railhead-Kathgodam



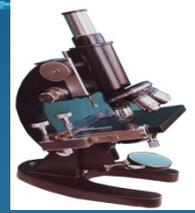
## Why to study FMD?

- ❖ Livestock + Fisheries contributed 5.26% of total GDP during 2006-07
- ❖ About 70% of output of livestock sector comes from milk (~92 million tonnes/annum)

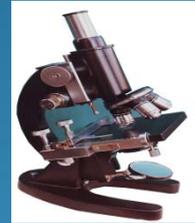
### **FMD in India is the biggest impediment to growth of livestock sector**

- ❖ Direct losses due to this disease are estimated to be more than Rs. 20,000 crores (4.45 Billion USD) per year.
- ❖ Indirect trade losses could be much more as milk and milk products, meat and hide are not accepted by countries free from the disease

**So the FMD ranks first in the priority when control programme for any animal disease need to be undertaken**

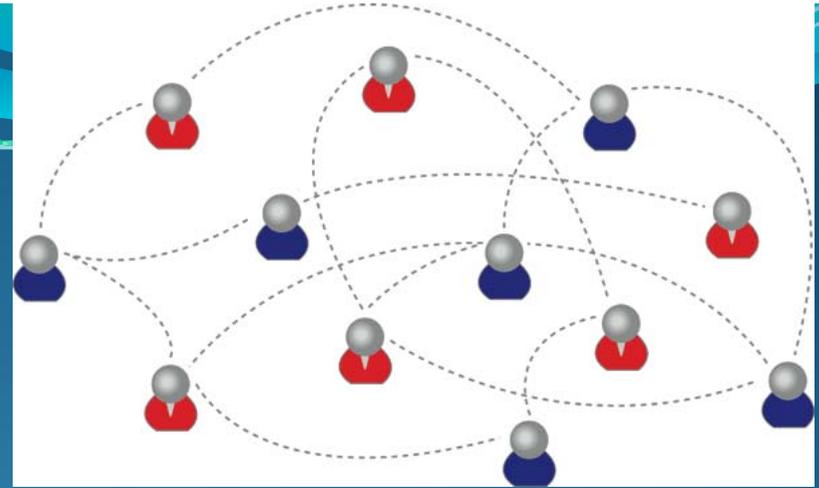


## Birth of Network Laboratories



- ❖ Research on FMD initiated in 1929
- ❖ Effort to control the disease by vaccination was felt and initiated way back in 1943 by the Government of India (ICAR).
- ❖ However, Lack of knowledge of epidemiology of the disease in the country impeded the formulation of control measures.

## Growth of the Network



- ❖ All India Coordinated Research Project (AICRP) on FMD virus typing in 1968

Central Laboratory at IVRI, Mukteswar

3 Regional Centers at Hisar, Hyderabad and Calcutta

- ❖ Expansion of the AICRP on Epidemiological studies on Foot-and-Mouth Disease in 1971

increased out lay, inputs in terms of laboratory space, experimental animal shed facility, scientific manpower, 4 additional Regional Centers and Epidemiological Network Units for extensive FMD surveillance throughout the country.

## Up gradation of the Network

Up to 8<sup>th</sup> plan (1992-1997) the activity of the project was expanded by incorporating several Regional Centers and Network Units

During 9<sup>th</sup> Plan Period (1997-2002) the AICRP was elevated to **Project Directorate on Foot and Mouth Disease** in 2001 with 8 Regional Centers and 12 Network Units

In 10<sup>th</sup> Plan (2002-2007), 3 more New Network Units were added to expand surveillance of the FMD in the country



# Present Setup



## Project Directorate on FMD

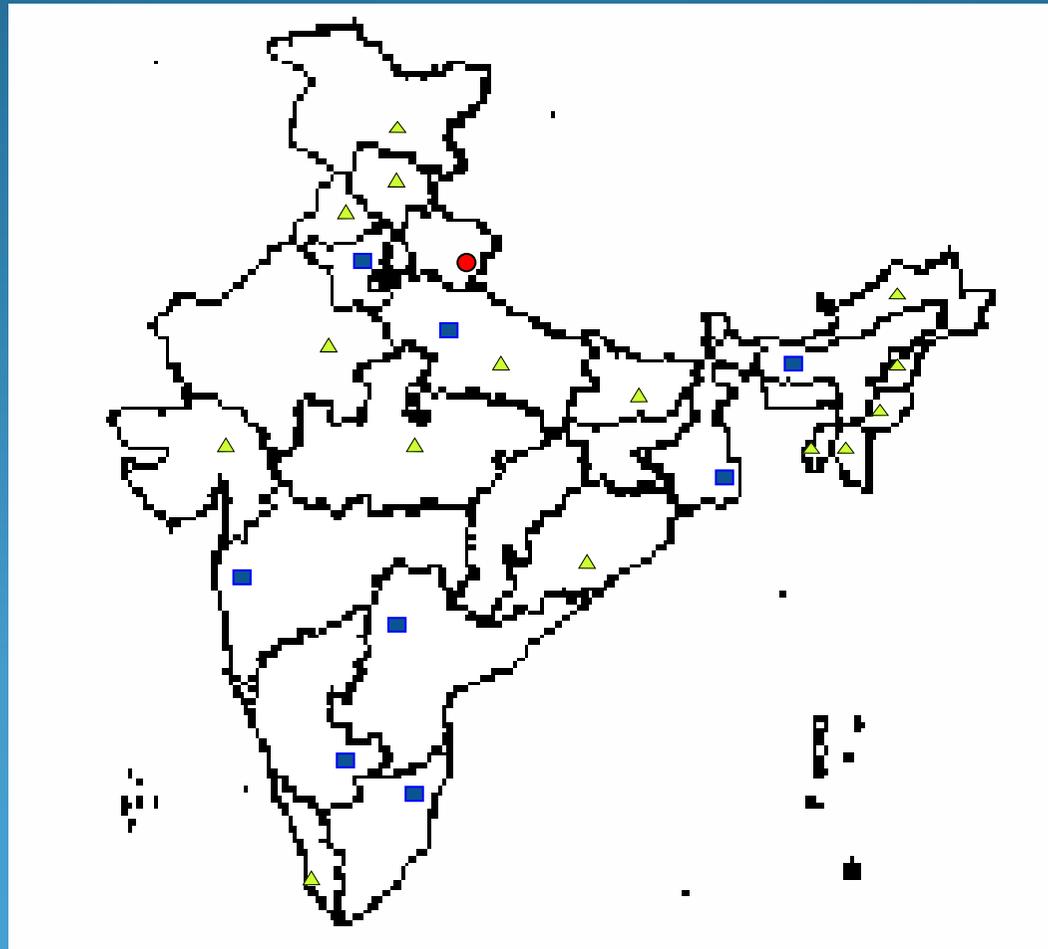
■ Regional Centers (08)

- Guwahati
- Hisar
- Pune
- Kolkata
- Hyderabad
- Bangalore
- Ranipet
- Mathura

● Central FMD Laboratory

▲ Network Units (15)

- Agartala
- Kohima
- Manipur
- Aizwal
- Itanagar
- Bhopal
- Jaipur
- Jalandhar
- Patna
- Jammu
- Bhubaneswar
- Lucknow
- Shimla
- Thiruvananthapuram
- Ahmedabad





## Present National Scenario

- Endemic: ~ 2500 reported outbreaks in 2007-08 (may be an under estimate)
- Major incidence reported in cattle and buffaloes
- Three serotypes prevalent currently – O, A and Asia 1
- 70-80% of the outbreaks are due to type 'O' followed by A and Asia1; the fourth serotype C, last recorded in 1995
- Outbreaks occur throughout the year
- Higher incidence in winter months and during pre-monsoon season



# Control of FMD in India

## Control by vaccination

- ✓ Current prevention through an inactivated trivalent vaccine
- ✓ No systematic vaccination
- ✓ Restricted to few zones under FMD-Control Programme of GOI

## Diagnosis and epidemiology

- Epidemiology
  - Molecular & Seroepidemiology
- Diagnosis
  - Clinical surveillance
  - Serosurveillance (LPB-ELISA and DIVA test)
  - Serotype confirmation (S-ELISA)
  - Genome based (m-PCR & PCR-ELISA)

**Control can be achieved through coordinated action of Central FMD Laboratory, Regional Centers and Network Units in association with Central and State Governments**

## Objectives of the Network

- To conduct systematic epidemiological studies on Foot- and- Mouth Disease (FMD) in order to gather comprehensive information on :
  1. geographical distribution
  2. Seasonal occurrence of different serotypes
  3. Role of various factors associated with the origin, course and development of the outbreaks
  4. Genetic and antigenic make up of the outbreak strains
- To identify most appropriate strains for vaccine manufacturing
- To provide baseline epidemiological information on foot and mouth disease useful for planning the strategy of disease control programme and its implementation in different regions and in the country



# My Functions



## Central FMD Laboratory, Mukteswar

- ❖ Confirmatory serotyping
- ❖ Cell culture revival of outbreak viruses
- ❖ Antigenic analysis of field isolates
- ❖ Molecular Epidemiology by nucleotide sequencing of capsid coding region of FMDV genome.
- ❖ Regular vaccine matching exercise and updating of vaccine strains
- ❖ Assessment of post-vaccinal immunity in Government of India sponsored FMD-Control Programme
- ❖ Centralized production, standardization and distribution of diagnostic reagents under the network including in house validation of tests and reagents.
- ❖ Maintenance of National FMD virus and serum repository
- ❖ Development and validation of newer diagnostic techniques
- ❖ Human resource development
- ❖ Ensuring harmonization of laboratory practices and competence of Regional Centers and Network Units

# *Responsibility and Capacity*

## *Regional Centers and Network Units*

- Attending FMD outbreaks including reporting and detailed investigation
- Collection of clinical specimens and epidemiological data in their area of operation
- Virus Serotyping and Seromonitoring employing sandwich ELISA and DIVA-ELISA
- Participates in analysis of post-vaccinal sero-conversion under FMD control programme
- Validation of newly developed diagnostic assays at Central FMD Laboratory



# My achievements



- ❖ Sandwich ELISA for serotyping
- ❖ Liquid Phase ELISA for assessment of post vaccinal immunity
- ❖ 2D-MNT to assess the relevance of in use vaccine strains
- ❖ Multiplex PCR, PCR ELISA and lineage differentiating PCR
- ❖ Provided epidemiological data about prevalence and distribution of serotypes
- ❖ Establishment of National repository of FMDV
- ❖ Creation of a National sequence database of Indian FMDVs
- ❖ Identification and supply of appropriate vaccine strains
- ❖ Facilitated a National FMD control programme
- ❖ Trained work force to take up FMD research

## Impact of the Project

- ✓ Project Directorate is recognized as a resource centre for epidemiological data for national FMD control programme
- ✓ Development of Indigenous companion diagnostic kits for FMD virus serotyping, Seromonitoring and DIVA has made the country self sufficient and helped India launching the FMD Control Programme in 2004
- ✓ Developed infrastructure facilities for disease monitoring and surveillance, and trained manpower across the country
- ✓ Research on antigenic/ serological and molecular characterization paved the way for adapting a uniform policy for selecting appropriate vaccine strains for use by the Indian manufacturers of FMD vaccine
- ✓ Advised on the deletion of Type C vaccine strain from the quadrivalent FMD vaccine and replacement of type A vaccine strain based on the epidemiological studies
- ✓ Established a National repository of FMD viruses isolated since 1985 and FMDV genome sequence data base



## Concluding remarks

- ❖ Project in its thirty five years of existence has made the country self sufficient in FMD diagnosis and surveillance
- ❖ Provided base line epidemiological information regarding distribution of serotypes and prevalence of the disease
- ❖ identified vaccine strains and provided vital technical support to the Government sponsored FMD control program in the country

**This model in operation in India with visible success can be extended for control and eradication of FMD in entire South Asian Region**



## ACKNOWLEDGEMENT

- Scientists, supporting staff and students of Central FMD Laboratory, Mukteswar.
- Staff at the Regional Centers and Network Units
- **ICAR for financial support**

**Thank You**

