Changing Concept of FMD diagnostics: from Central to Local

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OBJECTIVES OF DIAGNOSIS IN THE FIELD/LOCAL

1. To arrive at quick diagnosis
2. To implement treatment, control/bio-security measures
3. To understand the introduction of any new disease/strain in the country

Requirements:

1. Understanding the epidemiology of the disease
2. Prevalence of economically important diseases
3. Necessity for differential diagnosis

OBJECTIVES OF DIAGNOSIS IN THE CENTRAL

1. To arrive at definitive diagnosis
2. To prescribe appropriate control measures

Requirements:

1. Tests shall be sensitive and specific
2. Test should provide differential diagnosis

Clinical Diagnosis

- Clinically vesicular diseases are indistinguishable from FMD

- Other vesicular diseases such as Swine Vesicular Disease, Vesicular Stomatitis Virus and Vesicular Exanthema are not reported in India

- Salivation, lameness with vesicles requires further testing

Making a definitive diagnosis of FMD usually depends on laboratory tests which can identify the virus

Diagnosis of FMD in samples of tissue or fluid

- by virus isolation
- by the demonstration of FMD viral antigen or nucleic acid.

- Detection of virus-specific antibody can also be used for diagnosis and antibodies to viral nonstructural proteins (NSPs) can be used as indicators of infection, irrespective of vaccination status.

Samples collected for the diagnosis of the disease:

- ✓ Tissue sample: vesicular epithelium of tongue/feet
- ✓ Blood (serum)
- ✓ probang samples
- ✓ Oral/mucosal swabs

Issues related to collection, preservation, storage and transport

1. All the Veterinarians are not equipped to collect the samples
2. Collection of sample are not done at appropriate time
3. Samples are not collected in appropriate container and media
4. Storage and transport are not done properly
5. To obviate the above problems use of FTA cards for collection and transportation of samples is under evaluation

Laboratory Diagnosis

- **Virus Detection**

  VI, Ag-ELISA, CFT, RT-PCR, Nucleotide Sequencing

- **Antibody Detection**

  - *Antibody against structural protein (SP)*

    : VNT, LPBE, SPCE

  - *Antibody against non-structural protein (NSP)*

    : DIVA test (3AB3 and 3ABC, Panel ELISA)

  - *Mucosal antibody detection*

    : IgA-ELISA

Assay Considerations

- Sensitivity/limit of detection
- Specificity/Reliability
- Time/speed
- Performance

✓If developed as kit format, then Scalability and Cost involvement are important issues to be considered

- ✓ **Tests are available which, allow a definitive diagnosis very quickly, within about half a day of a suitable sample arriving at the laboratory.**

- ✓ A Positive diagnosis is sometimes given very quickly

- ✓ A Negative diagnosis takes longer time to confirm

- ✓ The speed/time of diagnosis would vary depending on the distance from an appropriate laboratory.

- ✓ To handle multiple sample for both diagnosis and surveillance purpose in a large outbreak, a very high laboratory capability is also essential.

- ✓ for rapid diagnosis, there is a requirement of several diagnostic laboratories (a network) or

✓Point-of-care (POC) test (satisfactorily validated) to minimize the time required for confirmation of the disease.

Point-of-care test

1. Lateral Flow assay (LFA):

✓ helps in arriving at quick confirmation

✓ Limitation is adequate quantity of virus is required.

2. Portable PCR:

➢ Highly sensitive and specific

➢ Minute quantity of viral genome required

➢ Can be done in areas without electricity

➢ Some of the reagents are thermo labile

3. LAMP test:

- NA amplification at a single temperature
- More suitable for use in the field
- Highly sensitive
- Rapid test
- Minute quantity of virus genome is required
- Enzyme is stable at higher temperature

All the three tests are being evaluated and can be used provided samples shall be collected and dispatched to the laboratory for detailed investigation

Central Services

- ELISA
- PCR
- QPCR
- Nucleotide sequencing
- VI/MNT

The objective of detailed central laboratory investigation here

1. Confirmation of disease
2. Virus serotyping and epidemiology
3. Molecular epidemiology and phylogenetic analysis
4. Vaccine Matching
5. Virus Repository

Laboratory Services

1. Make the laboratory diagnostic services at the grass root level by imparting training to Veterinary practitioner on the uses of point-of-care test

2. Train Veterinary practitioner in collection, preservation, storage and transport of samples

3. Communication of results to the Veterinary practitioner, disease control authorities and epidemiological units

Validation of diagnostics and diagnostic methods (Central)

1. Development of test

2. In house validation

3. External validation

4. Evaluation in the field (local)

Conclusion

- ✓ Diagnosis of FMD is essential for implementing appropriate control measures
- ✓ Several point-of-care and laboratory tests are currently available
- ✓ PDFMD has capability of delivering point-of-care test methods and conducting Laboratory diagnostic methods
- ✓PDFMD is extending diagnostic support to the country and other member countries of SAARC by providing diagnostic services and HRD

Thank you