



OIE/FAO  
Foot-and-Mouth Disease  
Reference Laboratories  
Network



# Global foot-and-mouth disease situation: risks and new developments

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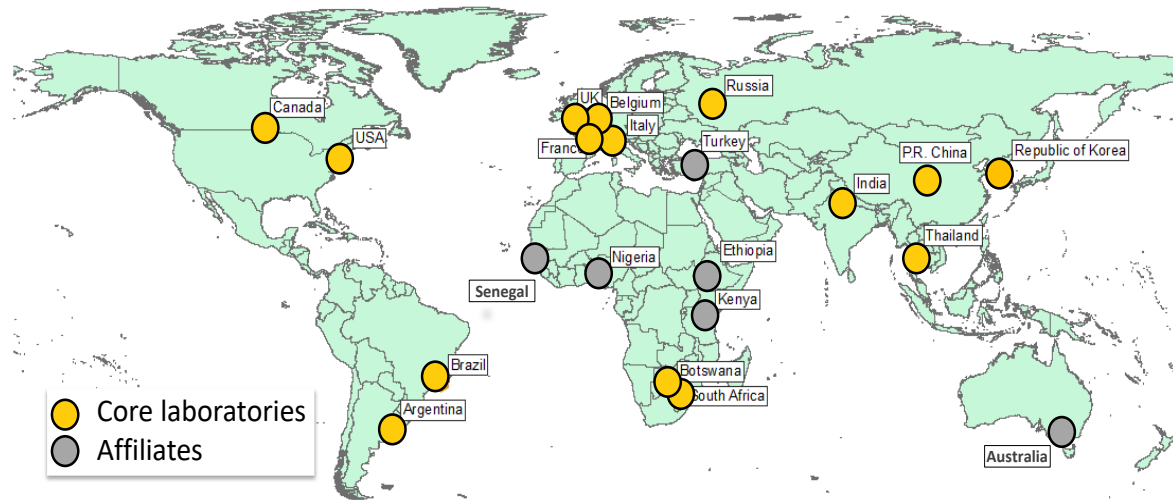
# OIE/FAO FMD Laboratory Network

[www.foot-and-mouth.org](http://www.foot-and-mouth.org)



## Network Members and affiliates:

New member: Wageningen Bioveterinary Research (WBVR), The Netherlands as FAO Reference Centre for FMD



## Core activities:

- Collation and exchange of data
- Review of FMD risks
- Test improvement and harmonization
- Support to GF-TADs regional RoadMaps



Network “virtual format” with >70 participants – December 2021

# Global Coordination Committee on Foot & Mouth Disease (GCC-FMD) with SEACFMD and WRLFMD

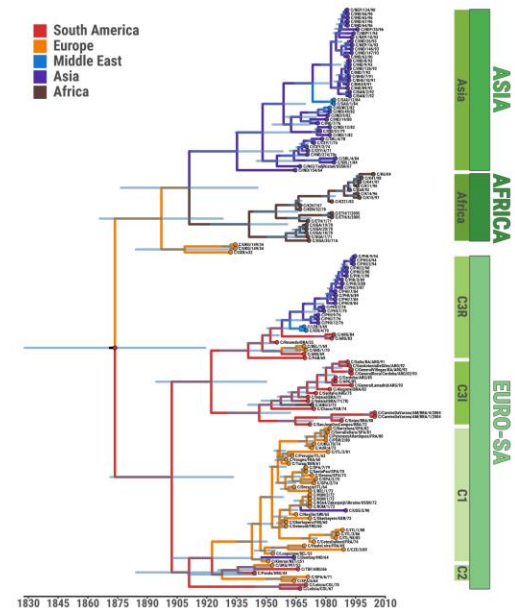
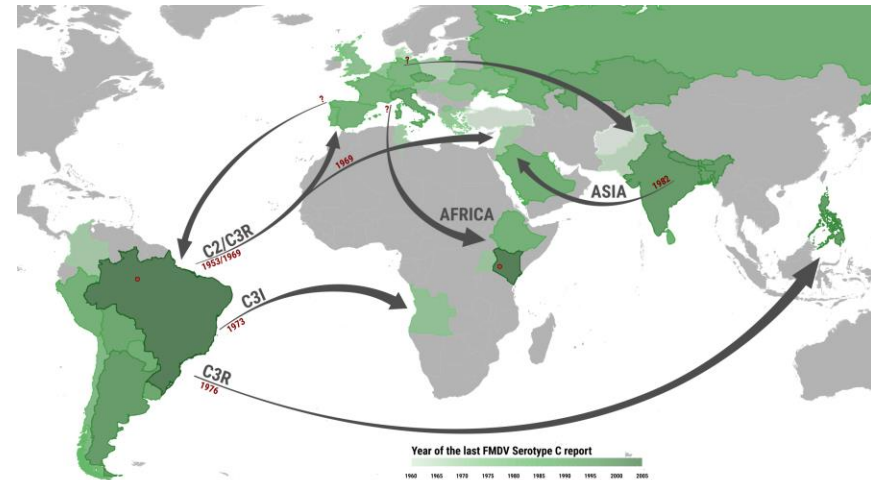
To facilitate the implementation of the Global Foot and Mouth Disease control strategy:

## **Expected outcomes:**

1. Better understanding of FMD dynamics and control strategies/initiatives at global, regional and national levels
2. Enhanced coordination and communication among the stakeholders to implement the global FMD control strategy for significant impact
3. Harmonized action plan for next phase of the global FMD control strategy developed
4. Resources mobilized for implementation of the global strategy through engagement and advocacy with development partners and stakeholders

# Extinction of serotype C?

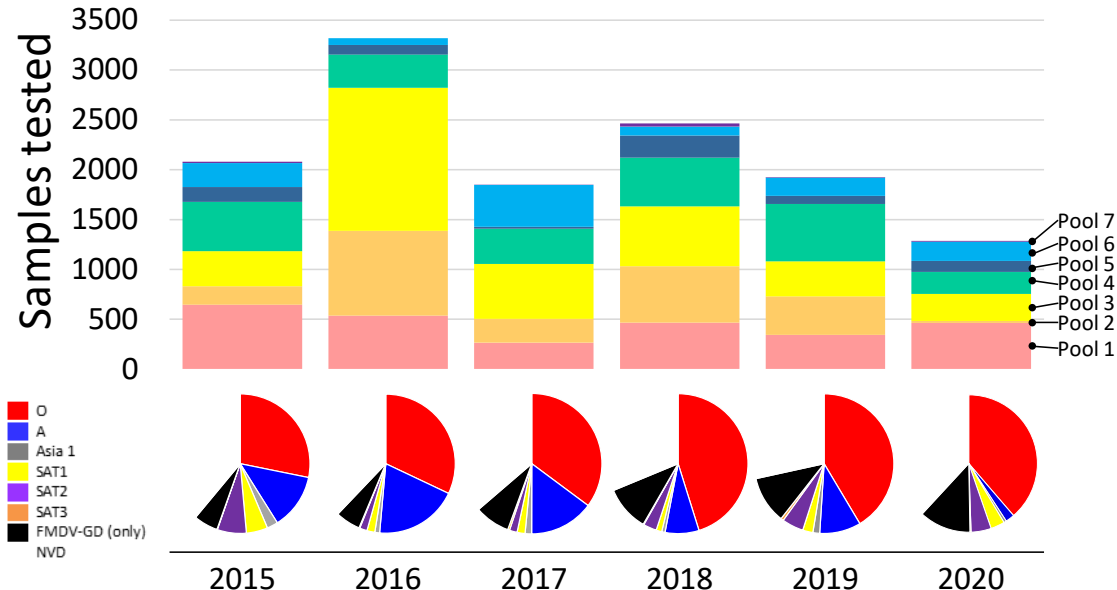
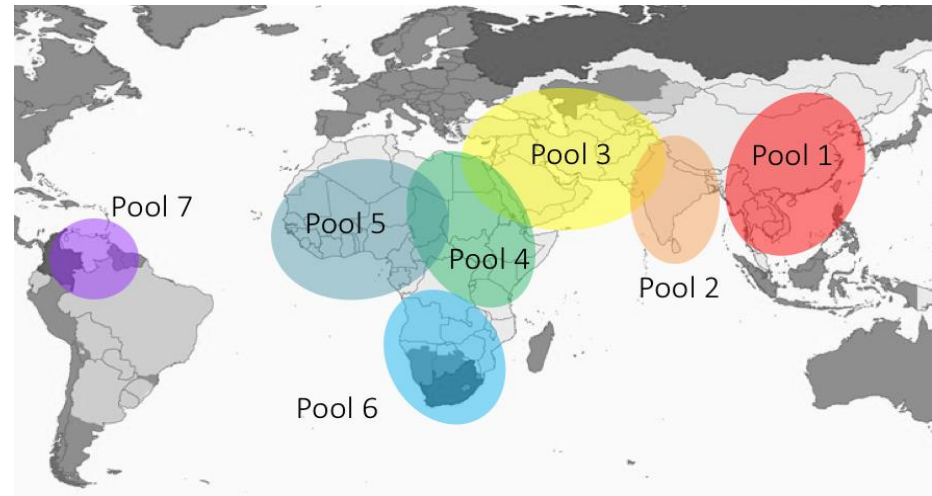
- No serotype C outbreaks recorded since 2004
- Network motivated a resolution that was endorsed by the OIE General Session (2017)
  - Recommendations regarding use of live FMDV strains in research and FMD vaccine development
- New OIE/FAO “serotype C” Taskforce formed in 2021
  - Measuring risk (i.e., how confident are we that this serotype is no longer present?)
  - Reducing risks of reintroduction and maintaining preparedness



# Samples tested by the OIE/FAO FMD Laboratory Network

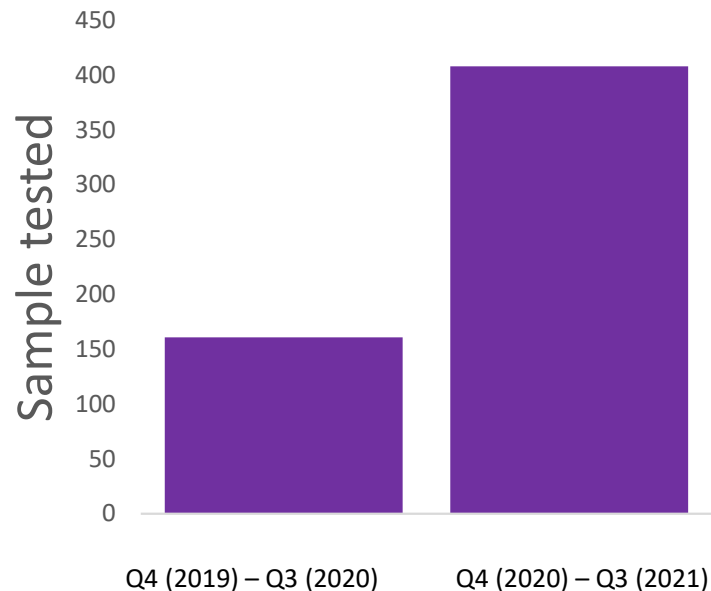
- Impact of COVID-19 on FMD surveillance
- ~30-50% samples are untyped or NVD
- Data used to define relative importance of different FMD virus lineages in each Pool
- Surveillance gaps in Pool 5 (W/C. Africa)

[www.foot-and-mouth.org](http://www.foot-and-mouth.org)



# Sample Submissions in 2021:

- Increased number of sample submissions during 2021 (vs 2020)
- Coordinated approach to target priority FMD endemic countries thanks to EuFMD/WRLFMD (Valerie Mioulet, Kees van Maanen and Paolo Motta)



- In addition - sequence exchange:
  - from India (ICAR-DFMD), Israel (KVI), Iran (IVO), Malawi (BVI), Malaysia (MNFMDL), Mauritius (ANSES), Namibia (BVI), Russia (ARRIAH), Tunisia (ANSES/IVRT), Turkey (ŞAP)

# Pool 1: Status in 2021

## Characterisation of different FMD virus lineages



Based on data from WRLFMD, RRLSEA, the OIE/FAO Lab Network and reported @SEACFMD

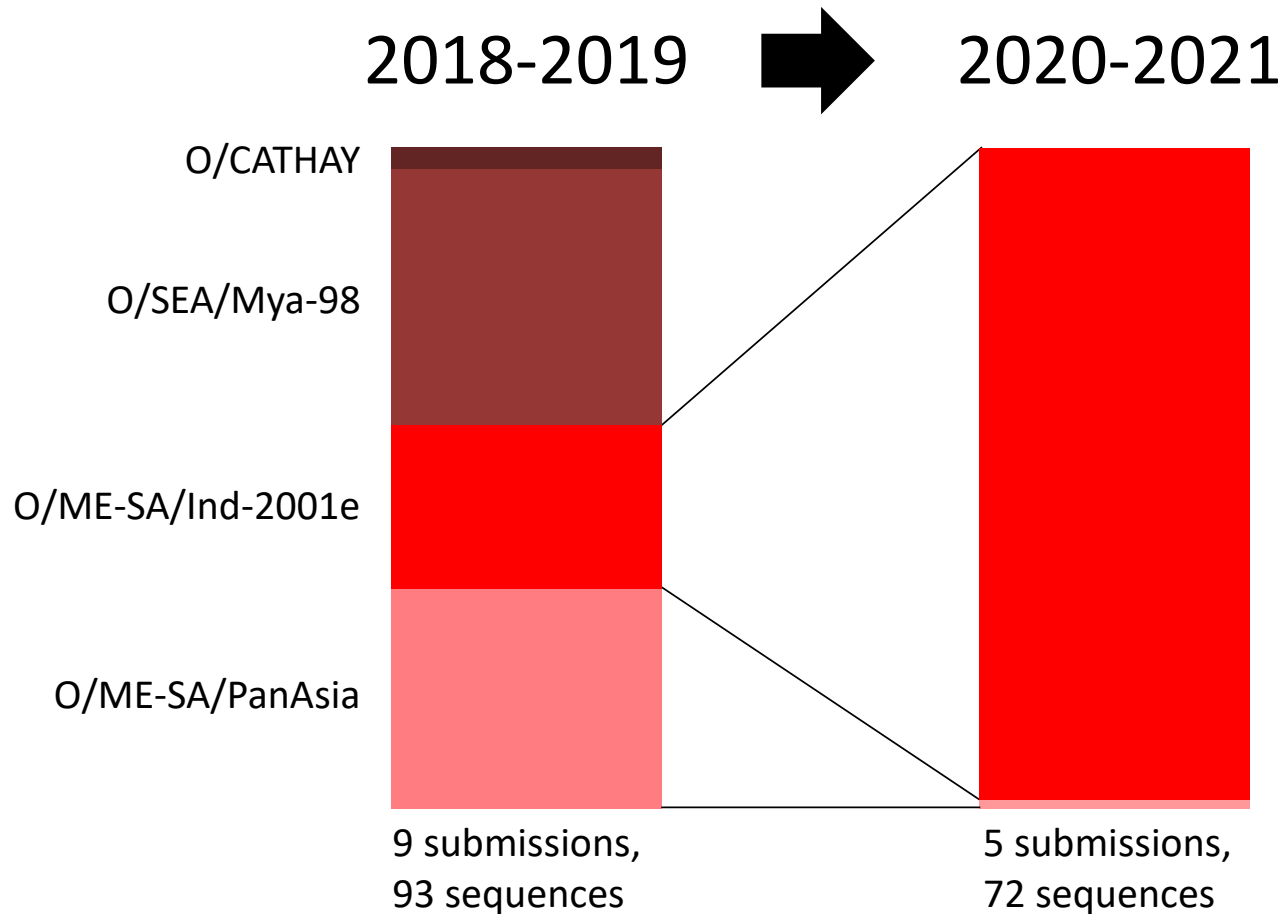
Country (date of last shipment/seq to WRLFMD)	O					A		Asia-1
	ME-SA/Ind-2001	SEA/Mya-98	CATHAY	ME-SA/PanAsia	ME-SA/PanAsia-2	ASIA/Sea-97	ASIA/Ind	
Cambodia (2021)	2019	2016		2018		2016		
Laos (2021)	2020	2017		2018		2018		
Malaysia (2021)	2021	2016	2005	2020	2009	2014		
Myanmar (2019)	2021	2021				2021	2010	2017
Thailand (2021)	2021	2018	2012	2019		2019		
Vietnam (2021)	2021	2019	2018	2018		2017		2006
PR China (2020)	2021	2020	2021	2019		2019		2009
Mongolia (2021)	2021	2018		2017		2015		

Is this the true picture of FMD in SEACFMD countries?

..... or does under-sampling bias our understanding of the epidemiology of the disease?

# Increasing dominance of O/ME-SA/Ind-2001e

Serotype O data for countries in mainland Southeast Asia:  
(sequences from Cambodia, Laos, Myanmar, Thailand, Vietnam)

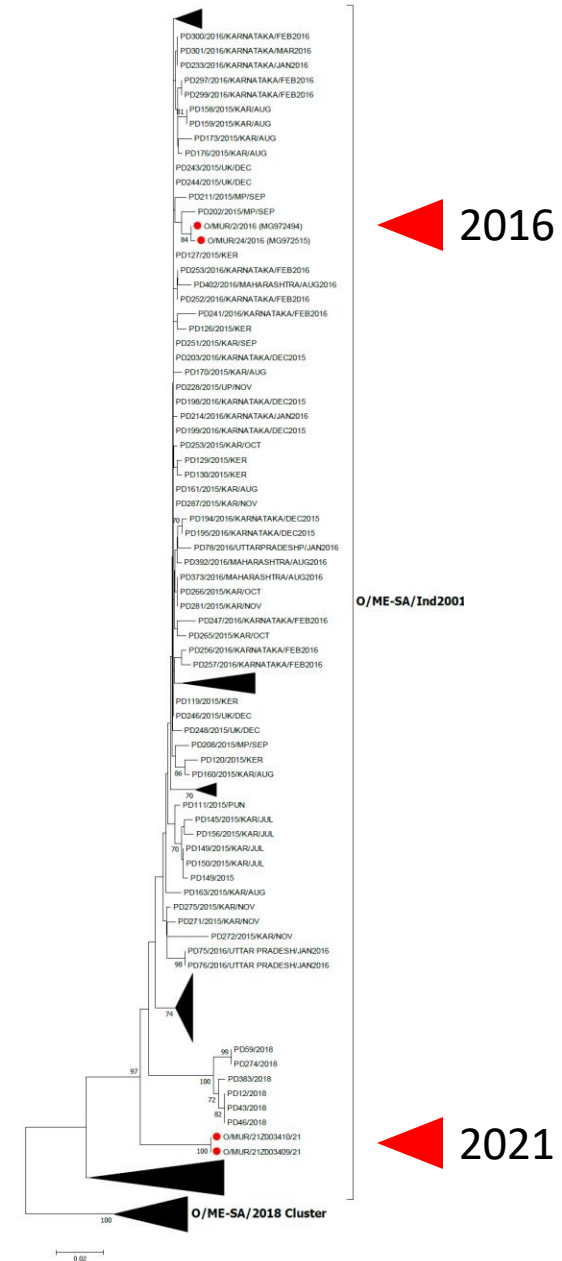


2021: Samples from Mongolia – this was the only lineage detected



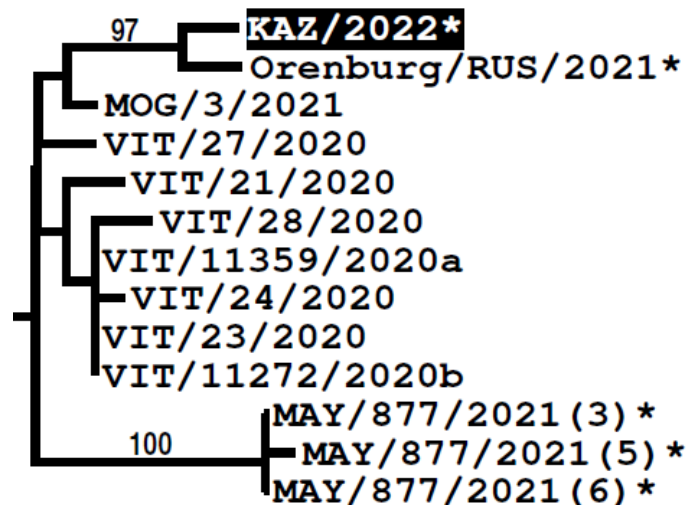
# O/ME-SA/Ind-2001e in Mauritius

- March 2021
- Outbreak in cattle on Rodriguez Island
- VP1 sequences provided by ANSES (France) and ICAR-DFMD (India)\*
- Closest nt identity (96.5%) with an FMD virus from Nepal (2018)
- Phylogenies support the idea that this outbreak represents a **new FMD incursion** into Mauritius that is distinct to the cases that occurred in 2016
- Thanks to: Dr Labib Bakkali-Kassimi, Dr Souheyla Benfrid, Dr RP Singh and Dr S Subramaniam



# O/ME-SA/Ind-2001e in the Russian Federation

- December 2021
- New FMD outbreaks in cattle, Orenburg, Russia
- Located in southern FMD vaccination buffer zone close to the border with Kazakhstan
- Caused by O/ME-SA/Ind-2001e lineage
- Sequence\* demonstrates 98.9% nt identity to virus from Mongolia (2021)
- FMD outbreaks due to O/ME-SA/Ind-2001e also reported in an FMD-free without vaccination) zone in Kazakhstan



\* Thanks to Dr Alexei Scherbakov, ARRIAH, Russia



# Headline events 2021/22

## Tunisia

Jan 2022

O/EA-3

A (untyped) – Libya

O (untyped) - Libya

## Russian Federation

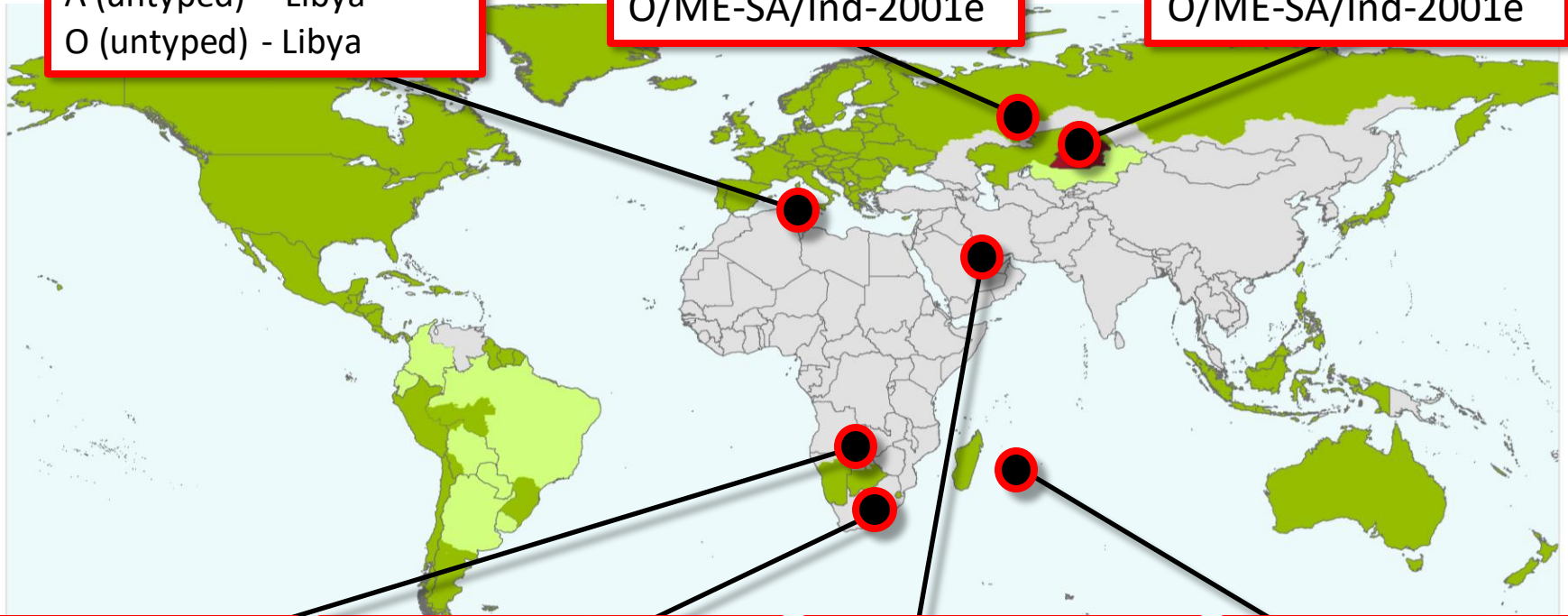
Dec 2021

O/ME-SA/Ind-2001e

## Kazakhstan

Jan 2022

O/ME-SA/Ind-2001e



## Namibia/Zambia

July 2021

O/EA-2

## South Africa

Limpopo:

Serotype SAT 3

March - Sept 2021

KwaZulu-Natal:

Serotype SAT 2

May-Sept 2021

## Bahrain

Feb 2021

O/EA-3

A/AFRICA/G-I

## Mauritius

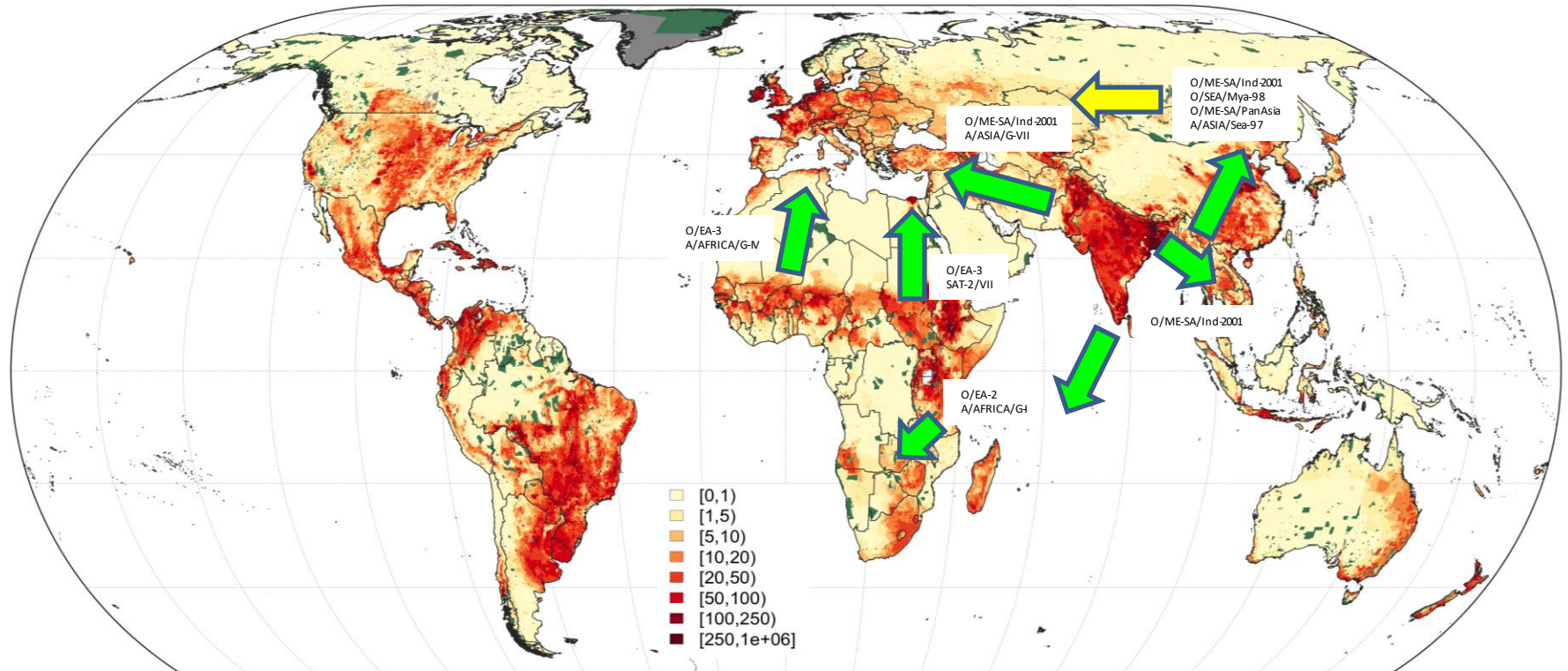
March 2021

O/ME-SA/Ind-200e

# Trans-pool movements of FMDV since 2015

Why do trans-pool movements matter?

- Impact/change regional FMD risks
- Selection of vaccines to control outbreaks



Cattle density map

Robinson et al., 2007

# Vaccine selection for Southeast Asia



AU-PANVAC  
Pan African Veterinary Vaccine Center of All-Burkina Faso



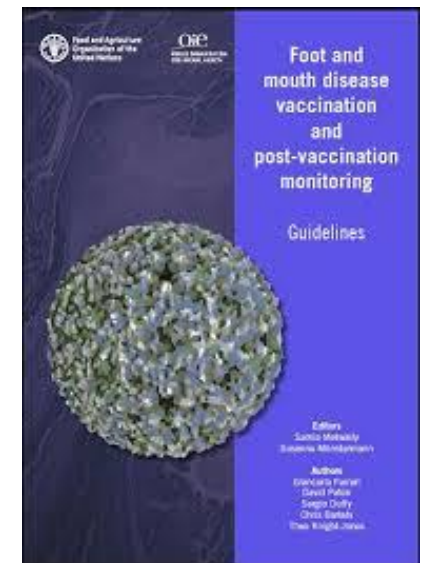
Twining project 2019-2022

## Obvious gaps and challenges:

1. Homologous/monovalent QA/QC (OIE Manual) vs heterologous vaccine performance **in the field** with multivalent products
2. Vaccine-matching considers strain suitability but NOT the quantity/quality/combinations of antigens in a final product (and is limited due to access to vaccine strains and BVS)

## Proposed testing:

- Increased focus on measurement of **heterologous responses**
- Using **final formulated product supplied to customers**
- Use common/standardized FMDV viruses (**Antigen Panels**) representative of the antigenic threats in a region – proposal for reference antigens for East Africa (<https://www.wrlfmd.org/node/2096/>)




# Future priorities for vaccine selection and QC

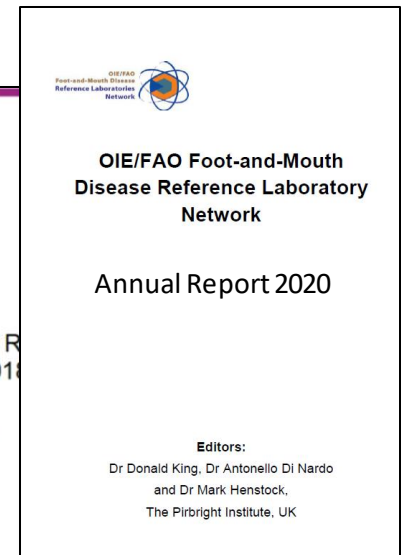
1. Agreement on FMD **virus reference antigens** that represent antigenic diversity in Southeast Asia
  - Prospect that these viruses will be shared among the labs
  - Capsid sequences should be made available
  - Antigenic profiling undertaken using available Mab and polyclonal sera
2. Collection of **representative sera**
  - Generated using final “formulated” products
3. **Calibration** of immunoassays
  - Inter-laboratory comparison of serological assays (e.g., EuFMD-FAR project)
  - Comparison between VNT and SP-ELISAs (particularly for wider use beyond the high containment labs)
4. Work to define **serological cut-offs** in target species
  - Challenging – but sera collected from heterologous challenge studies is useful
  - However, comparison between vaccines is always possible using this approach

# Additional information

- FMD reports and lab testing (<https://www.wrlfmd.org/ref-lab-reports>)
  - *Genotyping reports, Vaccine matching and Serotyping reports*
- Other data sources:
  - Quarterly WRLFMD/EuFMD report (<https://www.wrlfmd.org/ref-lab-reports>)
  - Annual report of the OIE/FAO FMD Laboratory Network (<http://foot-and-mouth.org/>)



The screenshot shows the WRLFMD website interface. At the top, there is a navigation menu with links for WRLFMD, REPORTS, LABORATORY PROTOCOLS, NEWS, EVENTS, and RELATED SITES. Below the menu is a large, colorful world map with numerous colored dots and lines representing FMD cases and transmission routes. A text box on the right side of the map reads 'FOOT-AND-MOUTH DISEASE'. Below the map, there is a 'Welcome' section with the WRLFMD logo (a purple bull in a hexagon) and a paragraph stating that the Pirbright Institute is designated as the World Reference Laboratory for Foot-and-Mouth Disease by the Food and Agriculture Organization (FAO) and as a reference laboratory for FMD by the Office International des Epizooties (OIE). To the right of the welcome text is a 'Country FMD Reports' section featuring a world map with colored regions and a link to 'Country Reports >'. Below the welcome text is a 'WRLFMD Quarterly Report April to June 2011' cover page, which includes the WRLFMD logo, the title, the subtitle 'Foot-and-Mouth Disease', and logos for BBSRC, the Department for Environment, Food & Rural Affairs, and eofmd.

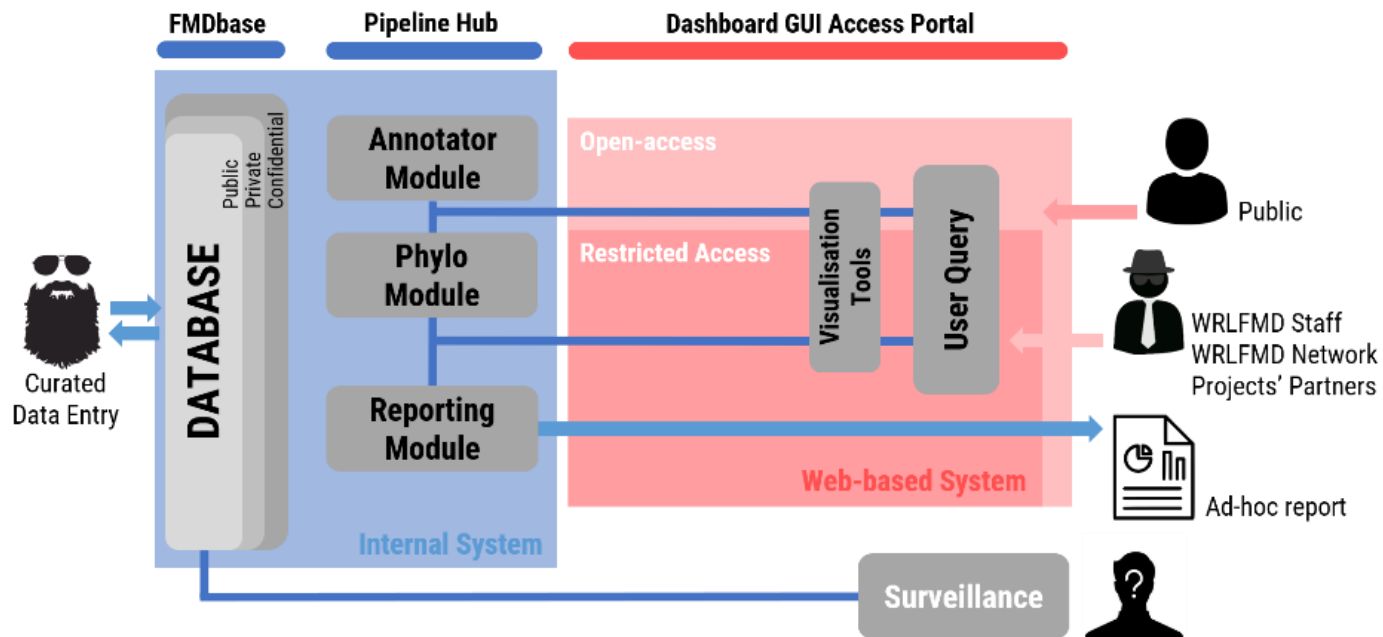


The image shows the cover of the 'OIE/FAO Foot-and-Mouth Disease Reference Laboratory Network Annual Report 2020'. At the top, there is the OIE/FAO logo and the text 'Foot-and-Mouth Disease Reference Laboratory Network'. Below this, the title 'OIE/FAO Foot-and-Mouth Disease Reference Laboratory Network Annual Report 2020' is prominently displayed. At the bottom, the editors are listed: 'Editors: Dr Donald King, Dr Antonello Di Nardo and Dr Mark Henstock, The Pirbright Institute, UK'.

# FMDbase:

a new open-access system for FMD sequences

- To address problems with the accessibility of FMDV genomic data and limited to personal data or data available on public repositories (GenBank), with often non-existent, limited or incorrect metadata annotation
- System went “live” in 2021





# Acknowledgements

- Support for the WRLFMD and research projects
- Collaborating FMD Reference Laboratories in Europe
- Partners within the OIE/FAO FMD Lab Network



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