



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



Overview of recent global FMD events:

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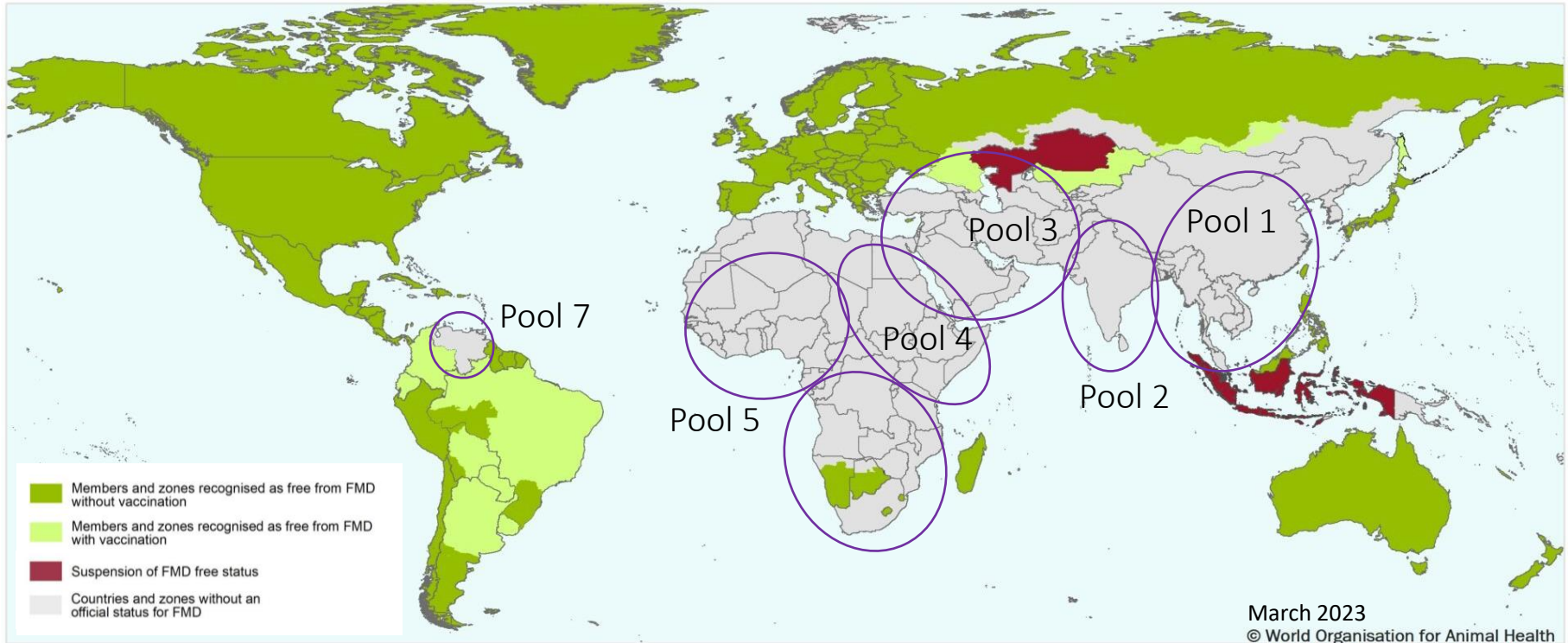


World Organisation
for Animal Health
Founded as OIE
FMD Reference Laboratory



Global status of FMD

- FMD is endemic in much of Asia and Africa (and parts of South America)



- Seven endemic pools** requiring tailored diagnostics and vaccines
- Six circulating FMDV serotypes with an unequal distribution
 - Serotype C has not been detected globally since 2004

WOAH/FAO FMD Laboratory Network

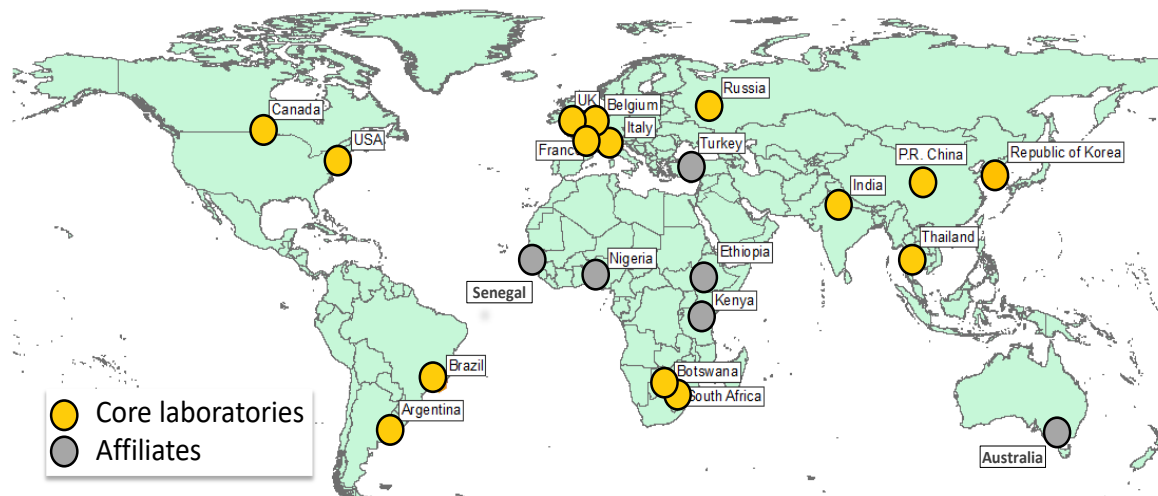
www.foot-and-mouth.org



Network Members
and affiliates:

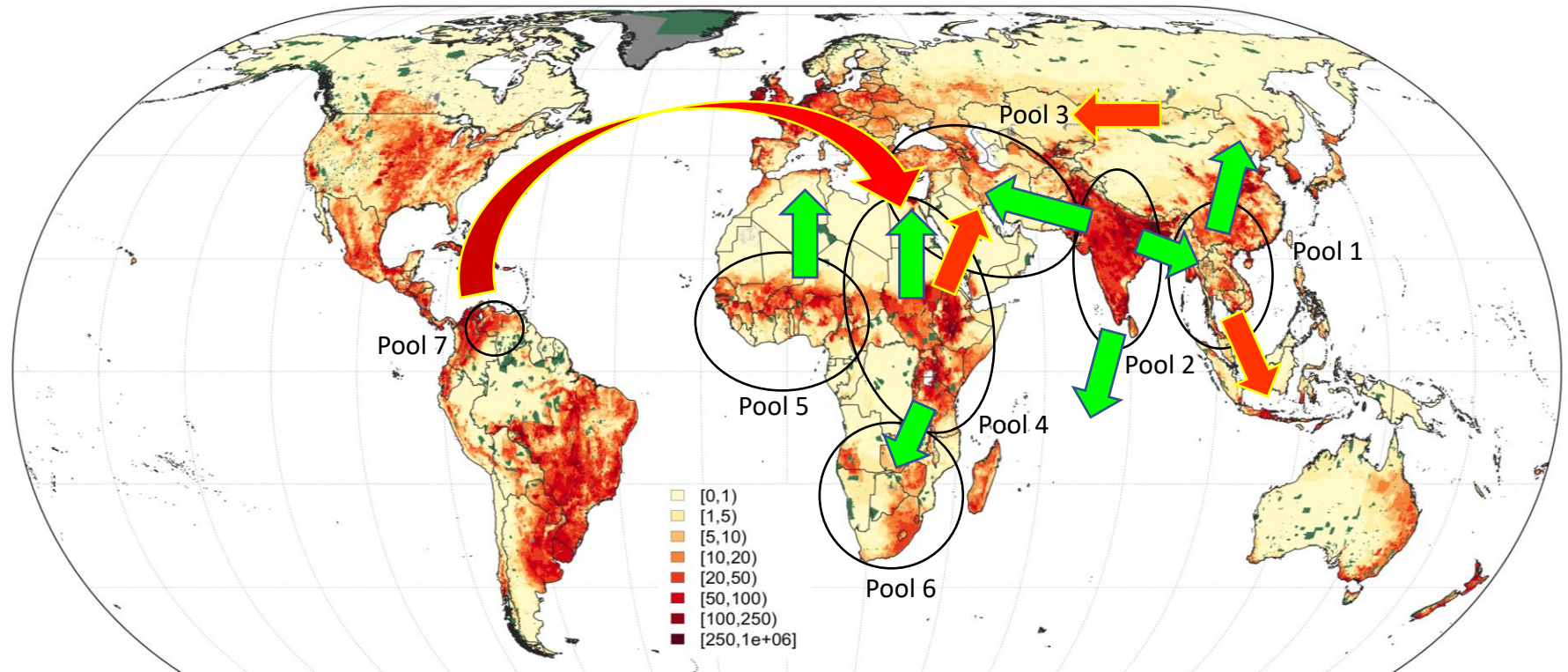
Core activities:

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



2022 Network Meeting, Lelystad, The Netherlands

Trans-pool movements are important



Cattle density map

Robinson et al., 2007

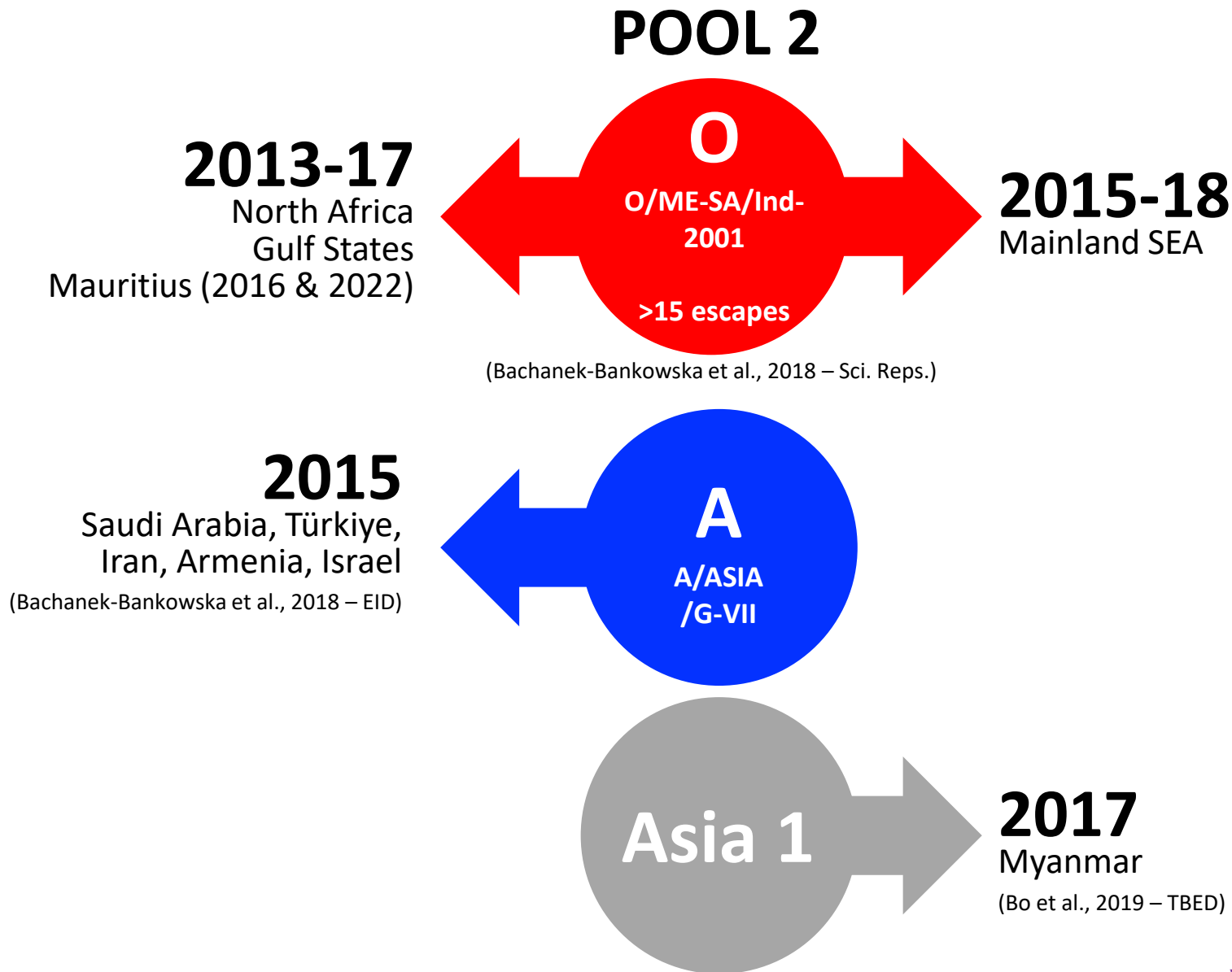


New events 2021-23

Long distance (trans-pool) FMDV movements (since 2015)

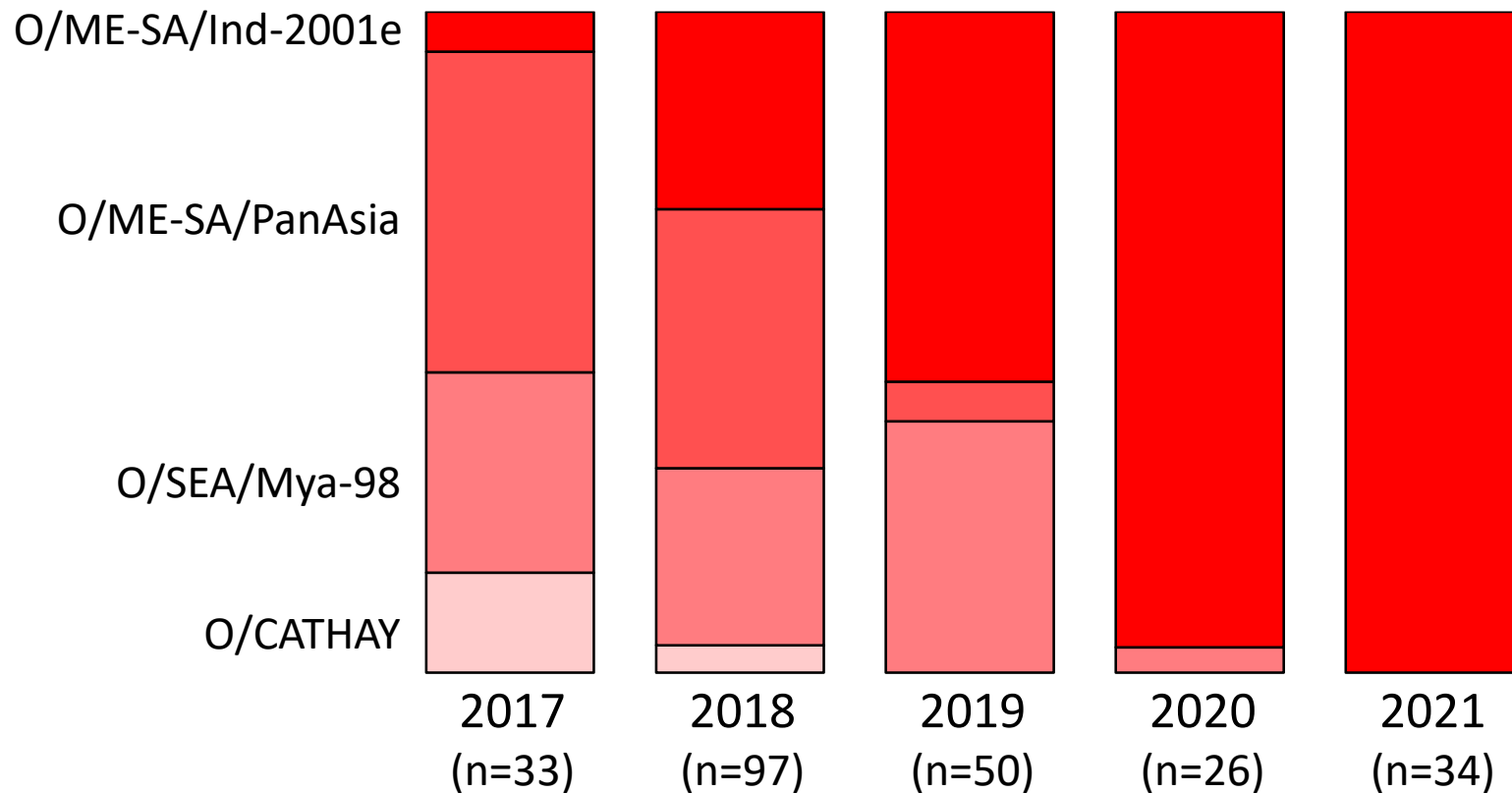
- Impact/change regional FMD risks including FMD free countries
- Selection of vaccines to control outbreaks

Spread beyond Pool 2 – 10-year historical context



Pool 1: dominance of O/ME-SA/Ind-2001e

- Origins in SEA reviewed in Bachenek-Bankowska et al., 2018
- Multiple introductions from Pool 2 – events started in 2015-17
- Serotype O data for SEACFMD countries (WRLFMD data):



Data for 2022: this was the only FMDV lineage detected in samples submitted from Mongolia (2022) and Thailand (2022) – as well as sequences from Malaysia (2022)

O/ME-SA/Ind-2001e in Indonesia

- Previously FMD free (without vaccination) since 1990 (last outbreak in 1986)
- 17.7 million head cattle
- FMD cases detected on 3rd May (simultaneously on Java and Sumatra)
- Outbreaks detected in >200 districts located on 6 main islands (Sumatra, Java, Lombok and Kalimantan, Bali and Sulawesi)
- FMD Reference laboratories providing support to demonstrate that candidate vaccines generate adequate heterologous responses

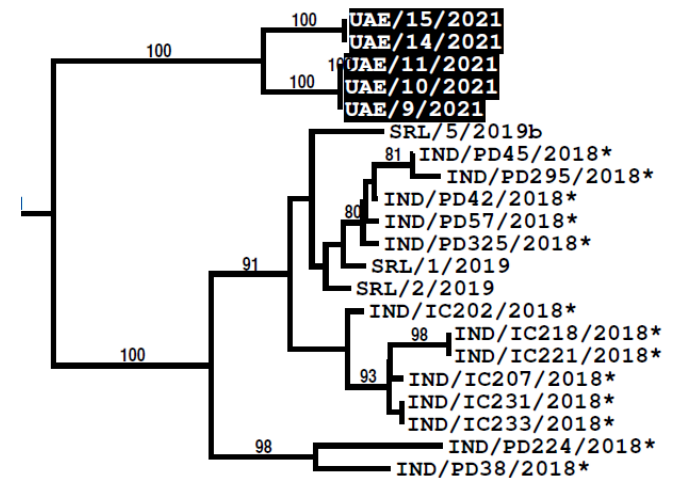
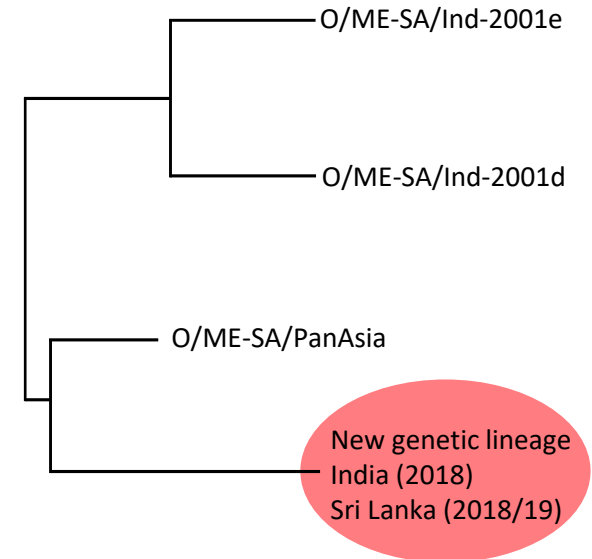


Pool 2/3: O/ME-SA/SA-2018: an emerging lineage?

- New serotype O lineage detected in Pool 2 (India, Bangladesh and Sri Lanka)
- Detected in UAE (2021) in small ruminants (sheep and goats)
- Scope to spread more widely – following pathways for O/ME-SA/Ind-2001 (d and e)
- Vaccine matching for lineage:

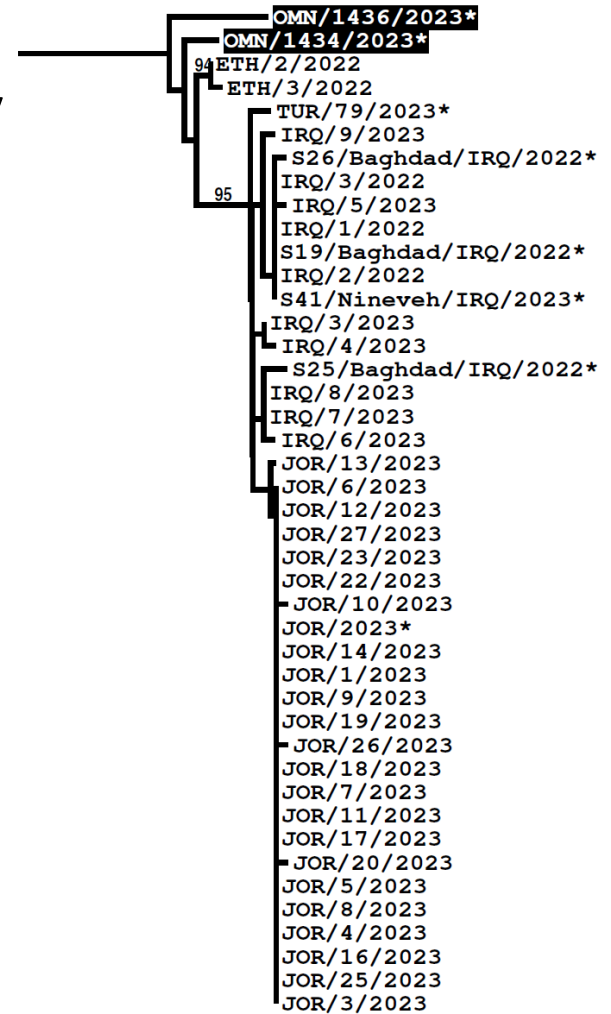
	Vaccine					
	BI	BI	MSD	BG	BI	BI
	O-Manisa	O-3039	O-TUR-5/09	O-Campos	O-Campos	O-PanAsia-2
Matched	4	4	4	2		2
Not-matched					2	

- What factors influence virus dynamics?
 - learning lessons from other successful lineages

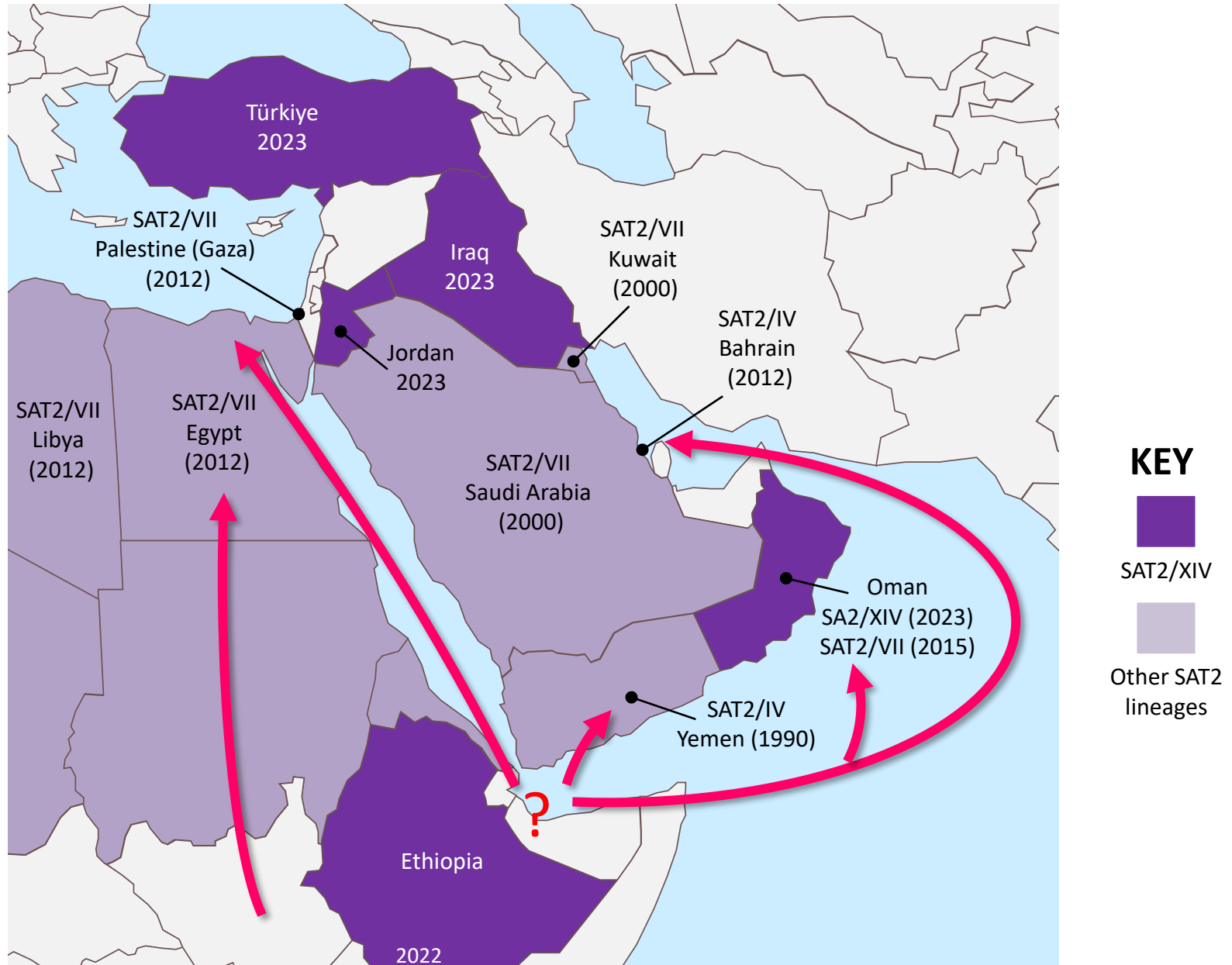


New FMD outbreaks due to SAT2/XIV

- VP1 sequence data and samples:
kindly shared by colleagues at: Central Veterinary laboratory and Researches Veterinary Dept, Iraq; FMD (ŞAP) Institute, Türkiye; JUST, Jordan, Central Laboratory of Animal Health, Oman; Sultan Qaboos University, Oman; ANSES, France and AHI, Ethiopia
- Most closely related to sequences recovered from samples collected in SW Ethiopia in 2022
- To our knowledge, this is the first time that serotype SAT 2 has been detected in Iraq, Jordan or Türkiye
- Topotype XIV has been detected on only one other previous occasion – in 1991



SAT 2 outbreaks in North Africa/Middle East



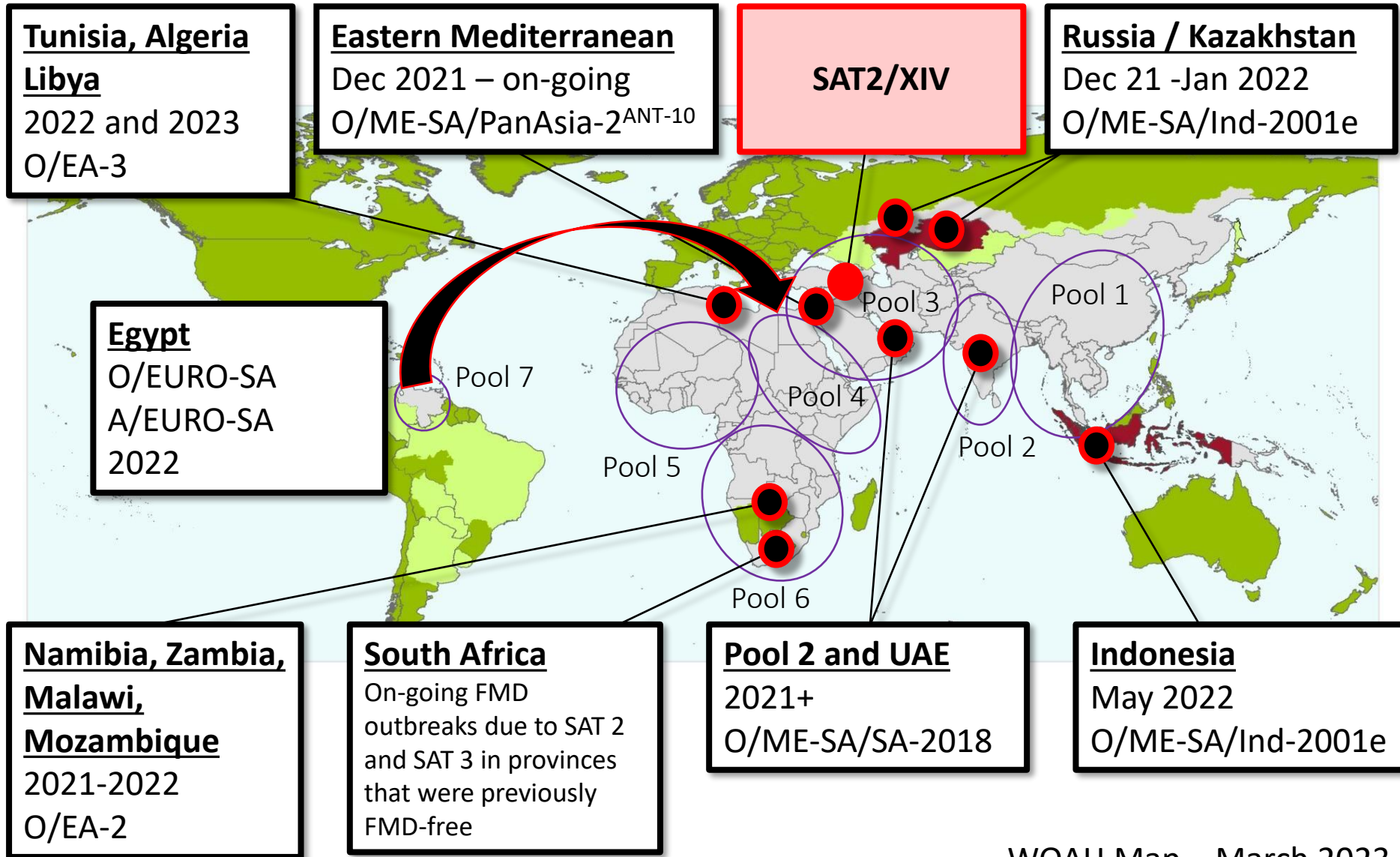
Arrows represent putative transmission pathways in the region (based on sequence relationships for previous outbreaks)

SAT2/XIV – a quickly changing situation

Some points to consider....

1. SAT2/XIV is spreading in naïve animals without any immunity conferred by previous infection/vaccination
2. Reports of mortality associated with SAT2/XIV infection (or secondary infection) and corresponding disease severity particularly in large ruminants (cattle/buffalo) – similar to reports in Egypt in 2012 associated with SAT2/VII outbreaks?
3. Source (and timing) of the virus in the region is currently still being investigated as well as the risk pathways by which SAT2/XIV has been introduced into the region
4. Transmission pathways within affected countries (and within region) are not well understood
5. There is uncertainty about the status of neighbouring countries in the region (wrt SAT2/XIV)

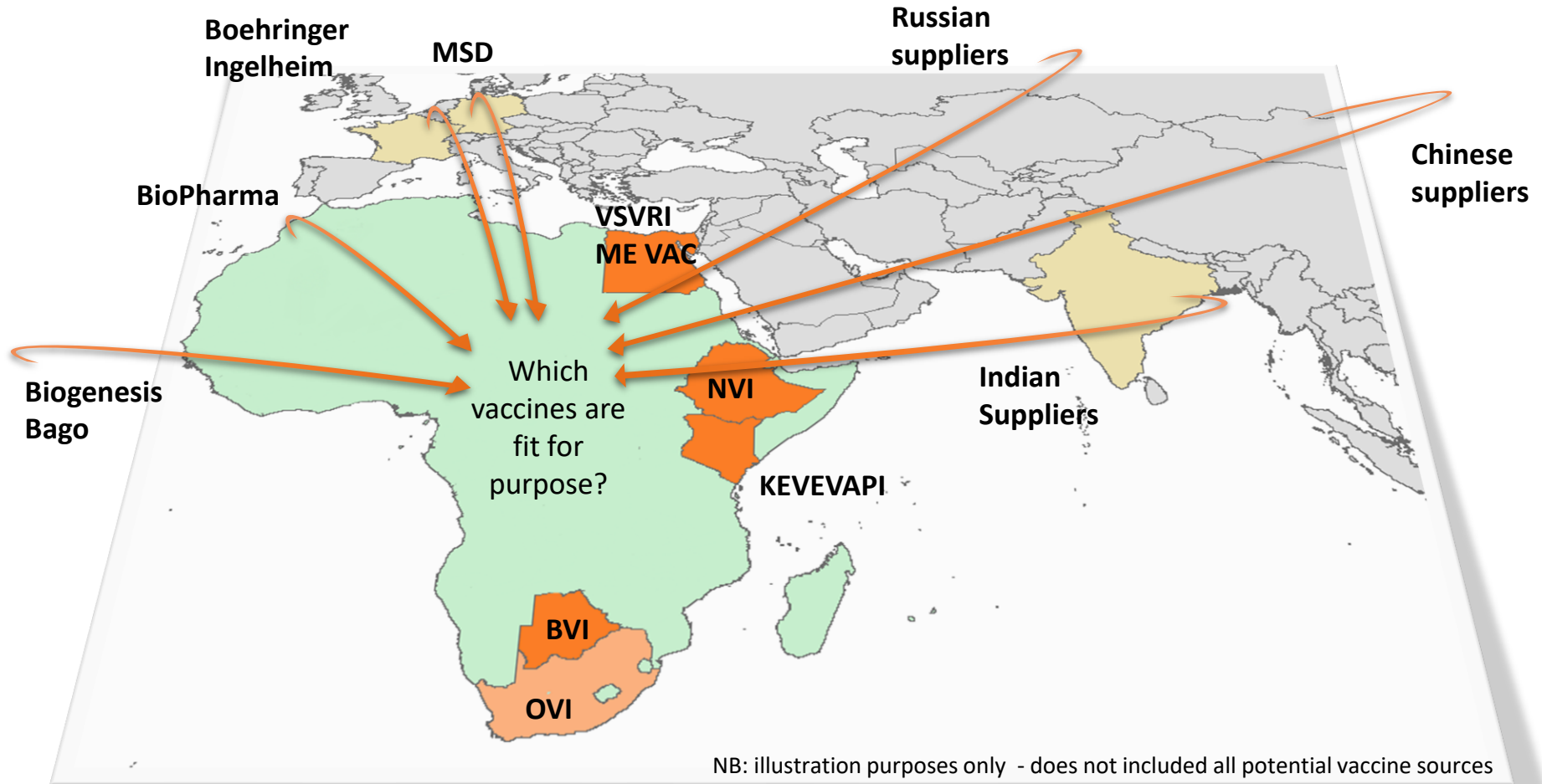
Headline global events (2021/23)



WOAH Map – March 2023

Selection of FMD vaccines is complex

(different antigens, formulation, potency)



Inherent genetic (and antigenic) diversity in field viruses from different FMD serotypes (O, A, SAT 1, SAT 2 [SAT 3])

Vaccine selection for endemic pools



AU-PANVAC
African Union Pan-African Veterinary Vaccine Centre of African Union



Twining project 2019-2022

Obvious gaps and challenges:

1. The quality and performance of FMDV vaccines cannot be easily assessed through **direct** testing – immunisation of animals usually needed
2. Homologous/monovalent QA/QC (OIE Manual) vs heterologous vaccine performance **in the field** with multivalent products
3. WRLFMD only tests a limited number of vaccines

Proposed testing by FMD Reference Laboratories:

- 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/>)
- Adopt standardized protocols for post-vaccination testing (numbers of animals and sampling time points [including booster doses])

Summary....

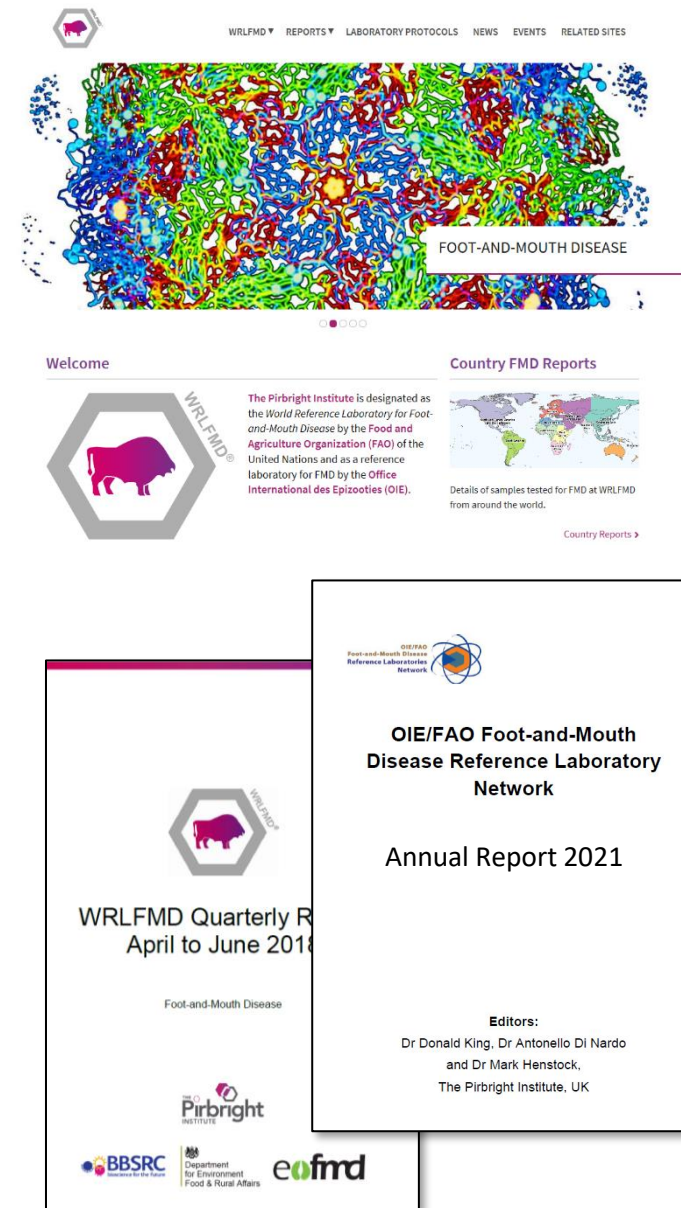
1. FMD epidemiology is very dynamic -
 - FMD viral lineages that arise in endemic pools can spread to other locations
2. Real-time exchange of lab and epi data can be used to enhance our understanding of FMD epidemiology and risk
 - Increasing costs and logistics provide impetus for alternative approaches to collect FMD surveillance data
 - New web-based dashboards (sequences, phylogenetics, FMD vaccines and surveillance) will be available shortly

Final remarks...

- Clinical cases are more difficult to spot in vaccinated animals
- Low probability events often underpin transboundary transmission pathways
- Impacts of FMD are high – is it possible to eliminate all risks?

Further 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 WOA/FAO FMD Laboratory Network (<http://foot-and-mouth.org/>)



Acknowledgements

- Collaborating FMD Reference Laboratories and field teams
- Partners within the WOA/FAO FMD Lab Network
- Support for the WRLFMD and research projects



Department
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