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FMD:
Global and Regional Update
April 2026

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FAO World Reference Laboratory for FMD
WOAH Reference Laboratory for FMD

Acknowledgements: Valerie Mioulet, Nick Knowles, Anna Ludi, Britta Wood, Ginette Wilsden, Krupali Parekh, Andrew Shaw, Antonello Di Nardo, Jemma Wadsworth, Clare Browning, Mark Henstock, Hayley Hicks, Victoria Chantler, David Paton, Nuredlina Prior, Dexter Wiseman, Ali Al-Rashed, Jozhel Baguisi, Harry Bull, Ryle Water, Deyzi Santos, Amy Sowood, Sarah Belgrave, Jessie Trussler

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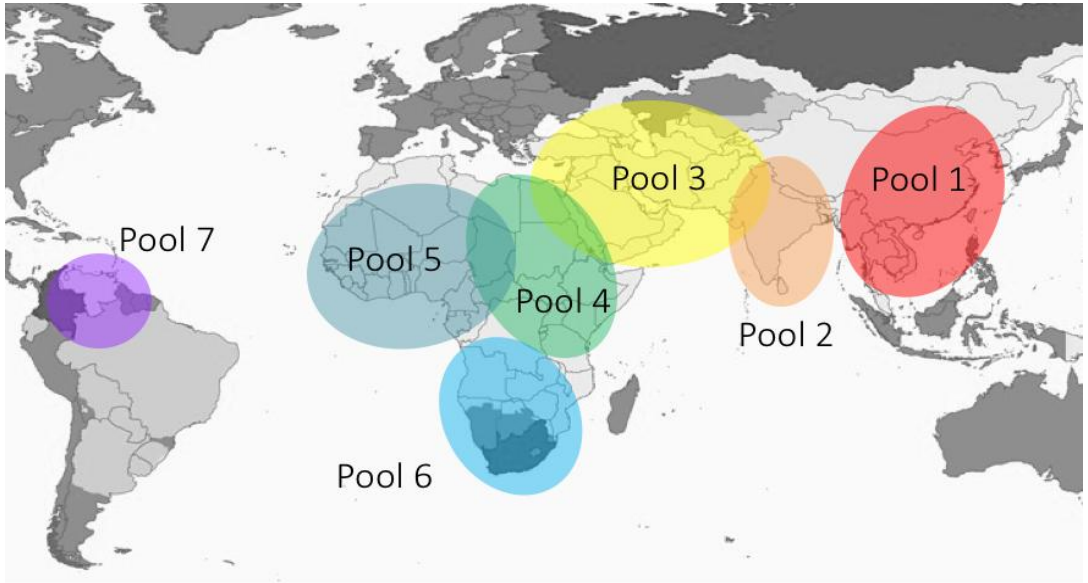
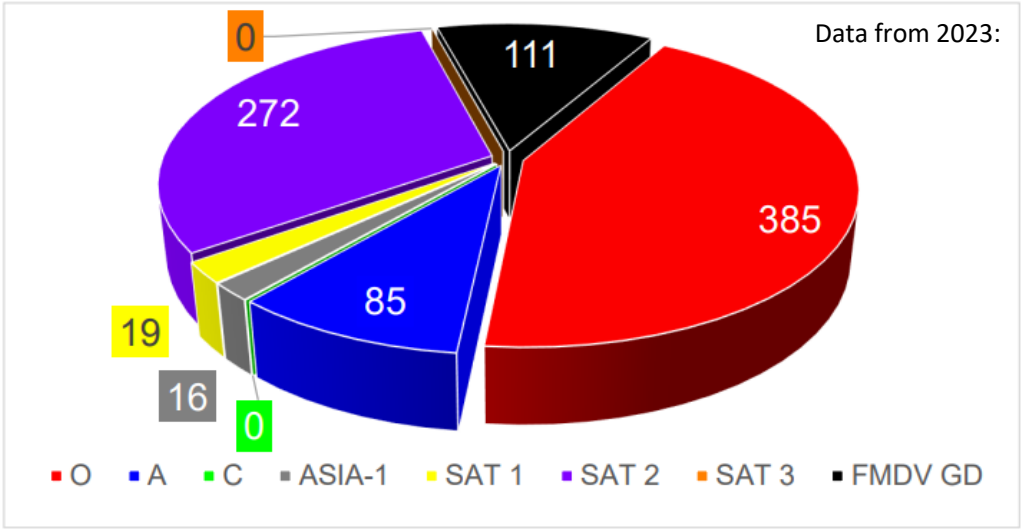
FMD epidemiology: background

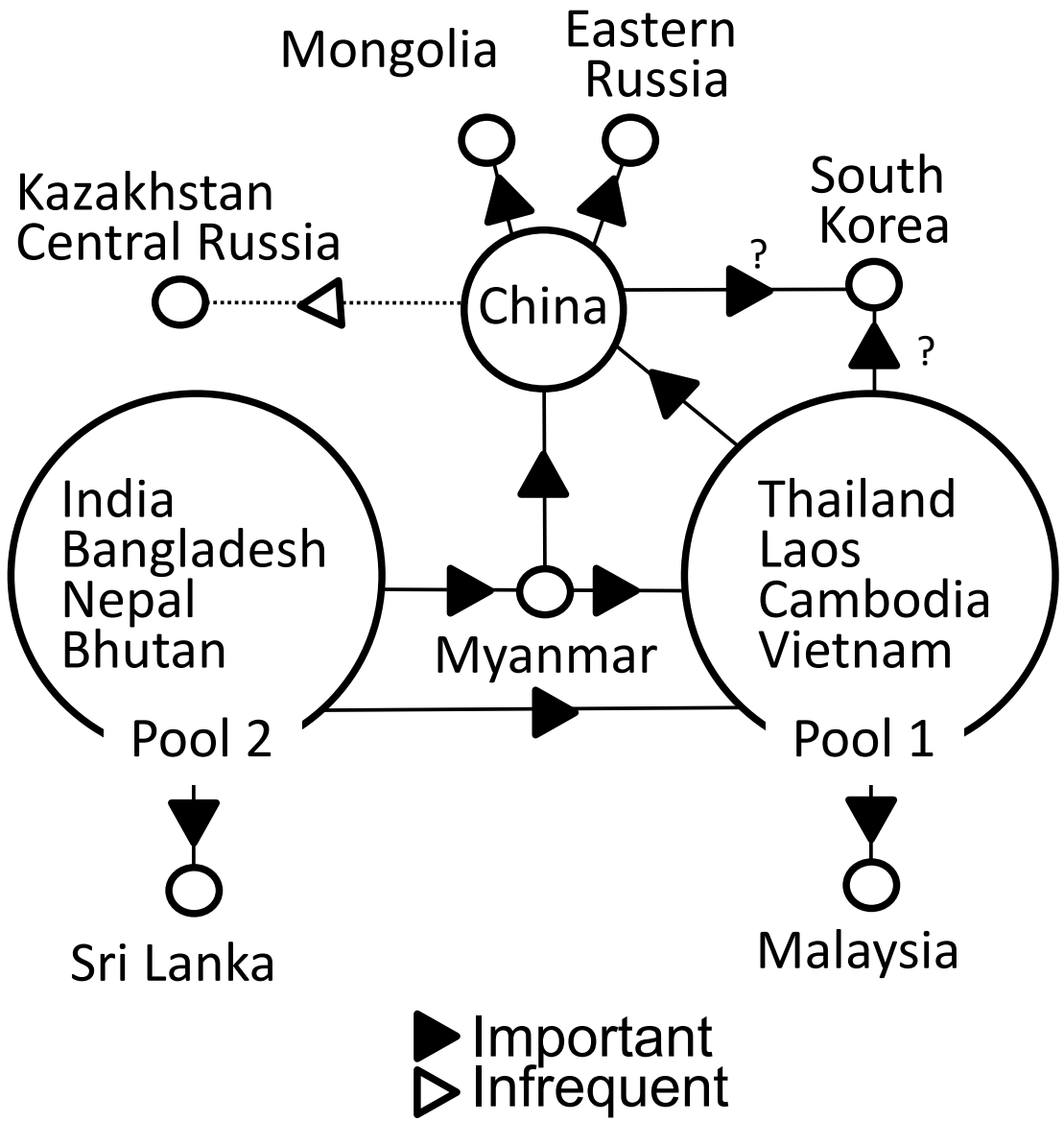
The epidemiology of FMD is dynamic, defined by:

- Seven virus ecosystems (Pools) that maintain specific FMDV strains requiring tailored diagnostics and vaccines
- Six circulating FMDV serotypes with an unequal distribution
  - Serotype C has not been detected globally since 2004
  - Serotype O is globally the most dominant serotype





Conjectured FMDV connections: South Asia, Southeast/East Asia



Viral sequences highlight most frequent connections between countries (reflect trade and animal movements)

Potential risk pathways:

- Legal and illegal imports
- Import of fodder
- Overseas workers
- Returning travellers
- Wildlife

Spread beyond Pool 2 – 10-year historical context

POOL 2

2013+
North Africa
Gulf States
Mauritius (2016 & 2022)

O
O/ME-SA/Ind-2001
>15 escapes

2015+
Mainland SEA

2015
Saudi Arabia, Türkiye, Iran, Armenia, Israel
(Bachanek-Bankowska et al., 2018 – EID)

A
A/ASIA /G-VII

Asia 1

2017
Myanmar
(Bo et al., 2019 – TBED)

Pool 1: Status in 2025

Characterisation of different FMD virus lineages

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

Country	O					A		Asia-1
	ME-SA/Ind-2001e	SEA / Mya-98	CATHAY	ME-SA / PanAsia	ME-SA/ PanAsia-2	ASIA / Sea-97	ASIA/Ind	
Cambodia	2024	2016		2024		2016		
Laos	2024	2017		2024		2018		
Malaysia	2024	2016	2005	2023	2009	2023		
Myanmar	2022	2021				2021	2010	2017
Thailand	2024	2018	2012	2019		2022		
Vietnam	2023	2024	2018	2024		2017		2007
PR China	2025	2020	2024	2019		2019		2009
Indonesia	2025							
Mongolia	2022	2018		2017		2016		

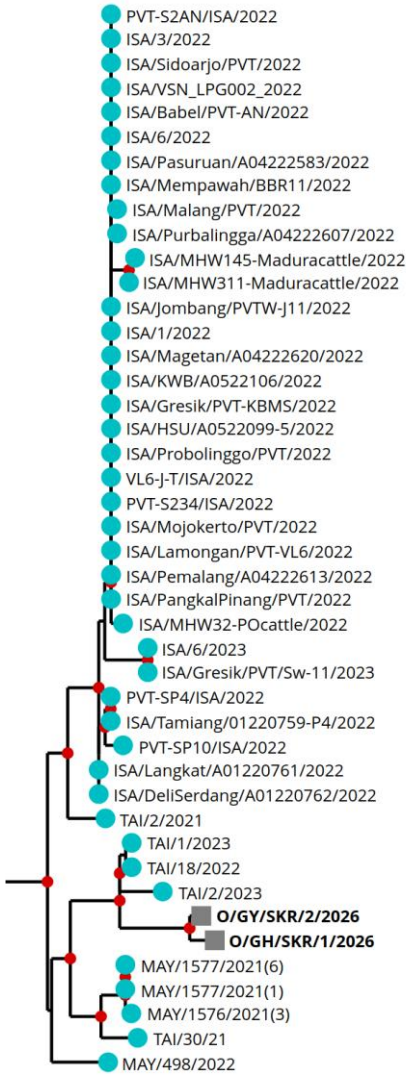
*Recent papers: Khanh et al., (2025)

2026: New FMD outbreaks in South Korea

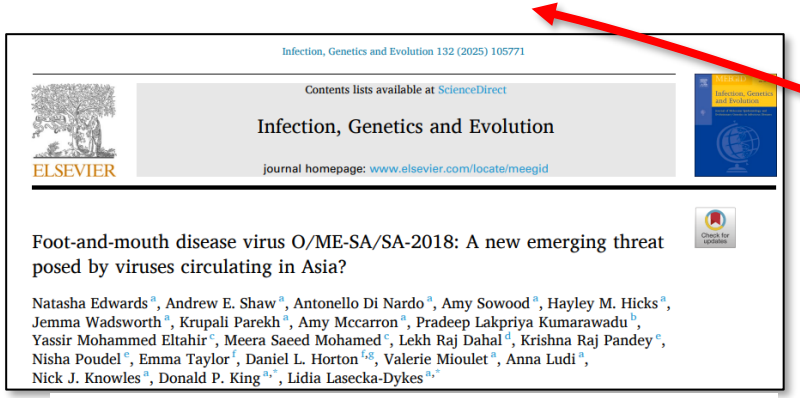
- Two FMD outbreaks in February and March
- Affecting cattle in Incheon and Gyeonggi-do
- O/ME-SA/Ind-2001e lineage
- **New introduction of FMDV into South Korea** – different to the virus that caused outbreaks in 2025

The Korea Herald

[S. Korea reports 2nd foot-and-mouth disease case - The Korea Herald]



O/ME-SA/SA-2018: pathways from Pool 2 into Pool 3



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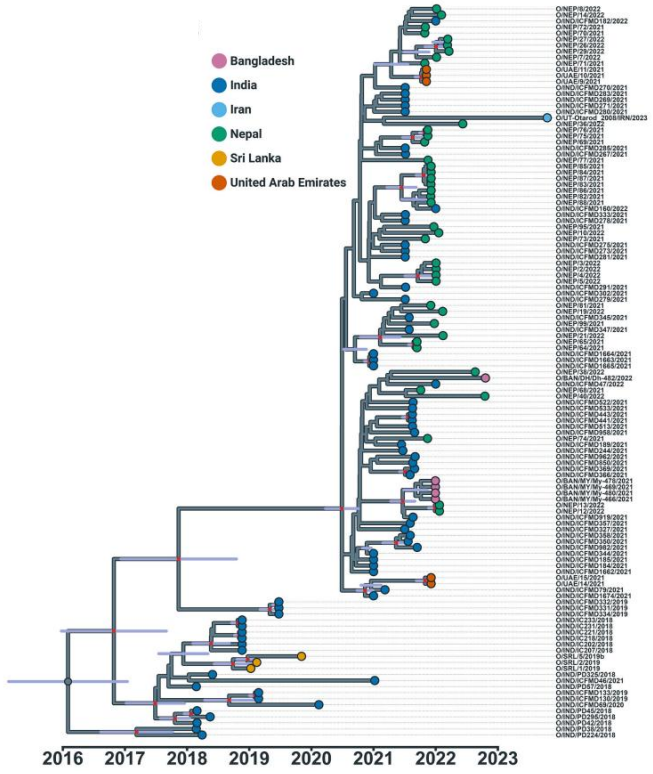
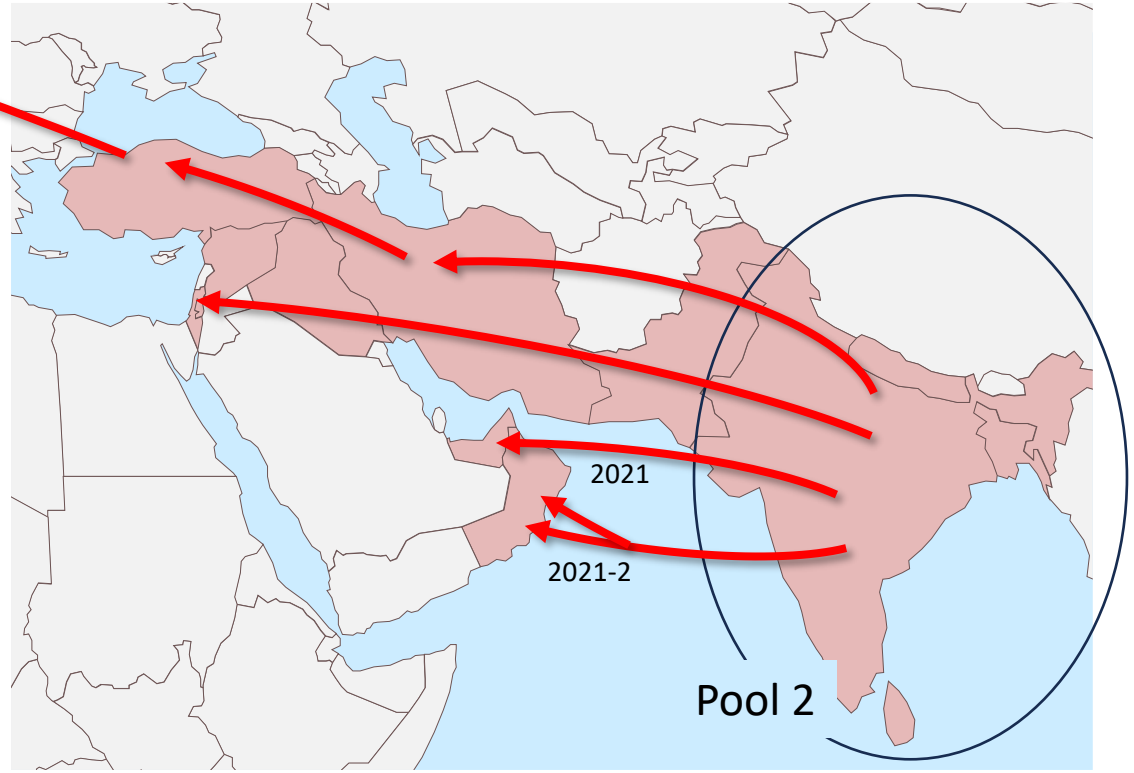
journal homepage: www.elsevier.com/locate/meegid

Foot-and-mouth disease virus O/ME-SA/SA-2018: A new emerging threat posed by viruses circulating in Asia?

Natasha Edwards [a], Andrew E. Shaw [a], Antonello Di Nardo [a], Amy Sowood [a], Hayley M. Hicks [a], Jemma Wadsworth [a], Krupali Parekh [a], Amy Mccarron [a], Pradeep Lakpriya Kumarawadu [b], Yassir Mohammed Eltahir [c], Meera Saeed Mohamed [c], Lekh Raj Dahal [d], Krishna Raj Pandey [e], Nisha Poudel [e], Emma Taylor [f], Daniel L. Horton [f,g], Valerie Mioulet [a], Anna Ludi [a], Nick J. Knowles [a], Donald P. King [a,*], Lidia Lasecka-Dykes [a,*]





O/ME-SA/SA-2018

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கால்நடை உற்பத்தி சுகாதாரத் திணைக்களம் - இலங்கை
Department of Animal Production & Health - Sri Lanka

- Spread conforms to the *East-to-West virus conveyer* – that has been documented for other lineages
- **Risk to Southeast Asia**

Updated FMD risks for Pool 3 (since 2020)

New virus introductions from South Asia and East Africa:

Estimated number of incursions

Lineage	x
SAT2/XIV	5
SAT1/I	2-3
O/EA-2	1
O/EA-3	2
A/AFRICA/G-I	2

East Africa (Pool 4)

West Asia, Gulf States and ME (Pool 3)

Endemic FMDV lineages:

- O/ME-SA/PanAsia-2*
- A/ASIA/Iran-05

  First cases in Türkiye in six years (09/24)
- Asia 1

*Note: New O/ME-SA/PanAsia-2 designations are proposed by Jamal et al., (2025) Emergence of new sublineages of serotype O foot-and-mouth disease viruses circulating in Pakistan during 2012-2021. *Virology* **605:** 110455

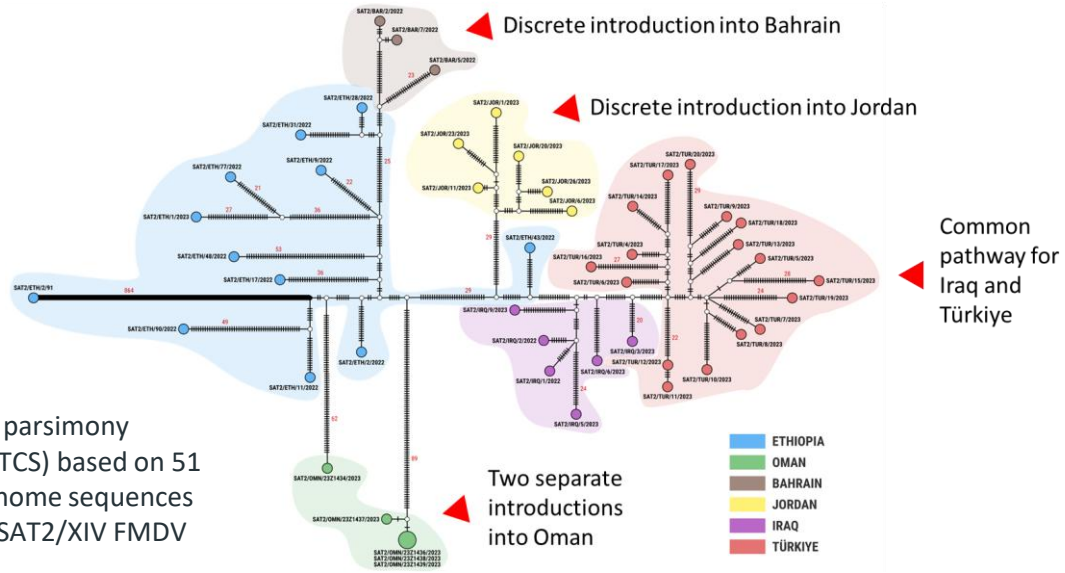
South Asia (Pool 2)

Lineage	x
O/ME-SA/SA-2018	~4
O/ME-SA/Ind-2001e	
A/ASIA/G-VII†	

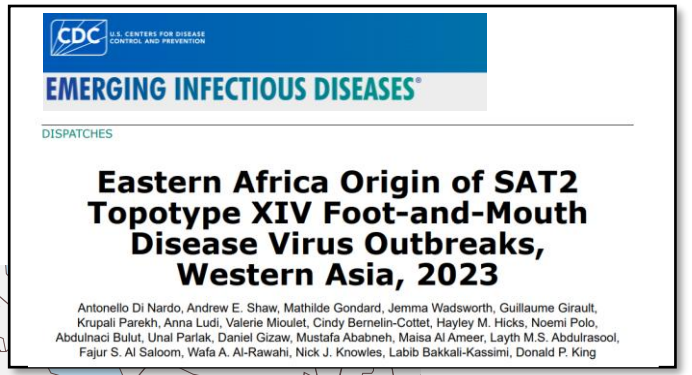
†Last reports cases in Pool 3 were in 2018 (Iran)

2022-25: FMD outbreaks due to the SAT2/XIV topotype

- 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

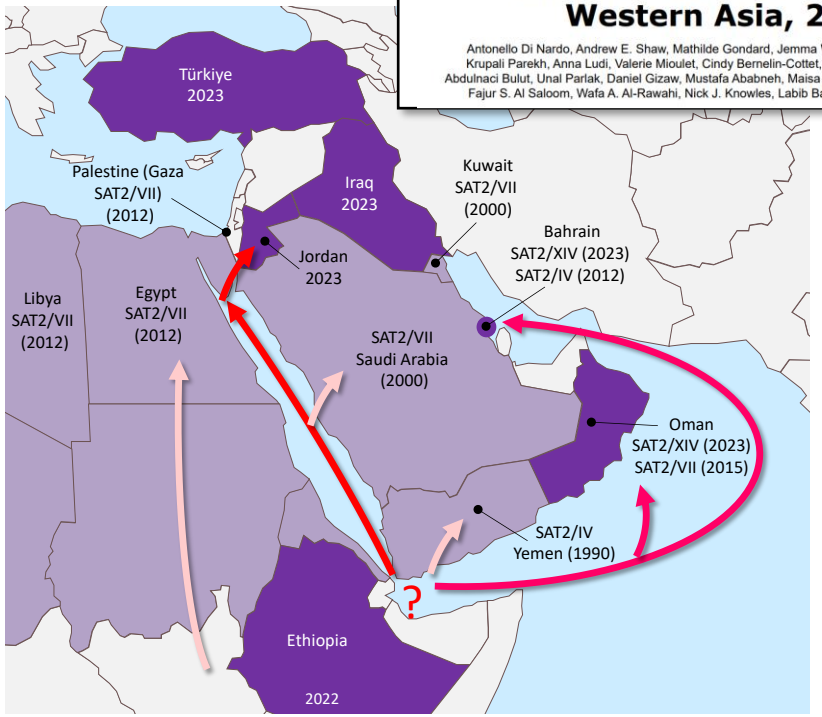


Statistical parsimony network (TCS) based on 51 whole-genome sequences (WGS) of SAT2/XIV FMDV isolates:


CDC U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION
EMERGING INFECTIOUS DISEASES®
DISPATCHES

Eastern Africa Origin of SAT2 Topotype XIV Foot-and-Mouth Disease Virus Outbreaks, Western Asia, 2023

Antonello Di Nardo, Andrew E. Shaw, Mathilde Gondard, Jemma Wadsworth, Guillaume Girault, Krupali Parekh, Anna Ludi, Valerie Mioulet, Cindy Bernelin-Cottet, Hayley M. Hicks, Noemi Polo, Abdulnaci Bulut, Unal Parlak, Daniel Gizaw, Mustafa Ababneh, Maisa Al Ameer, Layth M.S. Abdulrasool, Fajur S. Al Saloom, Wafa A. Al-Rawahi, Nick J. Knowles, Labib Bakkali-Kassimi, Donald P. King



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

Ministry of Municipalities Affairs and Agriculture

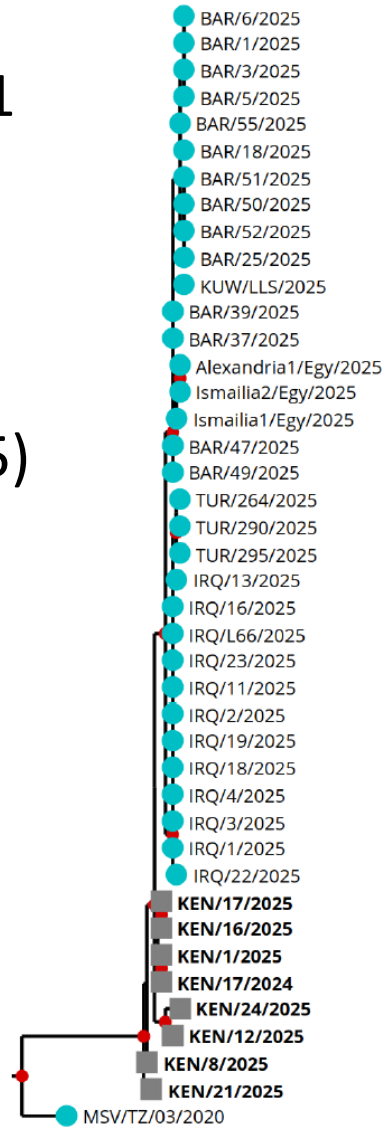
anses

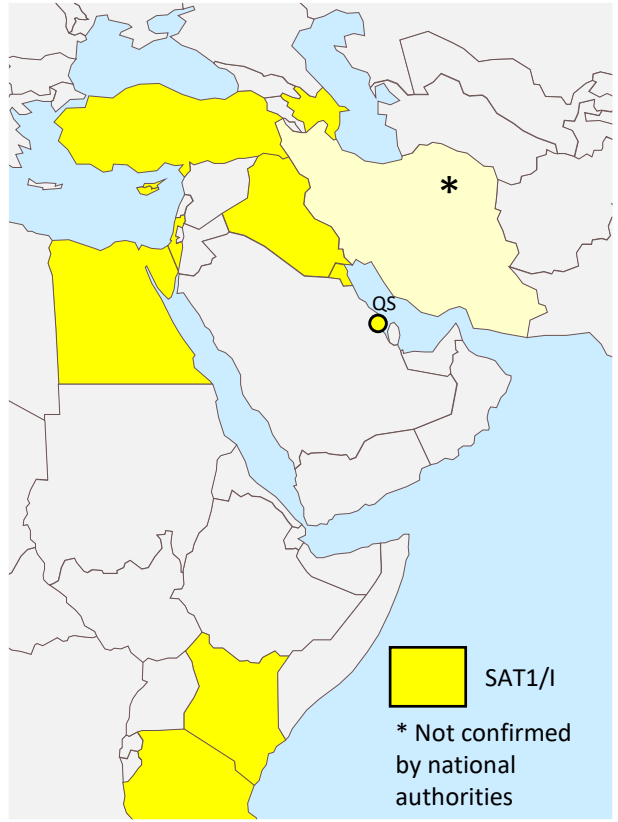
2025: Emergence of serotype SAT1 in the Middle East

Bahrain, Kuwait, Iraq, Türkiye and Egypt

- Reports of outbreaks in Iraq (Feb 2025) where local testing (by agELISA) identified serotype SAT1
- **SAT1/I** with >15% nt difference to the seqs from Qatar (2023) separate introductions into Pool 3
- SAT1 outbreaks in Bahrain (Jan 2025), Kuwait (April 2025), Türkiye (May 2025), Egypt (July 2025) due to SAT1/I topotype
- Vaccine matching:

Isolate	SAT1/Rho78[BI] r1value	SAT1/Rho78[BI] heterologous titre (log_{10})
BAR/37/2025	0.31	2.20
BAR/50/2025	0.39	2.30
IRQ/1/2025	0.26	2.13
IRQ/11/2025	0.19	2.00
QTR/6/2023	0.42	2.34
QTR/7/2023	0.61	2.50





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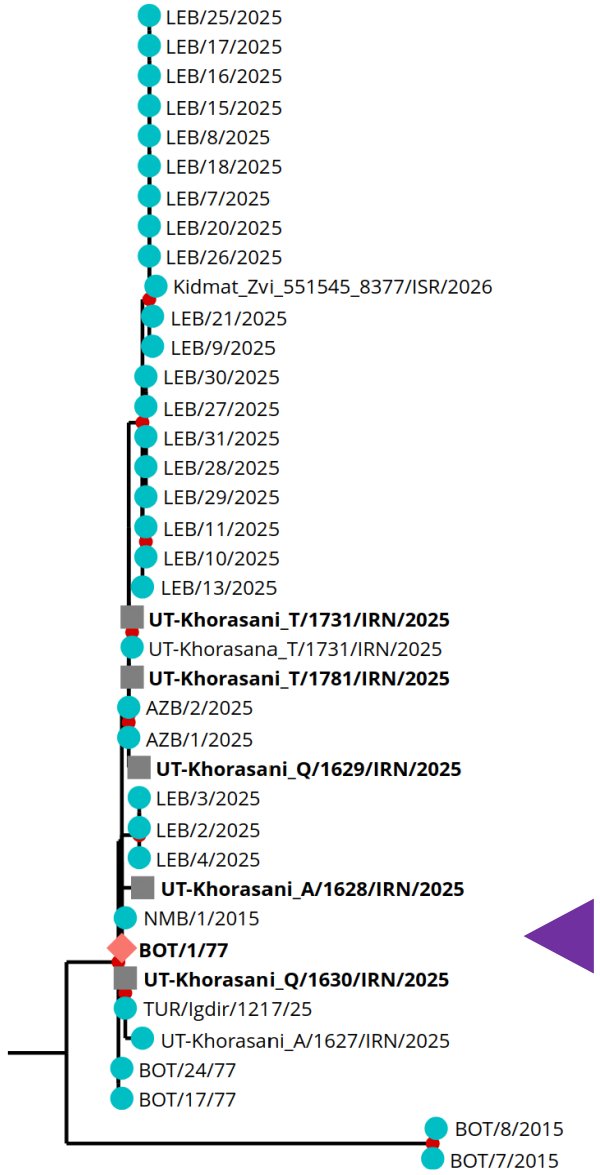
معهد بحوث الصحة الحيوانية
Animal Health Research Institute

November 2025 - new sequence data ……..

- VP1 sequence provided from the SAP Institute, Türkiye
- **Characterised as SAT1/III**
- Closely related (99.5% identity) to BOT/1/77 that is used as a vaccine strain by some companies



Co-circulation of serotype SAT 1 topotypes

Current data for 2025/26:

Country	From Pool 4 (East Africa) SAT 1/I	Vaccine escape? SAT 1/III
Bahrain	Yes (in quarantine)	
Iraq	Yes	
Kuwait	Yes	
Türkiye	Yes	Yes
Iran		Yes*
Egypt	Yes	
Lebanon		Yes
Azerbaijan		Yes
Israel		Yes
Cyprus		Yes
Syria		Yes*
Greece	Not yet reported	
CHINA	Not yet reported	

*Outbreaks not confirmed by the national authorities

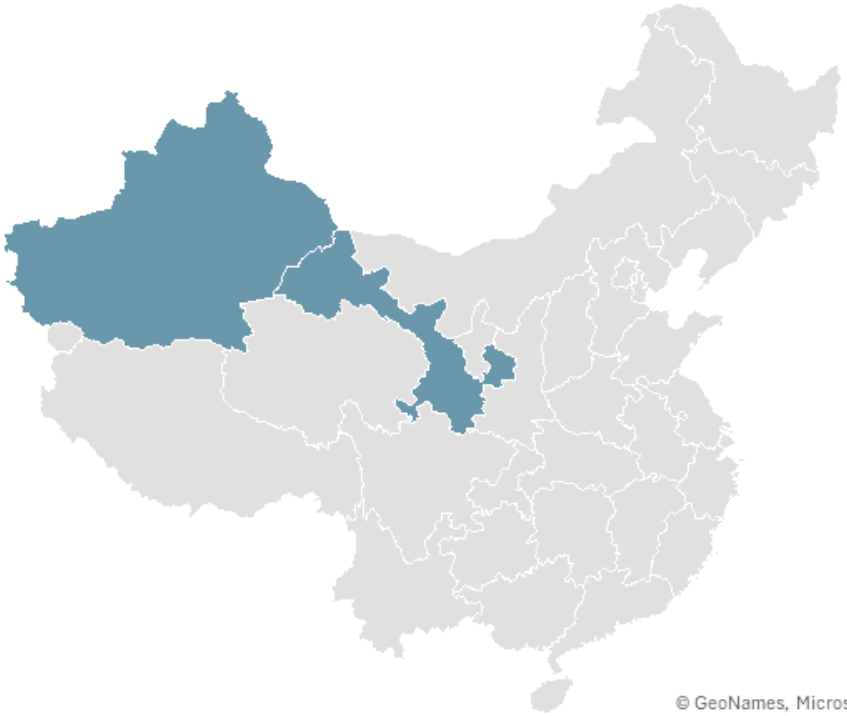
Serotype SAT 1 in China ……..

- **Not yet reported to WOAH-WAHIS**
- 2/4/26: reports of FMD outbreaks in cattle
- 216 cases of FMD in two herds
- Affected regions: Gansu province and the Xinjiang Uyghur Autonomous Region
- Reports describe links to the northwest border, a region that touches Kazakhstan, Mongolia, Russia and other countries
- First time that serotype SAT 1 has been detected in China
- Unconfirmed rumours of FMD in Russia

Press reports:

CHINA

China tightens border controls, culls cattle amid foot-and-mouth outbreak



Potential impacts of SAT 1

- Absence of pre-existing immunity in livestock to SAT 1
- Animals are naïve to this serotype - potential for rapid spread
- Cases can be expected to have high clinical impact

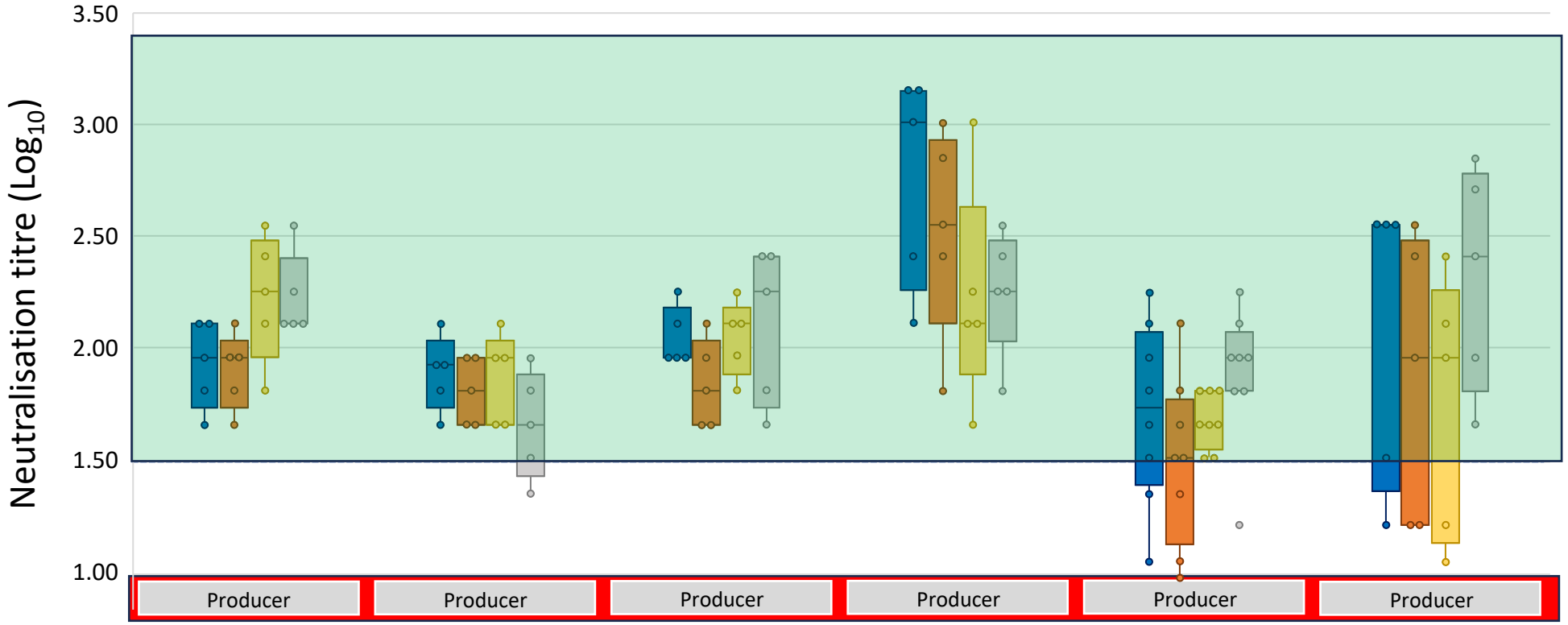
- Limited availability of SAT 1-specific vaccines

- Evidence gaps for disease epidemiology, species susceptibility and immune correlates

- FAO risk assessment published on the 4/3/26 (already out of date!):

https://www.fao.org/animal-health/rapid-risk-assessment-fmd/en

Heterologous responses of SAT1 vaccines against SAT1/I field isolates



Biogénesis Bagó	**DOLLVET**	**Boehringer Ingelheim**	**Biopharma**	**KEVEVAPI**	**BVI**
SAT1 2020	SAT1/BOT/1/77	SAT1/RHO-78	O/A/SAT1/SAT2	SAT1 T155	SAT 109
30dpv	21dpv	21dpv	21dpv	21dpv	35dpv
n=5	n=5	n=5	n=5	n=8	n=5

eufmd
European Commission for the Control of Foot-and-Mouth disease

Viral antigens
- BAR/50/2025
- IRQ/11/2025
- QTR/7/2023
- TAN/22/2014 *

*East Africa reference antigen (Paton et al., 2025)

Source of sera

Sera collected Day post-vaccination

NB: Some of the sera used for this testing was generated from trial-blends of vaccines and therefore customers are advised to carry out in-country testing with the final formulated product to confirm that responses in vaccinated animals achieve these levels of FMDV-specific antibody.

Vaccine matching for SAT1/III field isolates

- High (genetic) diversity of SAT 1
- Testing of vaccines and field isolates for SAT1/III is underway
- Vaccine efficacy is influenced by vaccine potency, antigenic match and vaccination regime.
- r1 = < 0.3 - suggests that the field isolate is antigenically different to the vaccine strain.

NB: Where there is no alternative, the use of this vaccine should carefully consider vaccine potency, the possibility to use additional booster doses and monitoring of vaccinated animals for heterologous responses

late	SAT1/Rho78[BI]		SAT1 2020 [BB]		SAT1 IRQ 2025 [DV]		SAT1/BOT/1/77[DV]		SAT1/HWANGE/94[DV]	
	r1value	heterologous titre (log_{10})	r1value	heterologous titre (log_{10})	r1value	heterologous titre (log_{10})	r1value	heterologous titre (log_{10})	r1value	heterologous titre (log_{10})
BOT/1/77	0.50	2.25								
AZB/1/2025	0.60	2.34								
AZB/2/2025	0.51	2.27								
LEB/8/2025	0.64	2.37								
LEB/9/2025	0.40	2.16								
LEB/10/2025	0.40	2.16								
SAR/6/2025	0.38	2.24	0.10	1.62	0.34	2.39	0.38	2.20	0.07	2.06
SAR/8/2025	0.38	2.24	0.08	1.51	0.26	2.27	0.32	2.13	0.08	2.09

Headline global status for FMD (April 2026)

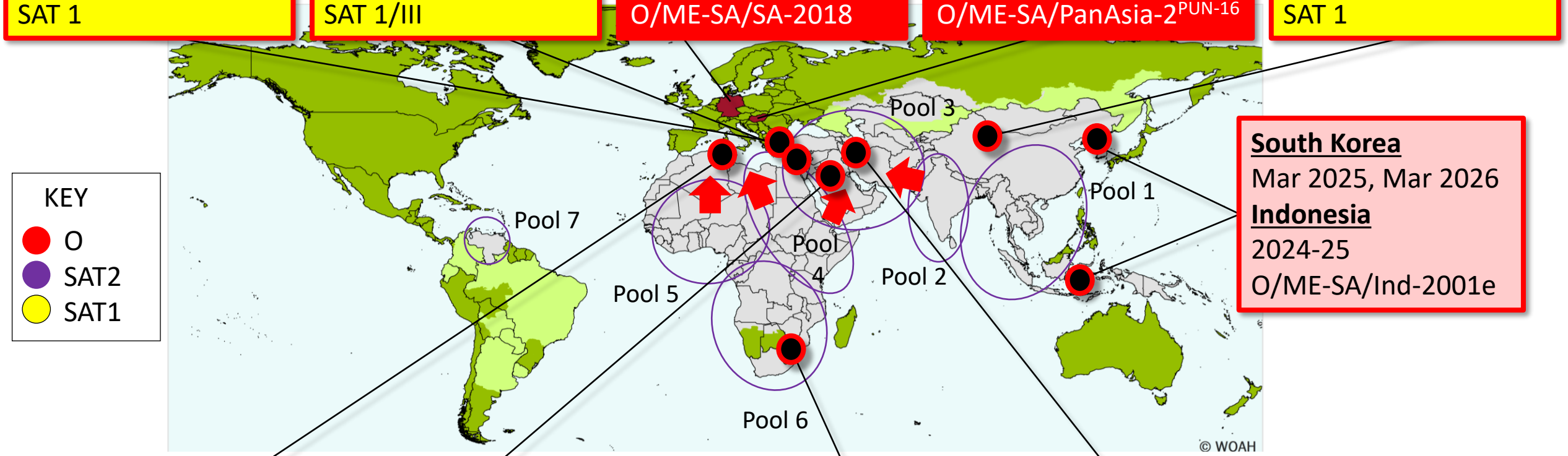
Greece
Mar 2026
SAT 1

Cyprus
Dec 2025
SAT 1/III

Germany
Jan 2025
O/ME-SA/SA-2018

Hungary, Slovakia
Mar 2025
O/ME-SA/PanAsia-2^{PUN-16}

China
April 2026
SAT 1



South Korea
Mar 2025, Mar 2026
Indonesia
2024-25
O/ME-SA/Ind-2001e

Maghreb (2025)
O/EA-3
Algeria (2023/4)
SAT2/V

Middle East (2025)
SAT1/I and SAT1/III
Middle East (2023)
SAT2/XIV

Southern Africa
Serotype SAT2
(and SAT1 & SAT3)
Eswatini
SAT2

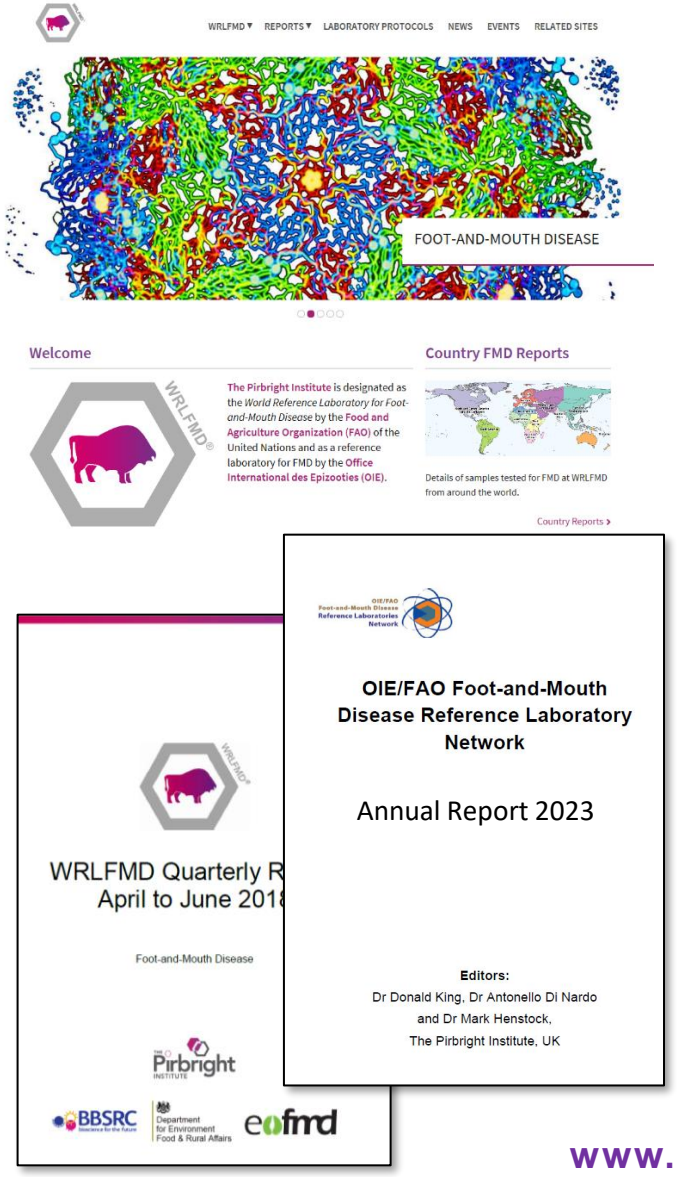
Iran, Iraq, Syria, Türkiye, Palestine, Pakistan, Israel
2023-2025
O/ME-SA/SA-2018

Talk summary

- Epidemiology of FMD is very dynamic
- New patterns due to virus incursions from East Africa and southern Asia
- Circulation of different FMD virus lineages impact the selection of appropriate vaccines to control outbreaks
- **New risks for countries in Southeast Asia**
- Sampling of field outbreaks is critical……
- WRLFMD and the WOAH/FAO Lab Network welcome sample submissions
  - Testing is free of charge
  - Contact: donald.king@pirbright.ac.uk
- Testing/evaluation of FMD vaccines is important
  - Vaccine matching
  - Heterologous testing
  - Small scale immunogenicity studies and evaluation of FMD vaccines in the field

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 WOAH/FAO FMD Laboratory Network (http://foot-and-mouth.org/)
    - OpenFMD (www.openfmd.org) – sequences, genotyping, vaccine selection and surveillance



Thanks:

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