FMD:

Global FMD Situation and Risks

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FAO World Reference Laboratory for FMD

WOAH Reference Laboratory for FMD

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FMD epidemiology: background

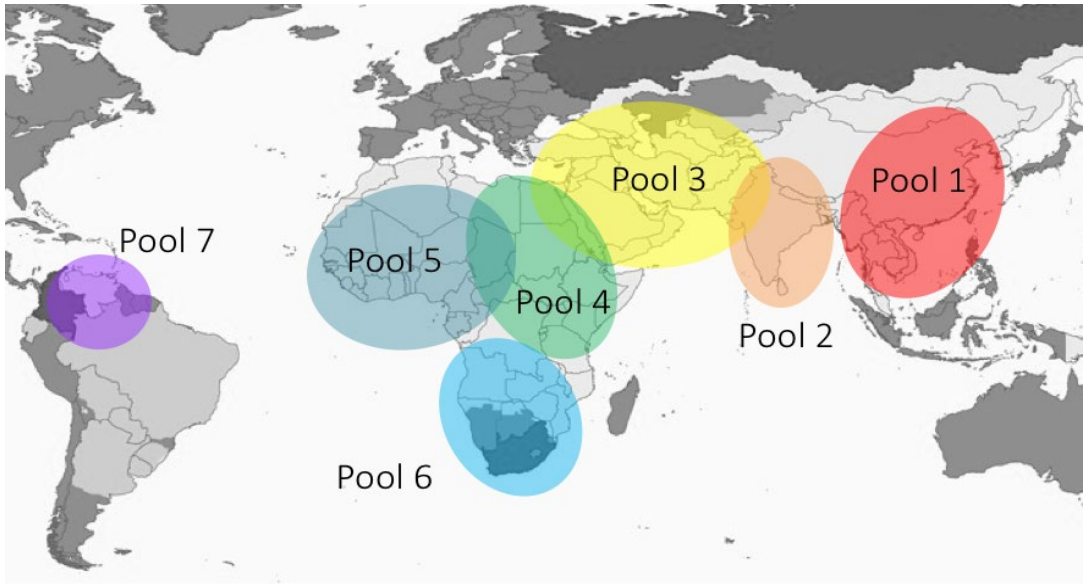
The epidemiology of FMD is dynamic, defined by:

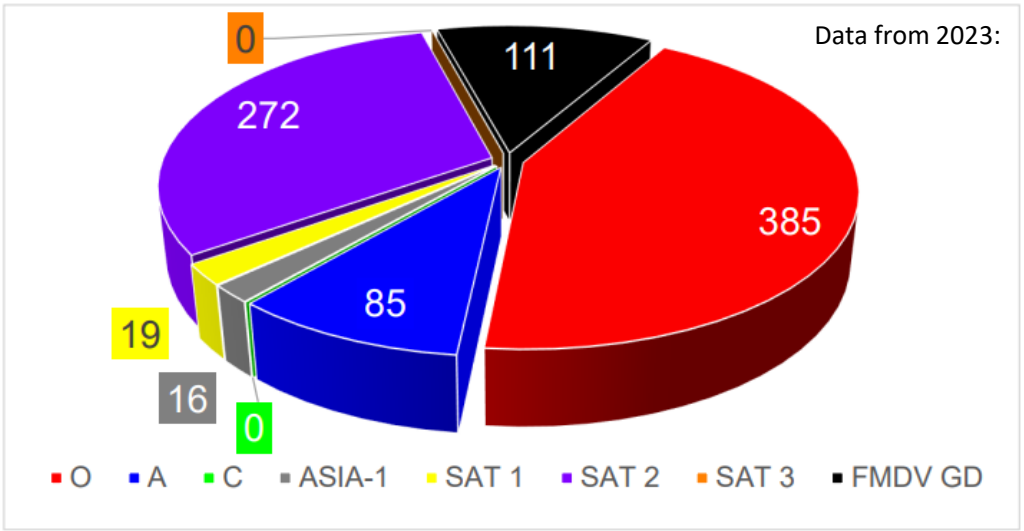
- Seven virus ecosystems (Pools) that maintain specific FMDV strains requiring tailored diagnostics and vaccines
- Six circulating FMDV serotypes with an unequal distribution
  - Serotype C has not been detected globally since 2004
  - Serotype O is globally the most dominant serotype

FMD control has led to FMD freedom in South America (except Venezuela)

2025: FMD incursions into Europe (O and SAT 1)

Loss of FMD free status in Indonesia (2022) and countries in southern Africa (2021 -)





Headline global status for FMD (November 2026)

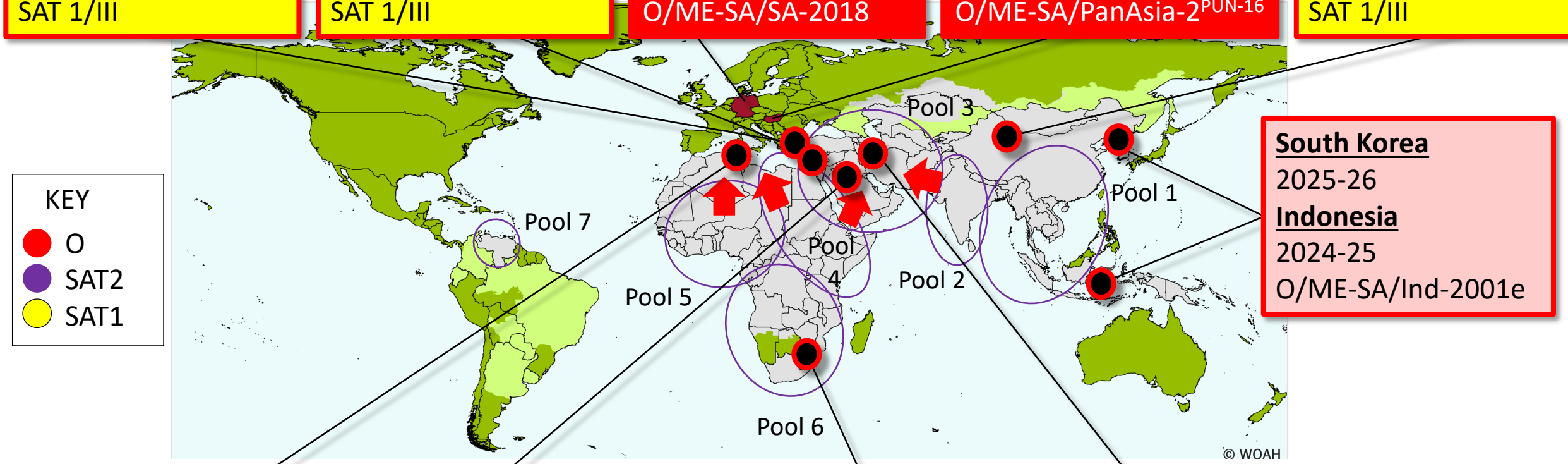
Greece
Mar 2026
SAT 1/III

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 & Mongolia
April 2026
SAT 1/III



South Korea
2025-26
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 SAT1
(and SAT2 & SAT3)
Eswatini, Lesotho
SAT1

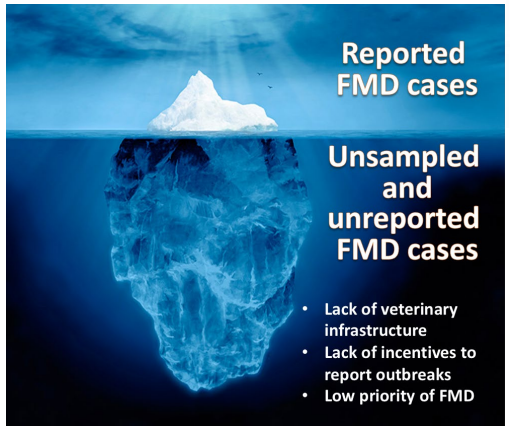
Iran, Iraq, Syria, Türkiye, Palestine, Pakistan, Israel
2023-2025
O/ME-SA/SA-2018

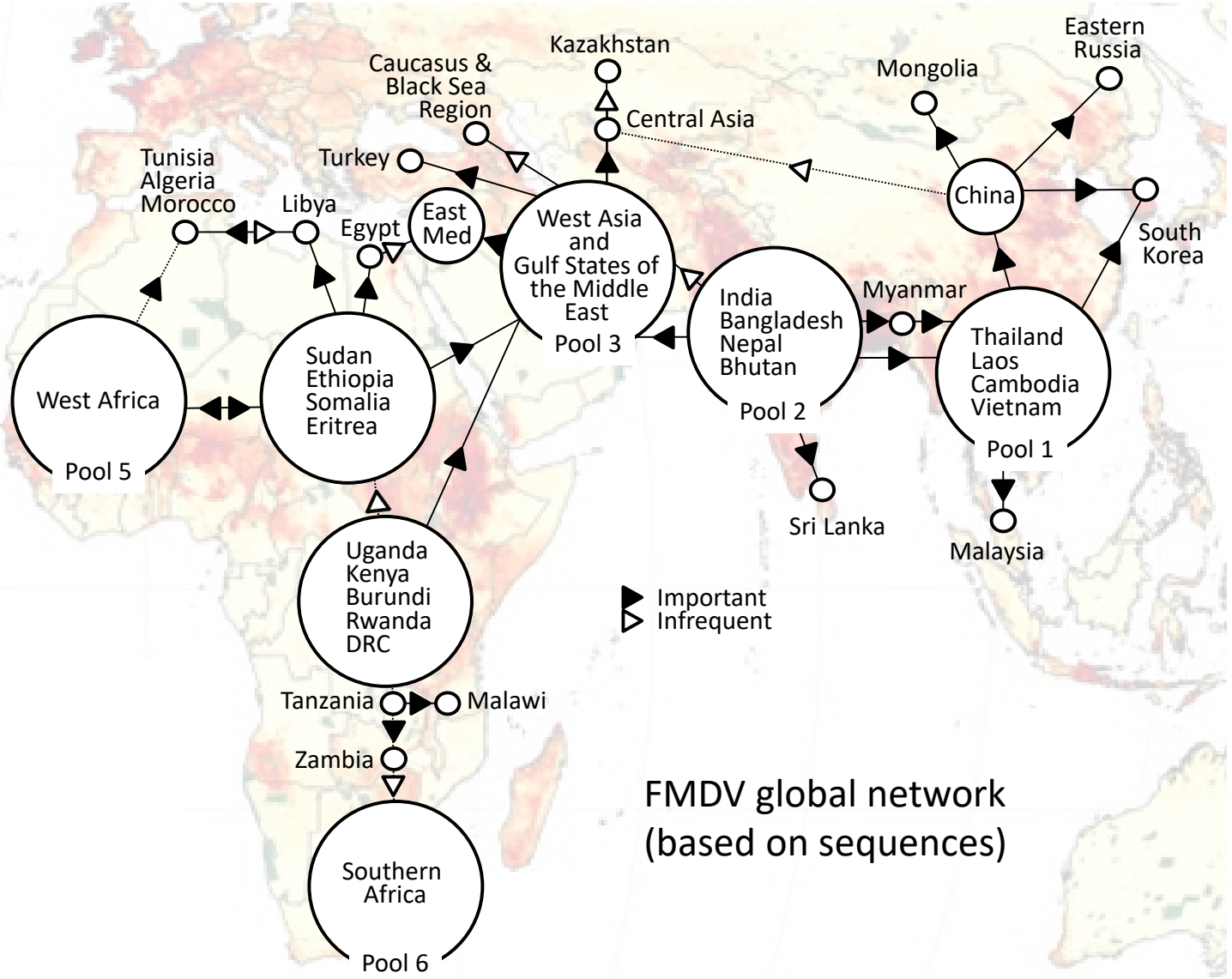
Sequences underpin our understanding of FMD epidemiology


6 FOOT-AND-MOUTH OUTBREAK

'Where did it come from? We just don't know'

How 1960s cattle plague shook UK







Nanopore training
University of Ghana

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

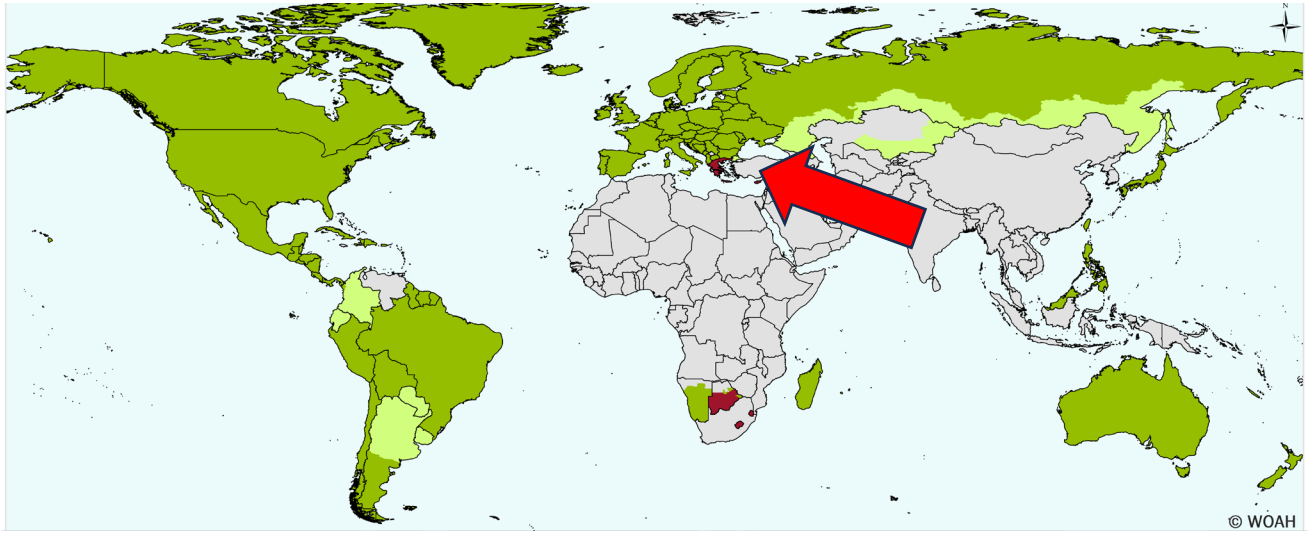
Country	O					A		Asia-1
	ME-SA/Ind-2001e	SEA / Mya-98	CATHAY	ME-SA / PanAsia	ME-SA/ PanAsia-2	ASIA / Sea-97	ASIA/Ind	
Cambodia	2024	2016		2024		2016		
Laos	2024	2017		2024		2018		
Malaysia	2024	2016	2005	2023	2009	2026		
Myanmar	2022	2021				2021	2010	2017
Thailand	2024	2018	2012	2019		2022		
Vietnam	2025	2025	2023	2024		2026		2007
PR China	2025	2020	2024	2019		2019		2009
Indonesia	2025							
Mongolia	2026	2018		2017		2016		

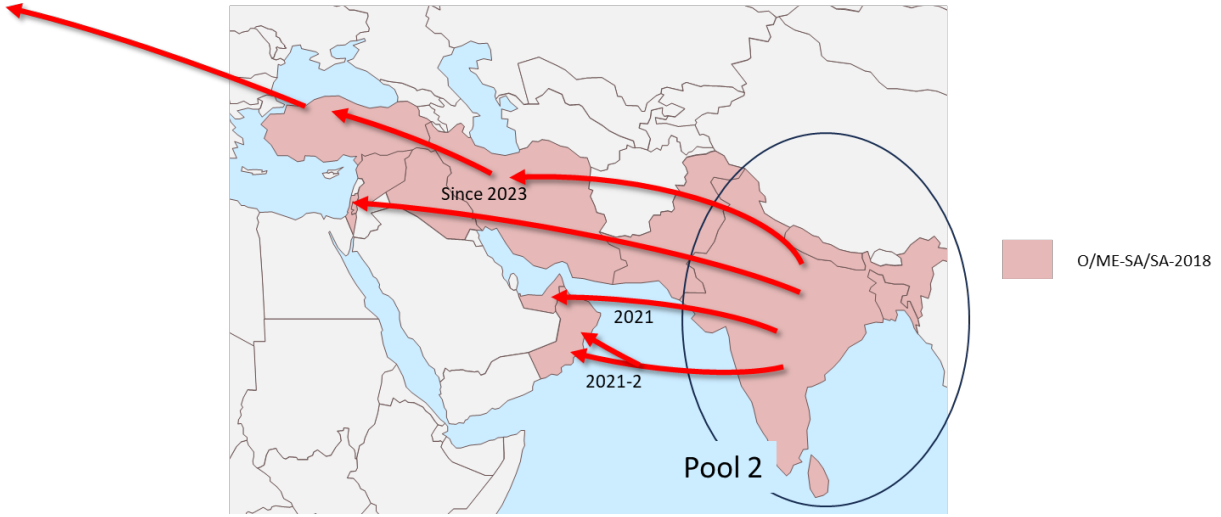
*Recent papers: Khanh et al., (2025)

FMD headline events – 2026: incursions from South Asian countries

- History tells us that pandemic serotype O lineages can emerge from South Asia (Pool 2)
- The **O/ME-SA/SA-2018** lineage is frequently detected in India, Nepal, Bangladesh and Sri Lanka
- Since 2021: increasingly detected in the Gulf States and West Asian countries via multiple incursions
- Caused outbreak in Germany in 2025
- Scope to spread more widely – into **<u>Southeast Asia</u>** following similar pathways for O/ME-SA/Ind-2001

WOAH Members' official FMD status map (April 2026)

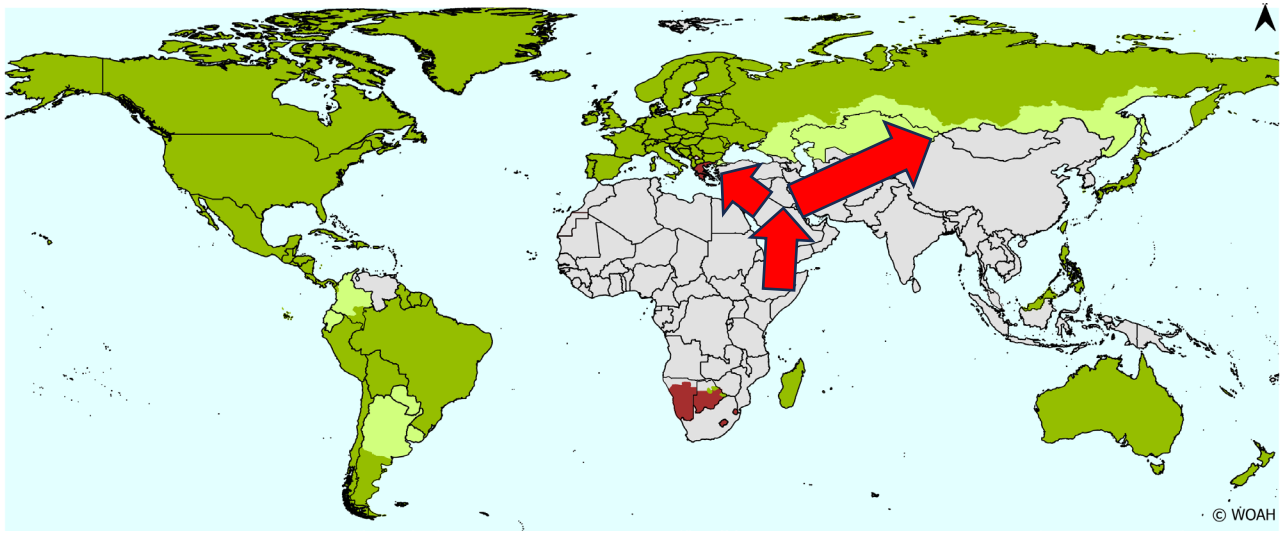




FMD headline events – 2026: exotic serotypes from East Africa

- **2022** — **SAT2/XIV** in Iraq, Jordan, Türkiye, Oman and Bahrain
- **Early 2025** — **SAT1/I** in Iraq and Bahrain - spread to Kuwait, Türkiye and Egypt
- **Late 2025** — Detection of **SAT1/III** in Iran and Türkiye closely related to a vaccine strain (>99% identity)
- **2025-2026** — **SAT1/III** outbreaks in Europe (Cyprus and Greece)
- **Mar/Apr 2026** — **SAT1/III** cases reported in China (two provinces)
- **May 2026** — **SAT1/III** cases in West and East Mongolia (Bayan-Olgii, Khovd and Dornod Provinces)

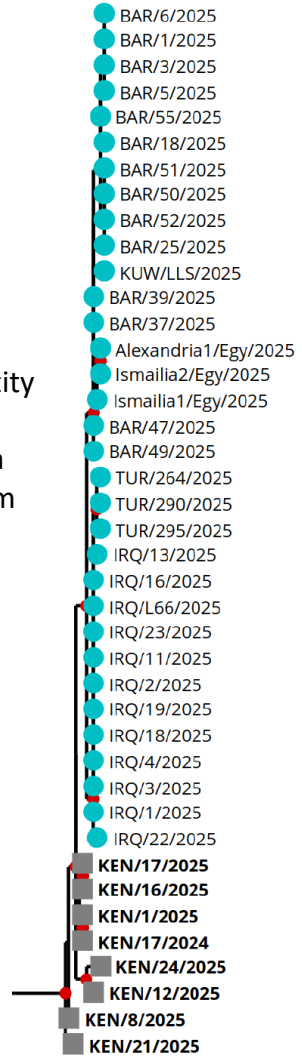
WOAH Members' official FMD status map (Sept 2026)



Affected Provinces in Mongolia:



Co-circulating SAT 1 topotypes



SATI/I

- Close identity to viruses from Kenya
- Source from East Africa

Country reports (earliest dates):

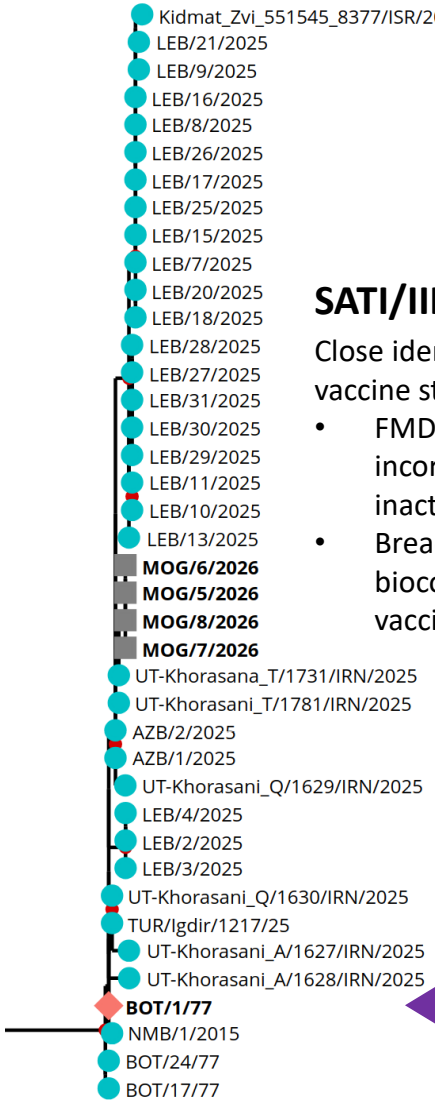
From Pool 4 (East Africa)

Vaccine escape?

Country	SAT 1/I	SAT 1/III
Bahrain	January 2025	
Iraq	February 2025	
Kuwait	April 2025	
Türkiye	May 2025	November 2025
Iran	*	*
Egypt	July 2025	
Azerbaijan		October 2025
Lebanon		November 2025
Israel		January 2026
Cyprus		Dec 2025/Feb 2026
Syria		January 2026*
China		March 2026
Greece (Lesvos)		March 2026
Mongolia		May 2026
Palestine		
Libya		

April 2026: topotype - not yet reported

July 2026: topotype not yet reported



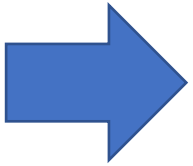
SATI/III

Close identity to BOT/1/77 vaccine strain

- FMD vaccine incorrectly inactivated?
- Breach of biocontainment at vaccine plant?

SAT 1 potential impacts and preparedness

- Wide range of susceptible species: reports of SAT1/III cases in cattle, small ruminants, pigs and yaks
- Most livestock in Asia are immunologically naïve
- Risk pathways in the region and to China/Mongolia are not well understood
- **Potential scope for rapid onward spread to other countries in the Middle East, Central Asia and East/Southeast Asia**
- High global demand for vaccines for a previously neglected serotype



- FAO has issued alerts to raise global awareness of these new risks
- Recent GF-TADs seminars on epidemiology and vaccines
- Importance of laboratory preparedness
  - Support from WOAH and FAO reference laboratories
  - SAT1/I and SAT1/III lineage-specific real-time RT-PCRs developed (by ANSES and WRLFMD)
  - Sequencing approaches (primers) are also available
  - www.foot-and-mouth.org
  - Ag-ELISA (from IZSLER) detects and discriminates viruses from this topotype

Selecting FMD vaccines: SAT 1/I

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
EGY/3/2025	0.33	2.14
TUR/9/2025	0.30	2.15
KEN/3/2022	0.30	1.72
QTR/6/2023	0.42	2.34
QTR/7/2023	0.61	2.50

Selecting FMD vaccines: SAT 1/III

Isolate	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								
TUR/22/2025	0.40	2.28								
TUR/24/2025	0.21	2.01								
MOG/5/2026	0.57	2.39			0.63	2.50	0.75	2.48		
MOG/7/2026	0.97	2.62			0.74	2.58	1.00	2.64		
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

From vaccine?

Field viruses in Southern Africa

Heterologous potency test recently conducted at Lelystad to demonstrate cross protection even though r1 value <0.3

Summary of global events (potential new FMD vaccine markets!)

- Emergence and spread of a new serotype O lineage (O/ME-SA/SA-2018) in the Middle East region
- **SAT1 in the Middle East** (Pool 3) – two co-circulating topotypes
  - SAT1/I sequences from Kenya – reinforce epidemiological connection between East Africa and the Middle East
  - SAT1/III sequences share close genetic identity to a vaccine strain (BOT/1/77)
  - Onward spread of SAT 1/III into Europe (Cyprus and Greece) and Central Asia (China and Mongolia, via poorly understood risk pathways)
- Detection of **O/EA-2** in Ethiopia for the first time
  - representing >80% of submitted samples
- A new incursion of **O/EA-3** in Algeria (December 2025)
- Upsurge of **SAT1** cases across Southern Africa – leading to the loss of FMD-free status in Botswana (two separate incursions), Eswatini, Namibia and Lesotho – other cases caused by SAT2 and SAT3
- New incursion of **O/ME-SA/Ind-2001e** into South Korea

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

