



Global FMD Surveillance and Regional Risks for West Eurasia

Anna Ludi

anna.ludi@pirbright.ac.uk

WRLFMD Team: Donald King, Valerie Mioulet, Nick Knowles, Ginette Wilsden, Bryony Armson, Pip Hamblin, Kasia Bachanek-Bankowska, Lissie Hendry, Jemma Wadsworth, Britta Wood, Barsha Thapa, Bob Statham, Abid Bin-Tarif, Ashley Gray, Clare Browning, Beth Johns, Mark Henstock, Alison Morris, David Paton, Nick Lyons, Dexter Wiseman, Julie Maryan, Sarah Belgrave

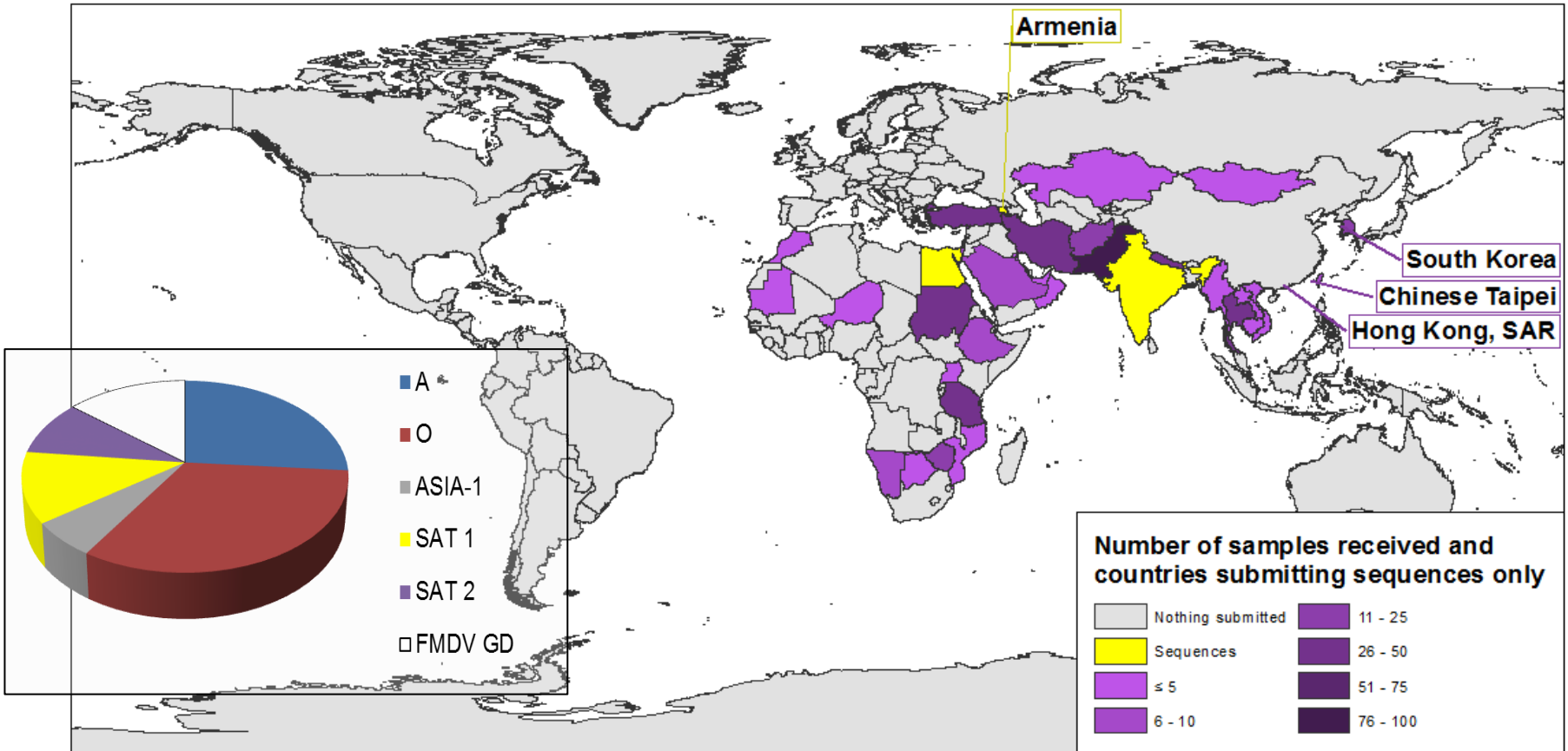


The Pirbright Institute receives strategic funding from BBSRC.

www.pirbright.ac.uk

Submissions to Pirbright

January 2015 – March 2016



- Sequence exchange with Egypt, India and BVI
- Reports for these samples can be found at: www.wrlfmd.org

WRLFMD surveillance in West Eurasia

Sample/sequence submissions (2014)

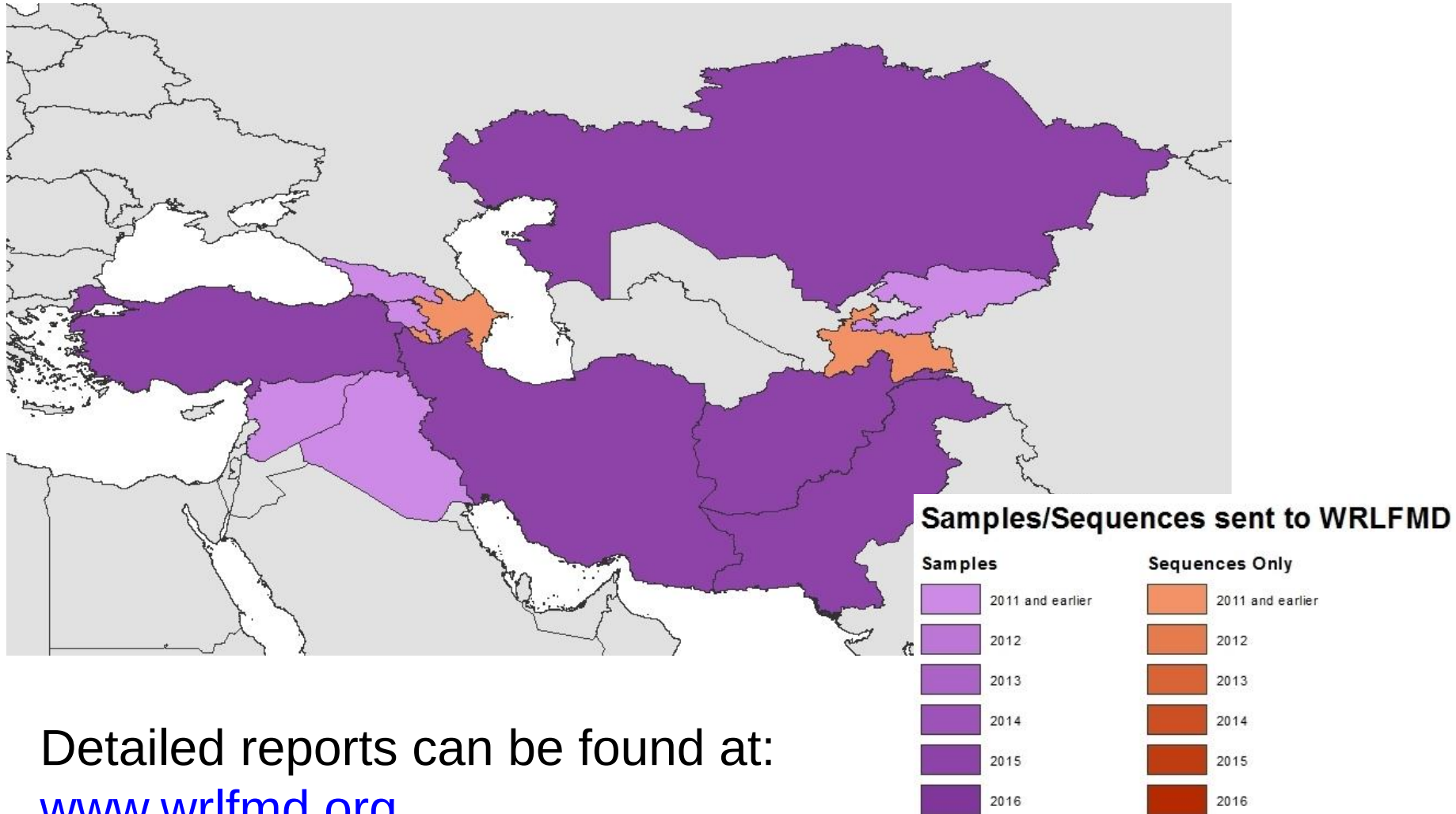


Detailed reports can be found at:

www.wrlfmd.org

WRLFMD surveillance in West Eurasia

Sample/sequence submissions (2015)



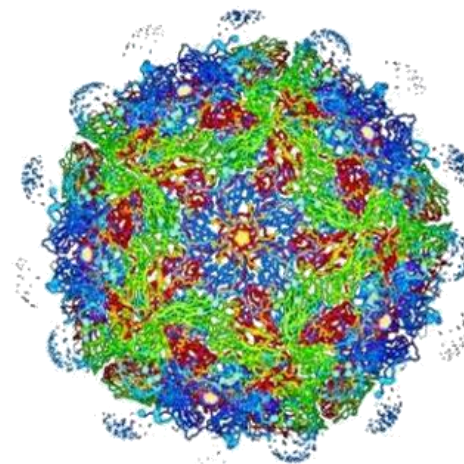
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West Eurasia

Circulating FMD virus lineages and regional threats)

Active outbreaks

- O/ME-SA/PanAsia-2
- A/ASIA/Iran-05
- Asia-1 (Sindh-08 lineage)

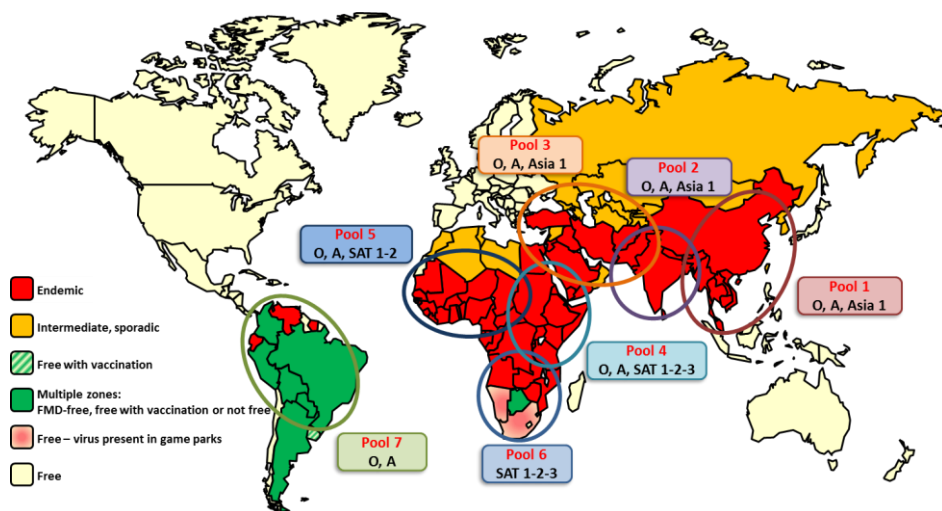


Sporadic incursions (in Kazakhstan)

- O/ME-SA/PanAsia (Pool 1) – **and Middle East**
- A/ASIA/Sea-97 (Pool 1)

New emerging risks (??)

- O/ME-SA/Ind2001 (Pool 2)
- SAT 2 (Pool 4)
- **A/ASIA/G-VII (Pool 2)**



O/ME-SA/PanAsia-2



2015 2014 2013 2012 2011

ANT-10

Iran					
Israel					
Saudi Arabia					
Turkey					
UAE					
Afghanistan					
Pakistan					
Libya					
Bahrain					

FAR-09

Iran					
Israel					
PAT					
Turkey					

2015 2014 2013 2012 2011

BAL-09

Iran					
Pakistan					

KAT-15

Nepal					
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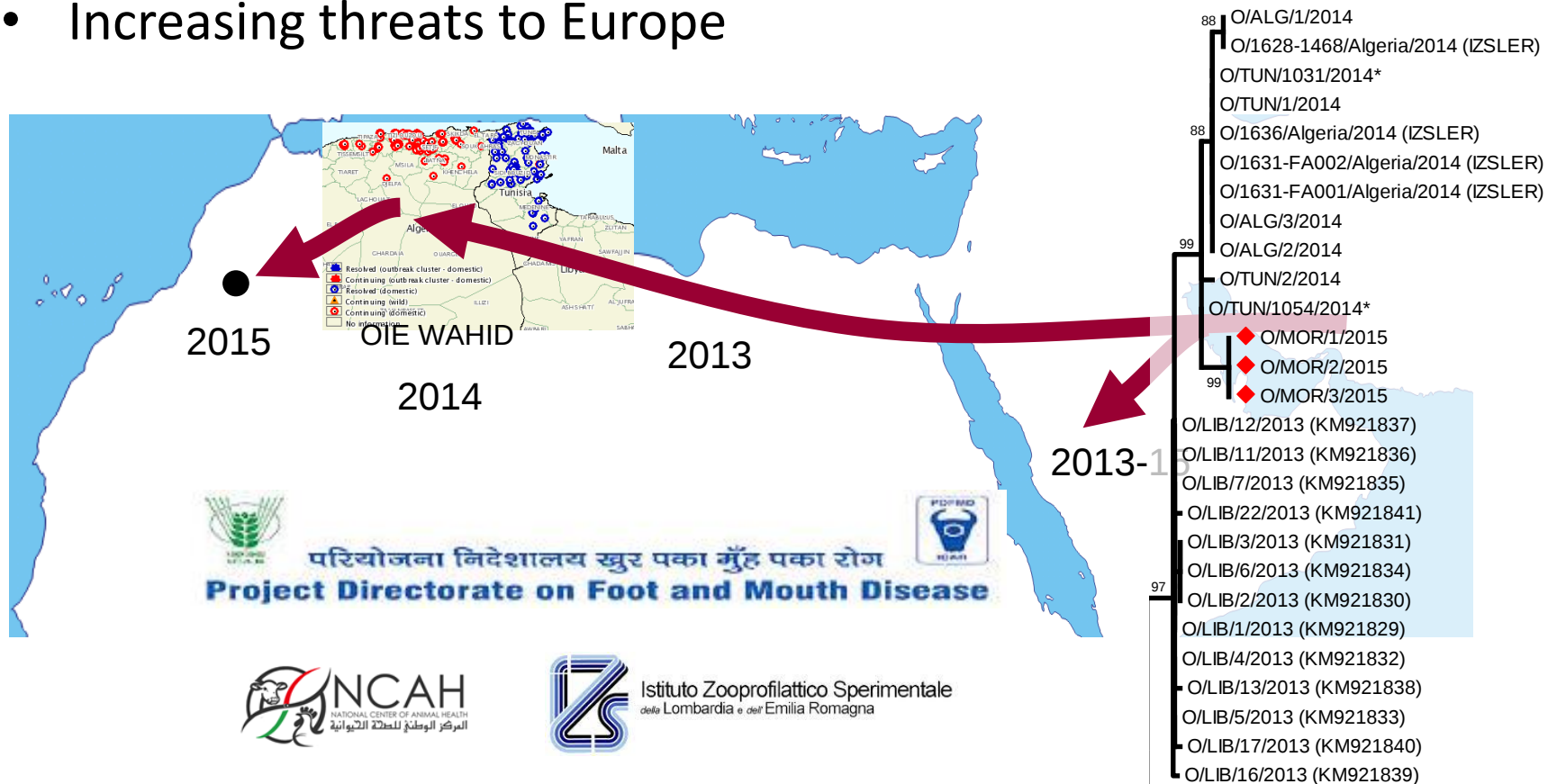
- **PanAsia**
 - Israel
 - Palestinian Territories

New sub-lineages and lineages seen in 2015... what is the impact in regards to control of the disease?

- Additional PAK/IRN sequences were from an un-named genotype

Recent serotype O cases in North Africa

- O/ME-SA/Ind2001 lineage from the Indian sub-continent
- Since 2013: FMD Outbreaks in **Saudi Arabia, UAE, Bahrain, Libya, Tunisia, Algeria**
- Transmission links from the Indian sub-continent unknown?
- Increasing threats to Europe

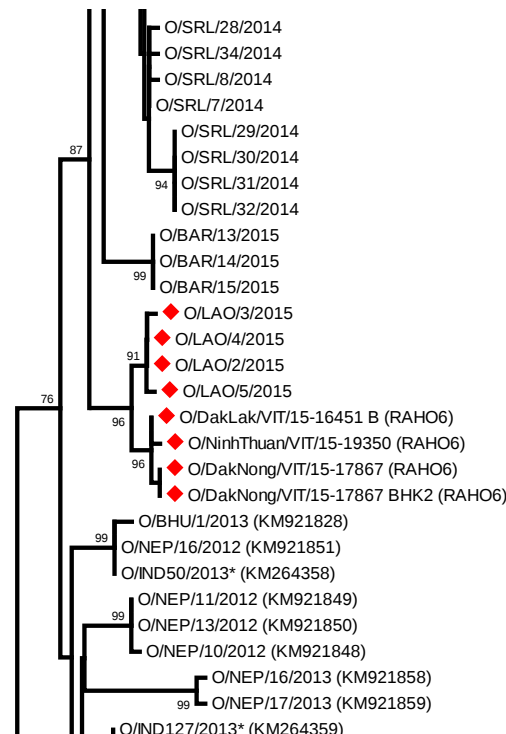


O/ME-SA/Ind-2001 in SEA

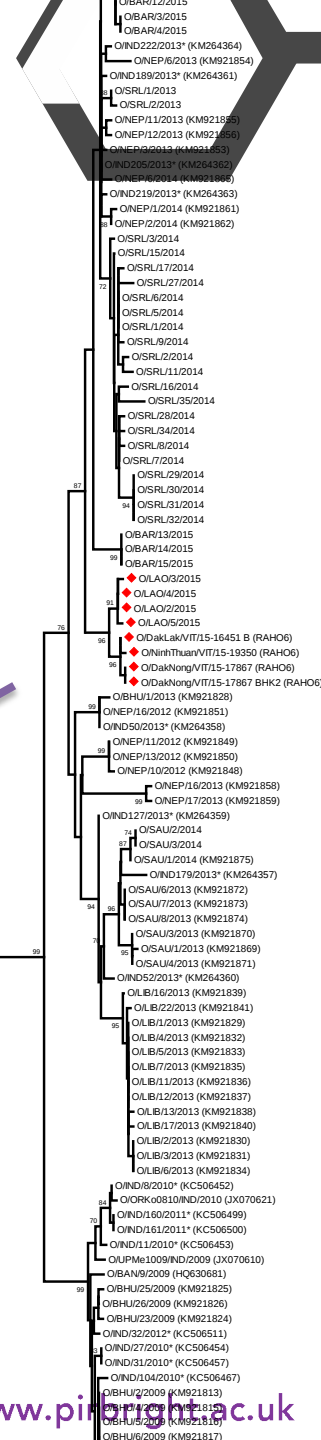
- O/ME-SA/Ind2001 lineage from the Indian sub-continent
- Spread to Laos and Vietnam PDR
- Samples collected in June 2015
- Genetically distinct to outbreaks in the Gulf States and North Africa
- Links to the Indian sub-continent possibly through frozen tongue meat



RRLSEA: Pakchong



Ind-2001d



O/ME-SA/Ind 2001

New full genome analysis

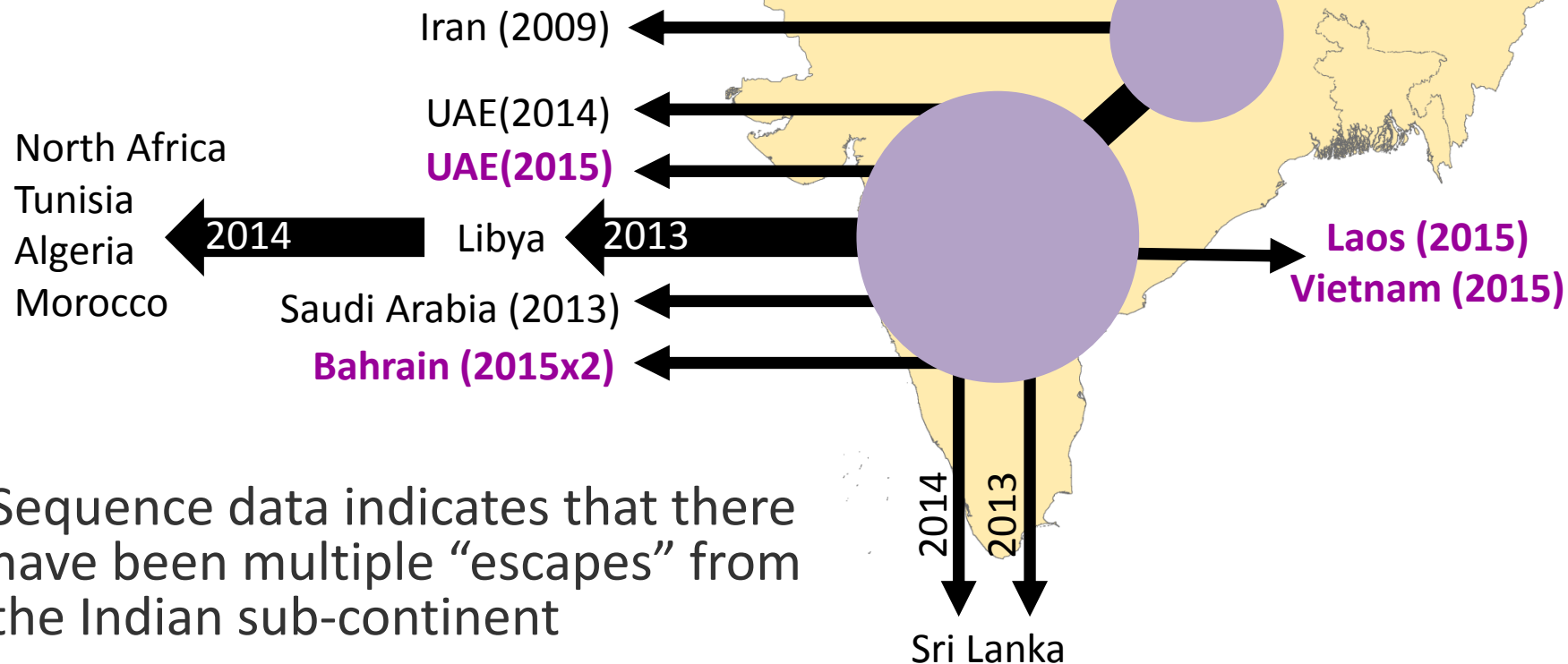
- Complete genome analysis
 - 47 complete genomes
 - 37 new sequences



परियोजना निदेशालय खुर पका मुँह पका रोग
Project Directorate on Foot and Mouth Disease



Istituto Zooprofilattico Sperimentale
della Lombardia e dell'Emilia Romagna



- Sequence data indicates that there have been multiple “escapes” from the Indian sub-continent
- **Increase threat to West Eurasia**

Vaccine matching for O/ME-SA/Ind-2001

26 field isolates:

Using VNT
r-value 0.3 cut-off

 Matched
 Not Matched

	Vaccine strain		
Field Isolate	O-3039	O Manisa	O/TUR/5/09
LIB 1/2013			
LIB 7/2013			
LIB 17/2013			
LIB 22/2013			
NEP 13/2012		borderline	
NEP 6/2012	borderline		
NEP 21/2012			
NEP 6/2013			
NEP 18/2013			
NEP 1/2014			
NEP 6/2014			
SAU 1/2013			
SAU 4/2013			
SAU 6/2013			
SAU 7/2013			
SAU 1/2014	borderline		
SRL 1/2013			
SRL 1/2014		borderline	
UAE 1/2014		borderline	
UAE 2/2014		borderline	
ALG 1/2014	borderline		
TUN 1/2014	borderline		
BAR 8/2015			
BAR 14/2015			
MOR/1/2015			
MOR/2/2015			

Vaccine Potency Trial

O/ME-SA/Ind2001

- Funded via EU (from EU-RL) contribution
- Experiments hosted by CVI-Lelystad
- Adopted protocol according to European Pharmacopeia
- O-Manisa vaccination (at least 6PD₅₀) with O/ALG/2014 challenge

Vaccine Dose	Number Protected vs Vaccinated	Serological Results (O Manisa Log ₁₀ VNT mean 21DPV)
Full	3/5	2.65
1/4	4/5	2.67
1/16	0/5	1.68
Unvaccinated*	0/2	0.9

- Estimated heterologous potency ~3 PD₅₀

- New SAT 2 samples from field outbreaks
- VP1 sequencing: two different genetic groups within topotype VII

- Cattle
- Genetically similar to FMD viruses from previous outbreaks in Egypt (Alx-12 sub-lineage)

- Cattle
- Genetically most similar to FMD viruses from Nigeria



A/ASIA/Iran-05

In the past 4 years: 9 sub-lineages:

2015 2014 2013 2012 2011

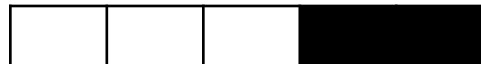
SIS-12

Pakistan and Iran



AFG-07

Afghanistan, Pakistan, Iran, Turkey



HER-10

Afg, Pak, Iran, Kazakhstan, Kyrgyzstan



QAZ-11

Iran



FAR-11

Afghanistan, Pakistan and Iran



FAR-09

Pakistan and Iran



ESF-10

Iran



SIS-10

Iran, Iraq, Turkey and Russia



BAR-08

Egypt and PAT



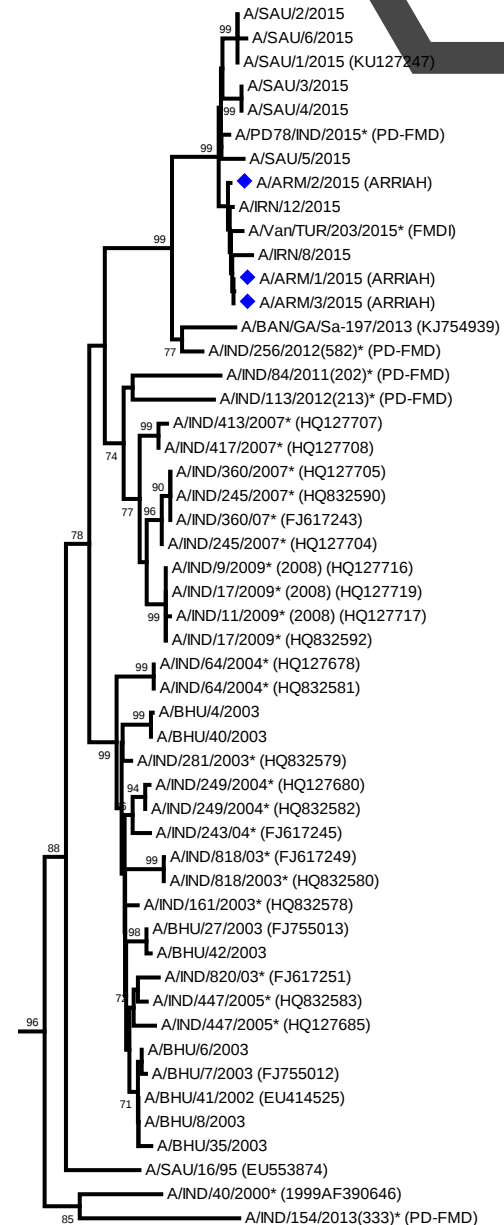
- Predominant lineages:

- SIS-10
- FAR-09
- FAR-11

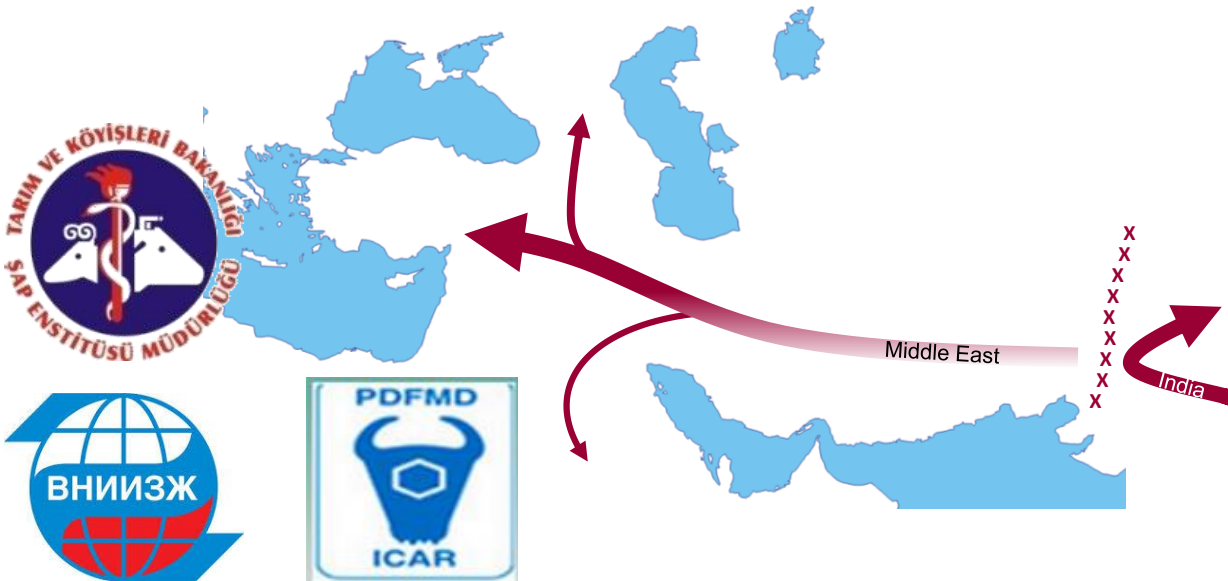
“Latest Challenge”!

New serotype A outbreaks in West EurAsia

- Initial reports September 2015
- **Saudi Arabia, Turkey, Iran, Armenia**
- Originating from the Indian sub-continent
- A further example of new “unexpected” FMDV movement between endemic pools
- Impact upon vaccination?



G-VII (G-18)

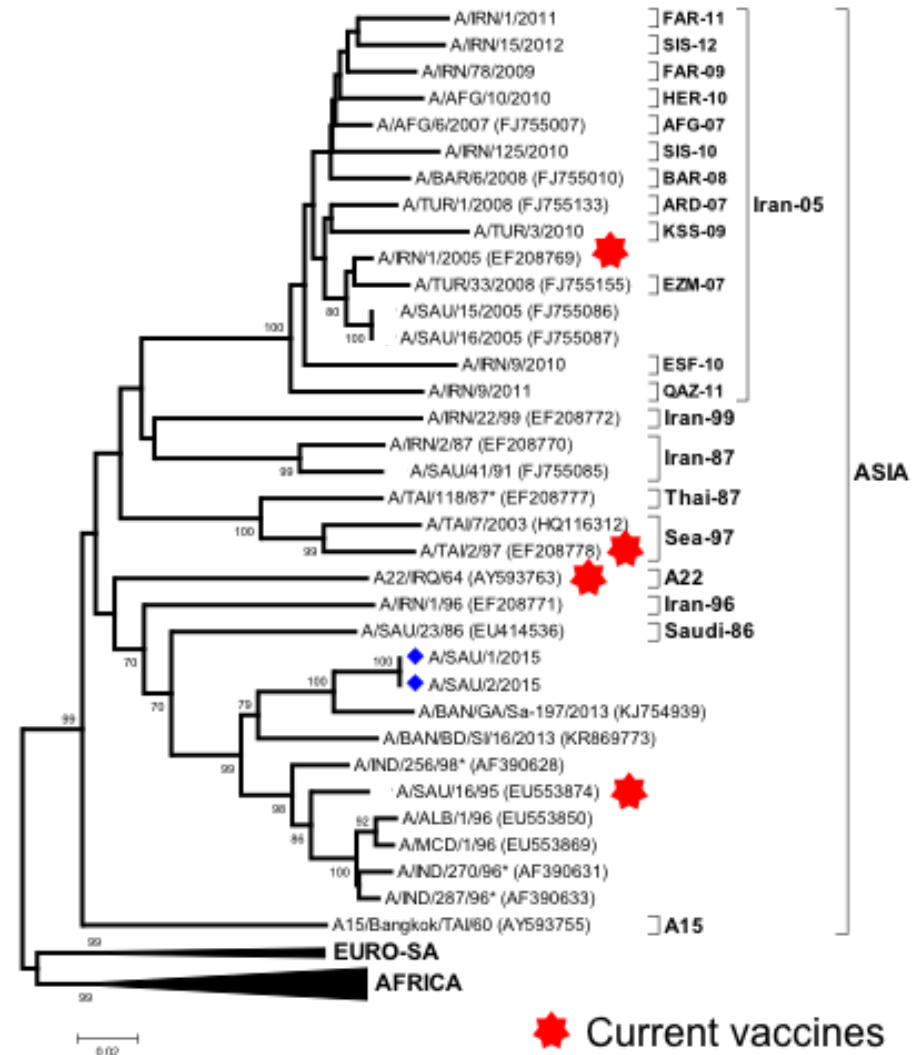


A/ASIA/G-VII (G18)

Poor in-vitro match to many commercial vaccines

Recent
r-values:

	A/SAU/1/2015	A/SAU/2/2015	A/IRN/8/2015	A/IRN/12/2015
A-Iran-05	0	0	0	0
A-Iran-87	0	0.04	nd	nd
A-Iran-96	0.04	0.06	nd	nd
A-Iran-99	0.01	0.01	nd	nd
A-Sau-95*	0.20	0.19	0.26	0.16
A-22	0.11	0.11	nd	nd
A-Tur-20-06	0.03	0.06	0.01	0.15
A-May-97	0.14	0.23	0.15	0.23
A-Tur-11	0.01	nd	0.10	0.04
A-Tur-14	0	nd	0	0
A-IND-40-2000*	0.26	nd	0.03	0.24



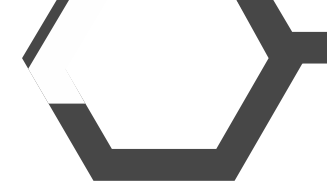
* Multiple BVS tested

A/ASIA/G-VII (G18) – vaccine trial



- Monovalent vaccines not currently available from Merial
- Hexavalent vaccine
 - O-3039, O-Manisa, A-Iran-05, **A-Sau-95**, Asia-1, SAT 2
- PPG format
- Challenge at 21 dpv with A/IRN/2015
- Data being analysed.
- Serological and clinical data analysed in context of detailed information obtained from field cases in Saudi Arabia





New tool for vaccine selection?

Draft Vaccine Recommendations for the West Eurasia Roadmap

For Serotype 1

A TUR/06 (or equivalent from local suppliers) or **A Iran 05** for A/ASIA/Iran-05 for the emerging **A/ASIA/G-VII lineage**, **Turkish vaccine A/ASIA/G-VII-TUR15**

Notes:

- [1] Vaccine matching data suggest that some circulating A/ASIA/Iran-05 field strains have poor match with these vaccines.
- [2] Many established vaccines are not expected to provide protection against the A/ASIA/G-VII lineage. Tailored vaccines, **A/ASIA/G-VII-TUR15**, for this emerging lineage have become recently available from a local supplier (Turkey), and are anticipated shortly from other manufacturers. Field vaccine evaluation of these products is pending.
- [3] For countries bordering China, it is advisable to consider addition vaccine components that cover A/ASIA/SEA-97 in the vaccine formulation

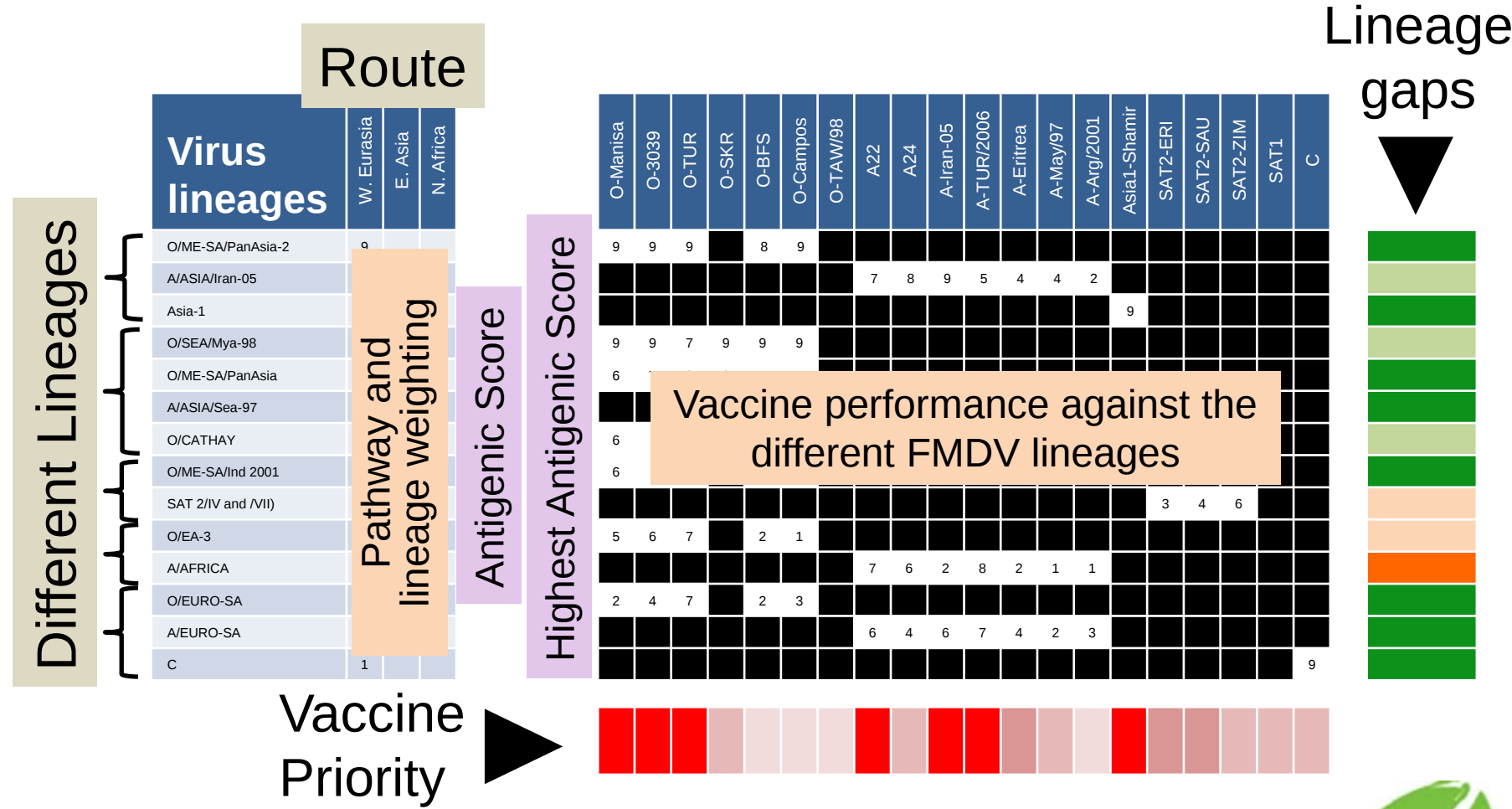
New tool for vaccine selection?



Vaccine selection should carefully consider the following FMDV lineages that are

- ❖ *circulating in the region: O/ME-SA/PanAsia-2, A/ASIA/Iran-05, A/ASIA/G-VII, Asia-1/Sindh-08.*
- ❖ *circulating in the neighbourhood that may warrant vaccine coverage: O/ME-SA/Ind2001 (sporadically in the Gulf States), A/ASIA/Sea-97 (via East Asia), O/ME-SA/PanAsia (via East Asia and recently in Israel and the Palestinian Autonomous Terr.) and SAT 2 (sporadically in the Gulf States).*

New tool for vaccine selection?



Coordinating Global Networks

OIE/FAO FMD Laboratory Network

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



- OIE and FAO Reference Centres (+ affiliates)
 - Working Groups (nomenclature and PVM)
 - Recommendations for Serotype C
- **Global surveillance and changing patterns in risk pathways**
- **Harmonised and improved lab capacity**

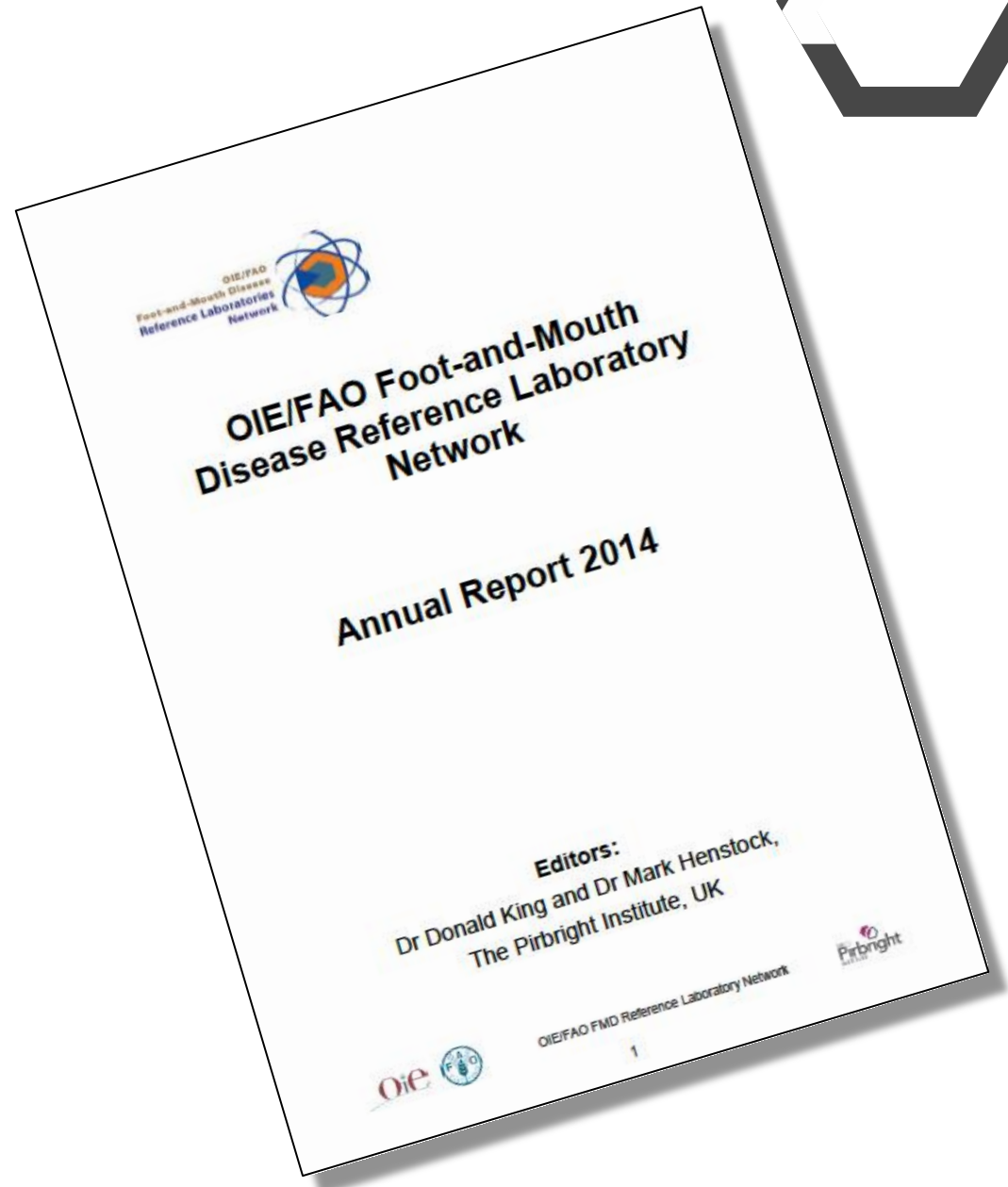


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Network report

- www.wrlfmd.org
- Contributions and suggestions welcome



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