



**Foot-and-Mouth Disease Virus  
Transboundary Movements Between  
Sub-Saharan Africa, North Africa  
and the Middle East**

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## Conclusions and Recommendations

- Increased trade and political/social upheaval have probably increased the transboundary transmission of FMD at the interfaces between virus pools.
- Recommend continued (and expanded) monitoring of viruses (sampling & sequencing) both in 'at-risk' countries and endemic countries from which viruses originate.

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## Introduction

- Foot-and-mouth disease (FMD) viruses are frequently geographically restricted, both at the serotype and toptotype level, and thus transboundary spread of virus can be traced using VP1 sequence information.
- We have examined the recent and historical spread of FMD viruses between sub-Saharan Africa, North Africa and the Middle East to assess current and future threats.

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## Materials & Methods

- FMD viruses, isolated in cell cultures from clinical samples received by the FAO World Reference Laboratory for FMD, were subjected to RT-PCR of the VP1-coding region using previously described methods.
- The resultant amplicons were sequenced using an ABI 3730 Automated Sequencer.
- VP1 sequences were assembled using SeqMan Pro 10 (DNASTar Inc.) and phylogenetic trees were constructed using MEGA 5.05 software.

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## Europe (SA) to North Africa

1977 – type A – South America (via Europe?) to Morocco / Algeria  
 1979 – type A<sub>5</sub> – Europe to Libya / Tunisia  
 1981 (-1982) – type O<sub>1</sub> – Europe to Libya  
 1983 – type A<sub>5</sub> – Europe (Spain?) to Morocco

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## Middle East to North Africa

1972 – type O – Libya  
 1972 – type O – Egypt  
 1987 – type O – Egypt  
 1988 (-1989) – type O – Libya  
 1989 (-1992) – type O – Tunisia / Algeria / Morocco  
 1993 – type O – Egypt  
 1994 – type O – Tunisia / Libya  
 2006 (-2011) – type O PanAsia-2 – Egypt  
 2009 – type A Iran-05<sup>BAR-08</sup> – Libya  
 2010 (-2011) – type A Iran-05<sup>BAR-08</sup> – Egypt

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## Sub-Saharan Africa to North Africa

1972 – type A – Egypt  
 1974 – type O EA-1 – Egypt  
 1999 – type O WA - Algeria, Morocco & Tunisia  
 2003 – type SAT 2 VII Lib-03 - Libya  
 2006 (-2009) – type A G-VII - Egypt  
 2012 – type SAT 2 VII Lib-12 - Libya  
 2012 – type SAT 2 VII Gbh-12 & Alx-12 Egypt  
 2012 – type SAT 2 VII Lib-12 - Libya  
 2012 – type A G-IV – Egypt  
 2012 – type O EA-3 - Libya  
 2012 – type O EA-3 - Egypt

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## Sub-Saharan Africa to Middle East

- 1962 (-1965) – type SAT 1 – Bahrain (Israel, Lebanon, Jordan, Syria, Turkey, Iran, Iraq, Greece)
- 1970 – type SAT 1 – Saudi Arabia & Kuwait
- 1984 – type SAT 1 VI - Yemen
- 1985 – type A G-II - Yemen
- 1990 – type SAT 2 IV – Yemen
- 2012 – type SAT 2 VII – Palestinian AT
- 2012 – type SAT 2 IV - Bahrain

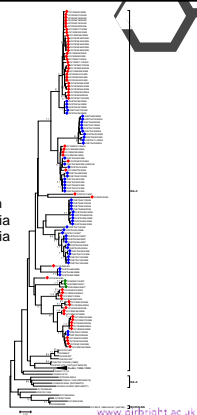
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## Africa to Yemen AR

### FMDV O East Africa 3 toptotype

1974  
 1977  
 1982-1983  
 1985-1987  
 1989-1990  
 1992  
 1995  
 2003-2004  
 2006  
 2008-2009

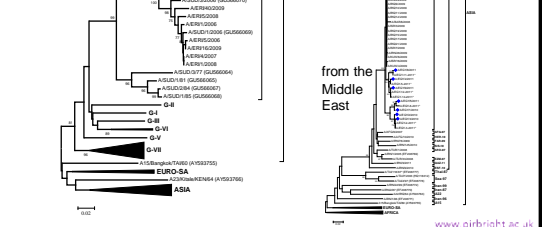
▲ Yemen  
 ▲ Ethiopia  
 ▲ Somalia



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## FMDV A

from Sub-Saharan Africa



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## FMDV O

from Sub-Saharan Africa

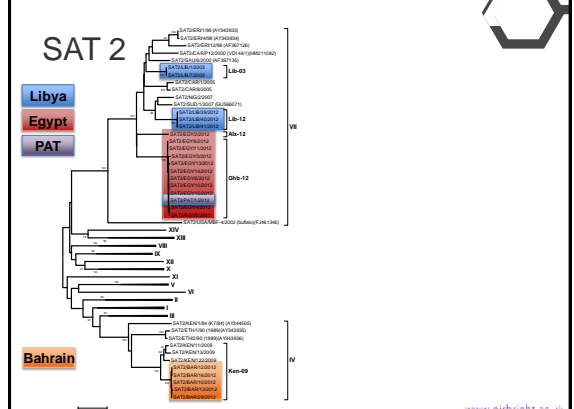


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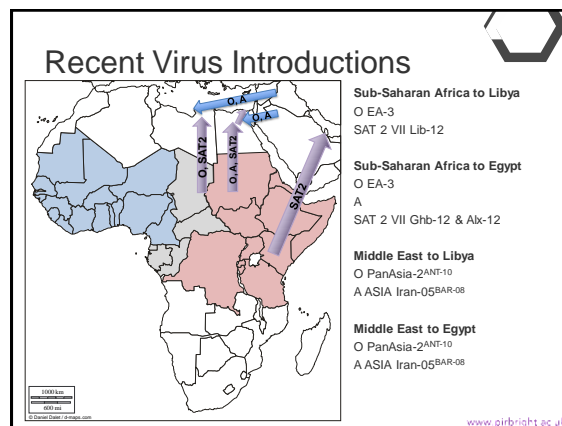
## SAT 2

Libya  
 Egypt  
 PAT

Bahrain



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## Conclusions

- Until recently the spread of FMD viruses into North Africa from sub-Saharan countries has been a relatively rare event. However, in 2012, examples of trans-Saharan FMD virus movements have been identified involving three serotypes, O, A and SAT 2 (three lineages).
- In the same period movement of FMD virus type SAT 2 from East Africa to Bahrain was also detected.

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OIE World  
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for Animal  
Health



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