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

Report from the 8th OIE/FAO FMD Laboratory Network Meeting Bangkok: 14th – 15th November 2013

Day 1: Dr Don King welcomed the delegates to the meeting

- Global update (from WRLFMD presented by Dr Don King)
  Over the past 12 months, 360 samples have been submitted to WRLFMD generating 219 FMD viral isolates representing 5 of the FMDV serotypes. The presentation highlighted three important epidemiological events that have occurred recently: the ongoing cases due to serotypes O and A in East Asia; the spread of new a serotype Asia-1 lineage (Sindh-08) in the Middle East; and the recent outbreaks due to serotypes SAT2 and O in the Middle East and in North Africa. The recent detection of O/ME-SA/Ind-2001 lineage in Libya (during November 2013) is unexpected and emphasizes the value of coordinated surveillance by network partners (in this case IZSLER, PDFMD and WRLFMD) to detect and characterize emerging FMD viral lineages.

Summary of regional and country updates

- Central Asia (from ARRIAH presented by Dr Svetlana Kremenchugskaya)
  During 2013, 20 outbreaks due to serotype A have been detected in Russia. Sequence data demonstrates that the outbreaks in the west of the Russian Federation are caused by A/ASIA/Iran-05 and distinct from those in eastern Russia (and East Mongolia and Southeast Kazakhstan) where the virus implicated is A/ASIA/Sea-97. Locally produced vaccines that are recommended for use against circulating strains are: A/Zabaikalsky/RUS/2013 (Sea-97), A/Krasnodarsky/RUS/2013 (Irn-05), O PanAsia-2 and Asia-1 Shamir/89. Large scale post-vaccine monitoring has been undertaken at 26 centers close to all of the southern borders of the Russian Federation involving 47,500 samples tested by LPBE and 26,500 samples tested by NSP ELISA. In addition, a further survey in Northern Russia has been undertaken in support of OIE-free status.

- Southern Africa (from OVI presented by Dr Livio Heath)
  Two FMD outbreaks have occurred in South Africa during 2013 (SAT1 in Limpopo Province and SAT2 in Mpumalanga Province, both in July 2013) and one in Namibia (SAT2 in Caprivi which was difficult to isolate). A new vaccine production facility at Onderstepoort will start in 2016 and will focus on vaccine production for South Africa.

- Southern Africa (from RRLSS - BVI presented by Dr George Matlho)
  This presentation provided an update of the reagents and tests available at RRLSSA. In addition to Botswana, RRLSS, receives samples from Namibia, Mozambique, Malawi and Zambia on a regular basis. Analyses of recent samples from Botswana and Zimbabwe have detected SAT2 serotype.

- Nigeria (from NVRI, Vom presented by Dr Hussaini Ularamu)
  Dr Ularamu provided an overview of the FMD situation in Nigeria where 4 of the FMD virus serotypes have been reported (O, A, SAT1 and SAT2). Recent results (for serotypes A, SAT1 and SAT2) using the new monoclonal antibody antigen ELISA kits from IZSLER were presented highlighting the utility of these new assays for use in the West African region.

- Southeast Asia (from RRL-Pakchong presented by Dr Somjai Kamolsiripichaiporn
  Serotypes O and A continue to cause FMD outbreaks in a number of countries in mainland SEA. During 2013, Ag-ELISA has been used to detect 21 serotype O viruses (from Laos, Cambodia, Vietnam and Thailand) and 18 serotype A viruses (from Vietnam and Thailand). Recent serotype O sequences provide evidence for the continued circulation of O/SEA/Mya-98 in Thailand and Cambodia and O/ME-SA/PanAsia in Laos and Cambodia. Serotype A sequences from the region represent the A/ASIA/Sea-97 strain. There has been no evidence of Asia-1 serotype in recent samples submitted to RRL.

- East Asia (from LVRI, presented by Dr Jijun He)
  During 2013, 23 FMD outbreaks have been reported in PR China. These represent serotype A (17 outbreaks), O/SEA/Mya-98 (2 outbreaks in pigs) and O/ME-SA-PanAsia (4 outbreaks in cattle). Nucleotide sequence data generated for the serotype O samples shared close relationships to previously characterized samples from the country. Serotype A appears to be mainly circulating in the west of China (in 4 provinces: Qinhai, Xinjiang, Tibet and Yunnan), apart from 1 single case in Guangdong in the southeast. Recent serotype A (A/ASIA/Sea-97) sequences are different to those previously characterized in PR China and indicate a close link to countries in Southeast Asia as well as recent sequences recovered from cases in Mongolia and the Russian Federation, although the precise transmission routes into the country are unknown. On-going surveillance activities in the south of China (serology and RT-PCR on lymph node tissues [n=1020]) and Inner Mongolia (serology and RT-PCR of OPF) have failed to provide evidence of local circulation of FMDV. FMD-free zones (with vaccination) are now being established (Hainan Island, Yongji, Jinlin and Liaoning Provinces), although an outbreak caused with O/SEA/Mya-98 strain in 2012 in Dalian from pig has led to a cancellation of FMD free status in Liaoning Province,and A/ASIA/Sea-97 strains were also found in OPF in active surveillance. An overview of laboratory capacity and reagents was also provided.

- South Asia (from PD-FMD presented by Dr Aniket Sanyal)
  This presentation provided an overview of the samples (n=77 isolates) that have been received to PD-FMD during 2013 from field cases of FMD in India. These are predominantly serotype O (n=32) which is found in all regions of India. However, cases due to serotype A (constant presence in south and north-east of the country) and Asia-1 (constant presence in west, east and northeast of the country) have also been detected. Sequences recovered demonstrate dominance of Ind-2001 strain (88/89 sequences generated during 2012-13). Within serotype Asia-1, all viruses characterized since 2005 have been grouped within a single major lineage (named lineage C), which can be sub-divided into two genetic clusters (termed Eastern and Western). Data was also presented for Bhutan, where serotype O (from O/ME-SA/Ind-2001 lineage) has been detected in 2013, Sri Lanka (serotype O), Nepal (most recent viruses characterized during 2012 were serotype O) and Bangladesh (where serotypes O and Asia-1 have been detected in 2013).

- Pakistan (from FAO Pakistan presented by Dr Muhammad Afzal)
  This year (until September 2013), 1639 FMD outbreaks have been reported in Pakistan, of which over 78% have been in Sindh Province. Data was presented that summarized these recent FMD outbreaks providing evidence that Serotype O, A and Asia-1 are actively circulating in the country. A number of these cases appear to present mixed

infections due to different combinations of these different serotypes. Sequence data was also presented from PIADC and WRLFMD characterizing these viruses as O/ME-SA/PanAsia-2 (at least two sub-lineages), A/ASIA/Iran-05 (SIS-12 sub-lineage) and ASIA-1/Sindh-08. In light of recent changes, the components of the trivalent vaccine used in the country have been modified during 2013 to include O/PanAsia-2, A/Turkey/06 and Asia-1/Sindh/08.

- South America (from SENASA presented by Dr Eduardo Maradei)
  No outbreaks have been reported in the South American Continent for over 12 months and no samples have been sent from suspect field cases during 2013. The presentation provided an overview of the vaccination program in Argentina and the processes in place to control the quality of vaccines. The results generated for an in-vivo vaccine potency trial using O/SP/Paraguay/2011 challenge strain were presented. An OIE twinning project with the FMD Laboratory in Paraguay (SENACSA) is underway to address FMD diagnosis, FMD vaccine quality control and characterization of FMD reference strains.

- South America (from PANAFTOSA presented by Dr Rossana Allende)
  This presentation provided an overview of the PHEFA and COSALFA plans for FMD eradication from South America. Dr Allende stressed the importance of coordination of countries (and laboratories) in South America to achieve FMD control in the region. In view of the marked reduction in clinical FMD cases, FMD active surveillance serosurveys have been undertaken recently in Paraguay (2012), Bolivia (2013) and Ecuador (2011-2013). PANAFTOSA has coordinated regional PT schemes and has provided reagents for diagnostic tests and vaccine quality tests to other countries in the region. An update was also provided to describe the use of the LPBE test for post-vaccine monitoring.

- North America (from NVSL-FADDL presented by Dr Consuelo Carrillo)
  The FMD related diagnostic activities undertaken by FADDL during 2013 included: ruling out FMD from domestic vesicular cases and international samples received for testing (all negative). This work included testing of samples by virus isolation (LK and IB-RS-2), real time RT-PCR and serology using VIAA and 3ABC NSP ELISA. A collaborative FMD project with NRVC in Kazakhstan was also initiated, providing training in FMD diagnostic tests and evaluation of post-vaccine monitoring. An OIE twining project is preparation. The laboratory also provided PT panels and reagents for diagnostic tests to US NALHN laboratories and Mexico

- North America (from CFIA presented by Dr Charles Nfon)
  The laboratory diagnostic activities undertaken by CFIA during 2013 were reviewed included suspect field cases (all negative) and samples received for export testing. The testing algorithm used to define positive and negative samples was described.

- Europe (from CODA-CERVA presented by Dr David Lefebvre)
  This talk provided an update about a European collaborative FMD project (DISCONVAC). The talk also updated the group about on-going research to develop antiviral compounds for FMDV.

- Europe (from IZSLER presented by Dr Santina Grazioli)
  IZSLER has developed a range of new ELISA kits for FMDV antigen (O, A, C and Asia-1), and antibody detection (O, A, Asia-1 and NSP). During 2013, a new SPCE for FMDV SAT2-specific antibodies has been developed. Ready-to-use kits have been provided to laboratories in Europe, Asia, Africa and Australasia for evaluation. During 2013, training has been provided to veterinary scientists from Egypt and Libya and samples (sera and clinical material from suspect cases) has been received by IZSLER for testing. These samples include O/ME-SA/Ind-2001 samples from Libya reported by WRLFMD.

- Australia (from AAHL presented by Dr Wilna Vosloo)
  A short update of national capacity was provided which includes devolved testing via the LEADDR network. Within this network, the specificity of a 3ABC assay (generated by AAHL) has been evaluated using 3311 sera. A summary was also provided outlining on-

going collaborative projects that particular focus on vaccine protection in Vietnam and training of early career scientists from Vietnam.

Breakout session 1:

In three groups, delegates discussed:

1. How can the FMD Network assist in the implementation of FMD control programs using the PCP monitoring tool?
2. Where are the gaps in the Network?..... proposing solutions
3. How can the FMD Network support the development of regional leading laboratories and network of NRLs ?

Summary of discussions and recommendations

- Improved tools to disseminate data rapidly between the Network partners, other NRLs and OIE and FAO are needed
- Interaction between regional pools: the network should ensure that experience (and best practise) gained in the control of FMD in endemic countries (such as in South America, Southeast Asia, SADC) is shared, and can be transferred (where appropriate) to other control programs.
- More efforts are required to harmonise tests used in different laboratories
- There are still many resource, functional and geographical gaps in the network
- In general, Reference Laboratories from FMD-free countries are willing to assist to close the gaps (it is often in their interest to do so), but they also require sustained funding, and perhaps a more coordinated approach to do this.

Day 2:

- Proficiency testing schemes (from WRLFMD, Presented by Dr Don King)
  An overview of PT schemes that aim to harmonize the performance of laboratory tests was provided including the scope of the PTS coordinated by WRLFMD on an annual basis. These exercises provide confidence to national governments (as wells as OIE and FAO) about the status and capability of the participating laboratories. In additional to WRLFMD, other network partners manage PT schemes for regional NRLs (including RRL-Pakchong for SEA, ARRIAH for labs in Russia and central Asia, SENASA/PANAFTOSA for laboratories in South America). In view of the time, effort and costs associated with the organization of these exercises, members of the network agreed to explore routes to better coordinate these activities.
- Vaccine Matching
  Members briefly summarized local tools and approaches that are used in their laboratories for vaccine matching. Most laboratories use VNT as their primary assay for vaccine matching although LP-ELISA is used at RRL-SEA (and also at WRLFMD and PANAFTOSA as a back-up).
  - WRLFMD – 293 field isolates (111 serotype O, 162 serotype A, 7 serotype Asia-1, 6 serotype SAT1 and 7 serotype SAT2) tested during 2013. An additional research project (funded by BBSRC/CIDLID) to investigate vaccine selection for East African viruses.
  - During 2012-2013, 90 field isolates have been tested at PD-FMD.
  - AAHL/CSIRO provided a short update of in-vivo vaccine efficacy testing carried out in pigs, cattle and sheep for SEA and East Asian field strains using vaccines in the Australian bank (from Merial)
- Post vaccination Monitoring (presented by Dr Samia Metwally, FAO)
  Talk outlined the rationale and benefits of employing PVM for FMD control. A working group (that includes some members of the OIE/FAO network) has been established to

provide guidelines for the use of PVM in different FMD control scenarios and to influence the use of this approach by decision-makers. The development of these guidelines was previously a component of the Network work plan for 2012. This work will be published shortly by OIE and FAO and there are also plans to publish this work in a peer-reviewed journal.

Breakout session 2:

In three groups (based on FMDV global virus pools), delegates discussed:

1. Vaccine priorities and recommendations
2. Gaps in vaccine availability and vaccination
3. Tools available to assess vaccine matching and effectiveness

Summary of vaccine matching discussion and recommendations

- A current focus of vaccine matching work undertaken within the network (particularly at WRLFMD) is to provide recommendations for FMD-free countries regarding antigens held in international vaccine banks
- There needs to be more emphasis on locally produced vaccines used in endemic pools.
- Where possible, vaccine recommendations should be tailored for each of the endemic pools
- Reagents used for vaccine matching studies need to be standardised (and more widely shared between laboratories), and the nomenclature used to define the reagents should be made clearer (as an example see table below)
- Efforts to harmonise approaches used by the different reference centres are urgently needed (see 2014 work-plan and suggested PT for vaccine matching)
- Once harmonised, it may be possible to share data between different reference centres to more effectively coordinate vaccine matching
- Data needs to be presented in a more coherent manner (matrix system)
- Additional reco**mmendation**: to implement a regional antigen bank for South and Central America (for exotic strains) which could coordinate with the North American vaccine bank

- Updates from OIE (FMD GF-TADs Working Group activities presented by Dr Joseph Domenech) and FAO (Update on regional PCP roadmaps and FAO activities presented by Dr Samia Metwally)
- Dr Filip Claes (FAO) provided an overview of the system (Open-FMD) that is being developed by the Swiss Institute of Bioinformatics with support from FAO. The goal is to provide an open access and curated system that includes FMDV sequences together with analysis and search tools (such as those used for sequence alignments and phylogenetic tree-building, BLAST etc.). This system will be linked to EMPRES-i to facilitate links to field epidemiology and FMD outbreaks. Users will be able to upload new data and use the tools to generate reports and undertake analysis. A prototype system is available at: http://openfmd.vital-it.ch/#/ and beta-testing will be initiated by the end of the year. Network partners recognised that this system provides a tremendous opportunity to improve the manner in which data is shared between FMD laboratories. The feedback from the members of the Network was very positive and it was agreed that the network would provide volunteers to test the system. A number of questions were raised about the content provided on the system and the security of “private” sequences. In view of these issues, the network

members were keen to maintain contact with SIB to influence (where possible) the format and functionality of the Open-FMD system.

The table below summarizes antisera and homologous vaccine reagents that have been used recently by the different network laboratories.

	FMDV serotype						
	O	A	C	Asia-1	SAT1	SAT2	SAT3
WRLFMD*	O1 Manisa Russia2000 O-3039 O-4625 SKR/2010 TAW/98 TUR/5/2009 MSD B921	A/ERI/98 A/IND/17/82 A/Iran/2005 A/Iran/87 A/Iran/96 A/Iraq/24/64 A/MAY/97 A/SAU/4/91 A/SAU/4/95 A/TUR/2006		IND/8/79 Shamir	RHO/12/78	ZIM/7/83 ERI 3218	
ARRIAH*	O1 Manisa PanAsia PanAsia-2	A22 N°550 A22 Iraq/64 A/Iran/97 A/TUR/06 A/Kyrg/07		Tadjikistan/2011			
LVRI*	Mya98/BY/2010 O/China 99	AF72 Re-A/WH/09		Asia-1/JSL/06			
OVI*					KNP/196/91 SAR/9/81 BOT/1/06 ZAM/1/06	KNP19/89 ZIM/7/83	KNP 10/90
BVI					SAT1/Botswana	SAT2/Zimbabwe	SAT3/Zimbabwe
PD-FMD†	O/IND/R2/1975	A/IND/40/2000		Asia1/IND/63/1972			
RRL-SEA	O/189/87	Sakolnakorn/97 A/Lopburi/12 A/118/87		Petchaburi/85			
SENASA*	O1 campos	A24 Cruzeiro A Arg/2001	C3 Indaial				
PANAFTOSA*	O1 campos	A24 Cruzeiro A Arg/2001	C3 Indaial				

* Capacity to undertake in-vivo vaccine matching trials
† Vaccine potency trials undertaken in India by ICAR Institute and DADF Govt. of India

- The work-plan for priority activities within the Network for 2014 was discussed (see agreed points on the next page below).

Acknowledgements

The meeting acknowledged the OIE and FAO for providing financial support for delegates to travel to the meeting and EuFMD for providing support to WRLFMD. The OIE/FAO FMD Laboratory Network warmly thanks Dr Tritsadee Chaosuancharoroen (Director) and Akarin Mogthaisong from The Department of Livestock Development, Thailand and for hosting the evening meal and providing logistical assistance with organisation of the venue and visa paperwork. Lastly (but certainly not least!), the secretariat of the OIE/FAO FMD Laboratory Network is grateful for the support and guidance of Dr Somjai Kamolsiripichaiporn (RRL-Pakchong) and Dr Joy Gordoncillo (OIE Sub-Regional Representation for Southeast Asia) without which it would not have been possible to organise this meeting.

Work Plan for 2014: Priorities:

- With assistance from OIE and FAO will obtain and analyse samples into the network from under-sampled endemic pools
- Vaccine matching
    - WRLFMD to prepare (and prioritise) a list of vaccine antigens for each virus pool
    - To identify who has antigens and antisera available for members of the Network
    - To consider how vaccine matching data generated by members of the Network are presented
- To consider undertaking a PT for vaccine matching tests
    - Harmonisation of approaches
    - Exercise to focus on Asia-1 to be initiated during 2014
- Network partners will support to the generation of PVM guidelines
    - Preparation of documentation outlining PVM guidelines
    - Reference reagents for PVM
- Network partners will continue to provide training in laboratory diagnostic methods
- Network partners will provide a central resource of expertise and advice regarding FMD control, vaccines and diagnostics
- To facilitate interactions with field teams and epidemiologists to optimize the interpretation of laboratory results as well as vaccine strain selection and vaccination strategies.
- To enhance real-time exchange of data between partners, possibly in each of the pools
    - Not just at the annual meeting
    - Possibly via regular teleconference or other forum??
    - The network endorses the concept of Open-FMD
        - Network is keen to influence the content
        - Network will provide volunteer labs to evaluate prototype system
- To examine opportunities to transfer the expertise accumulated from FMD control in South America into other FMD endemic regions.
- WRLFMD to coordinate the preparation of an Annual Report
    - Agreed timelines for preparation of 2013 report:
        - Final summaries: January 2014
        - Draft Report: February 2014
        - Report Published: March 2014
- WRLFMD to organise an Annual meeting (location to be agreed after discussion with OIE and FAO)
    - Agreed that (where possible) this should be hosted by a member lab of the network

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

Meeting Delegates:

Name	Email address
Alexey Mishchenko	mischenko@arriah.ru
Aniket Sanyal,	aniket.sanyal@gmail.com
Arshad Javed	Javed.Arshad@fao.org
Charles Nfon	Charles.nfon@inspection.gc.ca
Chris Morrissy	Chris.Morrissy@csiro.au
Consuelo Carrillo	Consuelo.Carrillo@aphis.usda.gov
David Lefebvre	David.Lefebvre@coda-cerva.be
Donald King	donald.king@pirbright.ac.uk
Eduardo Maradei	emaradei@yahoo.com
Filip Claes	filip.claes@fao.org
Hussaini Ularamu	ularamuhussaini@yahoo.co.uk
Jijun He	hejijun1979@163.com
Joseph Domenech	j.domenech@oie.int
Kingkarn Boonsuya Seeyo	noko2519@yahoo.com; rrl@dld.go.th
Kurt Zuelke	Liz.Middleton@csiro.au
Livio Heath	HeathL@arc.agric.za
Mpolokang Elliot Fana	efana@bvi.co.bw
Muhammad Afzal	MuhammadImam.Afzal@fao.org
Ngo Thanh Long	ngothanhlong60@gmail.com
Onkabetse George Matlho	gmatlho@bvi.co.bw
Panithan Thongta	ekkpasang3dld@hotmail.com
Qiang Zhang	qzhang1616@sohu.com
Rompruke Udon	romphrukeudon@yahoo.com
Rossana Allende	rallende@paho.org
Samia Metwally	Samia.Metwally@fao.org
Santina Grazioli	santina.grazioli@izsler.it
Somjai Kamolsiripichaiporn	somjaik@dld.go.th
Svetlana Kremenchugskaya	kremenchugskaya@arriah.ru
Wilai Linchongsubongkoch	wilaifmd@loxinfo.co.th
Wilna Wosloo	Wilna.Vosloo@csiro.au