

The 15th Annual Meeting of the OIE/FAO FMD Reference Laboratory Network

2nd and 3rd December 2020



Meeting attendees (virtual format):

Core Members

	OIE Reference Laboratory for Foot and Mouth Disease, Dirección de Laboratorio Animal, SENASA, Argentina Unfortunately, Andrea Pedemonte was unable to connect to the meeting due to technical difficulties, but she provided a presentation via email.
	OIE collaborating Centre for validation, quality assessment and quality control of diagnostic assays and vaccine testing for vesicular diseases in Europe, and FAO Reference Centre for Vesicular Diseases, Sciensano, Belgium: David Lefebvre, Kris De Clercq
	OIE Regional Reference Laboratory for Sub-Saharan Africa (RRLSSA), Botswana Vaccine Institute (BVI), Botswana: Joseph Hyera, Moagabo Kaebetswe, Mokganedi Mokokpasetso, Mpolokang Elliot Fana
	OIE Reference Laboratory for FMD, Pan American Foot-and-Mouth Disease and Veterinary Public Health Center, Pan American Health Organization/World Health Organization (PANAFTOSA/VPH-PAHO/WHO), Rio de Janeiro, Brazil: Edviges Maristela Pituco
	FAO FMD Reference Laboratory, National Centre for Foreign Animal Disease National Centres for Animal Disease, Canadian Food Inspection Agency, Canada: Charles Nfon
	OIE and China National FMD Reference Laboratory, Lanzhou Veterinary Research Institute (LVRI), CAAS, People's Republic of China: Dang wen, Jijun He, Jianhong Guo
	OIE FMD Reference Laboratory, French Agency for Food and, Environmental and Occupational Health & Safety (ANSES), France: Labib Bakkali Kassimi, Romey Aurore, Souheyla Benfrid, Stéphan Zientara
	FAO Reference Centre for FMD in South Asia, Indian Council for Agricultural Research (ICAR) Directorate of Foot-and-Mouth Disease, Mukteswar, Nainital (Uttarakhand), India: Jajati Keshari Mohapatra, Saravanan Subramaniam

	OIE/FAO FMD Reference Laboratory, Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER), Italy: Arianna Bregoli, Emiliana Brocchi, Giancarlo Ferrari, Giorgio Varisco, Giulia Pezzoni, Marco Bugnetti, Santina Grazioli
	OIE Reference laboratory for Foot and Mouth Disease, Animal and Plant Quarantine Agency (QIA), Republic of Korea: Cha Sang-Ho, Daraelim, Jong-Hyeon Park, Soyeon Ryoo
	FAO Reference Centre for FMD for Central Asia and West Eurasia and OIE Reference Laboratory for FMD, Federal Governmental Institute, Centre for Animal Health (FGI ARRIAH), Vladimir, Russian Federation: Iiya Chvala
	FAO Reference Laboratory for FMD in Africa and OIE FMD Reference Laboratory, Transboundary Animal Diseases Programme, ARC-Onderstepoort Veterinary Institute (ARC-OVI), South Africa: Livio Heath, Pamela Opperman with apologies received from Francois Maree
	OIE Regional Reference Laboratory for Foot and Mouth Disease in the South East (RRLSEA) Department of Livestock Development, Thailand: Kingkarn Boonsuya Seeyo, Sahawatchara Ungvanijban
	FAO World Reference Laboratory and OIE FMD Reference Laboratory, The Pirbright Institute Pirbright, United Kingdom: Anna Ludi, Antonello Di Nardo, David Paton, Don King, Hannah Baker, Nick Knowles, Valerie Mioulet
	FAO Reference Centre for FMD and other vesicular diseases for the Americas and the Caribbean and OIE FMD Reference Laboratory, Foreign Animal Disease Diagnostic Lab, Plum Island Animal Disease Center (PIADC), United States of America: Consuelo Carrillo, Jamie Barnabei, Robin Holland

Affiliates

	Australian Animal Health Laboratory (AAHL), Australia: Nagendra Singanallur, Petrus Jansen van Vuren, Wilna Vosloo
	NATIONAL Animal Health Diagnostic & Investigation Center (NAHDIC), Ethiopia: Daniel Gizaw
	Foot and Mouth Disease Laboratory, Kenya: Abraham Sangula
	National Veterinary Research Institute, Vom, Plateau State, Nigeria: Hussaini Ularamu
	Laboratoire National d'Elevage et de Recherches Vétérinaires (LNERV), Senegal: Gaye Laye Diop, Modou Moustapha
	Şap Institute (and WELNET FMD), Ankara, Turkey: Abdulnaci Bulut, Can Cokcaliskan
	Pan African Veterinary Vaccine Center for African Union (AU-PANVAC), Ethiopia: Ethel Chitsungo

OIE/FAO Representatives

	Food and Agriculture Organization of the United Nations: Astrid Tripodi, Estelle Kanyala, Samia Metwally, Christian DeBattisti
	OIE – World Organization for Animal Health: Min-Kyung Park
	The European Commission for the Control for Foot-and-Mouth Disease: Carsten Potzsh, Etienne Chevanne, Farbrizio Rosso, Kees van Maanen, Madhur Dhingra, Muhammad Javed Arshed, Nick Lyons, Paolo Motta, Melissa McLaws
	Laboratory Leaders for Regional Roadmaps: Rajeev Ranjan

TUESDAY 1ST DECEMBER 2020, DAY 1

Opening of meeting and adoption of agenda (Don King)

Recent achievements of the Network are listed below.

- Publication of the 2019 Annual Network Report summarising the global situation regarding the distribution of FMD in different regions of the world.
- Website (www.foot-and-mouth.org) has been updated to contain a “static” FMD dashboard.
- New inter-laboratory study to calibrate VNT methods has been funded by EuFMD.
- Two manuscripts with contribution from Network partners have been submitted for publication:
 - History of serotype C and recommendations to prevent re-introduction of the serotype – submitted to *Virus Evolution*
 - FMD Reference materials highlighting current gaps in available reagents – submitted to *Scientific and Technical Review of the OIE*

Update from the OIE (Min Kyung Park)

Summary of country applications for FMD submitted to the OIE during 2020:

- Chinese Taipei has been granted a zone FMD-free without vaccination.
- Brazil has merged two zones which are FMD-free with vaccination.
- Colombia has regained FMD free (with vaccination) status in four separate zones.
- Kyrgyzstan has been endorsed for an official OIE control programme.
- South Africa’s FMD OIE status is still suspended.

A revision of the OIE Terrestrial Animal Health Code (Chapter 8.8 *Infection with foot and mouth disease virus*) has been circulated to members for comment. The next foreseen revision of the FMD Chapter (3.1.8) in the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals will be during the 2022/2023 cycle.

Update from FAO (Samia Metwally)

It is recognised that there is a need to strengthen the support for countries to move from progressive control pathway (PCP: <http://www.fao.org/eufmd/global-situation/pcp-fmd/en/>) stage 0 to 1 and during Day 2 of this meeting PCP support officers will be introduced to the Network. The FAO and OIE have formed GCC-FMD (global coordination committee of FMD) which will coordinate the FMD global strategy over the next 5-year period. The partners included are PANAFTOSA, AU-IBAR, SEACFMD, Regional Economic Community, EuFMD, WRLFMD, GFRA, OIE Working Group on Wildlife, India and Ethiopia and *ad hoc* invited guests.

A new book on veterinary vaccines will be published by the end of the year.

During this year’s meeting, there was no update from OIE or FAO regarding the impact of the Nagoya Protocol (<https://www.cbd.int/abs/>) on work that is central to the Network (such as exchange and use of field samples, development of FMD vaccine strains and new diagnostic tests). In view of the importance of the Protocol to our activities, the consensus was that this should be kept on the agenda with a further update on the coordinated activities of OIE, FAO and WHO requested for next year’s meeting.

Action O20-01 Include an agenda item for an update on the Nagoya Protocol at next year’s meeting

Global Review (Don King)

In common with the international FMD Reference Laboratory activities of other Network partners, the number of field samples received this year to the WRFMD has decreased as a consequence of COVID-19 restrictions. During 2020, only 161 samples have been received from 5 countries in comparison to 400-700 samples that are normally tested.

From samples tested, recent sequence data indicate that the O/ME-SA/Ind-2001e lineage is becoming more established in Pakistan: this lineage was detected for the first time in 2019 (in two FMDV positive samples) and during 2020, 19 out of 50 samples were characterised as O/ME-SA/Ind-2001e. This shipment also highlighted the genetic diversity of FMD viruses causing other outbreaks in Pakistan where circulating lineages include O/PanAsia-2^{ANT-10}, A/ASIA/Iran-05 (SIS-13, FAR-11 sub-lineages and two isolates in un-named clades) and Asia 1/Sindh-08. Elsewhere, a new FMD viral lineage within the O/ME-SA topotype has been identified in Sri Lanka. These sequences are distinct to the PanAsia, PanAsia-2 and Ind-2001 lineages and genetically related to contemporary viruses collected in India (see Annex 1).

The WRLFMD has developed a new probe enrichment method that can be used to increase the analytical sensitivity of full genome sequencing methods for FMDV. During 2020, this method has been applied to environmental samples (with low viral copy number) collected in Cameroon (see: https://www.wrlfmd.org/sites/world/files/quick_media/WRLMEG-2019-00044-CAR-GTR-O-O_001.pdf).

Following on from work described at the meeting in 2019, further work has been undertaken in partnership with AU-PANVAC to improve vaccine selection for endemic countries. The basis of this work is the measurement of heterologous antibody responses using regional reference antigens (for examples see: <https://www.wrlfmd.org/node/2096/>). Looking forward, there are opportunities for the Network to contribute to this work, specifically to help define cut-offs for the serological assays that are used to monitor post-vaccination responses.

Action O20-02 Include an agenda item for vaccine selection for endemic pools.

Pool 1: Southeast Asia (Kingkarn Boonsuya Seeyo)

During 2020, samples have been received from Thailand (n=235), Cambodia (n=84) and Lao PDR (n = 9). Surveillance has also taken place in Thailand, with 78.9% of animals testing positive for FMDV-specific NSP antibodies.

Pool 1: East Asia and China (Dang wen)

A total of five outbreaks have been reported in China. Thirty-five samples have been sequenced and were found to comprise O/SEA/Mya-98 (n=16, 2 genetic groups with 92-93% genetic identity), O/CATHAY (n=15) and O/ME-SA/ind-2001 (n=4). There were no reports of outbreaks due to serotypes A and Asia 1 during 2020. The FMD vaccine strain O/BY/2010 appears to be a good match against the circulating serotype O strains collected from China by VNT except O/CATHAY.

Pool 1: East Asia and South Korea (Jong-Hyeon Park)

No outbreaks of FMD were recorded in South Korea during 2020; however, post-vaccination monitoring and NSP sero-surveillance studies are ongoing where SP (serotype O) positivity rates are >80% for cattle and pigs. An overview of the national FMD vaccination campaign was presented, where multivalent vaccines are currently being supplied from three companies (O-3039/O1-Manisa,

A22 from BI, O-Campos, A/Arg-2001, A24 Cruzeiro from Biogenesis Bago and O-Primorsky + A-Zabaikalsky from Russia) and are for both pigs (breeding and fattening) as well as cattle.

Pool 1: Russia (Ilya Chvala)

One FMD outbreak occurred in 2020 in cattle located at the border with Inner Mongolia, China. Sequence data characterised the causative FMD virus belonging to the O/SEA/Mya-98 lineage. Clinical signs were only observed in cattle; no clinical signs were seen in small ruminants. For three years samples, have been collected from wildlife – mostly Mongolian gazelle, where testing is underway. Current results show that both SP and NSP antibodies have been detected in these animals over the past two years where FMD outbreaks in cattle in the same region have occurred.

Pool 2: India (Jajati Keshari Mohapatra)

During 2020, ICAR-DFMD has been involved in testing for COVID-19 samples. For FMD, there have been 51 serotype O outbreaks and 1 serotype A outbreak. Over the past few years, the O/ME-SA/Ind-2001d has been superseded by O/ME-SA/Ind-2001e. Recent testing has highlighted sequences for 22 isolates that clustered distinctly and represent a novel lineage (tentatively named O/ME-SA/2018). The presentation summarised recent positive vaccine matching results for the IND R2/1975 vaccine strain.

UPDATE – Overnight there was an exchange of sequences between WRLFMD and ICAR-DFMD to determine whether the sequences for samples from Sri Lanka cluster with those isolated from India (O/ME-SA/2018 clade). These two outbreaks appear to be linked suggesting that this new lineage is already present in two countries. The situation will need to be monitored (see Annex 1).

Pool 3: Turkey and WELNET FMD (Abdulnaci Bulut)

The Thrace region of Turkey has remained free since May 2010. In Anatolia, serotype O has been the only FMD serotype detected since 2018 (i.e., no detected cases due to serotypes A and Asia 1). During 2020, 220 samples were received from 137 outbreaks: the majority of sequences (n=58) were characterised as belonging to the O/ME-SA/PanAsia-2^{Qom-15} sub-lineage, although two sequences for samples collected during August were genotyped as O/ME-SA/PanAsia-2^{Ant-10} that represent a new introduction of this sub-lineage into Turkey. National surveillance activities have tested 19471 sera for NSP-specific antibodies and 2374 sera for post vaccination monitoring. Vaccine matching indicates that the current vaccine strains (O TUR 07, O TUR 17 and O1-Manisa) are well matched against samples collected during 2019-20; however, there were difficulties to isolate a virus from the ANT-10 samples and therefore no vaccine matching was performed. Regional co-ordination is facilitated via the WELNET FMD where work undertaken by ANSES has assessed capacity and performance of national veterinary diagnostic labs in West Eurasia. A protocol has also been prepared (with EuFMD) to outline sample collection and testing by the Şap Institute and International FMD Reference Laboratories. Sharing of laboratory data has been discussed as part of two tripartite meetings (with Turkey, Iran and Pakistan) and further meetings with Transcaucasian countries.

Pool 4: Kenya – East Africa (Abraham Sangula)

One hundred and twenty-three samples have been submitted to the FMD Laboratory, Embakasi, Kenya during 2020. Using antigen-ELISA, serotype O (n=48) and SAT 1 (n=35) have been detected; however, no sequencing analyses have been undertaken. Serological testing has generated positive NSP results for 40.2% (n=1941) of samples, while VNT and SPCE diagnostic methods have also been used to test sera for post-vaccination monitoring purposes. Both local and internationally produced

FMD vaccines have been used for control – and vaccine matching testing has been performed for O K77/78 and SAT 1T 155/71 vaccine strains.

Pool 4: Ethiopia – East Africa (Daniel Gizaw)

During 2020, investigation of field outbreaks of FMD in Ethiopia has been impacted by COVID-19 restrictions. Out of 85 samples received to NAHDIC from 12 outbreaks, antigen ELISA was used to serotype samples as O (n=30), A (n=6), SAT 1 (n=10) and SAT 2 (n=29) – a further 10 samples were FMDV negative. Serological export testing has occurred for small ruminants, in which 1.2% were positive for NSP antibodies, and cattle, for which 14.7% were positive.

Pool 5: Nigeria – West Africa (Hussaini Ularanu)

In the past twelve months, 179 epithelial samples have been collected from cattle goats and sheep where serotypes O and A have been detected. Further samples comprising bovine meat juice (n=396), swine meat juice (n=69) together with cattle sera (n=1,060) have been collected as part of a collaborative project with NCFAD, Canada.

Pool 5: Senegal – West Africa (Modou Moustaphe)

Serotype O was identified in samples collected in 2018; however, samples collected recently need to be sent to WRLFMD for confirmation. A further 236 samples were received from Guinea – of which 92 tested positive.

Pool 4-6: Sub-Saharan Africa (Livio Heath)

In March 2020 there was an FMD outbreak in the protection zone (PZ) located in Limpopo Province. Clinical samples (n=125) have been received of which 33 have been serotyped as SAT 2 (topotype I). Sequence data indicates that the causative FMDV originated in buffalo and are distinct from earlier FMD outbreaks that occurred during 2019 (Jan/Feb and Dec 2019). Samples have also been received from Namibia and Swaziland for export purposes; these were all negative by RT-PCR. During 2020, sera have also been received for serological testing, where two positive reactors for samples collected in Zimbabwe have been identified. An in-house SPCE is now used to detect FMDV-specific antibodies for serotypes SAT 1, SAT 2 and SAT 3 (as a more rapid way to screen samples compared to the LPBE), while commercial kits are used for serotype O and A antibodies. Vaccine matching has been performed on the SAT 2 samples against the SAT 2 SAR/3/04 and SAT 2 KNP/1/10 vaccine strains and ARC has developed five new vaccine strains that are being prepared for commercial release and will be available to the region. The current risks in Pool 6 (Southern Africa) are serotype SAT 2 topotype I as well as serotype SAT 3, which has recently spread in parts of the region, perhaps due to the drought and movement of animals into new areas.

Pool 4-6: Sub Saharan Africa (Mokganedi Mokopasetso)

There has been a decrease in samples submitted to RRLSSA (Botswana) during 2020: clinical samples received during the year include 8 from Namibia (serotypes SAT 3 and SAT 2), 46 from Botswana (serotype SAT 1), 6 from Zambia (serotype O) and 2 from Malawi (serotype SAT 2). Final analyses for some of these samples is still underway, although sequencing analyses has detected the following FMD virus lineages: SAT 1/III (Botswana), O/EA-2 (Zambia), SAT 3/II (Namibia) and SAT 2/I (Malawi). Particular regional concern surrounds (i) the spread of O/EA-2 in Zambia (from Pool 4: East Africa) and the onward potential for this virus topotype to move further south into Southern Africa (Pool 6) and (ii) the on-going situation regarding serotype SAT 3 in Zambia and Namibia that motivates more surveillance studies in buffalo. Additional samples have been received for serological testing (by NSP,

LPBE and VNT) and vaccine matching results were report for a SAT 1 isolate (BOT/8/2020) for two BVI vaccine strains: SAT 105 (matched) and SAT 109 (not matched).

Pool 7: South America (Maristela Pituco)

There have been no reports of FMD in South America for >3 years and no samples from suspect FMD cases were received during 2020; however, testing continues to be performed for differential diagnostic purposes (vesicular stomatitis, Senecavirus A, bluetongue and poxvirus infection). The lab also performed vaccine tests for quality control. A project is currently underway to sequence historical South American FMDV strains (1950-2018) in partnership with CFIA, Canada. Since 2019, South America has used a bivalent FMD vaccine with O₁ Campos and A₂₄ Cruzeiro, except for Argentina which continues to use quadrivalent vaccine (O₁ Campos, A₂₄ Cruzeiro, A Arg/2001 and C₃ Indaial). The plan is to withdraw vaccination by 2026. Panaftosa has organized a proficiency testing for FMD/VS with the attendance of 20 laboratories from American continent. Furthermore, Panaftosa developed and validated a new ELISA 3ABC kit with higher sensitivity and specificity appropriate to the current epidemiological situation in the region. In partnership with MAPA/Brazil, the laboratory delivered 7 FMD e-training courses.

Pool 7: South America (presentation provided by Andrea Pedemonte)

This presentation summarised activities that have been undertaken during 2020 at SENASA, Argentina where differential diagnostic tests have been used to detect the presence of a range of livestock infectious agents in samples submitted from suspect FMD cases (bovine papular stomatis, vesicular stomatitis, bovine herpes virus-1, contagious ecthema, and BVD). Sera samples (n=12,000) have also been tested to demonstrate the absence of FMDV circulation in Argentina and to monitor population immunity after vaccination.

WEDNESDAY 2ND DECEMBER 2020, DAY 2

Update from CSIRO (Wilna Vosloo)

The name of the Geelong laboratory has changed from AAHL to Australian Center for Disease Prevention (ACDP). The COVID-19 pandemic has impacted ongoing international collaborations including work to assess virus inactivation techniques, vaccine matching, serotype-specific PCRs and the development of new NGS methods. Recent work undertaken in Australia has assessed surveillance approaches that can be adopted to regain FMD free status; results indicate that non-invasive bulk (herd-level) testing by real-time RT-PCR (such as bulk milk and rope chews) have the potential to speed up and reduce costs associated with disease surveillance after outbreaks in a country (further details will be provided in a presentation to the Open Session of EuFMD in Dec 2020).

Update from SCIENSANO (David Lefebvre)

No samples were received during 2020 from international partners. The OIE twinning project in Nigeria (with NVRI, Vom) has concluded and the research and surveillance outputs have been published in *Frontiers in Veterinary Science*. Work to establish a partnership with the FMD Lab in Burundi is still ongoing, although to date no new samples have been received.

Update from ANSES (Labib Bakkali Kassimi)

During 2020, LFD and swab samples have been obtained from Burkina Faso and Niger. From these samples, 15 viral isolates have been generated (from the swabs) that are currently being typed and

sequenced. In order to assess the capacity and expertise of veterinary laboratories, ANSES (with support of EuFMD) has undertaken a new survey to review the strengths and weaknesses of diagnostic testing for FMD and other “FAST” transboundary animal diseases involving REMESA (8 laboratories) and the south-eastern European neighbourhood (9 laboratories). A similar exercise has been carried out for 38 European countries. ANSES has organised a proficiency testing scheme for FMD/SVD (under the EU-RL); where thirty-eight countries have participated. From a research perspective, ANSES has started to develop a triplex real time RT-PCR to detect FMDV (including a GAPDH house-keeping control and the 3D assay defined in the OIE Manual, and where the 5’UTR target has been replaced with a new assay that detects 2B). Once validated, the goal is to provide a ready-to-use master mix for FMD laboratories.

Update from IZSLER (Santina Grazioli)

No FMD clinical samples have been received from overseas during 2020. There has been a 60% reduction in the request for antigen detection ELISA kits produced by IZSLER ELISA that could be connected to the COVID 19 emergency, with the logistic difficulties also for shipment of materials overseas. Currently the structural protein serotype O kits is most popular. IZSLER have recently developed of a multiplex LFD with 4 reaction lines (for type O, A, Asia 1 typing) in a single strip using the same set of well characterized MAbs, previously selected for the Ag-ELISA kit. Validation with field samples is in progress in collaboration with NRLs in endemic areas, as well as studies to develop a multiplex LFD for typing SAT1 and SAT2 viruses. Diagnostic performance of FMDV detection and serotyping assays on clinal samples collected in Tanzania during 2012-2018 has been conducted. The performance of the virological assays was compared, including a set of five serotype-specific real-time RT-PCRs for EA types/topotypes in order to compare the diagnostic performance including the capability to serotyping. During 2020, sera collected from a small-scale vaccination trial in Georgia and Armenia has been evaluated. The study analysed the onset and duration of neutralizing antibodies elicited after the first and the second vaccination in groups of small and large ruminants kept under controlled field conditions. Unfortunately, the humoral response against the vaccines analysed was modest and not expected to induce a protective and long-lasting population immunity.

Update from NCFAD (Charles Nfon)

During 2020, clinical samples (n=28) have been received and analysed from Nigeria (in partnership with NVRI, Vom) where serotypes O (EA-3 and WA), A (AFRICA/G-IV) and SAT 2 (VII) have been detected. For SAT 2, sequences have revealed two genetic clusters, that may indicate virus introduction into the country. Once full genome sequencing has been completed data will be exchanged with WRLFMD. NCFAD, WRLFMD and NVRI are currently working together to organise vaccine matching work for representative samples from Nigeria.

Update from APHIS, Plum Island (Consuelo Carrillo)

FMD diagnostic testing at Plum Island during 2020 has only involved domestic samples; all of these were negative. APHIS has also been involved with recent VS and RHD-2 cases in the USA. Due to COVID-19 social distancing measures there has been a delay in research and diagnostic objectives. In response to the request during last year’s meeting for large volumes for sera from vaccinated animals, APHIS can make available the following sera for distribution to Network partners: A Saudi-95 and SAT 1 ZIM collected at 21 days post vaccination.

Action O20-05 WRLFMD to add a new page to the Network website that lists available reference sera

Update from AU-PANVAC (Ethel Chitsungo)

AU-PANVAC harmonises vaccine registration and approves pre-registration certificates as well as post-registration certificates (for batch control). The OIE Twinning project (2019- 2022 with WRLFMD) aims to establish this capacity for FMD. AU-PANVAC has been invited to assist with the AgResults competition (<https://agresults.org/projects/fmd-vaccine>).

Update from EuFMD with overview of FMD vaccine survey for endemic countries (Kees van Maanen)

This presentation briefly summarised recent activities of EuFMD which are now expanded to support the control of FAST (FMD and similar transboundary) diseases (<http://www.fao.org/eufmd/what-we-do/en/>). During 2020, EuFMD (with WRLFMD) have delivered a FMD Laboratory Investigation Training Course (3rd edition) and have implemented work for vaccine security (led by David Mackay), where a new analytical model is being established to predict FMD vaccine demand for endemic countries. The presentation highlighted that an expert elicitation (seeking feedback from Network partners) is ongoing with the expectation that the model will be completed by the end of January 2021.

Introduction to regional LabNet leaders

The purpose of the regional laboratory networks (LabNets) is to harmonise diagnostics, share data, carry out training courses and have webinars in support of the regional FMD RoadMaps. The current LabNet leaders are Amer Younes Ahmed Saleh for the Middle East, Rajeev Ranjan for South Asian Association for Regional Cooperation (SAARC), Abdalnaci Bulut for West EurAsia, P. Makaya for Southern African Development Communities (SADC), Alfred Wejuli for East Africa, Lo Mbargou for West Africa, Richard Ngandolo Nare Bongo for Central African Republic. Abdalnaci Bulut and Rajeev Ranjan attended this meeting and briefly introduced their roles and highlighted opportunities for collaboration with the Network. The difficulties are commitment from countries for this type of work and overcoming poor communication during outbreaks (information is often received too late). It was agreed that the Network would continue to invite the regional LabNet leaders to future Annual meetings.

Progressive Control Pathway (PCP) Support Officers (PSOs) Etienne Chevanne

Etienne Chevanne introduced the concept of PCP FMD Support Officers (PSOs). These individuals advise countries on disease control policies and risk-based approaches for moving through the PCP including the planning and implementation of country-level plans. So far, thirteen PSOs have been assigned to 28 countries; however, approximately 31 additional countries are considered to need assistance from a PSO. There is also a need for new PSOs that speak languages such as Chinese, Russian, French, and Arabic. A PSO training development framework has been drafted and the FAO/OIE invite experts from the Network to sign up to become a PSO. David Paton commented how being a PSO helps to understand the wider issues regarding FMD control and Kees van Maanen highly recommended becoming a PSO. *If you are interested in becoming a PSO please e-mail FAO-FMD@fao.org. Additional information can also be found here: <http://www.fao.org/eufmd/global-situation/pcp-fmd/pcp-support-officers/en/>.*

Review of global and regional risks by Network partners

The Annual Report from the Network (for recent example see: <https://www.foot-and-mouth.org/sites/foot/files/user-files/research-paper/pdf/11-20/OIE-FAO%20FMD%20Ref%20Lab%20Network%20Report%202019.pdf>) collates data from different sources to map the distribution of important FMD lineages and highlight how these viruses may move in the future. Based on recent transboundary spread, there are currently five lineages included in these maps for Serotype O: O/ME-SA/Ind-2001, O/ME-SA/PanAsia, O/ME-SA/PanAsia-2, O/SEA/Mya-

98 and O/EA-3. Maps for serotype A include A/ASIA/Iran-05, A/ASIA/G-VII and A/ASIA/Sea-97 lineages, while serotype Asia 1 and SAT 2 (topotype VII) are shown in separate maps. The meeting participant reviewed these maps and agreed that the following points should be accommodated during the 2020 update:

A020-07 – Suggestion for updating global and regional risk maps

- In view of recent epidemiological events, include new maps to show the distribution of O/EA-2 and A/AFRICA/G-IV
- Consider whether are now lower risks associated with A/ASIA/G-VII in Pool 3 due to the reduced number of cases that have been reported due to this lineage in the region (2019/2020).
- Highlight that there are few (or no) opportunities for live animal movements across the India-Pakistan border
- Highlight that the spread of O/ME-SA/Ind-2001 into Egypt is constrained by the main pathway for animal importation into the country (which is from countries to the south)
- Include text to explain that serotype Asia 1 cases are due to two separate genetic lineages (Pools 2 and 3, respectively)
- Consider whether the colour scheme could more clearly show the historical distribution of the viruses
- Include updated text to explain the purpose of the arrows
- Where possible, adopt the UN Geoscheme definition of regions in the narrative text

New data-sharing and display tools

Proposal: a harmonised system to collect and display laboratory and field data from the Network
(Antonello Di Nardo)

In order to help collate laboratory and field data from the Network, the WRLFMD proposes that a simple Excel sheet is used by the partners to collect the metadata associated with samples collected from FMD outbreaks. This talk introduced a simple .xls sheet that might be used to collect these data to facilitate data sharing and enhance post-processing analysis.

A020-08 – ALL PARTNERS: please provide feedback on the feasibility of using this Excel format to report data and make any suggestions to improve the form.

The talk also briefly introduced an FMD open-access project which will allow users to explore of FMD data in real-time, including investigation of vaccine efficacy and protection as well as the endemic spread of the disease. The ideas for this project are currently being discussed with EuFMD and will include an FMDV sequence database (described below), bioinformatics pipeline and APIs, reporting module and visualisation client.

A020-09– WRLFMD and EuFMD welcome feedback – ALL PARTNERS, please respond to this survey to capture system requirements:

<https://forms.office.com/Pages/ResponsePage.aspx?id=Eh70v1zu20izMQzOHucOut-ijsc2qwZOo151ynO2MwhUN01SUFVROTc3TTRYRkiEMTU3WU1FTUyQy4u&wdLOR=c62C7239C-7FB3-854B-A0AD-AA977B792E0B>

FMDbase: a new “open access” database for FMDV sequences (Nick Knowles)

WRLFMD is developing FMDbase: a new “open access” database for FMDV sequences. This database is being scripted in MySQL and will contain GenBank, WRLFMD VP1 and complete genome sequences. The current number of sequences that will be added to FMDbase is 17,146, of which 2,062 are complete or near-complete genome sequences. It is anticipated that the database will be available during the early part of 2021. External users will be able to access the content via a web-portal with different security levels: public or private (unpublished data). It is currently anticipated that the Network MoU will cover data exchange between partners within the Network and once the system is established the WRLFMD hopes that the database will be widely used by different FMD Reference Laboratories.

COVID-19 experiences from Network partners

As anticipated, COVID-19 has significantly impacted on the work of the Network during 2020. Almost all of the presentations from the partners highlighted a reduction in samples tested as a consequence of local restrictions to send veterinary teams out to the field and difficulties to organise international shipments during this period. Furthermore, staff from a number of the laboratories have been engaged with the priorities of national COVID-19 diagnostics and equipment has been re-purposed for SARS-CoV-2 diagnostics. There were also examples of work being impacted by restrictions in the availability of reagents (such as PCR kits) and PPE.

Samia Metwally – Through her contacts it appears that people can go into the field to collect samples; however, there is limited, to no PPE. There also appears to be a decrease in the diagnostic tests that are available. A report is being written about this and Samia will share the results.

Action O20-03 Samia Metwally to share the results of the impact of COVID-19 with the Network

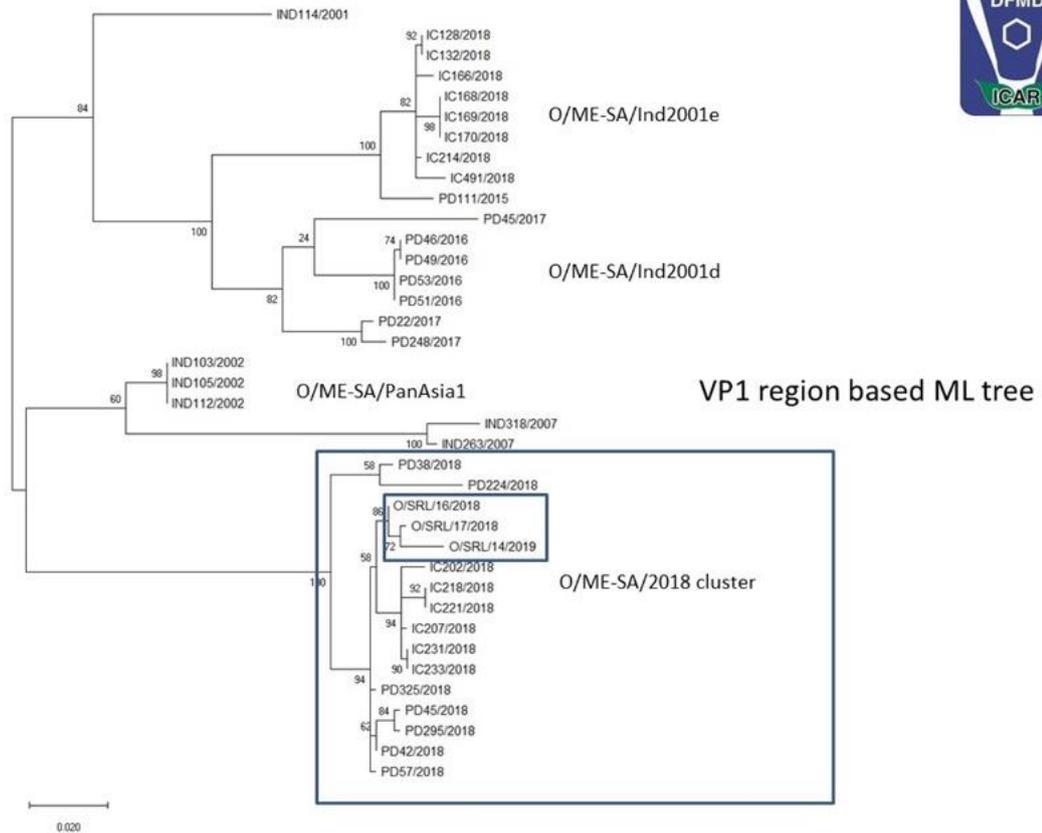
Min Kyung Park – As of yet there has been no decrease in the number of OIE-status applications, but this may only be reflected next year. However, the OIE has indications that there has been a delay in some sero-surveillance activities and the implantation of certain control measures.

Suggestion to carry out survey within the network to assess impact.

Action O20-04 WRLFMD will circulate a short survey (via Survey Monkey) to be completed by all partners and affiliates Results will be fed back to all partners as well as the OIE/FAO.

Annex 1: Phylogenetic analyses demonstrating close genetic relationship between Indian (coded PD) and Sri Lankan (coded O/SLR) FMD viruses within the “new O/ME-SA/2018” clade

Thanks to Drs Saravanan and Mohapatra and colleagues at ICAR-DFMD



Annex 2:

ACTION LOG: Progress on actions from previous meetings

Completed	Open (in progress)	Open (no progress)
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Action number	Owner(s)	Description and review
C4-17	David Lefebvre, Labib Bakkali Kassimi, Andrea Pedemonte, Consuelo Carrillo and Charles Nfon	To establish a working group to coordinate the review of the FMD chapter of the OIE Terrestrial Manual. Open but no imminent update in the OIE Manual is planned for 2020.
O2-17	ANSES, IZSLER SCIENSANO, NCFAD and WRLFMD	Review data from samples that generated inconsistent NSP results and report back to the Network with these findings (for the tests provided by ThermoFisher and ID.vet – but not with the indirect ELISA provided by IZSLER. A short publication on the NSP harmonisation exercise is in draft and awaiting feedback from all collaborators. NCFAD should also be included in these conversations. Observations from the European interlaboratory study have been published: Browning et al., 2020 – JVDI.
C5-18	WRLFMD/ALL	WRLFMD (and other partners) to consider whether a review article should be written to collate historical information on serotype C and to recommend the process to formally remove this serotype from FMD viruses circulating in endemic countries. Closed – the review article has been submitted to <i>Virus Evolution</i>.
C6-18 (see C4-17)	ALL	Working Group to prepare recommendations for appropriate modifications to the sections in the OIE Manual that describe vaccine-matching methods – including any relevant comments from the GFRA meeting held in 2017. There are no OIE manual updates planned for the next six months. This action will remain open as work is still being carried out by Network members to determine the best course of action Ongoing – Min Kyung Park will provide an update during this meeting.
C10-18:	Labib Bakkali Kassimi	Working Group to prepare a questionnaire will be sent out to help standardise sample nomenclature (lab coding maybe included) Ongoing – point will be discussed during 2020 meeting (Day 2)
O2-18	Don King	Don King to send around a draft figure of how viral pools are linked. Figure was attached to the minutes (see Appendix 1) with feedback requested for early 2020. Figure was sent – and some feedback was received. Final version of the figure needs to be prepared.
O3-18	Anna Ludi	To draft a document containing the BVS currently available at The Pirbright Institute. Other institutes including industry could then add to this list (only large quantities would be included). This could include a reference panel.

		Ongoing – list of available bovine vaccination sera has been included in a review article submitted to the OIE. Network website still needs to be updated.
C2-19	Min Kyung Park and Don King	Investigate whether a short article for the OIE bulletin can be published for 2020 Completed – text sent to the OIE
C3-19	ALL	The Nomenclature Steering Group requires a new coordinator (since Kasia Bankowska left WRLFMD)– Please send any nominations to WRLFMD Open
C4-19	ALL	Proposed laboratory capabilities required for different countries in the PCP pathway – to feed into the global PTS that is managed by WRLFMD Closed – feedback regarding laboratory capability and the PCP will be incorporated into the interpretation of PT results for the exercise that will be reported in early 2021.
O1-19	All	Other reference laboratories that are not OIE/FAO may also need to sign a type of MoU so that can be shared more easily within the Networks, specifically sequencing information. WRLFMD will investigate further. Open
O2-19	All	The O/EA-3 sequence data should be shared to study how this lineage is moving across Africa. This could include strains from WRL, ANSES and NCFAD. O/EA-3 sequence data from NVRI, ANSES, IZSLER, NCFAD and WRL has been collated – with a view to formally reporting these data (as a joint paper?)
O8-19	All	The annual report will be started in the New Year. Please reply to Mark Henstock e-mail regarding laboratory reports for 2019 activities. Closed – the 2019 network report has been published.
O5-19	Samia Metwally	There is a tri group reviewing Nagoya (representing OIE/FAO/WHO). Samia Metwally will get the most updated information from this committee. Update at the 2020 meeting