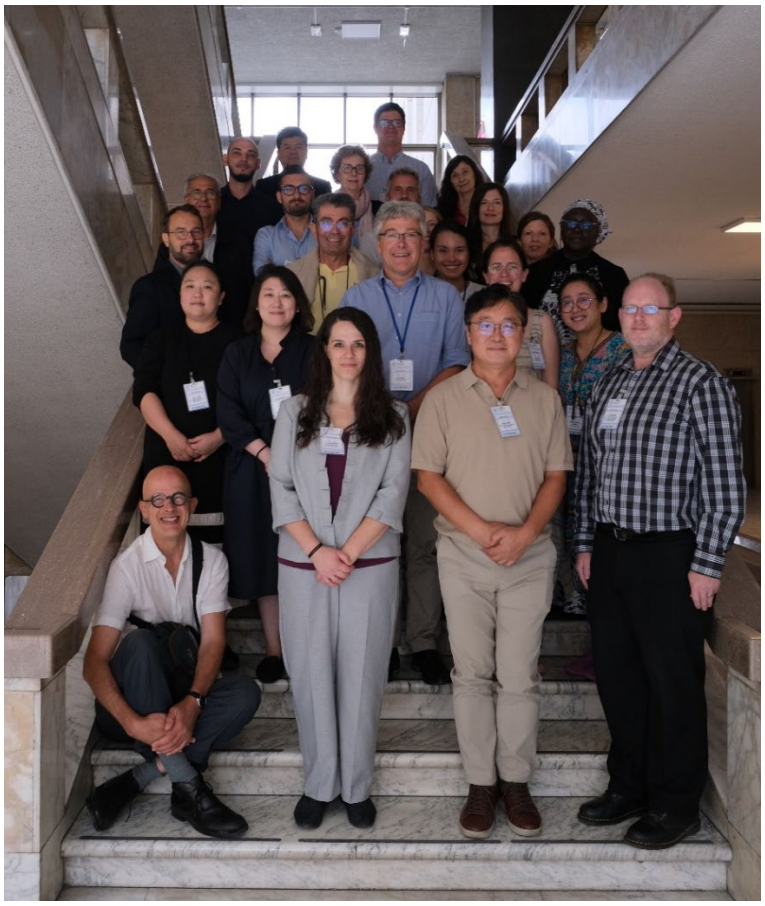
WOAH/FAO
Foot-and-Mouth Disease
Reference Laboratories
Network

The 19th Annual Meeting of the

WOAH/FAO FMD Reference Laboratory Network

25th-27th September 2024

Hosted by: FAO, Rome Italy



Core Members

	WOAH Reference Laboratory for FMD, Dirección de Laboratorio Animal, SENASA, Argentina Speaker: Sabrina Galdo Novo
	WOAH 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 Speaker: David Lefebvre
	WOAH Reference Laboratory for FMD Botswana Vaccine Institute (BVI), Botswana Speaker: Elliot Fana
	Centro Panamericano de Fiebre Aftosa (PANAFTOSA) and PAHO /WOAH Reference Laboratory for FMD, Brazil Speaker: Edviges Maristela Pituco; Participants: Euclides De La Torre
	WOAH/FAO FMD Reference Laboratory, National Centre for Foreign Animal Disease National Centres for Animal Disease, Canadian Food Inspection Agency, Canada Speaker: Shawn Babiuk
	WOAH and China National FMD Reference Laboratory, Lanzhou Veterinary Research Institute (LVRI), CAAS, People's Republic of China Speaker: Wen Dang; Participant: Haixue Zheng
	WOAH/FAO FMD Reference Laboratory, French Agency for Food, Environmental and Occupational Health & Safety (ANSES), France Speaker: Guillaume Girault, Labib Bakkali Kassimi
	FAO Reference Centre for FMD in South Asia, Indian Council for Agricultural Research, National Institute of FMD (NIFMD), Bubaneswar, India Speaker: Rabindra Prasad Singh
	WOAH/FAO FMD Reference Laboratory, Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER), Italy Speaker: Santina Grazioli; Participant: Tiziana Trogu, Giampietro Maccabiani
	WOAH Reference laboratory for FMD, Animal and Plant Quarantine Agency (APQA), Republic of Korea Speaker: Sang-Ho Cha; Participants: Soyoon Ryoo
	FAO FMD Reference Laboratory, Wageningen Bioveterinary Research, The Netherlands Speaker: Aldo Dekker; Participant: Phaedra Eble
	FAO Reference Centre for FMD for Central Asia and West Eurasia and WOAH Reference Laboratory for FMD, Federal Governmental Institute, Centre for Animal Health (FGI ARRIAH), Russian Federation Speaker: Viktor Nikiforov
	FAO Reference Laboratory for FMD in Africa and WOAH FMD Reference Laboratory, Transboundary Animal Diseases Programme, ARC-Onderstepoort Veterinary Institute (ARC-OVI), South Africa Speaker: Livio Heath
	Department of Livestock Development, Pakchong, Thailand Speaker: Kingkarn Boonsuya Seeyo
	FAO World Reference Laboratory (WRLFMD) and WOAH Reference Laboratory for FMD The Pirbright Institute, United Kingdom Speakers: Donald King, Anna Ludi, Antonello Di Nardo; Participant: David Paton
	WOAH FMD Reference Laboratory, Foreign Animal Disease Diagnostic Lab, Plum Island Animal Disease Center (PIADC), United States of America Speaker: Amanada Kortum; Participants: Wei Jia

Affiliates

	Animal Health Institute (AHI), Ethiopia Speaker: Daniel Gizaw

	Foot and Mouth Disease Laboratory, Kenya Speaker: Abraham Sangula
	National Veterinary Research Institute, Plateau State, Nigeria Speaker: Hussaini Ularamu; Participant: Maryam Muhammad
	Şap Institute (and WELNET FMD), Türkiye Speaker: Abdulnaci Bulut; Participants: Ünal Parlak
	Laboratoire National d'Elevage et de Recherches Vétérinaires (LNERV), Senegal Participant: Gaye Laye Diop

WOAH/FAO Representatives

eufmd	The European Commission for the Control for Foot-and-Mouth Disease Speaker: Donal Sammin; Participant: Fabrizio Rosso
	Food and Agriculture Organization of the United Nations Speakers: Melissa McLaws, Samia Metwally, Yu Qiu; Participants: Muhammad Arshed, Shahin Baiomy, Alex Drouin
World Organisation for Animal Health	WOAH – World Organisation for Animal Health Speakers: Min-Kyung Park; Participant: Charmaine Chng
	Armenia: West Eurasia EPINET Participant: Satenik Kharatyan

Vaccine Producers

Boehringer Ingelheim	Boehringer-Ingelheim, VPH Veterinary Public Health Participants: Pascal Hudelet
Biogénesis Bagó	Biogenesis-Bago Participants: Romina Scian
MERCK Animal Health	MSD, MERCK Participants: Chriche du Plessis

Observer

	GALVmed/Ag-Results Participant: Jef Hammond (Day 1)

Apologies from: Australian Centre for Disease Preparedness (ACDP), Australia

WEDNESDAY 25TH OF SEPTEMBER, DAY 1

Introductions and adoption of agenda – Don King (DK)

DK welcomed the in person and on-line delegates to the meeting. DK provided a brief overview of the Network activities including recent successes to prepare joint opinion articles on serotype C and the impacts of the Nagoya Protocol. The format and agenda for the meeting was agreed without objection by the participants.

Feedback and priorities from WOAH, FAO, EuFMD and the FMD Working Group

FAO - Samia Metwally (SM)

A questionnaire has been recently distributed to member countries across five FAO regions to seek views on: (1) current national priorities and challenges in Animal Health (2) potential contribution of FAO Reference Centres (3) Veterinary Vaccines for Animal Health and (4) Innovations for Animal Health. FMD continues to be a priority disease for countries, but of the 106 that responded to the survey only ~50% stated that they currently collaborate with any of the FAO reference centres. It was felt that these responses may have been biased by the position and experiences of the persons that responded to the survey, especially since FAO Reference Centres widely contribute to global FMD control initiates through the work of GF-TADS. However, the Network was encouraged to follow up these findings to increase engagement with member countries.

Action 24-01 – SM will share the results from this survey with the Network partners.

WOAH - Min-Kyung Park (M-KP)

M-KP reminded the delegates that FMD was the first disease that was listed by WOAH, and since then other disease have been added such as rinderpest, BSE, CBPP, AHS, PPR, CSF and dog-mediated rabies. Countries volunteer to apply to WOAH with the objective of complying with WOAH international standards which provides guarantees to trading partners the safe trade of the recognised Member's animals and animal products and increases a country's economic potential. Countries who apply also have wider access to international expertise and capacity-building activities. WOAH also directly links to the PCP pathway with GF-TADS and EuFMD.

Thirteen applications were received from countries during 2023, four applications covered the recognition of new FMD free zones or countries. These were: (i) FMD free without vaccination status (Lichtenstein) and (ii) FMD-free with vaccination status (one country + two zones). Kazakhstan continues to have its FMD-free zonal status suspended in the northern part of the country (since 2022). Guyana's status was suspended briefly due to non-submission of its annual reconfirmation which is obligatory for all Members having at least one official status or endorsed control programme recognised by WOAH, but this has been re-instated. Botswana reinstated the FMD-free zone status of Zone 6b at the border with Zimbabwe.

An update on the WOAH Terrestrial Code was provided where there is now provision to introduce FMD-vaccinated animals into countries/zones free from FMD where vaccination is not practised for direct slaughter and for further keeping. FMD surveillance guidelines for this scenario are to be published next year. Additional provisions have been included for recovery/reinstatement of FMD-free status (minimum three months with or without application of a stamping-out policy) after an outbreak in a country/zone having an FMD-free status.

EuFMD – Donal Sammin (DS)

EuFMD is one year into implementing its new workplan which cover activities through to 2027. The core focus of EuFMD is still FMD, and DS thanked ANSES, WRLFMD, IZSLER and SCIENSANO for their work in assisting EuFMD. DS also thanked the people that stand on technical and special committees. Through this work the EuFMD supports initiatives for global surveillance, collaborations on risk, vaccine matching (quarterly reports and dashboard) and update of PRAGMATIST. EuFMD is also supporting risk-based surveillance for FAST disease (particular in TRACE region).

GF-TADs FMD Working Group as well as FAO – Melissa McLaws (MM)

The East/Southern Africa Roadmap meeting was recently held in Dar es Salaam, Tanzania which highlighted the continued challenges in FMD disease investigation, sample collection and transport (nationally and internationally). Gaps for the region include (1) lack of a FMD reference centre in Eastern Africa, as well as (2) access to quality vaccines that are known to be effective.

The Global FMD Control strategy review highlighted that FMD remains highly relevant, but initiatives are constrained by limited resources, poor biosecurity, lack of quality vaccines and mechanisms to coordinate control at a regional level.

MM also provided an update and review of PCP-FMD (for dashboard, see: https://tinyurl.com/PCPFMDinfo). The tool is widely used by the GF-TADS regional roadmaps, but a review of progress highlights the challenges for countries to progress along the pathway. Many countries remain at PCP2 and find it difficult to move to PCP3 and perhaps smaller steps are required within PCP2 to allow countries to celebrate progress. Currently work is being undertaken to write surveillance guidelines for PCP 0-3 (MM will provide link when available). There are a lot of other resources available at the PCP-FMD Hub which will be on the FAO/EuFMD VLC platform. FAO have also developed a laboratory mapping tool which is available and provides a useful approach to assess laboratory capacity. The Network will continue to be asked for help and guidance in the development and deployment of these tools.

Update on AgResults - Jef Hammond (JH)

JH introduced the work of AgResults and the on-going prize competition to support the delivery of good vaccines into the market in Eastern Africa. One vaccine has been recently registered with AgResults and others are expected shortly. JH raised the issue that countries often expect that local FMDV strains are used in the vaccines that are registered for use. The East African panel developed by the Network and WRLFMD comprising regional reference strains has helped to show that this is not necessary and has been used to measure heterologous responses.

Update from the FMD serotype C Taskforce

FAO - Yu Qiu (YQ)

Serotype C has not been reported since 2004. The FAO-WOAH FMD Serotype C Taskforce has been established with an action plan to (1) estimate the confidence that serotype C is no longer circulating and (2) gather information regarding the location and continued use of serotype C. During the past 12 months, tailored surveys have been circulated to vaccine producers, veterinary diagnostic laboratories and national veterinary authorities. Results show that vaccine companies continue to hold stocks of serotype C, and there are at least 28 veterinary diagnostic laboratories which have serotype C samples in their archived collections. Of the laboratories and vaccine companies that currently hold stocks of serotype C, three of them keep them in facilities that only have BSL-2 level of biocontainment. The next steps for the Taskforce are to (1) reduce the number of facilities that hold serotype C stocks (2) where appropriate, assist with virus destruction and sequestration upon request and (3) work with countries to designate serotype C holding facilities for safe storage of remaining virus stock.

Action 24-02: YQ to share slides and The Network to review whether there is anything that is missing or isn't correct before the results of the surveys are circulated more widely.

FAO – Melissa Mclaws *(in collaboration with Sarah Mielke, USDA)*

Is there evidence that serotype C is extinct? MM provided a short update on work that uses Network data to provide evidence of confidence for lack of circulation of serotype C at different levels of prevalence in FMD samples (at 1%, 2% and 5%). Results from these analyses show that for each Regional Virus Pools (RVP) there was at least one country with a detection capability below 1% prevalence. However, there are many gaps in surveillance for Western and Southern Africa. These data support the absence of serotype C from the FMD infected populations that have been sampled.

Discussion: Over the past 20 years there have been lots of samples analysed by international FMD Reference Laboratories with no detection of serotype C; however, two SAT2 lineages (topotypes V and XIV) have recently appeared after a 30+ year absence from surveillance activities. The hypothesis for the SAT2 viruses is that African buffalo have maintained these viruses, on the other hand serotype C is not known to infect African buffalo and was more frequently identified as a serotype that infected domestic species (cattle and pigs) and not wildlife. However, we need to keep open the possibility that serotype C still circulates in unsampled hosts or an epidemiological compartment.

THURSDAY 26TH OF SEPTEMBER, DAY 2

Headline events from global FMD surveillance activities (2024) – DK

A total of 291 samples from 12 countries have been tested so far in 2024. The WRLFMD, with Network partners, has continued to investigate the origin of the SAT2/XIV cases in the Middle East that were first detected during 2023. Full genome sequences for Ethiopian samples from 2022 and 2023 are interleaved with the sequences from the Middle East, findings that support at least five independent introductions of these viruses into the region from East Africa. Another recent unexpected event has been the detection of SAT2/V topotype viruses in Algeria (thank you ANSES, France); this topotype was last detected in West Africa in 1991. Serotype O outbreaks have also been detected in North Africa, highlighting an increase in the frequency of introductions of FMDV strains linked to FMD cases in West Africa and Sudan into North Africa. DK also discussed the importance of O/ME-SA/SA-2018 which has spread to Sri Lanka as well as UAE and Oman with scope to spread more widely in Pool 3.

Due to O/EURO-SA and A/EURO-SA viruses being found in Egypt during 2022, South American strains have been obtained from PANAFTOSA for vaccine matching (20 isolates total). A range of vaccine strains matched for serotype O. For serotype A only one (A/G-VII) generated an r1-value above 0.3, but several gave heterologous titres above $10^{1.5}$.

Discussion:

Is there a way to capture the gaps that exist for global FMD surveillance? It was suggested that the Network could prepare a priority list for countries that have the biggest need for FMD surveillance. For FMD endemic countries, this assessment could include a focus on countries with a large livestock populations and where

multiple FMDV serotypes are present, and might also consider country-level connectivity prioritising those countries that are highly connected via trade in animals and/or animal products.

Action 24-03: The WRLFMD will work to prepare a simple tool that could be used to identify countries where the biggest/riskiest gaps exist for FMDV surveillance (for presentation next year).

Pool 1 – Thailand – Kingkarn Boonsuya Seeyo (KBS)

A total of 135 samples have been collected during this year, which for FMDV-positive samples only represent the O/ME-SA/Ind-2001e lineage. Sequence analysis suggests that O/ME-SA/Ind-2001e is moving from the northern parts of the country to the western and southern regions of Thailand.

KBS also outlined work that is currently being undertaken to upgrade the high-containment infrastructure at Pakchong (including a new BSL-3 building that will be completed in May 2025; funded by DTRA and MORU). The laboratory is current producing new monoclonal antibodies for serotype O, as well as maintaining capacity to produce guinea pig and rabbit antisera for antigen ELISAs. Plans are also under way to validate the real-time RT-PCR to ISO17025. A proficiency testing scheme for Southeast Asia will be distributed shortly (Oct-Nov).

Discussion:

The O/SEA/TAI-98 lineage was detected in a sample within a batch of samples submitted to the WRLFMD. Were there any further investigations to look for further spread of this lineage in the country? Yes, efforts were made to follow this up; however, no additional information could be obtained from the field.

Pool 1 – China - Wen Dang (WD)

In 2024 there has only been one FMD outbreak reported in China (reported during the morning of the presentation!). In 2023 there were four outbreaks in 3 provinces of O/ME-SA/Ind-2001e. The following lineages are currently circulating in the country: O/CATHAY, O/ME-SA/Ind-2001e, O/SEA/Mya-98 (where the last case in 2021 affected pigs), A/ASIA/Sea-97 (last detected 2018). Across this different lineages, O/ME-SA/Ind-2001e is the most dominant strain in China.

Current studies undertaken at LVRI suggest that the vaccines used in the country do not give a good protection against O/CATHAY viruses; therefore, this lineage may need a new master seed for vaccine production. The laboratory has developed a monoclonal antibody against SAT2 for use in a new serological diagnostic kit; this has been sent to the WRLFMD for further validation.

Discussion: O/CATHAY appears to be only present in China. Is there any information on the evolutionary patterns for this lineage?

Action 24-04: To better understand the evolution of O/CATHAY, LVRI will draw a phylogenetic tree encompassing all strains through the years.

Pool 1 – The Republic of Korea, Sang-Ho Cha (S-HC)

There have been no new cases of FMD in the Republic of Korea during 2024. S-HC presented a summary of samples tested by APQA which included Bangladesh (O/ME-SA/Ind-2001e, O/ME-SA/SA-2018, A/ASIA/Iran-05 detected), Vietnam (O/ME-SA/Ind-2001e detected), Cambodia (O/ME-SA/Ind-2001e and O/ME-SA/PanAsia detected) and Laos (O/ME-SA/PanAsia detected). These samples were collected as part of joint research projects. The detection of A/ASIA/Iran-05 viruses in Bangladesh (most closely related to viruses from Pakistan) is an important observation since this represents virus movement from Pool 3 to Pool 2 (NB: viruses tend to move from Pool 2 to Pool 3, not from Pool 3 to Pool 2).

A novel on-site PCR-based molecular test system developed in the Republic of Korea was introduced. It includes diagnosis and parallel serotyping (O, A and Asia 1) and has high sensitivity/specificity.

Pool 2 – India, Rabindra Prasad Singh

A total of 470 clinical samples have been collected during 2024, with the majority being serotype O. FMD strains circulating in 2023/2024 are: O/ME-SA/Ind2001e, O/ME-SA/SA-2018, A/G-18/non-deletion/2019 lineages and Asia 1 Group VII. For 2023/2024 a roughly equal proportion of FMD outbreaks were caused by O/ME-SA/Ind-2001e and O/ME-SA/SA-2018. Vaccine matching suggests the vaccine is a good match to serotype O and Asia 1; however, there is a proposal to change the master seed for serotype A in light of poor antigenic matching data. A proficiency testing scheme was completed in 2023/24 with 32 national laboratories; overall the laboratories did well with only a few follow-ups needed.

The Indian reference laboratory is keeping abreast of the situation in Pool 3 regarding SAT 2 and preparing diagnostic capability in case of an incursion of this serotype into the country.

Discussion:

Data for NSP sero-surveillance in the country was presented which showed an increase in the overall rate of FMD seropositivity (up to 16%). This is the first time that India has seen an increase in NSP positivity that is not linked to an increase in observed FMD clinical cases. However, further analyses of these data are required since NSP positive results can be affected by age, and repeated vaccination.

Action 24-05: NIFMD to carry out retrospective analysis of the two lineage O viruses that are present in India to document the recent changes in the dominance of the O/ME-SA/Ind-2001e and O/ME-SA/SA-2018 lineages.

Pool 2 – Russia, ARRIAH, Viktor Nikiforov (VN)

Currently there is one FMD free zone without vaccination and four FMD free zones with vaccination in Russia. During the past year, samples have been received from Russia (no virus detected), Jordan (SAT2/XIV) and Uganda (O/EA-2).

Russia undertakes pro-active surveillance using FMD RT-PCR and serology within the vaccination zone. For Central Asian and Transcaucasian countries, the status of FMD is unknown, but there is a recognised risk of incursions due to O/ME-SA/Ind-2001e and SAT2/XIV. A simulation exercise to ensure rapid response in case of FMD suspicion has taken place and an agreement with CIS member states for the prevention and control of FMD cases has been signed (running until 2025). A proficiency testing scheme including SAT2 samples has been sent to ten laboratories.

Pool 2 – Türkiye, Sap, Abdulnaci Bulut (AB)

A total 172 domestic samples have been received during the past year. Most FMDV positive samples were characterised as serotype SAT2 (n=117), while 3 samples were defined as serotype A. The situation with SAT2 appears to be stable and the number of outbreaks is lower with a low incident rate. Since May 2024, there has been no reported cases due to serotype O in the country (the last cases were O/ME-SA/PanAsia-2^{QOM-15}and O/ME-SA/PanAsia-2^{ANT-10}). During September 2024, cases due to serotype A (A/ASIA/Iran-05^{FAR-11}) were detected in Türkiye for the first time in six years. The source of the viruses causing these outbreaks has not been defined but are thought to be due to illegal movements of animals. Samples have also been received from cattle being moved across the Iraqi border (serotype O). The current Turkish vaccine appears to be well matched with the circulating SAT2 strain; however, the vaccine match with serotype A appears to be low although the vaccine and field strains are from the same lineage (FAR-11). In response, a new homologous vaccine is being developed and should be ready in a month.

Discussion:

Are there any insights about the FMD situation in Syria? IZSLER, Italy responded to say that they have recently analysed serological data from Syria, where it appears that serotype O is circulating, and there is no evidence of SAT2.

Pool 3 – East Africa, Daniel Gizaw (DG)

Four FMD serotypes circulate in Ethiopia (O, A, SAT1 and SAT2). For 2024, 18 samples have been tested by antigen ELISA, 12 of which were serotype SAT2 (no samples have been sequenced). Samples collected from previous years (2022-23) were sent to WRLFMD demonstrating the presence of serotypes O and SAT2. DG explained that the flow of samples from FMD outbreaks to the laboratory is decreasing due to conflict in the country.

Pool 4 – East Africa, Kenya, Abraham Sangula (AS)

Sixty-five samples have been tested so far in 2024; 26 of these were serotype O, 3 were SAT1 and 8 were SAT2. The number of samples that couldn't be serotyped has reduced from 50% to 43%. Samples were sent to the WRLFMD which highlighted the presence of O/EA-2, A/AFRICA/G-I, SAT1/I (new finding) and SAT2/IV.

Vaccine matching with regional/local vaccine demonstrates good responses with r_1-values greater than 0.3. *In-vivo* homologous potency tests have been carried out for the FMD vaccine produced by KEVEVAPI where results define a potency greater than $6PD_{50}$. Ongoing research projects are investigating sequence relationships between FMD viruses recovered from buffalo and cattle with samples going to USDA (collaboration with the University of Minnesota).

Pool 5 – Nigeria, Hussaini Ularamu (HU)

Surveillance and outbreak investigation suggest that serotype O is circulating (antigen ELISA data) in the country. VNT training has taken place at FMD-Embakasi, Kenya allowing the method to be successfully implemented at NVRI. Samples are being prepared for shipment to WRLFMD include specimens from North Africa (camels). The FMD lab is undergoing remodelling by DTRA.

Discussion: Any suspect case of SAT2 (specifically topotype V) should be prioritised for testing.

Pool 6 – South Africa, Livio Heath

During 2014, sixty-two samples have been submitted to OVI from clinical or suspected cases in South Africa and a further 469 samples were submitted for FMD surveillance. The majority of FMDV positive clinical samples were characterised as SAT3 (28) followed by SAT1 and SAT2 which both had 3 cases. After having no new FMD cases in 2023; there have been four reported cases in 2024: Mpumalanga (SAT1/II – linked to buffalo), Kwazulu-Natal (SAT2/I), Eastern Cape (SAT2/I and SAT3/I). Importantly, these cases represent the first recorded FMD outbreaks in Eastern Cape. Analyses suggest that the SAT2/I viruses are genetically homogeneous, while the SAT3/I viruses are experiencing a higher degree of genetic drift.

During 2022, the outbreaks were predominantly in beef cattle with limited disease; however, cases in the Eastern Cape have affected dairy cattle where the disease has caused severe lesions in the mouth, feet and udder (significant mastitis). There are a total of 32 open cases in the Eastern Cape, where animals have been vaccinated but they need to be vaccinated again as vaccine breakthrough is being observed.

Once a farm is positive, samples are no longer collected, and therefore only new outbreaks are being tested by the laboratory. In addition to FMD, OVI has noticed that some cases are also positive for LSDV. Farmers are currently given the option to slaughter (quicker return to freedom) or screening (testing animals until

samples are negative). It should be noted that some animals remain positive for up to 18 months after the first diagnosis. For the SAT1 outbreak the OVI vaccine was used, and it appears to have worked well (BVI vaccine is also being used in South Africa).

Discussion:

Is there any vaccine matching data available for the current outbreak? For our OVI vaccine (SAT1), the vaccine matching is above 0.3. The capability to perform this testing for the BVI vaccines is not available in South Africa.

Epidemiological links for cases in Eastern Cape: no obvious sources have been identified as no live animals were introduced onto farms and back tracing did not highlight any connections. However, tracing is difficult as there is no good animal identification system in the country. Similar uncertainties exist for the SAT2 cases, although there is a possibility that live animals were moved from the North into quarantine station to cause outbreak.

Long term plans to regain FMD freedom: discussions are occurring to prepare a national strategy noting that zoning was more realistic when the Cape was free from the disease.

Pool 6 – BVI, Elliot Fana

BVI has tested samples received from Botswana and Uganda. All samples from Botswana were negative for FMDV, while Uganda's outbreak was genotyped O/EA-2. A total 3688 samples have been tested for FMD sero-surveillance; all positive NSP cases were cleared by VNT (against 5 strains). In response to the threats posed by an incursion of O/EA-2, two-dimensional VNT has been undertaken demonstrating a good match for the field isolates from Southern African with O Manisa and O-3039.

Pool 7 – Brazil, PANAFTOSA, Edviges Maristela Pituco

No FMD outbreaks have been reported. Currently 35% of the South American continent is free without vaccination, 64% is free with vaccination and 1% is not free (Venezuela). Brazil and Bolivia will stop vaccinating in 2024. If endorsed by WOAH, this will result in 70% of the region being free without vaccination. Technical support from PANAFTOSA includes passive surveillance for vesicular disease, organisation of PT exercises, simulation exercises and harmonising procedures. Seneca Valley virus continues to circulate causing vesicular disease that impacts on pig production areas of Brazil. The laboratory also has a role to support the regional vaccine bank and the selection of vaccine antigens for the region. A reference serum panel for O1 Campos and A24 Cruzeiro has been established.

A new laboratory is being built in Rio De Janeiro to strengthen lab diagnostics.

Pool 7 - Argentina, SENASA, Sabrina Galdo Novo

In Argentina, the serotype C of the vaccine will be retired in March 2025; from that point forward, bivalent or trivalent vaccines including O Campos, A24 Cruzeiro and/or A Argentina 2001 will be included in the vaccine. During the past year, SENASA has received samples from 5 suspected cases which were all FMDV negative. Vaccine matching was performed against isolates from Vietnam, Pakistan and Iran with all having an r_1-value above 0.3. SENASA continues to collaborate with Vietnam (including lab training), Qatar and through a USDA/INTA/SENASA partnership. The laboratory is working to produce a NSP kit.

Discussion:

A question was asked whether complement fixation test was still used for diagnosis. SENASA still uses this as extra control for innocuity testing after third passage but not for routine diagnosis.

USA, USDA, Amanda Kortum

A total of 928 samples for suspect cases in the US have been tested by Plum Island; all of which were negative for FMDV. Proficiency panels for FMD/CSF (n=350) and FMD/SVA (n=250) were sent out to US State laboratories. Three foreign animal disease diagnostic courses took place, and one is scheduled for 2024. FMD surveillance projects are underway with the Republic of Georgia, Gambia and Ghana (FMDV sequencing).

Action 24-06: USDA to review whether reports could include information from the many research projects undertaken (for example, during this year, for the samples collected for the Republic of Georgia, Gambia and Ghana).

Canada, CFIA NCFA, Shawn Babiuk

NCFAD continue to receive samples associated with cases of SVA in Canada (SVD, FMD, VSV also tested in parallel). Ten laboratories across Canada are certified for real-time RT-PCR and the FMDV 3ABC ELISA which capability is tested via a proficiency test. Testing of an mRNA vaccine for FMD is underway: data to be reported at the EuFMD Open Session.

France, ANSES, Guillaume Girault

ANSES reported on the results of samples received from Algeria, Mauritius, Tunisia and Burkina Faso. Samples from Algeria were characterized as belonging to the SAT2/V topotype. This lineage was last reported in West Africa in 1991 and the origin of the recent cases in the region is unknown, although analyses of samples collected from Burkina Faso highlighted the presence of this lineage in pigs (from 2022). A lineage specific PCR has been developed for SAT2/V (which doesn't react against SAT2/XIV) and has been shared with Algeria and Tunisia. Samples received from Tunisia were characterised as O/EA-3 - similar to the viruses that have been reported in the country. FMDVs from Mauritius were sequenced as SAT3/I with a close relationship with sequences associated with FMD cases in South Africa. In addition to SAT2/V, testing of samples from Burkina Faso revealed the presence of A/AFRICA/G-IV and O/EA-3 topotypes. An FMD proficiency testing scheme has been completed for 2024 including 45 laboratories from 40 countries). A simulation exercise was held in conjunction with EuFMD (virtual workshop, 20 countries) and face-to-face training course has also taken place for FMD diagnostics (over 2 weeks).

Action 24-07 – Post the lineage specific PCR for SAT2/V on the Network webpage.

Italy, IZSLER, Santina Grazioli

During 2024, IZSLER has received nineteen FTA cards from Libya. RT-PCR was carried out and one sample was sequenced as O/EA-3. This isolate was genetically similar to the strains reported in Libya, Egypt, Ethiopia, Sudan and Palestine Autonomous Territories. The number of serology kits being sold has remained the same; however, the number of antigen detection kits has increased. Training in Syria is ongoing with a study currently taking place in country. There is also a WOAH project to support countries in the middle East Region (Egypt, Jordan, Iraq, Syria, Lebanon and Palestinian Autonomous Territories) progressing along the FMD progressive control pathway (by strengthening diagnostic and epidemiological approach).

Belgium, SCIENSANO, David Lefebvre

Samples from Nigeria (collected during 2023) have been received. These have not yet been tested due to ongoing demands on the laboratory (BTV outbreak testing). SCIENSANO would like to carry out vaccine

matching (heterologous neutralisation and r_1-values); however, help is needed from the producers with regards to obtaining appropriate BVS and vaccine viruses.

The Netherlands, WBVR, Aldo Dekker

Training was carried out for two people from Chile on the management of containment facilities. WBVR also plan to produce more reference serum (in large volumes) which will be calibrated to protection status of animals.

WBVR has recently undertaken testing of a FMD vaccine due to complaints that were raised by a customer in Asia.

Discussion:

It was noted that many FMD reference laboratories are frequently being approached to *certify* FMD vaccines for use and there is sometimes an expectation that a statement from a WOAH Reference Laboratory will accompany a bid in response to a national tender. It was agreed that WOAH/FAO reference laboratories should not certify vaccines since any type of endorsement is outside of the remit of WOAH/FAO reference laboratories. However, it is appropriate that FMD Reference laboratories undertake testing of FMD vaccines using specific tests – and that these data are reported to vaccine customers as independent evidence to help in the vaccine selection process.

Action 24-08: Network put together a short document as to what we can be provide regarding assessing vaccine quality (for agreement).

Update on Digital Dashboard, Antonello Di Nardo

The OpenFMD portal is now active (https://www.openfmd.org). This is a Network tool and hosts different analytical dashboards. (1) expert curated FMDbase which holds all FMDV sequences private and public. (2) FMDtype which is a genotypic tool to create phylogenetic trees. (3) FMDwatch which will incorporate data from WOAH/FAO reference laboratories, and WOAH WAHIS. This tool will allow for surveillance data to be submitted in the future (4) PRAGMATIST which is currently being targeted towards risk managers and vaccine companies. This tool can be customised completely with your own data.

In Q2 2025 the next versions of these dashboards and FMDnext will be available which will show the evolution of FMDV lineages. Documentation/virtual tours on how to use these dashboards will also be provided.

If you have any query, comment, suggestions, or run into an error message please e-mail info@openfmd.org. As always, an excel template will be provided to supply all the data that you have submitted. In the future an interactive tool on the website will mean that the excel is no longer needed.

Changes to the viral lineage risk profile for FMD Pools – *DRAFT PROPOSAL*

Pool 1	• Increase O/CATHAY by 5 points (15.5) and decrease O/Mya-98 by 5 (16.5) • Keep serotype A the same
Pool 2	• Add five points to serotype O and split points 50/50 between O/ME-SA/SA-2018 and O/ME-SA/IND-2001 • Drop 5 points from serotype A to 15% • Assign one point to A/ASIA/Iran-05 because of Bangladesh and drop Asia 1 by 1 to 3%
Pool 3	• Few points off SAT2 and increase serotype O PanAsia-2 • Drop 3 from A/G-VII to 2% • Increase Asia 1 by 3 (13%) with change in Pakistan phylogenetic tree

	• Introduce O/ME-SA/SA-2018 – 0.5% and decrease O/IND-2001e to 0.5%
North Africa	• Maybe increase SAT2 slightly and decrease the A
Pool 4	• Reduce A by 5 and increase SAT2 by 5 points
Pool 5	• Increase SAT2, and reduce serotype O to 55%
Pool 6	• Increase SAT3 (3 points, 19%) a little but not sure what to reduce; take some from SAT1?
Pool 7	• no change

Action 24-09a: Review the changes to the risk profile for the FMD Pools.

Action 24-09b: MM/DK to review the process that is used to update the lineage risk profiles.

FRIDAY 27TH OF SEPTEMBER – DAY 3

Comparison VNT and LPBE as correlate of immunity for SAT2 FMDV strains against challenge - Aldo Dekker (AD)

In view of the increasing risks posed by serotype SAT 2, this presentation reviewed data from homologous and heterologous vaccine potency studies that have been undertaken for this serotype. Testing of sera has allowed the comparison of LPBE and VNT, where there was good correlation between the VNT and LPBE but only when the SAT2/SAU/2000 antigen was used. The VNT gave better correlation with protection than LPBE when looking at the homologous study.

Action 24-10: Add to the agenda vaccine matching SOP and the work that has been undertaken to improve this assay at the WRLFMD.

Heterologous potency of SAT2 vaccines against challenge with SAT2/XIV - DK

Both the SAT2 ZIM/7/83 (n=8) and SAT2/ERI-98 (n=8) vaccines have been tested in pilot studies at Pirbright. The heterologous challenge strain was SAT2/JOR/19/2023, which is of the SAT2 XIV lineage. Unfortunately, the challenge at 21 days post vaccination did not produce a measurable viraemia so a second challenge was undertaken 4 days post the first challenge. For the SAT2/ZIM/83 vaccine five out of the eight animals were protected, while for the SAT2/ERI/98 vaccine four out of eight were protected. Virus replication was lower in animals that were protected compared to those that had lesions on the feet. The lower-than-expected levels of protection are being investigated, especially since the homologous and heterologous responses (measured by VNT) were good in all animals.

Revision of the WOAH Terrestrial Manual - David Lefebvre

Thank you to the Network working group for their work over the past 12months to update the FMD Chapter. The revisions proposed by the Network have been accepted by the WOAH Biological Standards Commission and will now go to members for comments before formally being adopted in 2025. Two parts of the chapter still need updating:

1. Vaccine and vaccine matching sections
2. Table 1 – Intended purpose of Test

Outstanding issues that still need to be address:

- Calculation regarding the transport media for the correct final concentration. The original source for this need to be found as this may influence how this is updated

- PBS vs media also needs to be addressed
- The diagnostic section needs to be re-organised to highlight what is now done (i.e. move the molecular sections further up)
- For the vaccine section has any legislation changed? There might not be much that we can do. European Pharmacopeia has update on lesions to say foot lesions and this has already been changed.
- There is no update from the serology working group for the vaccine matching section. Could this be done with a small working group led by David Lefebvre?

Action 24-11: David Levebvre and Anna Ludi to circulate the part of the chapter that needs to be looked at to a small working group including Aldo Dekker, Sabrina Galdo, Maristela Pituco +/- USDA. Needs to be finished by June for review by biological standard.

- Table 1 Intended Purpose of Test: message is to keep it simple (i.e. write whether highly or more sensitive). NB: company names for kits and reagents cannot be mentioned.

Action 24-12: Sabrina Galdo will start to prepare a draft version of Table 1. Deadline is June 2025 so a draft needs to be circulated in January/February 2025. Aldo Dekker and Santina Grazioli, Don King have agreed to help to identify primary references.

Regional Reference Panels for harmonised serology – Anna Ludi

The Network has previously agreed to identify suitable viruses that can be used as common reference antigens to establish a harmonised approach to assess post-vaccination responses with relevance for different endemic regions. The decision was made to put together a regional reference panel for the harmonisation of post-vaccination studies for each of the pools rather than only focusing on West Africa as discussed last year. Initially, the relevant lineages in each pool were identified followed by identifying viruses within these lineages that had already been optimised and/or where vaccine matching data exists. Using amino acid phylogenetic trees, each lineage was assessed; gaps will be identified, and viruses will be chosen as potential candidates. The viruses will then be tested to see if certain viruses could be used to represent different lineages or pools. A draft panel will be presented at the open session of EuFMD as a poster. The final panel will be circulating for formally approved by the WOAH/FAO FMD laboratories. Full genome sequencing of the panel will be available on the WOAH/FAO FMD website and the samples will be available for diagnostic purposes from the WRLFMD.

Action 24-13: The regional reference panel for harmonised serology will be shared with the network for comment.

Comparison of SP-ELISA used for FMDV serology – Anna Ludi

With the help of Santina Grazioli, a workplan to compare the performance of SP-ELISAs used to measure antibodies that are specific to FMDV structural proteins has been drafted. The aim of this study will be to compare the most frequently used SP-ELISAs to understand which tests are suitable for sero-surveillance and vaccine monitoring purposes. It is anticipated that work will be split into two studies: (1) to compare the diagnostic sensitivity and specificity of commercial SP-ELISA kits currently used by European and Global Reference Laboratories and (2) to determine a robust correlation between commercial SP-ELISAs and protection using sera that have been collected the day of challenge and where the protective status of the animal is known. Well-characterised monovalent sera will be used, ideally from samples sequentially collected post-infection or post-vaccination. The focus of this work will be serotypes O, A and Asia 1 and should include cattle, pig, sheep and goat. Negative sera will be from animals that have never been exposed or vaccinated with FMDV. Based on the data from the first study and the use of the kits for PVM studies, a subset of kits will be selected for testing where the protection status of the animal after

vaccination is known. Sera will be titrated and the dilution that corresponds to the protection will be defined (spot-test).

ACTION 14a: Network partners to identify and volunteer sera that could be used for these studies.

ACTION 14b: Network partner (specifically the serology working group led by AL) to approve the workplan for the comparison of commercial SP-ELISA kits.

Primary Reference Materials – Don King

DK has been sent a document from the WOAH PPR Network to outline a proposal for guidelines for the requirements covering primary reference material. The Network were in broad agreement with this document and agreed to work together to assemble a list of materials that could be suitable as primary reference standards.

Action 24-15: Partners to review and prepare lists of material that could be added as a WOAH Reference Standard

New approaches to facilitate shipping of samples between labs – update on bio-safe protocols and risk assessment – Labib Bakkali Kassimi

The difficulties in shipping samples include cost, material being banned by some airlines and packaging material include dry ice. New approaches include the inactivation of viruses and shipment at room temperature using FTA cards, LFD with virus inactivation and chemical inactivation of the samples. One negative of these methods is that it is more difficult to recover live virus for use in downstream applications. Work on the safety of FTA cards shows that they inactivate FMDV (data limited to certain serotypes), while safety of chemical inactivation is difficult to assess as it is likely dependent on the epithelial load.

ANSES developed an approach with LFDs and the inactivation of FMDV using citric acid, leading to safe, fast and inexpensive way to submit suspected samples to reference laboratories for further analysis. Initial testing was done using the Svanodip LFD (Svanova); however, these are no longer being produced so other manufacturers are being identified. Recent work recommends an increase in the concentration of citric acid from 0.2% to 0.5%. Transfection has successfully recovered live FMDV for serotypes O, A and Asia 1. However, it should be noted that inactivation only works with citric acid that is new and stored correctly; effectiveness of citric acid powder diminishes over time. Further validation still needs to be carried out.

As the analysis is now complete, a questionnaire will now be distributed to capture the increase in price that laboratories are seeing with shipments.

Alternative LFDs - Santina IZSLER

Lateral flow devices have been developed using the same monoclonals as those used in the IZSLER AgELISA kits: LFD 1 – O, A, Asia 1, PanFMD and LFD 2 – SAT, SAT2, and PanFMD. Recent validation data is encouraging showing that the devices can correctly identify a wide range of different FMDV serotypes and lineages. The diagnostic sensitivity and specificity have been calculated for epithelium homogenates (n=224); sensitivity: 87.5 % for LFD1 and 70% for LFD2. This work has been submitted as a manuscript and they are available for purchase.

Closing of Meeting

Partners voted a big thank you to Samia Metwally ahead of her retirement in 2025 as she has provided a huge amount of support to the Network over many years. The delegates also thanked WOAH and EuFMD for funding participants to attend the meeting, the FAO for hosting the meeting, and the meeting sponsors

(Biogenesis Bago, Boehringer Ingelheim and MSD). The meeting closed by thanking the in-person and on-line participants and wishing everyone a safe trip home.

Action 24-16: WRLFMD to set-up a What's app group for the Network members.