

OIE Reference Laboratory Reports Activities

Activities in 2019

This report has been submitted : 2020-01-15 14:28:16

Name of disease (or topic) for which you are a designated OIE Reference Laboratory:	Foot and mouth disease
Address of laboratory:	Transboundary Animal Diseases, ARC-Onderstepoort Veterinary Institute, Private Bag X05, Onderstepoort, 0110, SOUTH AFRICA
Tel.:	+27-12 529.95.75
Fax:	+27-12 529.95.43
E-mail address:	mareef@arc.agric.za
Website:	www.arc.agric.za
Name (including Title) of Head of Laboratory (Responsible Official):	Misheck Mulumba, Dr
Name (including Title and Position) of OIE Reference Expert:	François Maree, Dr Specialist Researcher
Which of the following defines your laboratory? Check all that apply:	Other: Para-governmental; Research

ToR 1: To use, promote and disseminate diagnostic methods validated according to OIE Standards

1. Did your laboratory perform diagnostic tests for the specified disease/topic for purposes such as disease diagnosis, screening of animals for export, surveillance, etc.? (Not for quality control, proficiency testing or staff training)

Yes

Diagnostic Test	Indicated in OIE Manual (Yes/No)	Total number of test performed last year	
		Nationally	Internationally
Indirect diagnostic tests		Nationally	Internationally
Virus Neutralization Test	Yes	0	0
Solid phase competition ELISA	Yes	60499	16162
NSP ELISA	Yes	3869	57
Direct diagnostic tests		Nationally	Internationally
Virus Isolation	Yes	150	0
RT-PCR	Yes	118	0
Sequencing	Yes	15	0
Antigen ELISA (typing)	Yes	0	0
Real-time RT-PCR	Yes	32	0

ToR 2: To develop reference material in accordance with OIE requirements, and implement and promote the application of OIE Standards.

To store and distribute to national laboratories biological reference products and any other reagents used in the diagnosis and control of the designated pathogens or disease.

2. Did your laboratory produce or supply imported standard reference reagents officially recognised by the OIE?

No

3. Did your laboratory supply standard reference reagents (non OIE-approved) and/or other diagnostic reagents to OIE Member Countries?

No

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to OIE Member Countries?

Yes

Vaccine name	Amount supplied nationally (ml, mg) (including for own use)	Amount supplied to other countries (ml, mg)	Name of recipient OIE Member Countries
Aphtovax, BVI	78000 doses	0	SOUTH AFRICA

ToR 3: To develop, standardise and validate, according to OIE Standards, new procedures for diagnosis and control of the designated pathogens or diseases

6. Did your laboratory develop new diagnostic methods validated according to OIE Standards for the designated pathogen or disease?

No

7. Did your laboratory develop new vaccines according to OIE Standards for the designated pathogen or disease?

No

ToR 4: To provide diagnostic testing facilities, and, where appropriate, scientific and technical advice on disease control measures to OIE Member Countries

8. Did your laboratory carry out diagnostic testing for other OIE Member Countries?

Yes

Name of OIE Member Country seeking assistance	Date (month)	No. samples received for provision of diagnostic support	No. samples received for provision of confirmatory diagnoses
NAMIBIA	Jun	377	0
ZIMBABWE	Aug	82	0
UGANDA	Feb	3152	0

9. Did your laboratory provide expert advice in technical consultancies on the request of an OIE Member Country?

No

ToR 5: To carry out and/or coordinate scientific and technical studies in collaboration with other laboratories, centres or organisations

10. Did your laboratory participate in international scientific studies in collaboration with OIE Member Countries other than the own?

Yes

Title of the study	Duration	Purpose of the study	Partners (Institutions)	OIE Member Countries involved other than your country
Persistence of a highly contagious pathogen: ecological and evolutionary mechanisms in foot-and-mouth disease virus.	4 years	The main objectives of the study is (i) to understand the condition allowing persistence of FMDV; (ii) to evaluate a novel immunological mechanism for re-activation of carrier hosts in FMDV infection; and (iii) evaluate the role of antigenic shift at epidemiologically relevant time scales.	The Pirbright Institute (UK), Oregon State University (USA), DAFF (SA) ARC (SA), SANParks (SA). Oregon State University, USA DAFF, SA ARC, SA SANParks, SA	UNITED KINGDOM UNITED STATES OF AMERICA
Novel Countermeasures Designed for the Progressive Control of FMDV in Uganda	3 years	The main purpose of this study is (i) to conduct surveillance of FMDV in Uganda and identify the serotype, subtype and genetic makeup of FMDV circulating in the country. (ii) To carry out serological studies of FMDV circulating in Uganda in support of vaccine matching studies. (iii) Develop collaborations that will support fundamental and applied research ties with Uganda, South Africa and USDAARS scientists working on FMD.	ARS, USDA, USA UVRI, Uganda Makerere University, Uganda ARC, SA	UNITED KINGDOM UNITED STATES OF AMERICA
Synthetic modified dendrimer replicon RNA vaccines for cellular and humoral protection against multiple foot and mouth disease serotypes.	2 years	To evaluate a synthetic modified dendrimer replicon RNA vaccine for cellular and humoral protection against FMD in guinea pigs and cattle.	TIBA Biotech (USA) and Moredun Institute (Scotland)	UNITED KINGDOM UNITED STATES OF AMERICA
Construction of foot-and-mouth disease (FMD) virus-specific phage-display libraries and epitope identification for improved FMD vaccines generation.	1 year	Construction of foot-and-mouth disease (FMD) virus-specific phage-display libraries and epitope identification for improved FMD vaccines generation.	Institute of Virology, National Institute of Agricultural Technology (INTA), South America. The Pirbright Institute, UK. University of Glasgow, UK.	ARGENTINA UNITED KINGDOM

ToR 6: To collect, process, analyse, publish and disseminate epizootiological data

relevant to the designated pathogens or diseases

11. Did your Laboratory collect epizootiological data relevant to international disease control?

No

If the answer is no, please provide a brief explanation of the situation:

We collaborated with Makerere University, UVRI (Uganda) and USDA on the surveillance of FMDV in Uganda during 2014 to 2017. Samples were still tested for the completion of the study in 2019.

12. Did your laboratory disseminate epizootiological data that had been processed and analysed?

No

If the answer is no, please provide a brief explanation of the situation:

See papers and conference contributions below.

**13. What method of dissemination of information is most often used by your laboratory?
(Indicate in the appropriate box the number by category)**

a) Articles published in peer-reviewed journals: 6

1. Scott KA, Maake L, Botha E, Theron J, Maree FF. (2019) Inherent biophysical stability of foot-and-mouth disease SAT1, SAT2 and SAT3 viruses. *Virus Res.* 264:45-55. doi: 10.1016/j.virusres.2019.02.012.
2. Cortey M, Ferretti L, Pérez-Martín E, Zhang F, de Klerk-Lorist LM, Scott K, Freimanis G, Seago J, Ribeca P, van Schalkwyk L, Juleff ND, Maree FF, Charleston B. (2019) Persistent infection of African buffalo (*Syncerus caffer*) with Foot-and-Mouth Disease Virus: limited viral evolution and no evidence of antibody neutralization escape. *J Virol.* 00563-19. doi: 10.1128/JVI.00563-19.
3. Mwiine FN, Velazquez-Salinas L, Ahmed Z, Ochwo S, Munsey A, Kenney M, Lutwama JJ, Maree FF, Lobel L, Perez AM, Rodriguez LL, VanderWaal K, Rieder E. (2019) Serological and Phylogenetic Characterization of Foot and Mouth Disease Viruses from Uganda during Cross Sectional Surveillance Study in Cattle between 2014 and 2017. *Transbound Emerg Dis.* doi: 10.1111/tbed.13249.
4. Munsey A, Mwiine FN, Ochwo S, Velazquez-Salinas L, Ahmed Z, Maree F, Rodriguez LL, Rieder E, Perez A, VanderWaal K. (2019) Spatial distribution and risk factors for foot and mouth disease virus in Uganda: Opportunities for strategic surveillance. *Prev Vet Med.* 171:104766. doi: 10.1016/j.prevetmed.2019.104766.
5. Ferretti L, Pérez-Martín E, Zhang F, Maree F, de Klerk-Lorist LM, van Schalkwyk L, Juleff ND, Charleston B, Ribeca P. (2020) Pervasive within-host recombination and epistasis as major determinants of the molecular evolution of the foot-and-mouth disease virus capsid. *PLoS Pathog.* 16(1):e1008235. doi: 10.1371/journal.ppat.1008235.
6. Mamabolo MV, Theron J, Maree F, Crampton M. (2020) Production of foot-and-mouth disease virus SAT2 VP1 protein. *AMB Express.* 10(1):2. doi: 10.1186/s13568-019-0938-7.

b) International conferences: 5

1. FF Maree & M Mulumba. Preparedness for FMDV Type A and O outbreaks in Southern Africa. SADC Livestock Technical Meeting on Emerging Serotypes of FMD in the SADC Region, June 2019, Johannesburg.
2. M.Chitray, P.Opperman, W. Van Wyngaardt, J. Fehrsen, J. Frischmuth, F.Maree. The use of novel single-chain antibody fragments against SAT serotype foot-and-mouth disease viruses in diagnostics. GFRA 2019, Bangkok, Thailand.
3. P. Opperman, M. Chitray, T. Nefefe, J. Fehrsen, F. Maree. Construction of a recombinant antibody phage display library derived from the immune repertoire of FMD-SAT infected buffalo. Potential new diagnostic reagents? GFRA 2019, Bangkok, Thailand.
4. Ochwo S, Mwiine FN, Velazquez-Salinas L, Ahmed Z, Munsey A, Kenney M, Lutwama JJ, Maree FF, Perez AM, Rodriguez LL, VanderWaal K, Rieder E. Phylogenetic analysis of foot-and-mouth disease viruses from Uganda

during cross-sectional surveillance in cattle between 2014 and 2017. GFRA 2019, Bangkok, Thailand.

5. Scott, K, Mwiine, F, Sylvester, O, Lutwaama, J, Chitray, M, VanderWaal, K, Rieder, E, Maree, F. Spatial patterns of foot-and-mouth disease serotypes in Uganda (2014-2018) – clues to improving vaccination strategies. GFRA 2019, Bangkok, Thailand.

c) National conferences: 5

1. De Klerk-Lorist, L, Maree, F.F., Scott, K.A., Lorist, R., Van Dyk, D.S. & Steinman. A chameleon called Sattoo broke the heart of Bushwillow Creek. 17th Annual Congress of the SASVEPM, 19-23 August 2019, Umhlanga, SA.

2. F.F. Maree, K. Scott, L. Maake, E. Perez-Martin, F. Zhang, L. de Klerk-Lorist, L. van Schalkwyk, B. Beechler, A. Jolles, B. Charleston. Longitudinal sero-surveillance of foot and mouth disease in an isolated buffalo herd in the Kruger National Park. 17th Annual Congress of the SASVEPM, 19-23 August 2019, Umhlanga, SA.

3. Chitray, M., Opperman, P., Van Wyngaardt, W., Fehrsen, J., Frischmuth, J. and Maree, F.F. The use of novel single-chain antibody fragments against SAT serotype foot-and-mouth disease viruses in diagnostics. 17th Annual Congress of the SASVEPM, 19-23 August 2019, Umhlanga, SA.

4. Opperman, P., Chitray, M., Tshifhiwa N., Fehrsen, J. and Maree, F.F. Construction of a recombinant antibody phage display library derived from the immune repertoire of FMD-SAT infected buffalo. Potential new diagnostic reagents? 17th Annual Congress of the SASVEPM, 19-23 August 2019, Umhlanga, SA.

5. FF Maree. Foot and mouth disease and possible solutions. Bio Africa Convention, 26-28 Aug 2018, Durban, SA.

d) Other:

(Provide website address or link to appropriate information) 0

ToR 7: To provide scientific and technical training for personnel from OIE Member Countries

To recommend the prescribed and alternative tests or vaccines as OIE Standards

14. Did your laboratory provide scientific and technical training to laboratory personnel from other OIE Member Countries?

Yes

a) Technical visits: 2

b) Seminars: 1

c) Hands-on training courses: 1

d) Internships (>1 month): 0

Type of technical training provided (a, b, c or d)	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
a	Uganda	2
b	APQA, South Korea	15
c	APQA, South Korea	6

ToR 8: To maintain a system of quality assurance, biosafety and biosecurity relevant for the pathogen and the disease concerned

15. Does your laboratory have a Quality Management System?

Yes

Quality management system adopted	Certificate scan (PDF, JPG, PNG format)
ISO 17025	V 0034.pdf

16. Is your quality management system accredited?

Yes

Test for which your laboratory is accredited	Accreditation body
VNT	SANAS
LPBE	SANAS
NSP ELISA	SANAS

17. Does your laboratory maintain a “biorisk management system” for the pathogen and the disease concerned?

Yes

*(See Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, Chapter 1.1.4)***ToR 9: To organise and participate in scientific meetings on behalf of the OIE**

18. Did your laboratory organise scientific meetings on behalf of the OIE?

No

19. Did your laboratory participate in scientific meetings on behalf of the OIE?

No

ToR 10: To establish and maintain a network with other OIE Reference Laboratories designated for the same pathogen or disease and organise regular inter-laboratory proficiency testing to ensure comparability of results

20. Did your laboratory exchange information with other OIE Reference Laboratories designated for the same pathogen or disease?

Yes

21. Was your laboratory involved in maintaining a network with OIE Reference Laboratories designated for the

same pathogen or disease by organising or participating in proficiency tests?

Yes

Purpose of the proficiency tests: ¹	Role of your Reference Laboratory (organiser/ participant)	No. participants	Participating OIE Ref. Labs/ organising OIE Ref. Lab.
The aim of this exercise is to complete a PTS for virology and serology diagnosis for FMD and SVD during 2018/2019.	participant	64	TAD, ARC-OVI

¹ validation of a diagnostic protocol: specify the test; quality control of vaccines: specify the vaccine type, etc.

22. Did your laboratory collaborate with other OIE Reference Laboratories for the same disease on scientific research projects for the diagnosis or control of the pathogen of interest?

Yes

Title of the project or contract	Scope	Name(s) of relevant OIE Reference Laboratories
Persistence of a highly contagious pathogen: ecological and evolutionary mechanisms in foot-and-mouth disease virus.	The main objectives of the study is (i) to understand the condition allowing persistence of FMDV; (ii) to evaluate a novel immunological mechanism for re-activation of carrier hosts in FMDV infection; and (iii) evaluate the role of antigenic shift at epidemiologically relevant time scales.	The Pirbright Institute, UK

ToR 11: To organise inter-laboratory proficiency testing with laboratories other than OIE Reference Laboratories for the same pathogens and diseases to ensure equivalence of results

23. Did your laboratory organise or participate in inter-laboratory proficiency tests with laboratories other than OIE Reference Laboratories for the same disease?

No

Note: See *Interlaboratory test comparisons in: Laboratory Proficiency Testing* at: <http://www.oie.int/en/our-scientific-expertise/reference-laboratories/proficiency-testing> see point 1.3

ToR 12: To place expert consultants at the disposal of the OIE

24. Did your laboratory place expert consultants at the disposal of the OIE?

No

25. Additional comments regarding your report:

None