FAO Reference Centre - Annual report

(Thematic areas[1])

Title of FAO Reference Centre	**FAO Reference Centre for FMD and SVD**
Name of the Institution and contact details	**Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER), Brescia - Italy**
Director of Institute	**Dr. Piero Frazzi**
Head of the FAO Reference Centre	**Emiliana Brocchi**
Name, title and function of reporting officer (if different from above)	**Emiliana Brocchi, Dr. Head of national/OIE/FAO Reference Centres for FMD and for SVD, head of Biotechnology Lab**
Reporting period	**2019 – April 2020**
Date of reporting	**25/04/2020**

[1] Applies to: Veterinary Epidemiology, VPH, Laboratory Biosafety and biocontainment, Veterinary drugs and vaccine control, Wildlife health, Human- animal -environment interface

Please report activities as specified in the paragraph "areas of collaboration" in the designation letter – *Where applicable, please always give details on beneficiary countries, project names, activities carried out, outcomes and recommendations*

1. **Test(s) carried out for FAO member countries**

Foot-and-Mouth Disease

SEROLOGICAL TESTS (NSP-ELISA, SP-ELISAs for different serotypes, Virus Neutralization tests (VNT) with a variety of serotypes and strains.

Country	Year	Purpose testing	NSP ELISA	SP ELISA (end-point titration)					VNT (end-point titration)		
				O	A	SAT1	SAT2	Asia1	O	A	SAT2
Tunisia	2018-2019	Field vaccination trial [1]	372	372	372		372		136 (O Manisa) 136 (O ALG 14) 136 (O ALG 19) 136 (O CAM 98)	136 (A 22 Iraq) 136 (A ALG 17)	136 (SAT 2 EGY 12)
Algeria	2019	Field vaccination trial [1]	110	110					40 (O TUR 68/09) 40 (O ALG 19) 40 (O TUN 14)		
Georgia	2019	Field vaccination trial [1]	206	206	206			206	100 (O TUR 07)	100 (A TUR 06) 100 (A GVII)	100 (Asia1 TUR 15)
		Field survey	100	100	100			100			
Tanzania	2019	Serotypes diversity investigations [2]	1880	1880	1880	1880	1880				

[1] To estimate effectiveness of the vaccines currently used in the country and potential cross-protection vs circulating viruses. Samples testing from the trial conducted in Tunisia was started in 2018 and concluded during 2019. A detailed report of results was provided to each country.

[2] To determine FMD virus serotype diversity in endemic settings by measuring the level of antibodies reactive against the serotypes O, A, SAT2 and SAT1

Overall, in support to FAO Member Countries during the reporting period IZSLER performed:
9664 SP-ELISA tests for detection of FMDV Ab against different serotypes, with end-point titration of sera
2668 NSP-ELISA tests
1472 VN tests for detection of neutralizing antibodies against different serotypes/strains.

Virological tests (Virus Isolation in BHK-21, IBRS-2 and LKBK; Ag detection and serotyping ELISA, VP1 sequencing)

Year testing	Country	samples	VI	Ag-ELISA	Pan-FMDV RealTime PCR	Topotypes-specific RealTime PCRs	VP1 sequence
2019	Algeria	Epith.	18 (6x3 cell lines)	6	6		6
2019	Libya	FTA cards [1]			16	16	1
2019	Tanzania	Epith. [2]	79	140	140	700 (140x5)	27

[1] N. 16 suspect samples (epithelium, swabs, blood on FTA cards)

[2] Samples from years 2012-2017. Serological and virological surveillance in Northern Tanzania is being performed to inform predictive models of foot-and-mouth disease spread

Swine Vesicular Disease

Extensive testing is carried out every year for the SVD Italian surveillance plan. The request for SVD testing from other countries is occasional and limited to confirmatory testing, in particular to clarify sporadic serological reactivities (singleton reactors).

Country	Year	5B7 competitive ELISA	VNT	IgG Isotyping ELISA	IgM Isotyping ELISA	Realtime RT-PCR
Italy	2019	89,776 (ref lab) + 330,000 (other regional labs)	480	470	470	1762

2. Involvement in other non-FAO technical assistance projects or activity

It should be noted that FAO/OIE/EUFMD assistance projects are often conducted collaboratively.

During 2019, IZSLER received the request of Saudi Arabia to undertake an OIE Laboratory twinning project with the aim to improve the capacities of KSA ARRAD's personnel to perform FMD laboratory diagnosis, in order to better manage FMD risks and to be able to increase the level of FMD control in the country. IZSLER has proposed to the candidate Institute a draft project, based on the collaboration of IZSLER for technology transfer, including laboratory training, FMD diagnostic procedures, quality control, biosecurity and activities to be implemented for Post Vaccination Monitoring.
Strengthening of relationships between both Institutes should allow a better understanding of FMD viruses circulation in the region and improvement of disease control measures.

3. Participation in international, regional scientific collaborative studies or projects (please mention partners and/or organisation; country, objectives and activities)

The following studies have been conducted during the reporting period.

Title: Field vaccine trials to predict efficacy of FMD vaccines and potential cross-protection vs circulating viruses
Countries involved: Morocco, Algeria and Tunisia.
Organisations: EUFMD, OIE Tunis and IZSLER

Context

Vaccination has been adopted as crucial measure to control FMD in the region, however preliminary knowledge on vaccines effectiveness is important to predict whether vaccination can contribute to control FMD.

Preliminary estimates of vaccine effectiveness can be obtained by simple field studies.

Therefore, the three Maghreb countries (Algeria, Tunisia, Morocco) have agreed to perform field vaccine trials to evaluate and predict the effectiveness of FMD vaccines currently used in each country, according to the proposal jointly developed by EuFMD, OIE Tunis and IZSLER.

Objectives

The aim of the study was to evaluate the strength, kinetic and duration of the humoral response to field vaccination with FMDV multivalent vaccines used in the country. elicited by one or by repeated vaccinations, in order to acquire knowledge on vaccination effectiveness and optimize FMD control program. Focus was given to neutralizing antibodies, since due to their capability to neutralize virus infectivity (*in vitro* and *in vivo*), they better correlate with protection.

For additional information, the study compared titers of antibodies neutralizing the administered vaccine strains (homologous) with titers of antibodies capable to cross-neutralize FMD viruses recently circulated in Maghreb region.

Experimental design and activities

Planned sample size

A homogeneous study was proposed to Morocco, Algeria and Tunisia. According to the scheme planned, two species and two age-groups of animals were to be enrolled in the vaccine trial, one composed of 20 young animals (10 calves and 10 sheep), never vaccinated before, and a second composed by another 20 animals (10 cattle and 10 sheep), adult and previously vaccinated, thus receiving a booster vaccination. Ideally, each group of 20 animals had to be selected from 2 farms.

The number of animals actually selected slightly diverged from the planned scheme and particularly in Tunisia more animals were enrolled in the trial.

Sampling criteria

The following samplings were scheduled for the trials to be conducted in the three Maghreb Countries:

- Before vaccination (day 0),
- 5 days post vaccination (DPV) in adult animals that had received a booster vaccination and 10 DPV in primo-vaccinated animals, for evaluation of early immune-response to vaccine,
- 30 DPV, as standard time to evaluate vaccine-induced immune response.

Testing scheme

Serum samples were analyzed at IZSLER lab with three different diagnostic tests:

- **NSP-ELISA** to confirm absence of exposure to infection in the selected animals, previously and during the trial. The IZSLER kit named 3ABC-trapping ELISA was used;
- **SP-ELISA** to measure the level of antibodies elicited against the vaccine serotypes. Sera titration was performed using IZSLER kits;
- **VNT** to measure the level of virus neutralizing antibodies raised against the virus strain(s) present in vaccine formulations (for the test the vaccine strains or same topotypes or strains with good antigenic matching were used) and against the field viral strains recently detected in Northern Africa.

IZSLER collaborated in study design, conducted all tests, elaborated results and produced a detailed report of results for each of the three participating country, that was also disseminated to the international organizations.

A similar study with similar objectives was planned and is being conducted in three Transcaucasus countries.
Title: Small-scale trial for the evaluation of vaccine quality and immune responses in vaccinated animals in the TransCaucasus countries .
Countries involved: Georgia, Armenia, Azerbaijan.
Organisation: EUFMD with collaboration of IZSLER.
Objectives: The results of the field study should provide information on:

- the expected proportion of animals that will develop a specific level of antibodies following the administration of a single dose of the vaccine,
- the effect of a booster dose,
- the duration (and level) of specific antibody titers over time.

Activities: Testing has been almost completed for the trial conducted in Georgia, while shipment of sera collected from Armenia and Azerbaijan trials has been postponed due to the COVID-19 emergency.

ZSLER has established a collaboration with the University of Glasgow for the study entitled:
Title: Serological and virological surveillance in Northern Tanzania to inform predictive models of foot-and-mouth disease spread.
Objectives:

- To time outbreaks of specific serotypes and inform epidemiological models of disease spread.
- To determine FMD virus serotype diversity in endemic settings by measuring the level of antibodies reactive against the serotypes O, A, SAT2 and SAT1. This would also enable exploitation and validation of IZSLER kits for use in East Africa.
- Exploitation of realtime RT-PCR specific for FMDV topotypes circulating in East Africa region (virus pool n. 4)

Partner: University of Glasgow, UK
Country: Tanzania

IZSLER has the following research collaborations ongoing:
Title: Research agreement for Development of new and improved diagnostic ELISAs and reagents
Objectives and **activities**: Research on

- Incorporation of recombinant products (Integrin, VLPs) in ELISA kits
- Development of new prototype tests (pan-SP serology, evaluation of 146S integrity)
- Cross-reactivity of SP Ab-ELISAs
- Development of diagnostic tools for SAT3

Partners: IZSLER, Italy and The Pirbright Institute, UK

Title: Research agreement to study the interaction between FMDV and host proteins during infection
Objective: production and provision of mAbs suited for research studies
Partners: IZSLER and USDA ARS PADC Foreign Animal Disease research, Plum Island NY, US

4. Organisation/participation in international/regional scientific meetings

IZSLER experts participated at the following scientific meetings with active contributions:

Title of event: Meeting of the EUFMD "Special Committee on Biorisk Management (SC-BRM)"
Date and location: January 2019, Switzerland.
Role: SC-BRM member.
Work: Revision of the document: "Minimum Biorisk Management Standards for laboratories working with FMDV in vitro/in vivo (MBRM)" (Collaborative editing of Minimum Standards document).

Title of event: Workshop on Post Vaccination Monitoring in North Africa (Algeria, Morocco and Tunisia).
Date and location: 03/2019 - Tunis, Tunisia.
Role: OIE/FAO lab expert, communication.
Work presented: Detailed results of field vaccine trials to estimate the effectiveness of the vaccination program implemented in the Maghreb region.

Title of event: 43rd General Session of the European Commission for the Control of Foot-and-Mouth Disease.
Date and location: FAO Rome, 17-18 April 2019.
Role: participants as OIE/FAO reference Laboratory experts.
Work presented: Ongoing activities on FMD and other TADS at IZSLER: National/FAO/OIE FMD Reference Laboratory (poster).

Title of event: Management meeting - Regional cooperation between TransCaucasus and neighbouring countries for the prevention and control of Foot-and-Mouth disease (FMD) and similar Transboundary Animal Diseases.
Date and location: 16 September 2019, EUFMD/FAO Rome.
Role: participants as OIE/FAO reference Laboratory experts.
Work presented: Results of the evaluation of vaccine quality and immune responses in vaccinated animals (trivalent vaccine O, A, Asia 1) in Georgia.

Title of event: First meeting of the Special Committee for Surveillance and Applied Research (SCSAR). Objective: Improving neighbourhood surveillance and European preparedness for Foot-And-mouth disease and Similar Transboundary (FAST) animal diseases - Workshop on the new work programme of the EuFMDFAST.
Date and location: 24-25 September 2019, Bari, Italy.
Role: participant as OIE/FAO reference Laboratory expert, member SCSCAR.
Work presented: update on scientific activities and experimental results of the Reference centre regarding IZSLER's research program on LSD.

Title of event: Annual meeting of the FMD/SVD/VSV National Reference Laboratories within EU.
Date and location: 8-9 October - EURL, ANSES, France.
Role: National/OIE/FAO Reference Laboratory for vesicular diseases.
Work presented:

- Experiences of field vaccine trials to predict efficacy of FMD vaccines and potential cross-protection vs circulating viruses.
- Performance of molecular tests (topotype-specific Real-time RT-PCR) applied to field samples from Africa and comparison with other diagnostic assays (VI and Ag-detection).

Title of event: 14th OIE/FAO FMD Laboratory Network Meeting.
Date and location: 3-5 December 2019 - Busan, South Korea.
Role: OIE/FAO Lab expert.
Work presented: Updates from the OIE/FAO reference lab-IZSLER.

Title of event: National Workshop on FMD and SVD updates for laboratory experts of Italian Regional laboratories and official veterinarians.
Date and location 5th November, Ministry of health, Rome.
Role: Organizer (as National Reference Laboratory for Vesicular Diseases).
A series of Lessons on epidemiology, diagnosis, results of Proficiency Tests, surveillance, International programmes have been provided by experts of the NRL.

5. Publication and dissemination of information relevant to the work of FAO including list of scientific publications, internet publishing activities, presentations at international, regional conferences

a) Articles published in peer-reviewed journals

1. Ming Yang1, Kayla Gagliardi, Leanne McIntyre, Wanhong Xu, Melissa Goolia, Thanuja Ambagala, Emiliana Brocchi, Santina Grazioli, Kathleen Hooper–McGrevy, Charles Nfon, Alfonso Clavijo. Development and evaluation of swine vesicular disease isotype–specific antibody ELISAs based on recombinant virus–like particles. Transbound Emerg Dis. 2020 Jan;67(1):406-416. doi: 10.1111/tbed.13363. Epub 2019 Oct 9.
2. Pezzoni G, Bregoli A, Grazioli S, Barbieri I, Madani H, Omani A, Sadaoui H, Bouayed N, Wadsworth J, Bachanek-Bankowska K, Knowles NJ, King DP, Brocchi E. Foot-and-mouth disease outbreaks due to an exotic virus serotype A lineage (A/AFRICA/G-IV) in Algeria in 2017. Transbound Emerg Dis. 2019 Jan;66(1):7-13. doi: 10.1111/tbed.13017
3. Daniel Nthiwaa, Bernard Bett, David Odongo, Eucharia Kenya, Martin Wainaina, Santina Grazioli, Efrem Foglia, Emiliana Brocchi, Silvia Alonso. Seroprevalence of foot-and-mouth disease virus in cattle herds raised in Maasai Mara ecosystem in Kenya. Prev Vet Med. 2020 Mar;176:104929. doi: 10.1016/j.prevetmed.2020.104929. Epub 2020 Feb 13.
4. Asfor A, Howe N, Grazioli S, Berryman S, Parekh K., Wilsden G, Ludi A, King DP, Parida S, Brocchi E, Tuthill TJ. Detection of antibodies against a conserved capsid epitope as the basis of a novel universal serological test for foot-and-mouth disease. Journal of Clinical Microbiology (JCM). J Clin Microbiol. 2020 Mar 18. pii: JCM.01527-19. doi: 10.1128/JCM.01527-19. [Epub ahead of print]
5. Beatriz Sanz-Bernardo, Ismar R Haga, Najith Wijesiriwardana, Philippa C Hawes, Jennifer Simpson, Linda R Morrison, Neil MacIntyre, Emiliana Brocchi, Karin E Darpel, Philippa M Beard. Experimental lumpy skin disease is characterised by severe multifocal dermatitis with necrotising fibrinoid vasculitis. Veterinary Pathology, 2020. In press. Doi: 10.1177/0300985820913268
6. Santina Grazioli, Nigel P. Ferris, Giovanna Dho, Giulia Pezzoni, Alison S. Morris, Valérie Mioulet, Emiliana Brocchi*. Development and validation of a simplified serotyping ELISA based on monoclonal antibodies for the diagnosis of foot-and-mouth disease virus serotypes O, A, C and Asia 1. *Submitted 2020 (Transbound Emerg Dis.)*
7. Michael Eschbaumer*, Andrea Vögtlin, David J. Paton, Charles Nfon, Emiliana Brocchi, Labib Bakkali Kassimi, David Lefebvre, Kris de Clercq, Donald P. King, Stéphan Zientara, Christian Griot,

Martin Beer. Mini Review: Non-discriminatory exclusion testing as a tool for the early detection of foot-and-mouth disease incursions. *Submitted 2020 (Frontiers in Veterinary Science)*

8. Clare Browning, Antonello Di Nardo, Lissie Henry, Tim Pollard, Lynne Hendry, Aurore Romey, Anthony Relmy, Phaedra Eble, Emiliana Brocchi, Santina Grazioli, Satya Parida, Donald P. King, Anna B. Ludi. An inter-laboratory exercise to compare two ELISA kits used for foot-and-mouth disease virus non-structural protein serology. Short communication. *Submitted 2020 (Journal of Veterinary Diagnostic Investigation)*

b) International conference:

Brocchi E., Grazioli S., Pezzoni G. Ongoing activities on FMD and other TADS at IZSLER: National/FAO/OIE FMD Reference Laboratory. 43rd General Session of the European Commission for the Control of Foot-and-Mouth Disease; FAO Rome, 17-18 April 2019 (poster)

c) National conference:

Anfossi L., Grazioli S., Russo A., Nogarol C., Rosati S., Brocchi E. Development of a multiplex pen-side rapid test for identification and serotyping of FMD viruses type O, A and Asia 1. XIX Congress of Italian Society for Veterinary Diagnostic Laboratories (SIDiLV); 23-25 October, 2019 Matera-Italy

d) Scientific meetings

1. Workshop on Post Vaccination Monitoring in North Africa (Algeria, Morocco and Tunisia). 19 March 2019 Tunisi (vcf) – Results of field trials to estimate the effectiveness of the vaccination program implemented in the Maghreb region. (Brocchi E.)
2. Management meeting EUFMD/FAO Rome - Regional cooperation between TransCaucasus and neighbouring countries for the prevention and control of Foot-and-Mouth disease (FMD) and similar Transboundary Animal Diseases - 16 September 2019, FAO/Roma (vcf): Results of field trials to estimate the effectiveness of the vaccination program implemented in Georgia (E. Foglia)
3. Annual meeting of National Reference Laboratories in EU for FMD, organized by EURL, ANSES-Maison-Alfort, France, 07-08 October 2019:
   - Experiences of field vaccine trials to predict efficacy of FMD vaccines and potential cross-protection vs circulating viruses. (E. Brocchi)
   - Performance of molecular tests (topotype-specific Real-time RT-PCR) applied to field samples from Africa and comparison with other diagnostic assays (VI and Ag-detection). (G. Pezzoni)
4. 14th Annual meeting of the Network of OIE/FAO Reference Laboratories for FMD, 3-5 December, South Korea. Report on activities conducted by the FMD Reference Laboratory during 2019 (S. Grazioli)
5. National Workshop on FMD and SVD updates for laboratory experts of Italian Regional laboratories and official veterinarians. 5th November, Ministry of health, Rome.

   Lessons provided by NRL experts on FMD:
   - Overview of FMD global epidemiology
   - Programs of the National/OIE/FAO reference centre for international cooperation
   - Laboratory Contingency Plan
   - Reports of Proficiency Tests and plans for future
   - Initiatives of international organization (OIE/FAO/EUFMD) for the global control of FMD and The Progressive Control Pathway
   - Presentation of the model EUFMDis

   Lessons provided by NRL experts on SVD:

- Overview of SVD epidemiology in Italy and in the world
- Phylogenetic analysis of the strains circulated in Italy from 1992 to 2015
- Molecular diagnostics of SVDV
- Serology and false positives issues (Singleton reactors)
- SVDV Proficiency tests: scopes and overview of results of proficiency tests organised by the National/OIE reference Laboratory in several subsequent years
- National SVD surveillance perspectives in the light of the recently recognised SVD-free status

6. Any major change in staff or institution, including governmental institution(s), during the reporting period

No change in laboratory staff occurred during the reporting period.

According to the regular four-year turn over a new Director General and a new Technical Director have been nominated by the regions Lombardia and Emilia-Romagna, they entered into force at the beginning of 2020.

7. Update on accredited tests (list of tests)

FMD *Diagnostic tests – Indirect tests*	Accreditation status
Competitive ELISA – Structural Proteins (serotypes O, A, C, Asia 1, SAT1, SAT2)	ISO 17025
Virus Neutralization Test (all seven serotypes)	ISO 17025
NSP Ab ELISA (3ABC trapping ELISA)	ISO 17025
FMD *Diagnostic tests – Direct tests*	
Virus Isolation (IB-RS2, BHK21, LFBK)	in process of accreditation
Conventional RT-PCR (3D gene)	ISO 17025
Real Time PCR-3D gene	ISO 17025
Real Time PCR-5UTR region	ISO 17025
Ag detection and serotyping ELISA (MAbs based)	ISO 17025
Real Time topotypes-specific	lab internal protocol
VP1 sequencing	lab internal protocol
Complete genome sequencing	lab internal protocol
SVD *Diagnostic tests – Indirect tests*	
Competitive ELISA (OIE prescribed test for screening)	ISO 17025
IgG-specific ELISA	lab internal protocol
IgM-specific ELISA	lab internal protocol
Virus Neutralization Test	ISO 17025
SVD *Diagnostic tests – Direct tests*	
Virus Isolation (cell culture)	in process of accreditation
Conventional RT-PCR (3D-fragment)	ISO 17025
Realtime RT-PCR (3D-fragment)	ISO 17025
Sandwich ELISA (mAbs-based) based)	ISO 17025
Sequencing (3D region, IRES, VP1)	lab internal protocol
Complete genome sequencing	lab internal protocol

8. Other activities indicated in areas of collaboration

In addition to the topics reported above, IZSLER has been active in some other areas of collaboration, namely organization of training, organization of/participation to proficiency tests, distribution of diagnostics.

TRAININGS AND TECHNICAL VISITS ORGANIZED

1. Technical visit of a Russian delegation (5 scientists) to visit labs and reagents/kits production facilities and discuss subject of potential collaboration
2. Technical visit of an Argentinian delegation (5 members from Ministry and labs) to learn about scientific support and diagnostic tools of official labs, with focus on FMD and other vesicular diseases
3. Two-week training on Biosafety and Biosecurity provisions for BSL-3/4 facilities (Laboratories and Animal housing). Training conducted in the framework of OIE twinning for "The establishment and development of an OIE collaborating centre on camel diseases". Attendees: two vets from ADFCA, Abu Dhabi (UAE)
4. Two-week hands-on laboratory training on cultures and infection of BHK-38 cells in suspension for FMD vaccines production. Attendees: three vets from Veterinary Serum and Vaccine Research Institute of **Egypt** (VSVRI), Ministry of Agriculture (8-21 October)

PROFICIENCY TESTS

IZSLER **participated** at the following international Proficiency Tests:

1. FMD/SVD Proficiency Test 2019, organized by the FMD-EURL. It aimed to evaluate testing laboratory capability for early detection of FMD/SVD outbreaks using virological and serological methods. Panels 1-live viruses for FMDV/SVDV detection, typing and sequencing (tests applied: VI, Ag detection and serotyping ELISA, rtRT-PCR, VP1 sequencing with phylogenetic analysis); Panel 3 for FMDV serological tests (tests applied: NSP-Ab ELISA, SP-Ab ELISA, VNT); Panel 4 for SVD serological tests (tests applied: competitive ELISA, IgG/IgM ELISA, VNT).
   Participating Labs: 26 FMD National Reference Laboratories of EU member countries (which include 4 OIE Ref Labs), 5 EU candidate countries, 6 strategic countries supported by EUFMD.
   Organizing Lab: EURL, ANSES, France.
2. Inter-laboratory exercise to compare the performance of two commercial kits based on competitive ELISA used for FMDV non-structural protein serology.
   Participating Labs: IZSLER (Italy) and ANSES (France) OIE Ref Labs, Wageningen Bioveterinary research-Netherlands, Animal Plant & Health Agency, UK.
   Organizing Lab: The Pirbright Institute, UK.

IZSLER **organized** the following PT:

1. National Proficiency Test for FMD serology, to maintain preparedness of regional laboratories to support the NRL in case of emergency.

Samples: Panel of 22 blind sera.
Tests: ELISA for Ab to NSP, ELISA for Ab to serotype A, ELISA for Ab to serotype O (by IZSLER kits)
Participants: N. 10 Italian regional Laboratories.

2. Annual inter-laboratory test to monitor the harmonisation and performance of the 5B7-competitive ELISA for SVDV Ab detection, carried out in 10 Italian regional laboratories for the national surveillance plan.
3. Proficiency test for FMD diagnosis, focused on virological (Antigen detection ELISA and rtRT-PCR) and serological (NSP antibody detection) tests for the Laboratory of Turkish Cyprus.

DISTRIBUTION OF DIAGNOSTICS

During 2019, IZSLER produced and distributed 7 different typology of ELISA kits for FMD diagnostic. Summary tables showing details of kits typology and global distribution are provided below.

Ready-to-use Master Mix for FMDV rtRT-PCR was provided to Algeria and 10 Balkan countries.

BHK-38 cell line, BHK-21 cell line, NSK cell line and Medium Eagle Brescia were provided to Veterinary Serum and Vaccine Research Institute of Egypt (VSVRI), Ministry of Agriculture.

Assembled reagents for 5B7-competitive ELISA (OIE prescribed test for SVD Ab detection) were produced and nationally provided for testing of 600,000 sera in Italian regional labs to accomplish the serosurveillance plan for SVD.

Assembled reagents for 5B7-competitive ELISA were also provided to NRLs in Canada, Russia and Poland.

Type of kit	FMDV antigen detection and serotyping ELISA types O, A, C, Asia1, SAT1-2	NSP Ab ELISA KIT (DIVA test)	Competitive ELISA Kits for serotype-specific Ab				
			FMDV O	FMDV A	FMDV Asia1	FMDV SAT2	FMDV SAT1
Total N. kits	245	125	1665	373	135	51	24

	Country or organization	FMDV antigen detection ELISA type O, A, C, Asia1, SAT1-2	NSP Ab ELISA	SP Antibody ELISA Kit				
			3ABC	FMDV O	FMDV A	FMDV Asia1	FMDV SAT2	FMDV SAT1
	Training FAO	6	2	2	2	1		
Asia	Taiwan	1		2	2	1	1	
	South Korea	30		2				
	China	5	5	600	150	30		
	Bangladesh			1	1	1		
	India	3		3	3	3		
	Vietnam			1				
	Myanmar	12						
	Malaysia	5						
	Singapore	2		1	1	1		
	Mongolia	2		31	31			
Central Asia & WestEurasia	Iran	15		7	7	7		
	Iraq	1						
	Kazakistan			869				
	Georgia	2		9	9	8	5	5
	Armenia		22	3	3	3		
	Azerbaijan				37	43		
	Russia	2		8	8	4	1	1
	Pakistan	38	10	10	10	10		
Middle East	Turkey	3	1	3	3	3		
	Palestine			1	1	1		
	UAE	1		24	24		3	3
	Israel	5		1	1	1	1	
	Kwait	12		22	22			
	Saudi Arabia	10	3	7	1			
Africa	Egypt	2		2	2		2	
	Zambia	6		1				
	Uganda	11	12					
	Kenya	17	20	10	10		10	10
	Botswana							
	South Sudan	5	30	10	10		10	
	Mali	1						
	Libya	2	2					
	Morocco			6	6			
	Ivory Coast	1						
	Nigeria		1					
	Tunisia	3						
	Mauritania	5						
	Algeria	3	15	11	11		11	
Countries FMDV-free	Cyprus	1						
	Greece			1	1	1		
	Switzerland	2						
	Serbia	1						
	Japan	1						
	Romania	1	1	1	1	1		
	Ukraine	1		1	1	1		
	France	8					1	
	Austria	3		3	3	3	3	3
	Albania	1		1	1	1		
	Ireland	1		1	1	1	1	1
	Belurus	1		1	1	1		
	Latvia	1		1	1	1	1	
	Bosnia	1		1	1	1		
	Bulgaria	1		1	1	1		
	Hungary	1						
	Moldova	2		1	1	1		
	Macedonia	1		1	1	1		
	Motenegro	2		2	2	2		
	Kosovo	1		1	1	1		
	Slovenia	1	1	1	1	1	1	1
South America	Brasil	2						
	Total N. kits	**245**	**125**	**1665**	**373**	**135**	**51**	**24**

9. Comments or remarks on any general or technical matter/finding/trend

Nothing to report

Reporting officer

Dr. Emiliana Brocchi

Documento prodotto in originale informatico firmato digitalmente ai sensi del "Codice dell'Amministrazione Digitale" D.Lgs. 82/2005 e s.m.i.