



## FAO Reference Centre - Annual report (Thematic areas<sup>1</sup>)

<b>Title of FAO Reference Centre</b>	<b>FAO Reference Centre for FMD and SVD</b>
<b>Name of the Institution and contact details</b>	<b>Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER), Brescia - Italy</b>
<b>Director of Institute</b>	<b>Dr. Piero Frazzi</b>
<b>Head of the FAO Reference Centre</b>	<b>Santina Grazioli Giulia Pezzoni</b>
<b>Name, title and function of reporting officer (if different from above)</b>	
<b>Reporting period</b>	<b>2022</b>
<b>Date of reporting</b>	<b>23/01/2023</b>

<sup>1</sup> Applies to: Veterinary Epidemiology, VPH, Laboratory Biosafety and biocontainment, Veterinary drugs and vaccine control, Wildlife health, Human- animal -environment interface

## Report activities 2022:

Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER)

Designation: FAO Reference Centre for Foot-and-Mouth Disease and swine vesicular disease

Technical Area: Foot-and-Mouth Disease (FMD)

Although the technical Area of the centre is FMD, laboratory activities on Swine Vesicular Disease (SVDV) and Lumpy Skin Disease Virus (LSD) are also briefly described in this report.

### 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.**

In November, as part of activities described in the LOA between IZSLER and FAO, the lab received 1900 sera for the Post Vaccination Monitoring collected in Lebanon for testing against NSP and titration against SP type O, A, and Asia1. All activities are ongoing and it is estimated to have the final results by the end of February 2023.

On the 30th of December 2022, the laboratory received 600 sera from Jordan to evaluate the vaccine efficacy used in the field. All the testing will be supported by IZSLER.

#### ***Swine Vesicular Disease***

In the framework of the activities of the WOA Reference Laboratory for SVDV, no samples were received for serological and virological testing.

### 2. 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
Real-Time RT-PCR-3D gene	ISO 17025
Real-Time RT-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 (WOAH 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
Real-time 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

#### ***Capripox Diagnostic tests – Direct tests***

Real-time PCR	lab internal protocol
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In order to ensure the reliability of the results of the diagnostic methods listed above, every year the laboratory participates in Proficiency Tests (PT).

### Participation in international Proficiency Tests

1. FMD/SVD Proficiency Test 2022, organized by the FMD-EURL, ANSES, France.  
It aimed to evaluate testing laboratory capability for early detect FMD/SVD outbreaks using virological and serological methods. Panels 1-live viruses (four samples) for FMDV/SVD detection, typing and sequencing (tests applied: VI, Ag detection and serotyping ELISA, rtRT-PCR, VP1 sequencing with phylogenetic analysis); Panel 3 (5 samples) for FMDV serological tests (tests applied: NSP-Ab ELISA, SP-Ab ELISA, VNT); Panel 4 (four samples) for SVD serological tests (tests applied: 5B7 competitive ELISA, SVDV isotype-specific ELISA for IgG and IgM, VNT).  
Feedback: All reported results are consistent with the expected results
2. FMD Proficiency Testing scheme 2022, organized by the WRLFMD.  
On 16<sup>th</sup> December 2022, the Lab received the PT 2022 organised by the Pirbright Institute. The PT includes two panels focused on an outbreak scenario (Panel 1) and post-surveillance serology (Panel 2). Testing is planned in January, the PT deadline is the 15<sup>th</sup> of February 2023.  
Feedback of the PT 2021, received in 2022, confirmed the highest laboratory capability in diagnostic testing as requested at WOA/FAO reference Laboratory (PCP 5).

### Organization of National Proficiency Tests

IZSLER organized the following PTs:

1. National Proficiency Test for FMD serology addressed to maintain and practice preparedness of regional laboratories to support the NRL in case of FMDV emergency.  
Samples: Panel of 20 blind sera.  
Tests: ELISA for SP type O Ab (by competitive ELISA IZSLER kits)  
Participants: N. 10 Italian regional Laboratories.
2. National Proficiency Test for SVDV serology addressed to monitor the harmonisation and performance of the 5B7-competitive ELISA for SVDV Ab detection.  
Samples: Panel of 20 blind sera.  
Participants: N. 10 Italian regional Laboratories.

The deadline for both PTs is 20<sup>th</sup> February 2023.

### 3. Production and distribution of diagnostic reagents

Calibrated reagents for the Competitive ELISA for SVDV antibody (WOAH prescribed test for screening) were supplied to Canada and Polonia, in addition to the Italian network of regional laboratories for conduction of serological testing (for approximately 17,000 sera testing in Italian regional laboratories and approximately 38,000 tests at the national reference lab).

During 2022, IZSLER produced and distributed 7 different typologies of ELISA kits for FMD diagnostic. The table showing details of kits typology and global distribution is provided below.

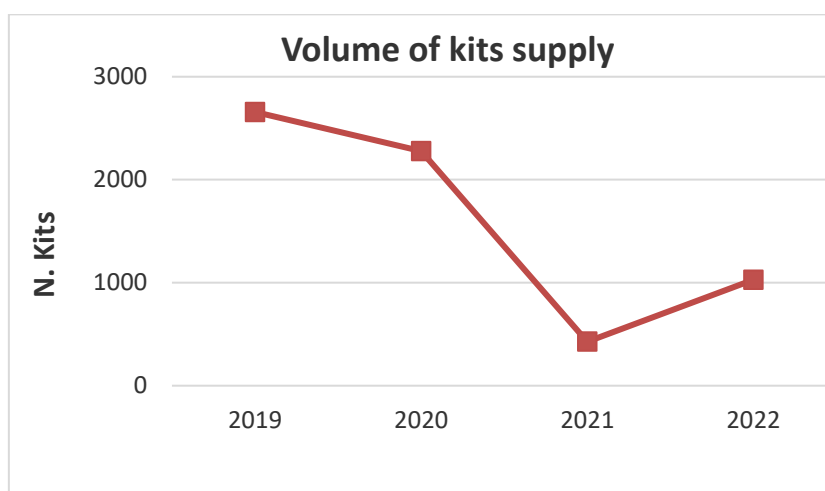
Type of reagent	Quantity	Recipient of the reagent (Laboratories / Countries)	
FMDV Ag detection ELISA type O, A, C, Asia1, SAT1-2	144	Distributed in 49 countries	
NSP Ab ELISA KIT (3ABC)	99		
FMDV O	476		
FMDV A	177		
SP-Antibody ELISA Kit	FMDV Asia 1		61
	FMDV SAT 1		29
	FMDV SAT 2		43
TOTAL		1029	

In 2022, the lab distributed a total of 1029 kits with an overall increase in sales volume of 58% compared to 2021; as well as the number of countries requesting the kits resulted in 49, which corresponds to a 25% increase.

In the period 2019-2022, we observed a sharp drop in sales in 2021 corresponding to the COVID-19 pandemic, which presumably affected the diagnostic activities in FMDV-endemic countries. However, sales recovered in 2022, confirming a resumption of disease control activities in the field (Fig. 1).

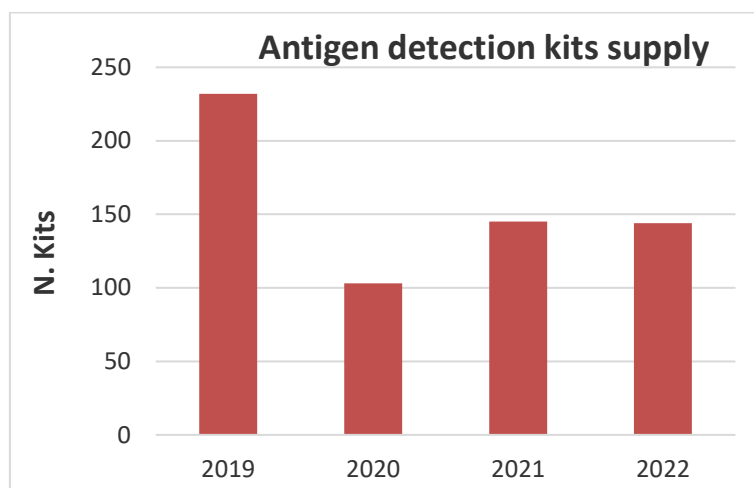
Among the ELISA kits distributed by IZSLER, the SP ELISA kit for the detection of antibodies against serotype O is confirmed to be the most requested.

*Fig. 1: Volume of kits supplied in the period 2019-2022*



Furthermore, the request for FMDV Antigen detection Kits was less affected by the COVID-19 pandemic, and the number of kits distributed in 2022 resulted the same as those distributed in 2021 (Fig. 2)

Fig. 2: Volume of FMDV Antigen detection Kit supply in the period 2019-2022



The supply conditions of IZLSER kits at a “special price”, originally established by a contract TF/INT CPA 268778-2011/AGHA between FAO and IZSLER expired on May 2015, were extended and maintained unmodified also for the year 2022.

In the framework of the SEE reagent bank collaborative project with EUFMD, IZSLER provided to 11 Balkans countries the reagents which were used for the proficiency test provided by the EURL. The reagents included a ready-to-use master mix to perform the 3D pan-FMDV real-time RT-PCR, the RNA extraction kit, positive control for molecular tests consisting of inactivated FMD virus and IZSLER ELISA kits.

IZLSER supported the supply of the following diagnostic kits/reagents:

1. To EuFMD → N. 60 multiplex Lateral Flow Device (LFD) for detection and typing of FMDV and extraction kits to be used in the Hybrid Real-Time Training Course held in June in Turin and in the Real Time Training Course held in Kenya in December.
2. To the “Official National de Recherches et de Développement de L’Elevage et du Pastoralisme” (ONARDEP) - Republique Islamique de Mauritanie → N. 3 FMDV Ag detection ELISA type O, A, C, Asia1, SAT1-2

In the framework of the activities of the WOAHP Reference Laboratory for SVDV, inactivated SVDV was provided to “Laboratório Federal de Defesa Agropecuária de Minas Gerais (LFDA/MG)” in Brasil by means:

Three FTA classic cards (Whatman plc) were spotted with 100ul of Binary ethyleneimine (BEI) inactivated SVDV.

Four vials containing 140ul of BEI inactivated SVDV in guanidine thiocyanate lysis buffer for viral RNA extraction.

The inactivated SVDV was provided for RNA extraction, to be used as a positive control for the validation of a molecular diagnostic test for SVDV detection.

#### **4. Provision of expertise to FAO or FAO member countries (please list countries, type and duration of expertise)**

Dr. Grazioli is a member of the “Special Committee on Biorisk Management (SC-BRM)” and in 2022 she participated in the following meetings :

- 23<sup>th</sup> March 2022 (online h.16.00-h.18.00)
- 15<sup>th</sup>-16<sup>th</sup> June 2022. (in person at FAO - Rome).
- 09<sup>th</sup> November 2022 (online meeting)
- 14<sup>th</sup> and 15<sup>th</sup> November 2022 (in person at Wageningen Bioveterinary Research Institute Lelystad, Amsterdam)

Mainly topics covered at the meetings:

- Biorisk training (update, technical content and delivery plans)
- Biorisk inspections
- Matrix of disinfection methods
- Tiers A and B questionnaire and drafting
- Tier C and D pending amendments

Remote assistance and technical support were provided to colleagues of Northwest Syria for carrying out serological tests, and for elaborating and interpreting the results on samples collected in the post-vaccination monitoring for foot-and-mouth disease using the IZSLER kits. The activities will also continue in 2023.

Information about sample transport using FTA card technology was provided by means of EUFMD to colleagues from Mozambique, in particular, tools and protocols to transport FMDV nucleic acid were discussed.

## **5. Involvement in FAO project or activity preparation, implementation or assessment (please list project name, country and main activities and attach pertinent documents, if applicable)**

The study “Validation of Lateral Flow Devices (LFD) for detection and serotyping of Foot and Mouth Disease Virus (FMDV) and antigenic detection of Lumpy Skin Disease Virus (LSDV)” was selected for funding in the framework of the 10<sup>th</sup> Call – EuFMD Fund for Applied Research (EuFMD-FAR) – 2022.

Summary: The study aims to evaluate the performances of the newly developed LFDs, which thanks to their easiness, and portability could be strategic tools for the detection and control of FMD and LSD, especially in developing countries where the diseases are endemic, and the general lack of expertise and adequately equipped laboratory make difficult to control them. It is noteworthy that, especially for FMDV, the LFDs are also considered a way to sample and transport viral nucleic acid to Reference Laboratories in biosafety conditions for subsequent virus characterisation and phylogenetic studies.

The main expected outcome of the study is the evaluation of the analytical and diagnostic performances of the developed tests:

- FMDV LFD1 for detection and serotyping of FMDV O, A, Asia 1 and Pan FMD
- FMDV LFD2 for detection and serotyping of FMDV SAT 1, SAT2 and Pan FMD
- LSD LFD for detection of LSD and eventually other Capripoxviruses

Their complete validation will make them suitable for the dissemination and distribution as diagnostics for field uses, improving the capacity to undertake the detection of FMD and LSD viruses in real-time and speeding up FMDV-typing and characterization. Many partners are involved in the study, including colleagues from endemic countries, who play a key role to achieve the final goal, due to the availability of clinical samples on which to assess the performance of LFDs.

Duration of study: 7<sup>th</sup> October 2022 – 30<sup>th</sup> September 2023

## **6. Involvement in other non-FAO technical assistance projects or activity**

Continuous remote assistance and advice are regularly provided to various Member countries for elaboration and interpretation of results recorded with the diagnostic kits supplied for FMD diagnosis and serology.

Online training was organized for the Indonesian distributor of IZSLER kits “PT. Elo Karsa Utama”. In Indonesia the kits are mainly used for post-vaccination monitoring, thus the training addressed the following main topics:

- Overview of the kit ELISA available in the IZSLER portfolio
- Principle of SP kits
- Interpretation of serological results and use of the Excel sheet to calculate the Ab titres.

Date and location: 10 November 2022, virtual event

Participants: staff of the company PT. Elo Karsa Utama, regional laboratory staff.

Trainer : Dr. Grazioli S

Indonesian colleagues requested also protocols and information regarding FMDV molecular diagnostic tests and FMDV sequencing methods.

## **7. Provision of capacity building activities to personnel of FAO member countries or other countries (please list countries, type/area of capacity building, number of persons etc)**

### **a) Participation of IZSLER staff as trainers**

The organization of in-person training was affected by the COVID-19 emergency, however, IZSLER actively contributed to the online training supported by the EuFMD and addressed to vet colleagues from Northwest Syria. The training has allowed starting a fruitful collaboration with Syrian colleagues.

Training title: Foot and mouth disease diagnostic methods, focused on ELISAs and the basics of ELISAs in Northwest Syria - Lecturers Dr. Grazioli and Dr. Foglia

- Development and validation of the antigen detection and serotyping ELISA - How to do the test and how to interpret the results.
- Development and validation of 3ABC antibody trapping ELISA - How to do the test and how to interpret the results.
- Development and validation of the solid-phase competition enzyme-linked immunosorbent assay (SPCE) type A, O, Asia1)- How to do the test and how to interpret the results/fill and use the Excel sheet.

Date and location: 02<sup>nd</sup> March 2022, virtual event.

Dr Grazioli participated in the Hybrid Real-Time Training (h-RTT) pilot held in Turin, (21-24 June 2022), for supporting the EuFMD staff in the exercise session (day 2) showing the use of LFD starting from the preparation of epithelium suspension to the testing included the interpretation of results.

### **b) Participation of IZSLER staff at courses/training/workshops as trainees**

Title of the training: Hybrid Real-Time Training (h-RTT) pilot

Provider: EuFMD

Location: Turin – 21<sup>st</sup> 24<sup>th</sup> June 2022

Participants: Dr. Ventura, Dr. Tonni

Title of the training: BTSF “the animal Disease preparedness, including early warning, contingency planning and animal disease control”. Course focus on FMD

Provider: BTSF “Better Training for safer Food” Initiative – face-to-face training

Training session: TS03-ADP

Location: Utrecht – 14<sup>th</sup>-18<sup>th</sup> November 2022

Participants: Dr. Ventura, Dr. Tonni, Dr. Torreggiani

**NOTE:** In 2023 IZSLER staff, that participated in the training mentioned above, are expected to organise training courses addressed to field veterinarians in Italy based on the same format.

Title of the training: EuFMD Real-Time Training (RTT) Reunion Europe

Provider: EuFMD

Location: 29<sup>th</sup> September 2022, virtual event

Participants: Dr. Merialdi e Dr. Garbarino.

Title of the course: Preparing to use emergency vaccination for fast animal diseases in european countries.

Provider: EuFMD

Location: 10<sup>th</sup> March and 14<sup>th</sup> June 2022, virtual event

Participants: Dr. Trogu

Title of the course: Multicountry Lumpy Skin Disease Course

Provider: EuFMD

Location: on the EUFMD platform from 25<sup>th</sup> May to 22<sup>nd</sup> June 2022, virtual event

Participants: Dr. Trogu, Dr. Pezzoni

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

In 2022, IZSLER participated in the research activities described in the Research agreement signed in June 2021 between IZSLER and The Pirbright Institute.

Research activities were mainly focused on the project programme 'Development of assays for foot-and-mouth disease vaccine quality using VP4 as a marker for intact antigen', due to the great international interest in this topic. In addition, the collaboration between the two research groups allowed the publication of two papers in scientific journals. The research activities will continue in 2023.

## **9. Organisation/participation in international, and regional scientific meetings**

### ***a) Participation in scientific meetings with an oral contribution***

1. Title of the event: Virtual meeting second meeting of the regional GVA for FAST diseases in the South East European Neighbourhood (SEEN) countries  
Date and location: 25<sup>th</sup> January 2022. Virtual event  
Work presented: Field trials to estimate the effectiveness of the vaccination program implemented in Transcaucasian Countries – Georgia, Armenia, and Azerbaijan (Dr. Foglia E).  
Participants: Dr. Grazioli, Dr. Foglia, Dr. Pezzoni
2. Title of the event: Third GFRA / EuFMD Regional workshop for Africa, Public-private partnerships for Progressive Control of foot-and-mouth disease in endemic settings.  
Date and location: 16<sup>th</sup> – 17<sup>th</sup> February 2022. Virtual event  
Work presented: Abstract: QA/QC pipeline for FMDV vaccines. G. Wilsden, A. Burman, A. Ludi, S. Belgrave, C. Browning, A. Asfor, M. Afzal, N. Knowles, A. Di Nardo, D. Paton, S. Grazioli, E. Foglia, N. Nwankpa, C. Rahamatou, M. Boukary, E. Chitsungo. D. King (Abstract).
3. Title of the event: Animal Health Surveillance workshop, Management meeting - Thrace and South Eastern Europe, Laboratory network meeting. Organised by EuFMD  
Date and location: 13<sup>th</sup> – 15<sup>th</sup> June 2022. Virtual event  
Work presented: SEE diagnostic bank - content, management and experience (Dr. Pezzoni G.)
4. Title of the event: 3<sup>rd</sup> GVA meeting for FAST disease. Organised by EuFMD  
Date and location: 08<sup>th</sup> September 2022. Virtual event  
Work presented: Small scale immunogenicity studies implemented in Transcaucasian Countries – final conclusions and general issues (Dr. Foglia E.)  
Participants: Dr. Grazioli, Dr. Foglia, Dr. Pezzoni
5. Title of the event: Annual meeting of the FMD/SVD/VSV National Reference Laboratories within EU.  
Date and location: 27<sup>th</sup> – 28<sup>th</sup> September 2022- EURL, ANSES, France.  
Role: National/WOAH/FAO Reference Laboratory for vesicular diseases.  
Work presented: Multiplexing lateral flow immunoassay for detection and typing of foot-and-mouth disease virus (Dr. Grazioli S).  
Participants: Dr. Grazioli and Dr. Pezzoni
6. Title of the event: 16<sup>th</sup> WOAH/FAO FMD Laboratory Network Meeting.  
Date and location: 29<sup>th</sup>- 1<sup>st</sup> December 2022. Lelystad.  
Role: WOAH/FAO Lab expert.  
Work presented: Updates from the WOAH/FAO reference lab-IZSLER (Dr. Grazioli S).

### ***b) Participation at scientific meetings without an oral contribution***

1. Title of the event: Pre-second meeting of the regional GVA for FAST diseases in the South East European Neighbourhood (SEEN) countries. Organized by EuFMD  
Date and location: 21<sup>st</sup> Gennaio 2022 h 10-11. Virtual event  
Participants: Dr. Grazioli S. e Dr. Foglia E.



2. Title of the event: Pre-second meeting of the regional GVA for FAST diseases in the South East European Neighbourhood (SEEN) countries. Organized by EuFMD  
Date and location: 21<sup>st</sup> Gennaio 2022 h 10-11. Virtual event  
Participants: Dr. Grazioli S. e Dr. Foglia E.
3. 17<sup>th</sup> June 2022: online meeting with colleagues Dr. Ayam Abdlkader, Dr. Baiomy Shahin, Dr. Dayub Jaffan) Dr. Kees Van Maanen to plan the activities to test the sera collected for the PVM in Northh West of Syria.  
16 September 2022: online meeting with colleagues Dr. Ayam Abdlkader, Dr. Baiomy Shahin, Dr. Dayub Jaffan, Dr. Kees Van Maanen to evaluate the preliminary results obtained on 100 samples.  
Participant: Dr. Grazioli S.
4. Webinar WOA. Organised by WOA SRR Abu Dhabi Webinar  
Title: Biosafety e Biosecurity  
1<sup>st</sup> and 2<sup>nd</sup> February 2022.  
Participants: Dr. Maccabiani e Dr. Grazioli
5. Webinar (about 1 h) organised by GFRA Global Foot-and-Mouth Research Alliance  
31<sup>st</sup> August 2022: GFRA Seminar Series. Dr. Jonathan Arzt  
28<sup>th</sup> September 2022: WO(AH)W Gold is not precious anymore in diagnostic test development. Dr. Nagendra Singanallur.  
Participant: Dr. Trogu
6. 21-22 September 2022 Webinar. International Veterinary Biosafety Workgroup (IVBW).
  - 21<sup>st</sup> Settembre (2h): h.12.00 – h.13.45  
Decommissioning of Lindholm. (Dr. Kirsten Tjørnehøj)  
Effluent decontamination systems of containment laboratories. (Dr. Uwe Mueller-Doblies)  
Challenges with the removal of bedding / manure from the Lelystad containment facility. (Dr. Douwe Kuperus)
  - 22<sup>nd</sup> Settembre (2h): h.22.00 – h.23.35  
National Bio and Agrodefense facility (NBAF) (Dr. Maggie Behnke)  
National Centre for Biosecurity and Infectious Diseases. (Dr. Joseph O'Keefe)  
Preparing for the ACDP Part Life Refit (Dr. Rod Howard)
 Participants: Dr. Grazioli, Dr. Vicari, Dr. Maccabiani e Ing. Greco.

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

### **a) Articles published in peer-reviewed journals**

1. Andrew E Shaw, Alison Burman, Amin Asfor, **Emiliana Brocchi**, **Santina Grazioli**, Clare Browning, Anna Ludi, Tobias J Tuthill, Donald P King  
Avidity of polyclonal antibodies to foot-and-mouth disease virus in bovine serum measured using Bio-Layer interferometry.  
Viruses. 2022 Mar 29;14(4):714. doi: 10.3390/v14040714.
2. Simone Cavallera, Alida Russo, Barbara Colitti, Sergio Rosati, Chiara Nogarol, **Efrem Alessandro Foglia**, **Santina Grazioli**, **Giulia Pezzoni**, Fabio Di Nardo, Thea Serra, Matteo Chiarella, Claudio Baggiani, **Emiliana Brocchi** and Laura Anfossi  
Design of multiplexing lateral flow immunoassay for detection and typing of foot-and-mouth disease virus using pan-reactive and serotype-specific monoclonal antibodies: evidence of a new hook effect  
Talanta. 2022 Apr 1;240:123155. doi: 10.1016/j.talanta.2021.123155.
3. Ming Yang, Leanne McIntyre, Wanhong Xu, **Emiliana Brocchi**, **Santina Grazioli**, Kathleen Hooper-McGrevy, Charles Nfon  
Validation of a competitive enzyme-linked immunosorbent assay to improve the serological diagnosis of swine vesicular disease.  
Can J Vet Res. 2022 Apr;86(2):157-161.PMID: 3538822

4. **Pezzoni G**, Calzolari M, **Foglia EA**, **Bregoli A**, Nardo AD, Sghaier S, Madani H, Chiapponi C, **Grazioli S**, Relmy A, Bakkali Kassimi L, **Brocchi E**  
Characterization of the O/ME-SA/Ind-2001d foot-and-mouth disease virus epidemic recorded in the Maghreb during 2014-2015.  
Transbound Emerg Dis. 2022 Jun 10. doi: 10.1111/tbed.14611.
5. Anna B. Ludi, Alison Morris, Simon Gubbins, Amin Asfor, Madeeha Afzal, Clare F. Browning, **Santina Grazioli**, **Efrem Alessandro Foglia**, Ginette Wilsden, Alison Burman, **Emiliana Brocchi**, David J. Paton \*, Donald P. King  
Cross-serotype reactivity of ELISAs used to detect antibodies to the structural proteins of foot-and-mouth disease virus  
Viruses. 2022 Jul 8;14(7):1495. doi: 10.3390/v14071495.PMID: 35891476
6. Canini L, Blaise-Boisseau S, Nardo AD, Shaw AE, Romey A, Relmy A, Bernelin-Cottet C, Salomez AL, Haegeman A, Ularanu H, Madani H, Ouoba BL, Zerbo HL, Souare ML, Boke CY, Eldaghayes I, Dayhum A, Ebou MH, Abouchoaib N, Sghaier S, Lefebvre D, DeClercq K, Milouet V, **Brocchi E**, **Pezzoni G**, Nfon C, King D, Durand B, Knowles N, Kassimi LB, Benfrid Identification of diffusion routes of O/EA-3 topotype of foot-and-mouth disease virus in Africa and Western Asia between 1974 and 2019 - a phylogeographic analysis.  
Transbound Emerg Dis. 2022 Sep;69(5):e2230-e2239. doi: 10.1111/tbed.14562. Epub 2022 Jun 3.PMID: 35435315.
7. Simone Cavalera, **Giulia Pezzoni**, **Santina Grazioli**, **Emiliana Brocchi**, **Stefano Baselli**, Davide Lelli, Barbara Colitti, Thea Serra, Fabio Di Nardo, Matteo Chiarello, Valentina Testa, Sergio Rosati, Claudio Baggiani, Laura Anfossi  
Investigation of the "Antigen Hook Effect" in Lateral Flow Sandwich Immunoassay: The Case of Lumpy Skin Disease Virus Detection  
Biosensors (Basel). 2022 Sep 8;12(9):739. doi: 10.3390/bios12090739.
8. Artur Summerfield, Heidi Gerber , Rebeka Schmitt , Matthias Liniger, **Santina Grazioli**, **Emiliana Brocchi**  
Relationship between neutralizing and opsonizing monoclonal antibodies against foot-and-mouth disease virus  
Front Vet Sci. 2022 Oct 12;9:1033276. doi: 10.3389/fvets.2022.1033276. eCollection 2022.
9. Fadila Abosrer, **Giulia Pezzoni**, **Emiliana Brocchi**, **Anna Castelli**, **Stefano Baselli**, **Santina Grazioli**, Hafsa Madani, Elfurgani Kraim, Abdunaser Dayhum, Ibrahim Eldaghayes  
FTA Cards as a Rapid Tool for Collection and Transport of Infective Samples: Experience with Foot-and-Mouth Disease Virus in Libya  
Animals (Basel). 2022 Nov 18;12(22):3198. doi: 10.3390/ani12223198.

**b) International conferences:**

1. **Foglia Efrem Alessandro**, **Baselli Stefano**, **Brocchi Emiliana**, **Grazioli Santina**, **Pezzoni Giulia**.  
Analysis of in vitro simultaneous replication of two serotypes of Foot-and-Mouth Disease Virus  
Europic 2022: European Study Group on the Molecular Biology of Picornaviruses 05/09 June 2022
2. **Giulia Pezzoni**, **Efrem Foglia**, **Giampietro Maccabiani**, **Tiziana Trogu**, **Giuseppe Merialdi**, **Santina Grazioli**. Ongoing activities on Fmd and other TADS at IZSLER: National/FAO/WAOH FMD Reference Laboratory. (Poster)  
WAOH-30<sup>th</sup> Conference of the Regional Commission for Europe, Catania, Italy 3/7 October 2022
3. **Castelli A**, **S. Baselli**, **M. Corsa**, **R. Benevenia**, **B. Zanetti**, **A. Bregoli**, **S. Grazioli**, B. Hoffmann, J. Wolff, **G. Pezzoni**.  
Evaluation of the immunogenicity of three structural proteins of lumpy skin disease virus  
OS22 – EuFMD OPEN SESSION Special Edition; 26,27, 28 Ottobre 2022, Hybrid event/Marsiglia
4. Simone Cavalera, **Giulia Pezzoni**, **Stefano Baselli**, **Santina Grazioli**, **Emiliana Brocchi**, Barbara Colitti, Thea Serra, Valentina Testa, Sergio Rosati, and Laura Anfossi  
Preliminary evaluation of lateral flow immunoassay for the antigen detection of lumpy skin disease virus,  
OS22 – EuFMD OPEN SESSION Special Edition; 26,27, 28 Ottobre 2022, Hybrid event/Marsiglia

5. **EA Foglia, G Pezzoni, G Maccabiani, M Corsa, S Baselli, T Trogu, S Grazioli**  
Correlation between virus neutralization test and Solid Phase Competitive ELISA on vaccinated animals. the impact of homology among Foot-And-Mouth Disease Virus strains behind vaccines and tests  
OS22 – EuFMD OPEN SESSION Special Edition; 26,27, 28 Ottobre 2022, Hybrid event/Marsiglia
6. **EA Foglia, V Mioulet, S Inel Turgut, A Sangula, L Anfossi, C Nogarol, C Cavalera, L Henry, G Pezzoni, S Rosati, A Bulut, D King, E Brocchi, S Grazioli**  
Preliminary validation of multiplex Eurasia lateral flow device for on-field identification and serotyping of Foot-And-Mouth Disease Viruses serotype O, A and Asia1  
OS22 – EuFMD OPEN SESSION Special Edition; 26,27, 28 Ottobre 2022, Hybrid event/Marsiglia
7. Abdelaziz A. Yassin, Alison Burman, **Santina Grazioli**, Madeeha Afzal, David Paton, **E Brocchi**, Daniel Horton, Donald P. King, Amin S. Asfor  
Identification of a cross-reactive epitope within the G-H loop of FMDV  
OS22 – EuFMD OPEN SESSION Special Edition; 26,27, 28 Ottobre 2022, Hybrid event/Marsiglia

**c) National conferences:**

Title of event: National Congress organised by SIMeVep – Italian Society of Veterinary Medicine

Date and location: 20 May 2022. Rome

Work presented: Epidemic emergencies for veterinary services and socio-economic impact (Grazioli).

Participation of the Head of NRL at the round table.

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

In February, the WOAHA accepted the nominations proposed by IZSLER of Dr. Grazioli and Dr. Pezzoni as designated experts of the WOAHA Reference Laboratory for Foot and mouth disease and WOAHA Reference Laboratory for Swine vesicular disease respectively.

Dr. G. Maccabiani was trained to take over the role of D-BRO in 2023 by assisting the former D-BRO (Dr. Grazioli) with the management of the biosecurity for the IZSLER high containment facility.

In addition, Dr. Trogu, from January 2023, will have a short-term placement assignment (COF WOC) for a duration of at least 6 months, and a maximum of 11 months, at the FAO in Rome.

**12. Other activities indicated in areas of collaboration**

INTERNATIONAL COOPERATION AGREEMENT

28<sup>th</sup> September 2022: Signature of Memorandum of Understanding (MoU) between the Government of the Republic of Zambia acting through the Permanent Secretary-Ministry of Fisheries and Livestock, Department of Veterinary Services and IZSLER (IZSLER document: DecretoN.268/2022).

With the MoU, the parties commit to:

- a. Undertake joint research projects in animal diseases;
- b. Conduct joint programmes to control animal disease;
- c. Joint development of diagnostic programmes;
- d. Scientific exchange of materials and development of joint programmes.

11<sup>th</sup> October 2022: Signature of the Letter of Agreement (LoA) “Reagents bank maintenance, FMDV serosurvey and vaccination monitoring” between FAO and IZSLER.

The Services will contribute to the objective of Pillar I, Component 1.4 of the EuFMD Workplan, for improved surveillance and emergency preparedness against FAST diseases in South-Eastern Europe (SEE), achieved through increased collaboration in the region, implementation of risk-based surveillance approaches, assessment and improvement of contingency plans and access to a diagnostic bank; as well as contributing to the objective of Pillar II, Component 2.2 of the EuFMD Workplan, inasmuch support will be given to the development of disease surveillance programs focused on specific risk hubs, in order to provide timely risk information, optimize the veterinary service resources deployed in the field and improve the effectiveness of control measures implemented. (IZSLER document: decreto 307/2022)

23<sup>rd</sup> December 2022: Signature of a cooperation agreement between IZSLER and the University of Ljubljana, Slovenia – Veterinary Faculty (UL VF). (IZSLER document: Decreto 398/2022)

With the agreement IZSLER, upon request of NMVRI, committed to:

- a. Analyze samples submitted by UL VF, in order to confirm or rule out the presence of FMD virus;
- b. Perform antigenic and genomic characterization of virus isolates;
- c. Provide consultancy and collaboration in planning a serological survey in case of the need to recover the FMD-free status after an outbreak

Signature of N. 2 Material Transfer Agreement (MTA) for sharing Mabs against FMDV NSP-3D with ANSES, Maisons-Alfons France (IZSLER document: N.23773/2022) and reagents against LSD (LFD, Mabs, prototypes ELISA for serology) with FLI, Insel Riems, Germany. IZSLER document: N.23774/022)

#### Reporting officers

Dr. Santina Grazioli & Dr. Giulia Pezzoni

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