Food and Agriculture Organization of the United Nations

European Commission for the Control of Foot-and-Mouth disease

Minimum Biorisk Management Standards for laboratories working with foot-and-mouth disease virus (MBRMS)

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European Commission for the Control of Foot-and-Mouth Disease

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European Commission for the Control of Foot-and-Mouth Disease

MINIMUM BIORISK MANAGEMENT STANDARDS FOR LABORATORIES WORKING WITH FOOT-AND-MOUTH DISEASE VIRUS

DRAFT FOR CONSULTATION

Ahead of Circulation to Member States and Proposal for Adoption at the 45th GENERAL SESSION OF THE EUFMD COMMISSION, 2023, ROME, ITALY

A List of Changes from the current (2021) Standard is available and circulated alongside this Version

Note on the Version GS45/MBRMS/1

1. The EuFMD Special Committee on Biorisk Management (SCBRM) reviewed the current standard "Minimum Biorisk Management Standard for Laboratories Working with Foot-and-Mouth Disease Virus", as had been endorsed at the 44th General Session of EuFMD in 2021, and which superseded all prior Standards (1993, 1985, 2009, 2013, 2019).
2. Their recommendations for changes to the Standard are contained in Version GS45/MBRMS/1, for circulation to Biorisk managers of facilities handling infectious FMDV in EuFMD member states ("Tier D") and to biorisk managers of representative "Tier C" laboratories in the European region.
3. Following their responses, the proposed Standard will be finalised and sent out to the EuFMD member states with responses invited in advance of the 45th Session.

Development of standards covering Tier A and B was postponed but will be in the SCBRM workplan for 2021 onwards. SCBRM encourages the participation of endemic countries in the development of these standards.

MINIMUM BIORISK MANAGEMENT STANDARDS (MBRMS)

FOR LABORATORIES WORKING WITH

FOOT-AND-MOUTH DISEASE VIRUS

TIER D.

LABORATORIES WORKING WITH INFECTIOUS FOOT-AND-MOUTH DISEASE VIRUS

IN VITRO AND IN VIVO

National and International FMDV reference laboratories working with infectious FMDV, including for the purpose of vaccine development and production, in FMD-free countries

TIER C.

LABORATORIES PERFORMING FMD DIAGNOSTICS WITHOUT USING INFECTIOUS FMDV

CATEGORIES:

I. CONTINUOUSLY WORKING TIER C LABORATORIES:
- National reference laboratory without permit to work with infectious FMDV

II. CONTINGENCY LABORATORIES UNDERTAKING DIAGNOSTIC INVESTIGATIONS FOR FMD IN THE FRAMEWORK OF A NATIONAL CONTINGENCY PLAN (UPGRADED LOWER LEVEL OR NEW)
- Regional laboratories supporting routine exclusion diagnostics with the option to be more involved during an outbreak
- Emergency laboratories

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FOREWORD

In 1985 the European Commission for the Control of Foot-and-Mouth Disease (EuFMD) at the Food and Agriculture Organization (FAO) of the United Nations adopted a document entitled "*Minimum Standards for Laboratories working with FMDV in vitro and in vivo".* This document described a set of precautions to be taken by foot-and-mouth disease (FMD) laboratories to avoid an escape of virus. It was prepared at a time when the majority of countries in continental Europe employed systematic annual prophylactic vaccination of their cattle. Council Directive 90/423/EEC amending Directive 85/511/EEC on Community control measures for FMD made the above standards a condition for the approval and operation of laboratories handling infectious FMD virus (FMDV).

Although the above document dealt with all important aspects of FMD containment, it had been found necessary to review it with special reference to the need for more specific technical and general requirements as a consequence of the change in Europe to a policy of non-vaccination. The security standards as specified in the 1993 revision had to be considered as minimum requirements for FMD laboratories located in FMD-free countries with or without systematic prophylactic vaccination. Article 65 of Council Directive 2003/85/EC on Community measures for the control of FMD and repealing Directive 85/511/EEC made the FMD lab standards, as amended in 1993, a condition for the approval and operation of laboratories handling infectious FMDV. Effective 21 April 2021, the FMD directive 2003/85/EC was repealed and replaced by Regulation (EU) 2016/429 of the European Parliament and of the Council of 9 March 2016 on transmissible animal diseases and amending and repealing certain acts in the area of animal health, and its delegated and implementing acts. Article 6 of Regulation 2016/429 obliges laboratories handling disease agents to follow relevant international standards and take appropriate measures to prevent the escape of these agents. In accordance with Article 16(2) of that Regulation, the Commission is empowered to adopt delegated acts concerning the safety measures for the prevention and control of listed and emerging diseases as regards laboratories, facilities and other natural or legal persons handling the disease agents, vaccines and other biological products in relation to biosecurity, biosafety and bio-containment measures and movement requirements for disease agents, vaccines and other biological products.

After the accidental release of virus from an FMD facility in 2007, EuFMD undertook to review, and where necessary to adapt, the aforementioned FMD-lab standards. The edition of the "Minimum Standards for Laboratories working with foot-and-mouth disease virus *in vitro* and *in vivo*" adopted at the 38th General Session of EuFMD on 29 April 2009 superseded the edition adopted by EuFMD in 1985 and revised in 1993.

In the years after the adoption of the 2009 version of the "Minimum Standards", and particularly during the 2009-2011 EU Food and Veterinary Office (FVO) inspections of all EU national FMD reference laboratories, it became evident that not all European countries had laboratories that met the "Minimum Biorisk Management Standards for Laboratories working with foot-and-mouth disease virus *in vitro* and *in vivo*". Moreover, as facilities for work with infectious FMDV are expensive, set up for research and usually without high sample throughput capacity, in most instances, all diagnostic tasks in the framework of an FMD outbreak cannot be carried out at this level. Also, some countries in the European region have endemic presence of FMD and thus do not require the same level of containment laboratories for work with diagnosis of FMDV.

Therefore, the 2013 version introduced four Tiers for FMD laboratories with Tier D constituting high containment facilities with the ability to handle infectious FMDV *in vitro* and *in vivo*. Tier C laboratories included FMD Contingency laboratories restricted to tests not involving infectious FMDV (essentially RT-PCR and antibody ELISAs) but also national reference laboratories not using methods involving infectious FMDV.

The 2019 version further developed the Tier C laboratory concept and defined two laboratory categories:

- category I: national reference laboratories without a permit to work with infectious FMDV but maintaining a continually alert FMD biorisk management system including trained and vigilant biorisk officer, deputy biorisk officer and laboratory staff
- category II: FMD Contingency laboratories limited to performing FMD diagnostic tests on no risk or very low risk samples or not performing FMD diagnostics except in the framework of an FMD emergency

Tier C category I laboratories comprise national reference laboratories in countries that do not have a Tier D FMD laboratory for work with infectious FMD virus. The diagnostic methods employed in a Tier C category I laboratory could include serotype-specific molecular diagnostic methods that are currently being developed and published.

Tier C category II laboratories are FMD Contingency laboratories and can in the event of an FMD emergency be part of the contingency plans, as foreseen in Annex XV of Council Directive 2003/85/EC[1]. FMD Contingency Laboratories must not work with any infectious FMDV – except for virus that might be present in field samples submitted for FMD diagnosis from the region or country where the laboratory is situated. This means there is no risk of escape unless there is an outbreak in the field – in which case the risk posed by infected holdings by far outweighs any escape risk posed by a laboratory operating according to Tier C.

In contrast to the expectations in 2009 and 2013, there is still no fully validated protocol for inactivation of FMD samples on the suspect premises. However, trained staff adding FMD sample material to lysis buffers in a dedicated biological safety cabinet (BSC) poses almost no additional risk, and this procedure was therefore included in Tier C in 2013.

Even testing of non-inactivated samples by antigen ELISA in a Tier C laboratory can be justifiable during an FMD emergency, provided the risk is controlled by e.g. restricting all liquid handling steps to a BSC. It allows these laboratories to supplement RT-PCR results, maintain a back-up method in case RT-PCR fails and determine FMDV serotype. The national competent authority (NCA/CA) decides whether a Tier C Laboratory can be formally authorized to carry out antigen ELISA. This approach was applied successfully during the 2011 FMD epidemic in Bulgaria.

The authorization of FMD Contingency Laboratories eliminates the complications of sending samples to an extra-territorial laboratory for diagnosis with expected difficulties regarding transportation, importation and language barriers. This, combined with delayed and complicated communication between laboratory, field and official veterinarians, and national crisis centres, will easily jeopardize effective and swift control of the outbreak. The capacity of existing Tier C category II laboratories can also be used to substantially lower the psychological threshold for submitting samples for exclusion of FMD as a differential diagnosis when there is

[1] repealed and replaced by Regulation (EU) 2016/429

no FMD emergency. Several countries allow regular veterinary laboratories to carry out "routine exclusion testing", e.g. by RT-PCR, in cases which are not considered "suspect cases of FMD" in the legal sense but where FMD is considered a possible differential diagnosis. Using the Tier C measures can also reduce the biological risk associated with this approach.

Not all EuFMD member states are free of FMD, and the Minimum Biorisk Management Standard for FMD laboratories should reflect that. Therefore, a 4-Tier system is being implemented as follows:

Tier A: General diagnostic laboratories, in FMD endemic countries

Tier B: Laboratories working with infectious FMDV, in FMD endemic countries

Tier C: Laboratories undertaking diagnostic investigations for FMD without handling infectious FMDV; including both national reference laboratories without permit to work with infectious FMDV and FMD Contingency Laboratories

Tier D: National and International FMDV reference laboratories working with infectious FMDV, including for the purpose of vaccine development and production, in FMD-free countries

Tiers C and D were part of the 2013 version and further developed in the 2019 version, while Tiers A and B are still under development. Until the FMD MBRMS have been internationally adopted for Tiers A and B, the biorisk managers responsible for the diagnostic laboratory system in FMD endemic countries in the European region are encouraged to apply the principles of the Tier C and D MBRMS as far as can be reasonably achieved. In particular, exotic serotypes and topotypes of FMDV should be treated with the same precautions as FMDV in a country free of the disease.

FMD-free country[2]

Activity	**Biorisk Management Standard**
Any handling of infectious FMDV strains not present in the field	Tier D
National reference laboratories without permit to work with infectious FMDV	Tier C category I
Diagnostic investigations for FMD in the framework of a national contingency plan	Tier C category II
General diagnostic or research work on animal samples[3]	No FMD-related requirements *(Principles and elements of Tier C Standard should be applied according to risk assessment)*

[2] The term "FMD-free country" is used here for a country that has been recognized by the WOAH as being free of FMD, with or without vaccination, even during the phase of trying to regain this status during or after an epizootic.
[3] The term "animal samples" is used here for samples of species susceptible to FMD.

FMD-endemic country

Activity	Biorisk Management Standard
Any handling of infectious FMDV strains not present in the field	Tier D Standard
Infection of animals and vaccine production with infectious FMDV strains present in the field	Tier B Standard *(being drafted)* *(Principles and elements of Tier D standard should be applied depending on the stage of eradication reached)*
Handling on a regular basis, including propagation in small volumes, of infectious FMDV strains present in the field	Tier B Standard *(being drafted)*
General diagnostic or research work on animal samples[4]	Tier A Standard *(being drafted)*

[4] The term "animal samples" is used here for samples of species susceptible to FMD.

TIER D. MINIMUM BIORISK MANAGEMENT STANDARDS FOR LABORATORIES WORKING WITH INFECTIOUS FOOT-AND-MOUTH DISEASE VIRUS *IN VITRO AND IN VIVO*

INTRODUCTION

Foot-and-Mouth Disease (FMD) is one of the most infectious diseases known, and manipulating the virus in the laboratory without adequate precautions is a risk of environmental release. It has been shown that as few as 10 $TCID_{50}$ can be infectious to cattle by the airborne route. As a consequence of the low infectious dose, laboratories handling FMDV must work under high containment conditions, **in which the principal objective of the containment measures is to prevent release of virus that would give rise to animal infection outside of the laboratory (veterinary containment).**

The principles on which the containment measures are based are as follows:

– FMD virus is an animal health but not a human health hazard;

– containment measures for FMDV laboratories will differ in certain respects from those required of high containment facilities handling pathogens which present a significant human health hazard;

– effective implementation and maintenance of the containment measures will reduce the risk of an accidental release of virus to a level that can be considered acceptable in a risk management system, balancing those risks against the expected benefits of the services provided by such laboratory.

The containment measures were prepared on the basis of the documented evidence on the physico-chemical properties of FMDV, its inactivation kinetics, and infection route, matrix and quantity of FMDV required to infect susceptible species.

Key factors in establishing and implementing a successful containment system include:

1. Physical and operational barriers to the release of FMDV that involve three containment layers and multiple fail-safe mechanisms as follows:

1.1. Primary containment layer:

- contain the infectious FMDV at source within closed containers or a class I, II or III biosafety cabinet (BSC), or
- in the case of infected animals, contain the infectious FMDV by physical containment in specially constructed rooms with treatment of all waste and the HEPA filtration of air; in this case the room is considered as primary containment

1.2 Secondary containment layer:

- containing of FMDV-infected materials and staff working with such materials within a closed and highly controlled physical environment, and
- subject exiting solids, fluids and air to a treatment by validated procedures that will remove or inactivate FMDV;

1.3. Tertiary containment layer:

- prevent contact between infectious FMDV and susceptible livestock outside containment by appropriate measures, such as quarantine restrictions placed on staff and visitors to such livestock.
- physical and/or procedural measures to control access
- procedures for final handling/disposal of decontaminated materials/waste based on risk assessment

2. Commitment by senior management:
   - to provide the resources required to attain and maintain the containment measures, including the physical and human environment;
   - to fully recognise and prioritise the risks associated with facilities handling infectious FMDV;
   - to establish and maintain a management system and a working culture in the facility that facilitates continual improvement in preventing possible release of virus, the effectiveness of containment processes and root cause analysis of possible release incidents so as to prevent their recurrence;
   - to recognise and promote continual improvement in facility operations and biorisk management practices;
   - to ensure that all users are provided with the necessary training;
   - to comply with existing legal requirements and regulations.

General requirements

FMD risk management system: Each facility should establish, implement and maintain a FMD risk management system, appropriate to the level of risk associated with each of the mechanisms and routes by which FMDV could be released.

Policy: The management of the facility should have in place a policy that clearly states the FMD risk management objectives and the commitment to improving the FMD risk management performance.

Risk assessment: To operate a FMD risk management system, a risk assessment system should be in place in order to:

- identify and address the risks (likelihood and extent of impact) of release or escape of FMDV by each facility (plant);
- define the circumstances which would trigger a new or revised assessment, for example plans to construct new or modify existing facilities, changes to the work programme, changes to volume of activities, following incidents or near-misses, or as a result of elevated levels of biosecurity threats to the facility.

Hazard identification: The Hazard identification system should identify the situations, and other hazards, associated with the work of the facility that may impact on the risk of FMDV release, including emergencies (such as electrical failure, fire, flood, medical emergencies etc). The

requirements in this standard do not necessarily identify all hazards that may occur, but are written to reduce the risk associated with the hazards in facilities handling infectious FMDV.

The main sources of FMDV are:

– diagnostic specimens,
– infected tissue cultures,
– infected small experimental animals, e.g. mice or guinea pigs,
– laboratory based physical and chemical processing of large quantities of virus, and
– infected large experimental animals, such as pigs, cattle, sheep, goats and other susceptible large animals

The principal routes by which FMDV may escape or be released from laboratories include:

– personnel,
– air,
– liquid effluent,
– solid waste,
– equipment, and
– samples and reagents.

Due to its positive polarity and the internal ribosome entry site, full-length RNA of FMDV is demonstrably infectious for susceptible animals when injected, potentially infectious when brought into contact with injured mucosal surfaces and can cause infection of cell cultures even without transfection reagent. Any direct or indirect contact with animals or cell cultures outside of a Tier D facility must be strictly avoided.

Due to biosecurity and dual-use concerns, full-length FMDV RNA is often subject to import and export regulation by national authorities similar to infectious FMDV.

Intact full-length FMDV RNA or cDNA must not be released to third parties not licensed to handle FMDV. Only fragmented RNA, subgenomic cDNA or PCR amplicons should be submitted for off-site sequencing and similar services.

Risk control: Under the direct responsibility of the management of each facility (plant), the hazards which could lead to a risk of FMDV escape should be identified, quantified, prioritised and control options identified. The requirements indicated in this Standard should be considered a minimum, and do not release the management of each facility from the responsibility to undertake a site-specific formal risk assessment process.

Special attention should be given to:

– replacement and reduction in use of infectious virus where possible;
– security and recording of access to the facility;
– reliability and competency of personnel handling infectious FMD virus;
– the responsible behaviour of personnel within and when they leave the laboratory, including the use of changing and showering facilities;

- the compliance with rules for primary containment;
- the maintenance of the physical containment including the air handling systems to ensure a steady negative air pressure where virus is manipulated and the effective particulate filtration of all exhaust air;
- the decontamination of effluent and solid waste;
- the disposal of carcasses, organs, blood and other tissues in a safe manner;
- the decontamination of equipment and materials before removal from the containment zone

Use of alternative procedures: The use of alternative processes or procedures for inactivation of FMD virus to those specified in this Standard is permissible provided that the information from the validation of the process has been examined and found equal or superior in performance to those currently specified. Decisions on equivalence of the proposed procedures must be evaluated by the EuFMD SCBRM, who can choose to include the EuFMD Standing Technical Committee.

Residual Risk: The residual risk is the risk of a release of FMDV, after application of all control measures. The Biorisk Officer (BRO), management and ultimately the NCA or equivalent should consider the overall biorisk management system together with the hazard identification and risk control procedures, and identify if there are residual risks requiring either more effective controls to be put into place, or work to be suspended or modified.

Authorization of laboratories in respect to FMD

In respect of work with FMDV, laboratories may be authorized by the competent authorities to carry out one or more of the following types of work:

(1) infection of small and/or large experimental animals with FMDV;

(2) manufacturing activities that involve the production of large amounts of infectious FMDV, e.g. large-scale virus production for antigen banks or FMD vaccines at a capacity greater than 10 litres;

(3) activities involving the propagation of infectious FMDV, but are limited to up to 10 litres for each batch, and during which the FMDV is enclosed in containers which can be effectively autoclaved or disinfected;

(4) to test diagnostic samples for FMDV antigen by ELISA and related methods

(5) to test diagnostic samples for FMDV genome by RT-PCR and related methods

(6) to test diagnostic samples for antibodies to FMDV by ELISA and related methods

(7) to apply to the genome of FMDV methods of molecular biology that do not involve infectious FMDV manipulation

Laboratories carrying out the type of work mentioned under points 1, 2 and 3 must comply with Tier D.

In accordance with EU legislation, and in most cases national legislation, the manipulation of infectious FMDV requires a mandatory authorisation by the National Competent Authority.

The FMDV-associated risk of laboratories carrying out the type of work mentioned under points 5, 6 and 7 is usually much lower, while the risk associated with the activity mentioned under point 4 is intermediate.

However, in those cases where the laboratory tests field samples sourced within their own national boundaries, there is no FMDV-related risk as long as the disease is not present in the country and no samples from official suspicions are submitted.

In case of an FMD outbreak, the main risk is posed by the infected holding and activities directly involving that holding, provided that the risk of FMDV escaping from the diagnostic laboratory is being controlled by appropriate measures.

SPECIFIC REQUIREMENTS

The requirements below are intended to assist self-assessment, biorisk audit and inspection of facilities.

I. Management

Specific management requirements:

1. *Biorisk policy, delegation of responsibilities and communication*: The management of a facility is ultimately responsible for biorisks (biosafety and biosecurity) of its premises. This also includes the provision of sufficient resources for sustainable maintenance and servicing of the facility. The management should therefore define and document roles, responsibilities and authorities related to biosafety and biosecurity management in a formal policy statement and communicate this to all staff members.
2. *Formal process of Risk assessment / threat assessment*: The management must ensure that a formal process is in place to conduct, review and update a risk assessment. The need for a structured security threat assessment should be considered for each facility.
3. *System for continual improvement:* The management should put a system in place to guarantee that biosafety and biosecurity procedures and elements are thoroughly reviewed and audited on a regular basis. Records of audit findings should be maintained, including root cause analysis, actions taken to comply with the containment policy and review of efficacy of actions taken.
4. *Standard operating procedure (SOP)*: A system should be in place to maintain a complete set of SOPs for all operational processes that are considered critical to the containment of FMDV.
5. *Biorisk Officer (BRO)*: It is the duty of the management to properly monitor the biosafety and biosecurity by appointing a BRO, arranging for a deputy or replacement, and creating the necessary framework conditions in the facility. To ensure that biosafety and biosecurity are given full consideration in their activities, the management should carefully define the status, duties and responsibilities of a BRO:

    (a) The BRO should report directly to the top management representative (Director-General, site Director or similar) and should have authority to stop or modify the work in the facilities in the event that it is considered necessary to do so.

(b) The organisational status of the BRO should ensure their independence and the absence of any potential conflict of interest.

(c) Adequate financial, administrative and personnel resources should be allocated to the BRO to carry out their duties.

(d) The BRO should have the possibility of a direct link to the competent authorities responsible for the enforcement of biosafety / biosecurity regulations within the country or geographical/administrative area.

(e) The BRO should have appropriate training in virology, containment techniques and procedures to fulfil their duties. It is to be expected that they would also have a broad-based knowledge of FMDV with particular respect to its physico-chemical properties, mode of transmission and other topics of relevance to their role. The BRO must have sufficient resources for regular further training.

(f) The BRO should review regularly both technical reports concerning the various containment facilities as well as data relating to their day-to-day operation and monitoring. On the basis of such information, the BRO should inform management of any concerns they may have as they arise, as well as prepare an annual report on all relevant containment elements of the facilities.

6. *Accessibility to infectious FMDV*: Access to infectious FMDV should be limited to adequately instructed key personnel authorised by the management and should be part of a threat assessment (see Annex I, chapter III).

7. *Record keeping:* Detailed records of handling infectious FMDV (e.g. virus strains and dates used) should be kept and stored at least 5 years. Inventory lists including information on the location where a virus strain is stored should be maintained and periodically inspected and crosschecked. Laboratory books or other daily records of procedures by staff working with FMDV should be in place to enable retrospective analysis of activities for at least the previous 12 months.

8. *Accident / incident reporting system*: Each facility should have an accident / incident reporting system in place, with a procedure for rating of the risk of the event and a decision-making process for recording, reporting and remedial actions. An example of a risk rating system and associated decision tool is given in Annex I.

9. *Accident / incident review system*: there should be a system in place to ensure each accident / incident is reviewed to ensure that the lessons learned have been identified, the type of failing in control measures is recognised (root-cause analysis), and adequate and proportionate remedial measures set in place. A statistic concerning accidents / incidents should be made available to the management at least annually.

10. *Systems to review biorisk changes*: changes to the design, operation and maintenance of a facility including biosafety / biosecurity procedures and risk assessment should be reviewed, verified, approved and documented through a formal change control process before implementation. Trigger points for review or drafting of new risk assessments should be identified.

11. *Emergency management plans* (contingency plans): all types of emergencies should be identified, including fire, flooding, loss of essential services, breakdown of equipment

(e.g. autoclaves, waste treatment plants), security breaches and major events affecting integrity of buildings, and standard management procedures for each contingency event developed, documented and made available to staff.

12. *Access to site:* management should implement and document a system for controlling access to areas of the site where the activities of the area pose a potential hazard. There should be physical security measures to restrict access.

    Management should define the different zones on the site, taking into consideration the hierarchy of risk of activities in each zone. A suggested typology is:

Containment zone (e.g. RED)	*area where FMDV is manipulated and stored and/or which contain infected animals*
Support zone (e.g. ORANGE)	*area outside containment including support services, technical area and access to the Containment zone*
Clean zone (e.g. GREEN)	*general access and administration*

    It is necessary to clearly define and document the zones under control of the BRO, including definition of the outer perimeter of the site, lower risk areas for personnel and plant access, the location and barriers of the laboratories in which FMDV is handled, and the location and access points to waste treatment (including ventilation systems).

II. Training

13. The organisation should ensure that personnel are competent for their designated roles and receive appropriate training on a regular basis. In particular, training requirements and procedures for biosafety and biosecurity related training of personnel should be identified (training programme) and established (training manual) and training records should be maintained.

14. Training content and training tools should be defined, taking into account the different target audiences and the individual learning differences within a facility. Training efficacy assessment should be considered wherever possible and appropriate. Training should be reviewed on a regular basis.

    The BRO should be in charge of providing information and advice on biosafety and biosecurity to laboratory staff, cleaning personnel, visitors, contractors as well as to other persons working either in locations in which FMDV is handled or adjacent facilities such as service areas. Personnel should be made aware of the responsibilities, the specific containment features and the risks associated with such activities.

15. Training should be provided on the specific properties of FMDV, the primary and secondary containment features and the biosafety / biosecurity procedures pertinent to each facility.

16. All staff members must be appropriately informed and regularly trained in emergency evacuation procedures with special attention being given to biorisk requirements in cases of fire.

III. Laboratory Biosecurity

Note: Additional considerations and notes are given in Annex I.

The objective of Laboratory biosecurity is to protect biological materials containing FMD virus against deliberate removal from the facility.

17. It is part of the duty of care of every facility handling FMDV to ensure that it minimizes the risk of virus misappropriation by intruders and people with access rights to the facility, through measures taken following a *formal threat assessment process*.

    In a threat assessment, the critical assets of a facility should be identified and the facility's vulnerability to threats should be assessed. Based on the threat assessment, structural (e.g. building design, IT etc.), physical (cameras, fences, access etc.) and organisational (security policy, accessibility etc.) measures should be taken.

18. To comply with point 17, the minimum requirements are*:*

    (a) *Security system* that is appropriate to detect and alert security personnel to the presence of intruders, with a security plan in place for rapid response to intrusion.

    (b) E*ntry Recording system:* Access to the facility should be recorded to provide an audit trail of who was in the facility at any given time.

19. *Threat reduction/control measures*: Due to the unpredictability of the actual threat, controls are required to reduce the risk to an acceptable level. These controls should consider structural, physical and organisational measures and must address at least the following scenarios:

    - Intruder attempting to remove FMDV from the facility by forced or fraudulent entry;
    - Staff member maliciously removing FMDV from the facility;
    - Someone maliciously appropriating materials during shipment of virus containing materials.

IV. Personnel

20. Control of entry into and exit from the Containment zone must take place only through changing and showering facilities. This means a complete change from private or Support area working clothes to dedicated Containment zone working clothes on entry and the reverse process on exit but with a full body and hair shower before leaving the Containment zone.

21. A code of FMDV containment practice, including instructions for entry into and exit from Support and Containment zones, must be available.

22. The FMDV containment rules and other relevant documents provided by the management must have been read and signed by relevant employees at the beginning of their employment and prior to accessing the support and containment zones. At this time, it should also be made clear to new staff that any violation of such and similar regulations may result in disciplinary actions by the management and the terms of employment should indicate this.

23. *Control of access to critical areas*: A level of security checks is recommended for all individuals with access to FMDV laboratories or critical plant/service areas of these

laboratories. The performance of such checks will depend on the legislation of the country and procedures should have been developed in consultation with the relevant local and national agencies.

Access to FMDV-containing materials in the laboratory should be restricted to trained staff on the basis of legitimate needs and must be authorised. The number of individuals with access to virus storage areas should be kept as small as reasonably possible.

24. *Visitors*: There must be rules in place governing the access to controlled zones by visitors, covering at least the record keeping and the possible use of background checks. The security system should verify the identity of visitors through use of unique identifiers including passport or ID card details. The reasons for each visit and the responsible person must be recorded.

25. Visitors must be instructed in the specific containment procedures of each facility before entering the Support / Containment zones. There must be a system of oversight in place that guarantees that these procedures are properly followed.

26. *Oversight (mentoring)*: A system for oversight of new personnel should be established, such that all new staff are assigned a member of Support or Containment zone staff for oversight who is competent and has sufficient understanding of the biosafety rules.

27. Management should establish procedures to support compliance with biorisk management procedures. Management should be equipped with appropriate tools to react correctly in difficult situations where compliance with the biorisk management procedures may be compromised. At the workplace, such situations could include excess workload, bullying, undue stress, bad management style or lack of oversight. Also at the level of individual employees, problems like substance abuse or mental conditions could compromise compliance with biorisk management rules, and policies must be in place to deal with these adequately.

28. *Quarantine:* each facility must define and apply quarantine periods for persons authorised to work in each category of Controlled Zone, to reduce the risk of personnel causing a release of FMDV as a result of virus carriage on their body. A range of quarantine periods may be defined depending on the level of exposure to virus. Depending on the risk assessment, quarantine rules may be applied to other areas of a facility as well. For the Green Zone, usually no quarantine period is necessary.

    Persons, including visitors, authorised to enter the Support and Containment zones must agree not to keep any animals which are susceptible to FMD, nor reside on premises where such animals are kept, and for the Containment zone must abide by minimum standards of quarantine, i.e. no contact with animals susceptible to FMD for at least 72 hours. For the support zone, the need for quarantine must be risk assessed and will depend on the activities in the area and the risk for virus escapes to the areas.

29. *Personal protective equipment* and other items: management must ensure a regular supply of appropriate clothing for use within the Support and Containment zones. It is recommended to provide or financially support the procurement of dedicated equipment that is only used in the Containment zone, e.g. tools and personal items such as glasses, religious head coverings, hearing aids, toupees or prosthetics.

V. Containment Zone Design

30. General construction of buildings and their surfaces, including ducting of the air conditioning system:
    - maintain inward flow of air through doorways and other openings at all times (backflow prevention)
    - properly maintained condition with a high standard of airtightness
    - insect, rodent and bird proof.
31. Windows:
    - Sealed, toughened and preferably double glazed, and able to withstand operating pressures and all but major impacts.
    - Equivalent standard in animal rooms and at a height where animals are not able to break windows or damage seals.
32. Doors:
    - warning signs at entrances: (or equivalent in the local language)

      ACCESS FOR AUTHORISED PERSONNEL ONLY

      BIOLOGICAL HAZARD

    - access only through the doors restricted by access control systems that prevent the opening by unauthorised persons.
    - airlocks provided with airtight doors which are interlocked to prevent opening of both doors simultaneously; this is particularly important for fumigation airlocks.
    - doors to be equipped with inspection windows where appropriate (i.e. working areas, animal rooms etc.).
33. Walls, floors, ceilings:
    - In many respects, the surfaces and materials appropriate to pharmaceutical facilities, respecting GMP standards, are also relevant to laboratories handling FMD virus. Notably, surfaces should be impervious, smooth, crevice free and easily cleaned and disinfected. Cavities within the fabric of the facility should be avoided (e.g. cavity walls) unless all penetrations of the walls, floors and ceilings are thoroughly sealed with suitable materials certified for this purpose. Crevices and joins between surfaces should also be sealed with similar materials. Continuity of seal should be maintained between floors and walls. A continuous cove floor finish up the wall is recommended in particular for areas where major or frequent spillages will occur, e.g. animal and post mortem rooms.
    - Sealed (airtight) entry of service lines.
34. Laboratory equipment:

- *Workbenches* shall be smooth, impervious and resistant to any chemicals used in the facility. The junction between horizontal and vertical surfaces should have a continuous cove.
- *Centrifuges, sonicators, homogenizers and other equipment* must be designed so as to contain aerosols or be used within BSCs where any aerosols generated will not escape to the wider airspace of the laboratory. When using such equipment in BSCs, the current performance of the BSC with the equipment in place and in use has to be ensured by an appropriate test, e.g. using a smoke pencil.

35. *Communication*: All areas equipped with telephones or other means of communication and, in some areas, cameras, to ensure additional security outside of normal operations and allow staff to report issues including accidents and incidents without leaving work area.

36. *Emergency back-up power*: The laboratory facility should be equipped with a back-up source of electricity (e.g. an emergency generator) which starts with a delay of no more than a few minutes in the event of power failure and ensures supply to safety critical systems. The delay period that is permissible will depend on the design and the layout of the ventilation system and the airtightness of the key rooms in the facility where virus in aerosol form may be present. In the design of a Containment zone facility, special attention should be paid to the critical electrical supply circuits. There should be no possibility of the emergency supply being diverted from critical circuits by less important demand from non-critical equipment. The critical supply circuits include air handling systems, cold stores, BSCs and other equipment and installations relating to security and safety of the facility. An appropriately sized UPS should be considered for these safety critical systems. All backup systems should be tested at regular intervals and this process documented.

VI. Handling of FMD virus

37. *Recording receipt of virus-containing materials*: A documentation and recording system for the chain of custody should be in place for specimens and samples known or reasonably suspected to contain FMDV (reception, use, storage). The accompanying type and strain identification, or such information generated by the laboratory, should be recorded.

38. Except in cases when this is not technically feasible (e.g. during large-animal experimental studies and post-mortem examinations), materials known or expected to contain FMDV must either be kept within closed vessels or in devices that in combination with suitable operating procedures will function as primary containment. Such devices should be equipped with suitable filters, for example HEPA filters for which the requirements are defined in the Glossary, or equivalent off-gas or vent filters (primary containment). A suitable disinfectant must be kept close to the work areas such that a spillage can be rapidly dealt with.

39. In areas where less than 10 litres of virus is handled, liquids and suspensions containing FMDV must be inactivated by a validated procedure, for example, dilution in disinfectants, before disposal into the liquid waste system of the facility.

40. When large quantities of virus are processed (e.g. for vaccine production), it is necessary to transfer virus within a contained system of vessels, pipes and other equipment. To permit fluid transfers, air needs to enter and exit equipment and its infectivity must be efficiently removed by a suitably validated procedure. Usually, this is done by filtration and a number of manufacturers supply filters capable of removing FMD virus with very high levels of efficiency. Procedures are also required for decontamination of vessels, pipes and other equipment after the process has finished and before the process is either repeated or items are opened or stripped down for cleaning or maintenance. Usually this will require a chemical decontamination stage followed by steam sterilization.

41. Inoculation of animals, maintenance of infected animals, euthanasia and post-mortem examinations must take place within the Containment zone in rooms (normally dedicated animal or post-mortem rooms, respectively) that in combination with suitable operating procedures function as a primary containment. Animals cannot be taken out from the Containment zone alive. Personnel must wear appropriate and comprehensive protective clothing to minimise exposure of body surfaces to virus splashes and aerosols when handling virus suspensions and when inoculating or handling infected animals. On exit from animal and post-mortem rooms, protective clothes and footwear must be left inside these rooms or in ante-rooms to these rooms. In any case, a complete change of clothes and showering is required before personnel can exit the Containment zone.

42. Movement of materials known or expected to contain FMDV out of one zone (e.g. laboratory), to another zone (e.g. animal rooms) on the same site must be governed by a standard operation procedure (SOP) that prevents possible loss or spillage of virus. As a minimum requirement, such materials are transported between the zones within labelled double leak-proof containers of which at least one has to be break-proof. Staff making such transfers should be fully trained and authorised to do so and be familiar with the emergency response procedures in the event of an accident or incident.

43. Laboratory facilities must be kept clean and tidy. Areas including equipment where infectious virus is handled must be cleaned and appropriately disinfected regularly. In particular, benches and other flat surfaces exposed to virus should be wiped down with an effective disinfectant as soon as open work has finished.

Removal of biological material

44. Before sending biological material to another laboratory that lacks the required level of containment, the necessary precautions must be taken to ensure that the material does not contain infectious FMDV.

    Thus, if the source of the biological material is the Containment zone, it is essential that it is subject to a validated test according to a risk assessment (e.g. RT-PCR, cell culture) to demonstrate freedom from FMDV, or a validated treatment that destroys FMDV infectivity (see Annex I chapter VII).

    Although full-length RNA derived from FMDV may still be infectious under very specific conditions, for practical purposes samples can be considered inactivated after such treatment. However, as a precaution, these samples should not be handled without appropriate risk management measures, which must, in particular ensure that such

samples are at no stage of processing added to cell cultures, injected into animals or in any other way brought into contact with animals, except in facilities meeting Tier D requirements.

The recipient laboratory must be informed about the potential risk of material coming from a laboratory manipulating infectious FMDV. The recipient laboratory must further sign a statement that it is prepared to receive the material and that it will take the necessary precautions.

45. For the shipment of FMDV-containing materials to other laboratories an innocuity test is not required if the material is sent to a high containment laboratory licensed to handle infectious FMDV.

    The laboratory which provides FMDV to another laboratory has a duty of care to ensure that the recipient laboratory is authorised to handle FMDV. Before shipment, it has to ask for a statement from the recipient laboratory that it is requesting the virus only for legitimate purposes and will not redistribute the virus to other laboratories without written consent. The sending of materials containing FMDV is subject to international regulations for shipping biological materials.

    Note: If FMDV has been propagated in cell culture, it is mandatory to classify it as "Infectious substance, affecting animals only" (UN2900) and pack it accordingly. The packaging must comply with IATA Packing Instruction 620, the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) or other applicable regulations.

Removal of equipment and other material

46. It is important to ensure that only the equipment and the materials that are needed are brought into the containment zone.

    Before removal from Containment zones, equipment, materials and external surfaces of sample containers must be decontaminated according to the size and use of the equipment by a validated method. The method of choice for decontamination is autoclaving. Equipment or material that cannot be autoclaved can be chemically decontaminated as long as the method is validated (see Annex I, chapter VI). Before decontamination, dirt and organic material must be removed by thorough cleaning.

VII. Air Handling – Infectious Virus Facilities

Note: Additional considerations and notes are given in Annex I, chapter IV.

Ventilation systems

47. *Negative pressure ventilation system*: All facilities used for the handling of FMDV must operate under a negative pressure ventilation system with HEPA filtration of exhaust air and systems to prevent the escape of unfiltered air through the inlet supply.

    In areas where less than 10 litres of virus (in dilution or suspension) are handled, the minimum negative pressure relative to the ambient air should be -35 Pa but due consideration needs to be given to ensure a gradient from the periphery of the Containment zone to the area where virus is handled. From a practical perspective, it is difficult to achieve gradient steps of less than 10 Pa and this will tend to dictate the choice of pressure in the most negative part of the Containment zone.

For areas where larger quantities of virus are handled such as large-scale virus production rooms and large animal rooms, the minimum negative pressure should be -50 Pa.

For small animals, depending on the animal species, route and nature of infection and method of animal containment and handling, high titres of virus in relatively uncontrolled conditions might be produced. Consideration should be given to the appropriate negative air pressure requirements for small animal rooms, with 35 Pa negative pressure as the minimum.

A system should be in place to limit positive pressure occurring within the building due to failures of the Containment zone ventilation system.

48. *Exhaust air filtration system*:

Laboratories:	Double HEPA (H13 or H14) filtration of exhaust air. Use of a single HEPA filter may be acceptable, provided that it is demonstrated that open work with infectious virus is at all times restricted to within BSCs which also have HEPA filtration of exhaust air, thereby maintaining an effective double HEPA filtration during open virus work.
Animal rooms	Double HEPA filtration of exhaust air is obligatory.

Production laboratories (where volumes greater than 10 litres are produced):
Double HEPA filtration of exhaust air is obligatory.

49. *Inlet air supply*: A system must be in place to prevent escape of unfiltered air via the inlet in case of ventilation shut-down. This may be achieved by a single HEPA filter or automatic dampers in the air inlet system.

50. The air pressures within the different rooms of a Containment zone should be continuously monitored and a system must be in place so that staff working in these areas are informed if significant loss of air pressure occurs so appropriate actions can be taken. Monitoring systems should indicate the working pressure and the minimum and maximum limits within which open virus work is permitted. Under any of these alarm conditions, the primary action is to cease all open virus work and secure the workplace by sealing virus containers and disinfection of surfaces and protective clothing. The opening of doors leading to the Containment zone or to rooms containing infected animals or carcasses should be avoided as far as possible until the pressure difference has been restored.

51. All critical filters (HEPA) should be incorporated into a preventative maintenance programme. In particular, the efficiency of the installed HEPA filters should be checked at least once per year, and in line with requirements of EN 14644.

52. When HEPA filters are installed or replaced, an *in-situ* efficiency test must be carried out by trained personnel with validated equipment. Replacement of HEPA filters must be performed in accordance with an authorised procedure (SOP). Strict precautions must be taken to prevent the spread of virus with used filters or contaminated air. Replacement of filters from outside the Containment zone must take place after

decontamination "in situ" or in "safe change" air-handling units. Discarded HEPA filters must be autoclaved or incinerated on site.

Filter specifications and test results supplied by the manufacturer should be incorporated into the maintenance records but cannot replace *in-situ* testing because filters may have been damaged during transportation or may not have been fitted into the gaskets properly during installation.

53. Filters must be changed when the pressure difference exceeds certain limits in accordance with the instructions given by the manufacturer, or sooner if the filter fails one of the prescribed efficiency tests. Additionally, it may be necessary to change some filters more frequently if they are subject to high humidity or high particle challenge.

54. Animal rooms – pre-filters should be designed in a way that they can be changed without shut-down of the ventilation system.

55. The efficiency of the HEPA filters in BSCs must be checked at least once per year. Movement of BSCs must be accompanied by re-validation of the filter integrity due to possible flexing and movement on the filter cartridge or filter housing and operational issues in its new position.

56. Off-gas or vent filters require testing on installation and at least once per year.

VIII. Waste management

Effluent

57. Effluent from Containment zone laboratories and from facilities holding FMDV-infected or potentially infected animals must be treated in a manner, which ensures that there is no residual infectivity in the effluent using a suitable validated procedure. Both heat and chemical treatment may be used to process the effluent provided all of the material in the effluent is exposed to the specific treatment.

58. The treatment must be validated. The possibility that virus particles may be protected from inactivation by proteins or lipids, and/or by aggregation or precipitation, must be taken into account in the validation process.

59. The entire effluent treatment system must comply with high containment conditions. In every case, it must be ensured that no leakage from the primary containment system into the environment can occur. It should be possible to inspect the piping for leakage, visually or by other means, and it is preferable to situate the effluent treatment system within the same building as the source of the effluent.

60. There must be sufficient storage capacity (tanks) for the storage of untreated effluent in order to safely finish work and shut down the Containment zone in the event of a breakdown of the treatment plant.

61. The equipment must have automatic monitoring systems to ensure proper function. These systems must ensure that the required conditions for inactivation of FMDV have been reached before the effluent is discharged. The systems should be continuously monitored and all critical data recorded. The system should be designed in a way that in case of any failure, the likelihood of a release of potentially infectious material is minimised. The necessary risk assessments should also cover the routing of treated effluent after discharge.

62. Treatment options:

Heat treatment: FMDV is sensitive to heat at 100°C for 1 hour or an equivalent heat effect that has been shown to be sufficient to inactivate FMDV in effluent to the extent that no residual infectivity can be detected. The treatment process should be monitored by multiple, automatic and continuous time and temperature measurements, combined with automatic measurement of flow rates or volumes. Any treatment system must ensure homogeneity of the effluent during the inactivation process. All data relevant to the inactivation process and the release of effluent must be recorded. Critical data measuring and logging equipment must be calibrated by qualified personnel at least annually.

Chemical treatment: FMDV is sensitive to acidic and alkaline pH conditions. Alkaline treatment (e.g. NaOH or Na_2CO_3) at pH 12 for at least 10 hours has been shown to be sufficient to inactivate FMDV in effluent and is particularly effective because of its action on concentrated biological effluents. As with heat, thorough mixing of the materials must be ensured. The treatment process should be monitored by multiple, automatic and continuous time and pH measurements. When inactivated effluent is neutralized, precautions must be in place to prevent recontamination. All data relevant to the inactivation process and the release of effluent must be recorded. Critical data measuring and logging equipment must be calibrated by qualified personnel at least annually.

Solid waste (animal carcasses, feedstuffs, laboratory waste etc.)

63. The principal requirement is on-site inactivation of FMDV in waste using a validated method.

64. These methods include:

- Inactivation by steam using a vacuum-assisted autoclave (at least 121°C for at least 15 minutes or equivalent heat effect). It is essential that the different autoclave load types (e.g. plastic waste, paper, liquids, tissues) are each validated for the worst-case load with suitable recording devices, e.g. thermocouples, at different locations, including the centre of the load. Autoclaves should be double-ended so that treated waste does not re-enter the Containment zone. The efficacy of autoclaves should be retested at least annually and after maintenance by competent personnel. Depending on the national requirements, it may be necessary to dispose of the autoclaved waste by incineration on or off the site.
- Carcasses must be treated on site, in compliance with the requirements for category 1 animal by-products (Regulation (EC) No. 1069/2009 and Regulation (EU) 142/2011).
- Incineration on site: The incinerators must comply with national legislation and current safety standards and be fitted with afterburners.

IX. Decommissioning containment compartments for maintenance or renovation purposes.

Note: Additional considerations and notes are given in Annex I.

65. Maintenance, renovation work or decommissioning that may compromise the integrity of the containment barrier, thus possibly allowing the escape of air or liquids, must be preceded by an assessment of the risk and a safety plan.

66. Decontamination of rooms/compartments/critical zones, to reduce the risks to an acceptable level, is required before these can be decommissioned permanently or temporarily, for example during renovation.

    The efficacy of the decontamination methods must be demonstrated and documented.

67. Waste building materials generated by demolition and redevelopment and other potentially contaminated materials must be treated in a way that any residual infectivity is inactivated. If validated autoclaving or incineration is not feasible, building materials should be sprayed and/or fumigated to disinfect surfaces, and then stored on site for 6 months before removal.

Glossary

Biorisk (adapted from OHSAS 18001:2007): combination of the likelihood of the occurrence of an adverse event involving exposure to biological agents and toxins and the consequence (in terms of accidental infection, toxicity or allergy or unauthorised access, loss, theft, misuse, diversion or release of biological agents) of such an exposure.

Biorisk officer (BRO) or biorisk advisor (Biosafety / Biosecurity Officer): a staff member of an institution (particularly Tier D laboratories and Tier C Category I laboratories) who has expertise in the biological risks encountered in the organisation and is competent to advise top management and staff on biorisk management issues.

Biorisk responsible person (BRP): a staff member of a Tier C Category II laboratory who has the (delegated) responsibility to maintain a biosafe and biosecure situation in the laboratory during an FMD contingency (outbreak). All BRPs must be trained and competent for this role. A BRP must be present in the laboratory whenever samples are being received and must be reachable whenever diagnostic activities are being carried out; it is therefore advisable to designate and train a sufficient number of BRPs ahead of time.

Biosafety (adapted from WHO/CDS/EPR/2006.6): Laboratory biosafety describes the containment principles, technologies and practices that are implemented to prevent the unintentional exposure to biological agents and toxins, or their accidental release.

Biosecurity (adapted from WHO/CDS/EPR/2006.6): Laboratory biosecurity describes the protection, control and accountability for valuable biological materials within laboratories, in order to prevent their loss, theft, misuse, diversion of, unauthorised access, or intentional release from the Facility)

Competent authority (CA) or national competent authority (NCA): The regulatory body with the legally delegated responsibility to ensure that the Management and operations of Tier C and Tier D facilities are in line with this Minimum Biorisk Management Standards for laboratories working with FMDV. Depending on the political organization of the member states, this can be a national, regional or local government or agency.

Containment zone: area of the facility, bounded by physical barriers to prevent air and fluid escape except through air filtration and waste treatment systems. Work with infectious FMDV and samples suspected to contain FMDV, including manipulation, storage, diagnostic testing involving infectious FMDV and inoculation of experimental animals must take place in the Containment zone for work with FMDV.

Deputy biorisk officer (DBRO): a staff member of an institution (particularly Tier D laboratories and Tier C Category I laboratories) who has expertise in the biological risks encountered in the organisation and is competent to assist the BRO.

Facility: (complex of) buildings including the Containment zone, Support zone and clean zones on a site with an outer security barrier or fence.

FMD restricted zone: dedicated zone in a Tier C laboratory where samples submitted for FMD diagnostic testing are manipulated or stored. Tier C Category II laboratories only have an FMD restricted zone in an outbreak situation. Routine exclusion testing of samples from FMD-free countries or areas by RT-PCR or antibody ELISA does not require an FMD restricted zone.

HEPA filter: High Efficiency Particulate Air filter: the classification of HEPA filters is on the basis of efficiency of removal of the most penetrating particle size. HEPA filter performance requirements are defined by EN1822 (manufacturer); installed filters need to be tested on site according the requirements of EN14644. In the context of this minimum standard, all HEPA filters must at least meet H13 requirements; H14 filters can be used for an increased margin of safety.

Management: the administration of the organization, including the activities of setting the strategy of an organization and coordinating the efforts of its employees to accomplish its objectives through the application of available resources, such as financial, natural, technological, and human resources.

Open virus work, or open work: describes the handling of materials containing FMDV (usually liquids) in which exposure to room air occurs, for example during the pipetting of liquids into containers, and the subsequent exposure of the liquid handling object (pipettes etc.) to air.

Primary containment*:* measures that contain the infectious virus at source, within closed containers or within a class I, II or III biological safety cabinet, or for animals, by physical containment in specially constructed rooms with treatment of all waste including the HEPA filtration of air.

Routine exclusion testing: Exclusion testing must not replace or delay the declaration of an official suspicion, but may be appropriate in certain cases where FMD is a possible differential diagnosis that cannot be ruled out by clinical or epidemiological investigation. Samples for routine exclusion testing must be of domestic origin in a country or zone that is officially free of FMD.

If routine exclusion testing is not done in a Tier C or D laboratory, reagents and materials cannot include infectious FMDV or FMDV full-length RNA. The used diagnostic methods must not carry any risk of inadvertent propagation of FMDV from the samples.

SOP: standard operating procedure.

Support zone: area within the outer security barrier or fence of the facility, containing the support services for the Containment zone, the technical areas and zones for access.

Susceptible species: All domestic cloven-hoofed animals (including cattle, sheep, goats, buffalo and pigs), all wild cloven-hoofed animals (including deer, antelope, giraffes and wild boar) as well as elephants and camelids. (Adapted from the WOAH 'Technical disease card FMDV', available at www.woah.org).

Annex I

Additional Considerations and Examples

Chapter I: Establishing an FMD incident risk rating system

Each facility should establish a risk rating system and an associated set of incident management procedures, including reporting and responsibilities in the event that a high-risk incident occurs.

Risk is the product of consequence and likelihood. The consequences of an FMDV escape into susceptible livestock (resulting in an outbreak) is huge.

In establishing a risk rating system, the following factors should be considered:

– Where did the incident occur? (for example in an animal room)

– What type of event? (for example a visitor leaving without showering)

– How much potential virus exposure or loss? (for example number of persons, time or volume)

– To where was the virus released? (for example outside of the high containment area, to ruminants, to areas within the perimeter of the facility).

Each facility should establish their own risk rating system, taking into consideration e.g. the history of incidents, estimations of likelihood, objective data, and computer simulations. The risk rating system and reporting requirements should be agreed at the level of the top management of the facility, and reviewed on a regular basis.

Once established, the risk rating system can be used in training of staff on their reporting requirements, setting out the types of event or that should be reported to the line manager and/or biorisk officer.

Example of a risk rating system

Where		What		How much*		To where	
5	Animal room containing FMDV-infected pigs.	**5**	Potentially contaminated person, without showering.	**5**	Unknown or very high or long time: > 1 l or kg of fluid or material/day. > 10 days leakage of air. > 50 persons.	**5**	Outside containment suite, probable exposure of animals susceptible to FMD off site
4	Animal room containing FMDV-infected animals (not pigs).	**4**	Potentially contaminated waste.	**4**	High: 10 – 100 ml or g of fluid or material/day. 1 – 10 days leakage of air. 5 – 50 persons.	**4**	Outside containment suite, probable exposure of animals susceptible to FMD on site
3	Lab undertaking FMDV work Or During the first half of the FMDV disinfection process of formaldehyde or steam autoclaves or ethylene oxide sterilizers.	**3**	Potentially contaminated air. Or Potentially contaminated person, after showering.	**3**	Moderate: 1 – 10 ml or g of fluid or material/day. 1 – 24 hour leakage of air. 2 – 4 persons.	**3**	Outside containment suite, to animals NOT susceptible to FMD.
2	Lab not handling FMDV but within common building/containment to labs handling FMDV Or During the second half of the FMDV disinfection process of formaldehyde or steam autoclaves or ethylene oxide sterilizer.	**2**	Potentially contaminated fluid.	**2**	Little: < 1 ml or g of fluid or material/day. < 1 hour leakage of air. 1 person.	**2**	Outside containment suite, but on site, without contact to animals.
1	In engineering/maintenance areas – HEPA filter replacement, etc.	**1**	Other potentially contaminated items.	**1**	Very little << 1 ml or g of fluid or material/day. << 1 hour leakage of air.	**1**	In engineering/maintenance areas – HEPA filter replacement, etc.

* temperature, humidity, expired time will also have influence on this issue

Relative risk = where x what x how much x to where

Example:

A person who was working in the laboratory where infectious FMDV is handled was observed to pass to the area outside of high containment, without taking a shower, but did not leave the perimeter of the facility.

Risk rating: 3 x 5 x 2 x 2 = 60

relative risk	**≤20 is 'Acceptable'**	**21 – 60 is 'Low'**	**61 – 250 is 'Substantial'**	**>250 is 'Catastrophic'**
decisions	Report to Biorisk Officer.	Report to Biorisk Officer. Report to Biorisk Committee. Report to General Manager.	Report to Biorisk Officer. Report to Biorisk Committee. Report to General Manager. Call together Crisis Team. Decision about the necessity to inform authorities.	Report to Biorisk Officer. Report to Biorisk Committee. Report to General Manager. Call together Crisis Team. Report to National Competent Authority/Chief Veterinary Officer

Chapter II: Improvement of biorisk management through analysis of incidents

Management should take a high interest in learning from reported incidents. Each may be considered a form of failure or non-conformity to the expected performance of the risk control measures, and occur as a result of failure in the engineering controls and/or personnel related control measures.

The cause of each event may be categorised as:

Related to engineering:

– hardware (as facilities and equipment)
– design (as irrational lay-out and ergonomics)
– maintenance (as planning and availability)
– procedures (as standard operations and relevance)
– defences (as protective equipment and signals).

Related to personnel management:

– error-enforcing conditions (as occupational health and attitude)
– housekeeping (as tidiness and discipline)
– incompatible goals (as costs and safety)
– communication (as interpretation and point of time)
– organization (as responsibilities and authority)
– training (as knowledge and experience).

Chapter III: Threat assessment

In a threat assessment, at least the following should be considered:

1. The threat of criminal use of FMDV for any malicious purpose has to be carefully assessed to determine the additional risk that arises from operating FMDV facilities. FMDV laboratories have exclusively peaceful objectives concerned with development and implementation of disease control measures. They are critical for the technical cooperation with veterinary services around the world in order to minimize the economic impact of FMD on livestock and economies. The threat of criminal use of FMDV is subject to major change as the political agenda of terrorist group changes.

2. The threat and consequences of a terrorist attack will vary by country. Because of the transboundary nature of FMD, there is also the possibility that a deliberate release may occur in another, possibly neighbouring, country. For this reason, effective control measures must be consistently applied throughout all EU member states that operate FMD laboratories. As the motivation for a deliberate release may change unpredictably over a very short period, effective control measures need to be sustained at all times and be sufficiently flexible to allow an enhanced response if required.

   Facilities permitted to handle FMDV are obliged to prevent illegal access and removal of the virus.

Threat reduction/control measures: due to the unpredictability of the actual threat, controls are required to reduce the risk to an acceptable level. These controls should consider structural, physical and organisational measures and must address the following:

3. Intruder attempting to remove FMDV from the facility by forced or fraudulent entry.

   Appropriate controls include 1) physical security measures restricting access to authorised staff and contingency plans in the event of intrusion, 2) secure storage of virus-containing materials including maintenance of accurate inventories of stocks.

4. Staff member removing FMDV from the facility

   Appropriate controls include 1) vetting of persons before authorisation of access, and escorts for persons allowed temporary access when security clearance is not available; 2) restricted access to FMDV material in the lab to trusted staff on the basis of a legitimate need, 3) access to the facility is logged [and records maintained for at least two years] to provide an audit trail of who was in the facility at any given time. 4) Design of the laboratory or facility such that the number of staff needing to enter the secure areas is limited. E.g. some engineering aspects of the design of the facility can be arranged so that certain services can be maintained from outside of the security envelope.

5. Shipment of virus-containing materials

   Appropriate controls include standard procedures before authorisation, including receipt of adequate information from the intended recipient of its authority to handle FMDV, and written agreement that the recipient laboratory will not redistribute the virus to other laboratories without applying the same risk assessment and will adhere to relevant national or international legislation relating to shipment and supply of dangerous animal pathogens. Individuals undertaking these activities must have received adequate training in this and ensure that their competency is maintained up to date.

6. Disruption of the running of the facility

   Consideration should be given that all critical plants and control systems are adequately protected against malicious attack, which could lead to any disruption in support services and a consequential escape of FMDV. Special attention should be given to malicious attack on digital systems.

Chapter IV: Air-handling

1. Provisions must be in place to ensure that no overpressure is generated in the Containment zone. One approach is to interlock the inlet and extract fans so that the most that can occur is that the air supply and extract fails and the negative envelope pressure decays solely depending on the airtightness of the building. An emergency back-up extract fan is recommended so that the negative envelope can be restored in the event of the main extract fan failing and this should also be interlocked to the supply fan to avoid very high negative pressures

which may cause damage to the fabric of the building. As an alternative, the air extraction plant can be divided into several parallel sections so that the negative pressure can be maintained if one section fails or is shut down.

3. It is advisable to have and maintain other filters within the air handling system, notably, pre-filters upstream of the HEPA filters. These additional filters will extend the life of the HEPA filters and reduce the need to change them at the annual maintenance interval. In properly maintained systems, it is relatively rare to change the terminal extract filter due to the efficiency of particulate removal by all of the filters upstream. However, high levels of humidity will shorten the life expectancy of filters and large amounts of dust generated by nearby building works or other activities will soon blind filters even with efficient pre-filters up-stream.

4. Off-gas or vent filters: This type of filter is often steam sterilised and filter efficiency testing involves different approaches such as the water intrusion test. At the smaller scale, disposal cartridge filters may be appropriate as vent filters to allow gas exchange while preventing virus escape from the container to the laboratory environment.

5. Although not widely used, sterilisation of extract air may be done by heating the air as it passes through an in-line furnace.

6. To save energy, air extracted from a Containment zone may be partially recirculated into the same Containment zone provided it is passed through a HEPA filter before it re-enters the laboratory. However, the advisability of recirculation and the proportion of air recirculated will need to be considered against the quality of the air leaving and re-entering the work place and the activities within the workplace.

7. In the event that HEPA filters become blocked prematurely (i.e. prior to annual testing), this does not normally represent a problem in terms of the integrity of the affected filter(s), but it is probable that the increased resistance to airflow and consequent problems of balancing the pressures in the different rooms of the Containment zone will necessitate changing the affected filters.

Chapter V: Decontamination of compartments

The compartment must be made airtight to make fumigating possible, if necessary by means of temporary panels.

Formaldehyde procedure:

1. Check the compartment and accompanying drawings for connections with containment facilities that must be closed. Close down utilities such as gas, water, electricity, sewerage, steam and if possible ventilation.

2. Empty the compartment, for example by moving objects to other containment facilities. Remove porous material. Discard material via validated procedures like autoclaves and formaldehyde airlocks. Open non-removable installation parts to make them accessible to vapour.

3. Thoroughly clean the compartment and disinfect critical points which may be contaminated.

4. Prepare the fumigating equipment and shut the compartment airtight.

5. Disinfect air ducts and HEPA filters for example separately by injecting formalin.

   Use a fumigating method in conformance with a validated procedure used for formaldehyde airlocks.

   Use bioindicators, (preferably a rapid bioindicator system) to demonstrate the efficacy of the fumigating process.

   Set restrictions for access such as clothing, quarantine for people and demolition material, in order to be able to make corrections in case of accidents.

6. Inspect the maintenance and renovation activities to be performed in the compartment. Maintain detailed records of the full process, which must be undertaken as a collaboration between scientific staff, engineering/ maintenance personnel and BRO or deputy.

7. Staff undertaking these activities must be suitably trained in order for these to be carried out safely and correctly. A risk assessment must be in place defining which precautions must be taken to protect staff and the environment from harm from the disinfection procedures.

Chapter VI: Decontamination of equipment and other materials

Before removal from the containment zone, equipment and material must be decontaminated:

- by steam sterilization within an autoclave
- after surface cleaning and disinfection, fumigation with formaldehyde (10 g/m^3 at 70 % RH) for at least 10 minutes or (3 g/m^3 for 24 hours or equivalent with other aldehydes, e.g. glutaraldehyde, or ethylene oxide (0.8 g/litre at 50°C for 1.5 hours)) or other fumigation methods that have been shown to be effective against FMDV. Equipment, for example contractors' toolboxes, laptops, etc. which is fumigated out of a Containment zone should be cleaned and be opened as much as reasonably possible to allow penetration of the gaseous fumigant; or
- thorough washing in an appropriate chemical disinfectant[5] such as:
  - 4 percent anhydrous sodium carbonate or 10% washing soda (Na_2CO_3 decahydrate);
  - 0.5 percent caustic soda (NaOH);
  - 0.2 percent citric acid;

[5] Note: The efficiency of these chemical disinfectants is considerably improved by the addition of a non-ionic detergent. Some countries have national databases listing validated disinfectants.

- 4 percent formaldehyde or equivalent with other aldehydes, e.g. glutaraldehyde

– a validated disinfection protocol with an alternative method that has been shown to be effective against FMDV.

Decontamination of clothing before removal from the Containment zone for laundry must include a wet heat treatment step. A laundry process without autoclaving is permitted if performed on-site in a double-ended pass-through laundry device. Such a laundry process must include a validated alternative inactivation step.

Documents should be sent out of the Containment zone preferably in electronic format. In case papers have to be taken out of the Containment zone, they must be treated by a validated procedure e.g. autoclaving, irradiation or ethylene oxide treatment.

Chapter VII: Inactivation of biological material:

Before removing biological material from the Containment zone and sending it to a facility not licensed to handle FMDV, the material must be inactivated by a validated method.

There are several methods that can be used for the inactivation of FMDV:

- Treatment with an appropriate lysis buffer.
- Binary ethylenimine (BEI): inactivates virus by alkylation of nucleic acids with minimal effects on proteins.
- Formaldehyde fixation of tissues.
- Inactivation using β-Propiolactone (BPL): Suitable for solutions that contain little protein, e.g. cell culture supernatant; mechanism of action: BPL destroys the nucleic acids (alkylation)
- or another validated treatment with an alternative method.

TIER C. LABORATORIES PERFORMING FMD DIAGNOSTICS WITHOUT USING INFECTIOUS FMDV.

TIER C LABORATORY CATEGORIES:

I. CONTINUOUSLY WORKING TIER C LABORATORIES:
   - NATIONAL REFERENCE LABORATORY WITHOUT PERMIT TO WORK WITH INFECTIOUS FMDV

II. CONTINGENCY LABORATORIES UNDERTAKING DIAGNOSTIC INVESTIGATIONS FOR FMD IN THE FRAMEWORK OF A NATIONAL CONTINGENCY PLAN (UPGRADED LOWER LEVEL OR NEW)
   - REGIONAL LABORATORIES SUPPORTING ROUTINE EXCLUSION DIAGNOSTICS WITH THE OPTION TO BE MORE INVOLVED DURING AN OUTBREAK
   - EMERGENCY LABORATORIES

Introduction

The following Minimum Standards for laboratories undertaking diagnostic investigations, refers to the laboratories mentioned in Annex XV to Council Directive 2003/85/EC[6] which are designated by the competent authorities as "national laboratories" or in point 13 of Annex XV as "other laboratories". These laboratories would be licensed to undertake diagnostic tests, as part of national contingency plans, but only test field samples originating from the country where the laboratory is situated using assays which do not contain or require infectious FMD virus as reagents or controls and that do not amplify infectious virus. Such "FMD Contingency Laboratories" must operate to standards that will result in inactivation of infectious virus if received in samples. Samples or materials that could contain FMDV, whether inactivated or not, may under no circumstances come into contact – directly or indirectly – with cell cultures or animals.

During an outbreak, "FMD Contingency Laboratories" may offer significant advantages in respect of speed and sample throughput as the number of laboratories fully meeting the "MBRM Standards for FMDV Laboratories" is very limited. In some "FMD Contingency Laboratories", rooms equipped with an air handling system providing HEPA filtration of exhaust air may be available for the most critical activities.

Real-time RT-PCR has been introduced in many laboratories, e.g. regional veterinary laboratories. While the inactivation treatment prior to RT-PCR in principle may be carried out on the suspect premises, there currently is no validated and fully satisfactory procedure that could be used for this purpose and thus opening the vessels containing potentially infectious material in a BSC followed immediately by inactivation is considered a suitable alternative.

Furthermore, a national competent authority may decide to authorize a "FMD Contingency Laboratory" to test non-inactivated samples by **antigen ELISA** in order to allow these labs to supplement RT-PCR results, maintain a back-up method in case RT-PCR fails and to determine the serotype although this procedure poses a higher risk. The use of a **lateral flow device (LFD)**, either on the premise or in a "FMD Contingency Lab" in a BSC, is an alternative to antigen ELISA that poses a lower risk but currently does not allow serotyping.

Irrespective of the methods used (RT-PCR, antigen ELISA, LFD, etc.), the greatest contamination risk is the homogenization of vesicular tissue and other tissue samples, which can contain extremely high amounts of infectious FMDV.

Serology using commercially produced **FMDV ELISA kits** can be performed in many laboratories, e.g. regional veterinary laboratories, which can process samples with a high throughput. In case of an outbreak, the NCA can include such laboratories to increase the throughput of diagnostic samples significantly, which will often be a crucial factor for successful disease control and timely recovery of the previous disease-free status. Serological samples should be opened and processed in a way that the generation of potentially infectious aerosols is minimized and air that might contain such aerosols should be directed through a HEPA filter as far as possible.

While due to the dynamic nature of an FMD epidemic samples coming from holdings without clinical signs may occasionally contain virus, samples from holdings with clinical signs suggesting the presence of FMD represent a higher risk and should be handled with special caution.

[6] repealed and replaced by Regulation (EU) 2016/429

SPECIFIC REQUIREMENTS:

I: Management and responsibilities

1. The management of a facility is ultimately responsible for biological risks (biosafety and biosecurity) on its premises. This also includes the provision of sufficient resources to manage the duties and responsibilities of a Tier C laboratory (both categories).
2. It is the duty of the management of Category I laboratories to properly monitor the biosafety and biosecurity by appointing a BRO (Biorisk Officer) and deputy (DBRO), while category II laboratories must designate a biorisk responsible person (BRP). When receiving suspect samples and during outbreaks, there must be a BRO/DBRO or BRP on-site at all periods in which samples are being received and contactable at all periods when diagnostic activities are ongoing.
3. The BRO/DBRO must have sufficient experience and technical training to enable assessment of FMD risk and risk management procedures. The management should carefully define the status, duties and responsibilities of the BRO/DBRO:
    a. The BRO should report directly to the top management representative (Director-General, site Director or similar)
    b. The status of the BRO should ensure his/her independence and the absence of any potential conflict of interest.
    c. The BRO should have appropriate training in virology, containment techniques and procedures to fulfil his/her duties. It is to be expected that he/she would also have a broad based knowledge of the FMDV with particular respect to its physico-chemical properties, mode of transmission and other topics of relevance to his/her role.
    d. Procedures for reception, handling, testing, storage and shipment of suspect and positive samples must be defined by the BRO. Moreover, the BRO must be involved in the technical running of the facility.
4. For category I laboratories, a biorisk policy and systems for incident recording, assessment and notification, risk and threat assessments, and emergency management plans as described for Tier D must be in place.
5. Procedures for safely handling suspect and positive samples must be defined by the BRO for category I laboratories, and by the BRP for category II laboratories.
6. **When instituting category II laboratories during an FMD emergency, the national competent authority (NCA/CA) shall ensure that the laboratories implement Tier C standards.**

    For category II laboratories, once a positive sample has been identified, all potentially contaminated areas are classified as Containment zone.

II: Facility design and access

1. There must be a designated FMD restricted zone used for the receipt, testing and storage of suspect sample material which is separated from other activities in the laboratory. To prevent the accidental propagation of FMDV, no cell cultures or animals may be kept or handled in the FMD restricted zone during an outbreak investigation.

2. All potentially contaminated areas are classified as FMD restricted zones. Access doors should display a warning sign that access is restricted to authorised personnel only.
3. Controls must be in place to limit human and animal access, particularly people working with susceptible species.
4. Communications and reporting office space

   The laboratory must have an adequate provision of office space, computing and communications facilities (e.g. electronic communications, facsimile) to reduce the need to a minimum for staff, papers and physical records to exit the FMD restricted zone.
5. Rest rooms

   The FMD restricted zone should have sufficient rest rooms and lavatory facilities in relation to the staff number expected at peak periods of activity to reduce the need to a minimum for staff to exit the FMD restricted zone.

III: Personnel and training

1. Personnel must be authorised to enter and work in the FMD restricted zone by the BRO/DBRO or the BRP. For category I laboratories, authorised personnel working in the FMD restricted zone must be trained, their competencies maintained for their designated roles, and evidence of the training and competency recorded. The BRP for category II laboratories must ensure sufficient training of personnel before start of work in the framework of an FMD emergency. Where facilities for the inactivation of waste from the FMD restricted zone are located outside of this area, staff working with such waste must also be trained appropriately and evidence of the training recorded.
2. Authorised personnel must:
   a. change all clothing before entering and when leaving the FMD restricted zone
   b. sign an agreement stating that for at least 72 hours after leaving the FMD restricted zone they will not have any contact with animals of susceptible species, nor enter buildings or enclosed fields where animals of susceptible species are kept, and not handle items used in the care of susceptible species
   c. the agreement of the authorised personnel to these conditions must be recorded and a reminder notice of these conditions placed in a visible location at the exit point of the FMD restricted zone
3. Entry and exit of personnel to the FMD restricted zone must be recorded**.**
4. Entry and exit points to the FMD restricted zone must be kept to the minimum – preferably a single point of entry/exit.
5. A step-over line, or other clearly demarcated boundary, shall indicate the exit point. This is the point where the change of all clothing should occur. Changing facilities and lockers are required to enable staff to deposit personal items outside the FMD restricted zone. All outer protective equipment worn in the FMD restricted zone must be packaged safely and stored in the FMD restricted zone until treatment.
6. Preferably, personnel should shower out at the exit point. If this is not possible, personnel must remove their outer protective equipment and wash their hands at the exit point and shower before leaving the laboratory premises. If showers are not available on the premises, personnel should shower as soon as possible.

IV: Handling of samples

1. Sample reception area

The FMD restricted zone must contain a specified area for sample reception which must:

a. be easily disinfected in the event that leakage of samples occurs into packing materials or following opening of the packages

b. be equipped to enable repacking of samples into appropriate transport containers for shipment

c. have suitable facilities for waste disposal and have hand-washing facilities

2. Sample preparation area

a. The FMD restricted zone must contain a specified area for serum separation and/or RNA extraction

b. This area must have suitable facilities for surface disinfection and waste disposal and have hand-washing facilities

c. Samples originating from a holding with clinical signs indicating the possible presence of FMDV pose a higher risk. They must be opened, and the subsequent liquid handling steps be carried out in a biosafety cabinet (BSC). Centrifugation should be carried out in closed rotors or sealed centrifuge buckets, which can contain a spillage in case the primary vessel fails

d. Infectivity of the samples must be reduced before further processing in all cases where this does not affect the intended diagnostic tests. E.g. by mixing with an effective lysis buffer containing chaotropic salts prior to RNA extraction, or by heating serum samples for 2h at 56^0C. If suspension of lesion epithelium for RT-PCR or antigen ELISA is prepared using mortar and pestle or similar open method, this must take place in a BSC, the SOP for the procedure must reflect the high risk involved, and personnel should be aware of this high risk.

3. Testing area

a. The FMD restricted zone must contain a designated area for testing

b. This area must have suitable facilities for surface disinfection and waste disposal and have hand-washing facilities

c. The testing of serum samples originating from a holding with animals showing clinical signs indicating the possible presence of FMDV should if possible be carried out in a BSC

d. Antibody ELISA testing of samples from a holding without clinical signs should be carried out in a way that aerosol generation and spread is minimized. In particular, the initial steps including the first washing step are critical.

e. The testing of vesicular material for antigen e.g. by ELISA or lateral flow device (LFD) poses the highest risk of all activities carried out in Tier C Laboratories. It must be carried out in a way that all liquid handling steps are performed in a

BSC. If an incubator is used to guarantee the required incubation temperature, plates should be sealed or placed in a suitable secondary vessel.

4. Sample storage area
    a. The FMD restricted zone must contain a specified area for the storage of samples
    b. This area must be secured from unauthorized access, and have suitable facilities for surface disinfection.

5. Packaging and shipment of samples

    Samples must be put into watertight primary containers (e.g. plastic tubes) and the primary containers must be packed in watertight secondary packaging, which should be a strong crushproof and leak-proof container, with absorbent material that can absorb the entire contents of all the primary containers. The packaging process must include a disinfection of the secondary packaging. The packaging should comply with packing instruction P 650 and the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) or other applicable regulations.

    Diagnostic samples with unknown infection status should be labelled as biological substance, category B (UN3373). Samples known or suspected to contain infectious FMDV must not be sent to a facility that does not meet Tier C or Tier D requirements.

    Intact full-length FMDV RNA or cDNA must not be released to third parties not licensed to handle FMDV. Only fragmented RNA, subgenomic cDNA or PCR amplicons should be submitted for off-site sequencing and similar services.

V: Waste management

1. Location of autoclave

    An autoclave should be present on the site, preferably vacuum-assisted and with sufficient capacity for throughput at the maximum operating capacity of the laboratory.

2. Liquid waste
    a. Heat or chemical treatment of all waste water through a validated effluent treatment system is the preferred method, in compliance with requirements specified for FMD laboratories
    b. Alternatively, or additionally, the laboratory may demonstrate that it has put in place a robust management system for inactivation of liquid waste that is potentially contaminated with virus or has been in contact with potentially infectious materials. If treatment of all liquid waste from the FMD restricted zone (including waste water from the showers) is not possible, at least the ELISA buffers and washing fluids must be collected and treated.

3. Solid waste

a. For biological, solid waste, and all solid disposable materials that have been in contact with potentially infectious specimens, treatment by autoclave within, at an exit point to the FMD restricted zone, or on site, is the preferred option.

b. If such a treatment of all solid waste is not possible, handling of solid waste must be risk assessed by BRO/DBRO/BRP and discussed with management. Waste must be effectively chemically decontaminated, packaged into suitable leak- and break-proof containers and surface decontaminated by a validated method at the exit from the FMD restricted zone. Such packages must be transported in a controlled fashion as clinical waste under ADR regulations (UN 3291) for incineration at the closest authorized processing plant, or for autoclaving at another facility using a validated protocol for comparable material.

VI: Equipment and material

Removal of equipment, materials and clothing from the FMD restricted zone

a. Removal of any material and equipment from the FMD restricted zone is subject to authorisation by the BRO/DBRO or the BRP.

b. The BRO/DBRO or BRP must ensure that materials and equipment which has been in contact with risk materials (specimens) is not removed from the FMD restricted zone without a validated treatment to inactivate FMDV.

c. The reason for removal, date and destination must be recorded.

VII: Declassification

Declassification of the FMD restricted zone

a. The FMD restricted zone can only be declassified after decontamination according to a plan agreed with the national competent authority (NCA/CA).

b. If heat treatment or scanning of all paper from the FMD restricted zone is not possible, they should be packed into suitable containers, which should be disinfected and kept under lock for at least two years. If the containers have to be opened before, this has to be done in an FMD restricted zone meeting the Tier C standards.

c. All clinical specimens handled in the FMD restricted zone during a period when potentially infectious FMDV material was handled, should be considered as potentially contaminated with FMDV and should be destroyed before the declassification of the FMD restricted zone. Alternatively, the material needs to be tested and certified free from FMDV or undergo a validated inactivation process and surface decontamination in order to be released (see Annex 1, chapter VII). Samples may also be shipped to tier D laboratories according to international regulations for shipment of biological materials. These samples and processes must be approved by the BRO or BRP and/or the NCA/CA. Relevant documentation on these samples must be maintained according to national and international law.

PROTECT
RESPOND
CONTROL

MOVE FAST

FAST, Foot-and-mouth
And Similar Transboundary
animal diseases.

EuFMD structure

Secretariat, Executive Committee, Standing Technical Committee (STC), Special Committee on Risk Monitoring, Integrated Surveillance and Applied Research (SCRISAR), Special Committee on Biorisk Management (SCBRM), Regional Groups for FAST Coordination, Standing Committee on Prequalification of Vaccines against FAST diseases (SCPQv), Steering Committee TOM (SCTOM).

EuFMD Secretariat

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