

VRA 5 - What are the risks of causing a new outbreak of foot and mouth disease (FMD) through movement of animal by-products derived from FMD-susceptible animals from an approved slaughterhouse in a Restricted Zone?

1. SUMMARY OF OVERALL RISK

This risk assessment was compiled according to terms of reference provided by the Scottish Government regarding time of delivery, title of veterinary risk assessments (VRAs) and level of detail required. EPIC scientists created a generic framework suitable for the VRAs; collated and updated existing information on risks; filled gaps in the documents (including references where appropriate); and drafted new VRAs where necessary. These documents may require updating as new information becomes available or legislation develops, or if more in-depth assessment is necessary.

The purpose of this document is to qualitatively assess the risk of the specified activity in the face of an FMD outbreak in the UK. The assessment includes proposed actions to mitigate the risks associated with the specified activity, and which could form the basis of license conditions, should the activity be permitted. The summary of overall risk below assumes that the risk mitigation measures in Section 8 are implemented.

DEFINITIONS OF RISK LEVEL (OIE 2004, DEFRA 2011):

Negligible So rare that it does not merit consideration

Very low Very rare but cannot be excluded

Low Rare but could occur

Medium Occurs regularly

High Occurs very often

Very High: Events occur almost certainly

Overall risk: The risk of allowing the activity described is **VERY LOW in the Restricted Zone.**

2. LEGISLATION, DEFINITIONS & ASSUMPTIONS

Statutory disease control requirements are applicable to livestock premises on suspicion and confirmation of FMD. When suspicion of disease cannot be ruled out, and diagnostic samples are taken, a Temporary Control Zone is put in place (TCZ) surrounding the suspect premises. On confirmation of disease, a national movement ban (NMB) is enforced by introducing a national Restricted Zone (RZ). A 3 km Protection Zone (PZ) and 10km Surveillance Zone (SZ) are implemented which place restrictions on movements and activities around infected premises to prevent spread of disease. Later in the outbreak, restrictions may be relaxed either through reducing the size of the RZ or through allowing some resumption of normal activities under licence within the RZ, SZ or PZ. In this VRA, RZ is used to refer to areas which are within the RZ, but do not also fall within the PZ or SZ.

In a RZ, movement of carcasses or animal by-products (ABPs) from a slaughterhouse is allowed only for disposal, or under the authority of a licence granted by an inspector. The legislation specifies that the licence must include a condition prohibiting intermediate movement to any premises keeping susceptible animals, that anyone transporting animal by-products under the authority of a licence must do so in a drip-proof container or vehicle, and cleanse and disinfect the vehicle as soon as possible after unloading and in any event before re-use, and the occupier of premises to which any

carcasses or animal product is moved must ensure that it is not brought into contact with, or fed to, any susceptible animal (FMD (Scotland) Order 2006, schedule 6 paragraph 3).

Animal by products are: "entire bodies or parts of animals, products of animal origin or other products obtained from animals that are **not intended for human consumption**". This includes catering waste, used cooking oil, former foodstuffs, butcher and slaughterhouse waste, blood, feathers, wool, hides and skins, fallen stock, pet animals, zoo and circus animals, hunt trophies, manure, ova, embryos and semen not intended for breeding purposes (Article 3 of Regulation (EC) 1069/2009).

Manure and slurry fall within the definition of an ABP. Although outwith a disease outbreak, these are considered exempt from most ABP regulation requirements, in practice, during an outbreak, manure and slurry are treated as ABPs. This VRA covers the movement of ABPs from animals where FMD is not detected. If FMD is detected at the slaughterhouse, the slaughterhouse would become an infected premises and different procedures would be put in place. Movements covered by this VRA include movement of category 1 ABPs for disposal (incineration or rendering), movement of category 2 ABPs for processing or disposal, and movement of category 3 ABPs for processing (for example for pet food, feed for livestock, fertilisers etc.) or disposal. This VRA is concerned with the risks associated with transport of animal by-products and does not assess the risks associated with the potential further processing or disposal options for the material.

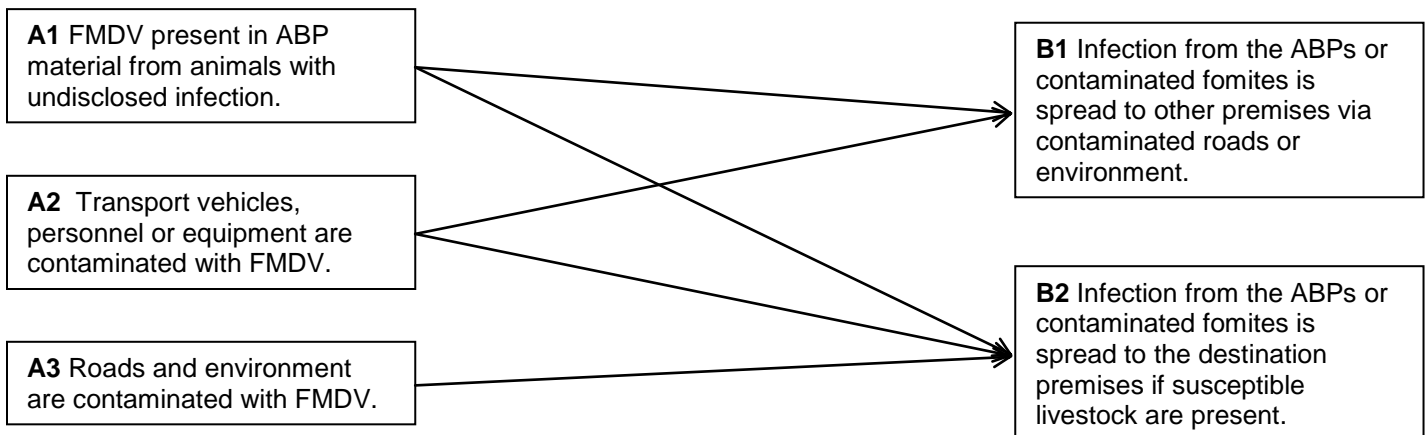
Disinfectants must be approved for use by the Diseases of Animals (Approved Disinfectants) (Scotland) Order 2008 as amended and used at the FMD Order dilution.

3. HAZARD IDENTIFICATION

(a) Hazard: FMD virus (FMDV)

(b) Specific risk: Movement of ABPs increases the risk of spreading infection to previously uninfected premises and livestock if by-products are contaminated due to undetected infection. However, logistically there is a need to be able to remove by-products from slaughterhouses to prevent environmental impact, attraction of vermin and build up of contaminants, and to allow the slaughterhouse to continue to function.

4. POTENTIAL RISK PATHWAYS



5. EXPOSURE ASSESSMENT

Factors which are likely to affect this probability of exposure are:	Comments and risk estimates if/where appropriate
Infection source: A1 FMDV present in ABP material from animals with undisclosed infection	
<ul style="list-style-type: none"> Presence of undetected or incubating infection in animals going through the slaughterhouse system 	<ul style="list-style-type: none"> Whilst clinical infection would be detected at ante or post mortem inspection, animals in the incubation stage of disease could pass through the slaughterhouse undetected, meaning ABPs (including category 3) could include potentially infective material. In the RZ this risk is low (see VRA 11 for analysis of the risks of animals moving to a slaughterhouse). Animals may incubate FMD for 2 to 14 days before the appearance of clinical signs (Sanson 1994), depending on initial dose, route of infection and virus strain. Infected livestock may excrete FMDV for several days before the appearance of clinical signs, potentially leading to transmission or contamination prior to disease detection, particularly in cattle and pigs (Alexanderson <i>et al.</i> 2003, Orsel <i>et al.</i> 2009). FMD in sheep can be difficult to detect clinically as not all animals show clinical signs, and clinical signs are usually mild and short lived (Hughes <i>et al.</i> 2002). There is therefore a higher risk that infected sheep could go through the slaughter process undetected.
<ul style="list-style-type: none"> Stage of outbreak 	<ul style="list-style-type: none"> Early in the outbreak there is increased risk of undetected infection.
<ul style="list-style-type: none"> Amount of virus on carcass 	<ul style="list-style-type: none"> Total viral burden varies with stage of clinical disease and is highest around the time that clinical signs appear. Virus levels are highest in vesicular fluid (Sellers 1971), on day 2-3 after the onset of clinical signs. By day 4-5 virus titre is reduced. FMDV may be present in fluids including blood, milk, urine and faeces of infected animals before the appearance of clinical signs (reviewed by Sanson 1994). In live animals dairy cows and pigs are the species most likely to transmit virus during the incubation period (Orsel <i>et al.</i> 2009), although it is unclear whether this would also be applicable to carcasses. FMDV is very sensitive to pH and becomes uninfected if the pH drops below 6. Muscle pH drops sufficiently following death to inactivate FMDV in muscle tissue within 24-48 hours. However, FMDV can remain viable in tissues such as bone marrow, lymph nodes and blood for weeks to months (Cottral 1969). FMDV is easily killed by approved disinfectants. Disinfection of the carcass reduces viral contamination. Low temperature (4°C) and relative humidity greater than 60% allow good survival of virus (Donaldson 1972, Bartley <i>et al.</i> 2002).
<ul style="list-style-type: none"> Strain type 	<ul style="list-style-type: none"> There are 7 serotypes of FMDV: O, A, C, SAT1, SAT2, SAT3 and Asia 1. The different serotypes (and different strains within each serotype) have different characteristics for example in terms of host species susceptibility, length of incubation period, ease of detecting clinical signs and likelihood of air borne transmission (Kitching and Hughes 2002, Gloster <i>et al.</i> 2008). Much UK research is based on the 2001 outbreak, which was caused by serotype O, strain PanAsia. However future outbreaks may involve

	other serotypes/strains and therefore present different epidemiological situations. On confirmation of FMD, the serotype and strain would be identified by The Pirbright Institute. This information would help to inform estimates of risk.
<ul style="list-style-type: none"> Slaughter house practices, e.g. <i>ante mortem</i> and <i>post mortem</i> inspection 	<ul style="list-style-type: none"> Appropriate <i>ante</i> and <i>post mortem</i> inspection will reduce risk of undetected infection.
<ul style="list-style-type: none"> Disinfection procedure 	<ul style="list-style-type: none"> FMDV is easily killed by approved disinfectants. Disinfection of ABPs may be appropriate, depending on material and later processing, to reduce risk of virus contamination.
Infection source: A2 Transport vehicles, personnel or equipment are contaminated with FMDV	
<ul style="list-style-type: none"> Presence of susceptible livestock at premises from which transport despatched (such as rendering plant) 	<ul style="list-style-type: none"> Presence of livestock introduces risk of vehicle, personnel or equipment being contaminated on leaving the premises if undetected infection present. Livestock are not permitted on premises used for processing or disposal of animal by-products.
<ul style="list-style-type: none"> Movement history of vehicle 	<ul style="list-style-type: none"> Any previous movements close to infected areas increase risk. Movements to multiple slaughterhouses or premises increase risk.
<ul style="list-style-type: none"> Failure to appropriately cleanse and disinfect vehicle, personnel and equipment prior to leaving each premises visited, including disposal premises 	<ul style="list-style-type: none"> FMDV is very sensitive to approved disinfectants and good biosecurity will reduce risk of virus transfer to roads via fomites such as personnel, vehicles and equipment
Infection source: A3 Roads and environment are contaminated with FMDV	
<ul style="list-style-type: none"> Proximity to premises with FMD, stage of outbreak, strain differences 	<ul style="list-style-type: none"> See A1.
<ul style="list-style-type: none"> Biosecurity of local premises, cleansing and disinfection procedures in place 	<ul style="list-style-type: none"> FMDV is very sensitive to approved disinfectants and good biosecurity will reduce risk of virus transfer to roads via fomites such as personnel, vehicles and equipment.
<ul style="list-style-type: none"> Survival of FMDV on road 	<ul style="list-style-type: none"> FMDV can survive on average for 2 to 3 months in bovine faeces at 4°C. Survival duration increases with decreasing temperatures and presence of organic material and varies with virus strain (reviewed by Bartley <i>et al.</i> 2002).
Risk of transmission: B1 Infection from the ABPs or contaminated fomites is spread to other premises via contaminated roads or environment	
<ul style="list-style-type: none"> Number of infected carcasses or degree of contamination of ABP material 	<ul style="list-style-type: none"> Since the risk is from animals where FMD has not been detected (i.e. animals which are incubating infection or have few clinical signs) it is likely that the number of infected carcasses and the viral load per infected carcass is low.
<ul style="list-style-type: none"> Cleansing and disinfection of vehicle, personnel, equipment 	<ul style="list-style-type: none"> Disinfection greatly reduces contamination of the vehicle. The risks associated with movement of infected material can be virtually eliminated by appropriate cleansing and disinfection with an approved disinfectant. However, failure to conduct appropriate cleansing and disinfection remains a risk.
<ul style="list-style-type: none"> Effectiveness of sealing vehicle 	<ul style="list-style-type: none"> Ineffective sealing presents a risk of releasing virus from the vehicle. The most likely failure to seal vehicles is the unintended leaving open of drainage apertures (Kitching 2001).
<ul style="list-style-type: none"> Road traffic or other accident leading to spillage 	<ul style="list-style-type: none"> Likelihood of accident occurring is very low. If accident occurs, likelihood of container damage leading to virus release is very low. However potential consequences are severe.
<ul style="list-style-type: none"> Distance and time travelled, number of stops, 	<ul style="list-style-type: none"> Increasing journey distance or time increases risk of contamination from vehicle. Increasing number of stops increases risk of contamination from both vehicle and

	personnel.
<ul style="list-style-type: none"> Proximity and density of susceptible livestock to transport route 	<ul style="list-style-type: none"> Increases risk that if any leakage of virus does occur, it will result in new outbreaks.
<ul style="list-style-type: none"> Failure to fully empty the vehicle and undergo cleansing and disinfection of vehicle, personnel and equipment after transport 	<ul style="list-style-type: none"> Increases risk of onward virus transmission.
Risk of transmission: B2 Infection from the ABPs or contaminated fomites is spread to the destination premises if susceptible livestock are present	
<ul style="list-style-type: none"> Presence of susceptible animals at premises of disposal 	<ul style="list-style-type: none"> Legislation states that ABPs must not be brought onto any premises where farmed animals are kept.

6. CONSEQUENCE ASSESSMENT

Spread of FMD to uninfected premises.

7. RISK MANAGEMENT OPTIONS

The movement of animal by-products does carry the risk of spreading FMD to uninfected farms due to contamination of roads and environment. This risk arises if animals with undetected infection enter the slaughterhouse system.

Potential risk management options:

- (i) Do not permit ABPs to be collected from slaughterhouses.
- (ii) Permit collection of ABPs but not in the very early stage of an outbreak, i.e. only after day 8.
- (iii) Permit collection of ABPs at any stage of the outbreak

If movements of animals in a RZ to a slaughterhouse in a RZ are permitted, movement of animal by-products is necessary to allow normal functioning of the slaughterhouse and to prevent environmental impact, attraction of vermin and build up of contaminants. Therefore option (i) is not feasible. Options (ii) or (iii) are appropriate in a RZ, provided that certain conditions are met, including disinfection of ABP material before movement where possible, no susceptible livestock at the premises of destination, and appropriate cleansing and disinfection of vehicle, personnel and equipment. Collection of ABPs may not be necessary in the early stages of an outbreak because movement of animals to slaughter in the Restricted Zone is unlikely to be permitted at that stage. After day 8 more information will be available on animal movements and the risk of undisclosed infection has reduced.

Overall the risk is very low in the RZ, provided mitigation measures are observed.

This risk level was assigned based on scientific literature available and expert opinion where appropriate by considering the risk pathways and the factors affecting each risk pathway, as listed in sections 4 and 5.

8. SUGGESTED RISK MITIGATION MEASURES

Subject to the following safeguards, collection of ABPs from a slaughterhouse in the RZ presents a very low risk, provided the following risk mitigation strategies are in place:

A. Prevent disease getting in to slaughterhouse

- (i) All livestock entering the slaughterhouse in a restricted zone will do so only under licence. Part of the criteria of this licence is pre-movement inspection of the livestock for FMD.

B. Before movement

- (i) Transporters must be approved or registered under appropriate legislation.
- (ii) Transporters must ensure only suitable, covered and leakproof vehicles of impervious construction are used, equipped with effective drainage and a sealed tank to collect all blood and liquids. Given variation in the standards of vehicles used, specific AHVLA approval of individual vehicles for use is recommended. Premises are not to allow vehicle on

premises if obviously not suitable. Transporters should complete Commercial Documents (which should specify place of origin, place of destination, type and quantity of material transported) before handling ABPs where possible, and leave a copy securely in a polythene bag, or other container provided on the location.

- (iii) Ensure all personnel going on site at slaughterhouse are wearing clean, disinfected clothing and boots, that the vehicle has been cleansed and disinfected prior to arrival, and that all equipment used is clean and disinfected.
- (iv) Animals held at slaughterhouse are inspected for signs of FMD infection.
- (v) Where possible ABPs leaving the slaughterhouse should be disinfected eg. spray litter with an approved disinfectant.
- (vi) Driver and vehicle to have no contact with susceptible livestock at slaughterhouse.
- (vii) Vehicles containing ABPs must be cleansed and disinfected prior to leaving the slaughterhouse premises. Sufficient supplies of water and approved disinfectant should be carried on the vehicle for this purpose.
- (viii) Before leaving the slaughterhouse, the vehicle should be checked to ensure it is sealed.

C. During movement

- (i) The vehicle should go direct to its destination, with no intermediate movements to other slaughterhouses or any premises keeping susceptible animals.
- (ii) A contingency plan should be kept in case of accident or breakdown *en route*, to minimise any increases likelihood of spread of disease if it was present.

D. After movement

- (i) The destination premises must be approved under appropriate legislation. The destination must not be premises where live FMD-susceptible animals are kept. The occupier of the premises to which any carcasses or animal product is moved must ensure that it is not brought into contact with, or fed to, any susceptible animal.
- (ii) During an outbreak, manure and slurry are treated as ABPs. If a slaughterhouse can find another route, such as premises without susceptible animals where manure may be safely stored, the AHVLA may consider issuing a licence for this movement. But otherwise it goes as ABP, and cannot go to premises keeping susceptible livestock. Manure and stomach contents can be sent for rendering or potentially go to compost or biogas plants or incineration. The latter is unlikely due to cost. Slaughterhouses also produce stomach (rumen) content and sometimes gut content are treated in the same way.
- (iii) All personnel leaving any "dirty" area or having used such vehicle or equipment must appropriately cleanse and disinfect, or change clothing, prior to entering a clean area, or leaving the premises. All vehicles and equipment leaving a dirty area must be appropriately cleansed and disinfected. Wheels and wheel arches of all vehicles leaving site must be appropriately disinfected. Approved disinfectants must be used at the correct concentration.
- (iv) It is already a requirement that records must be kept by slaughterhouse of destination of product, dates of transport and amount of material transported.
- (v) Personnel on handling/disposal premises must not keep or care for susceptible livestock
- (vi) Care and every effort must be made to keep "dirty" and possibly contaminated areas, vehicles and equipment separate to "clean" areas, vehicles and equipment.

It is assumed that all relevant legislation normally applicable is followed regarding animal by-products.

9. SOURCES OF EXPERT ADVICE

This is based on VRA 2009 #4 "What is the risk of causing new outbreaks of FMD by the movement of animal by-products (other than meat for human consumption), manure, slurry, digestive tract contents and used litter from a slaughterhouse in the RZ?"

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11. REFERENCES

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12. NOTES

None