VRA 15: What are the risks of causing new outbreaks of foot and mouth disease (FMD) by staging an equestrian event?

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 where necessary.

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:

	PZ	SZ	RZ
With no mitigation measures	medium/high	medium	low/medium
With mitigation measures below	medium	low/medium	low

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.

There are restrictions on horse movements and events during an FMD outbreak. Horses may not be moved off a premises where FMD is suspected or confirmed unless authorised to do so by a licence granted by the Scottish Ministers (FMD (Scotland) Order 2006 Schedule 2, paragraph 11). In a PZ, movements of horses from or to premises which keep susceptible animals, or into or out of a PZ, can only be carried out under the terms of a licence granted by an inspector. (FMD (Scotland) Order 2006 Schedule 4, paragraph 11,12). Point-to-point meetings are not permitted in a PZ (FMD (Scotland) Order 2006 Schedule 4, paragraph 15).

In general, access to infected premises or premises under suspicion of infection is not permitted. Scottish Ministers can prohibit access to land within a PZ, including core paths (FMD (Scotland) Order 2006, article 35). Local authorities can

close land for up to six days. In addition landowners can request closure of their land for longer periods - subject to a risk assessment AHVLA and local authorities can sanction closure and notify Scottish Ministers (Land Reform Act (Scotland) 2003, chapter 4, paragraph 11).

In this document the term 'horses' refers to all equidae including donkeys, mules and other hybrids. This risk assessment covers events, shows, point-to-point races, carriage driving, traveller horse fairs (e.g. Appleby) and similar activities (in this VRA all referred to as 'the event') but does not include hacking, horse racing or drag hunting for which there are separate risk assessments.

In this VRA, the term 'agricultural land' or 'agricultural areas' refers to land that is being used or has been used for keeping livestock or other FMD-susceptible animals. It does not include arable land where no livestock have been present for an extended period of time.

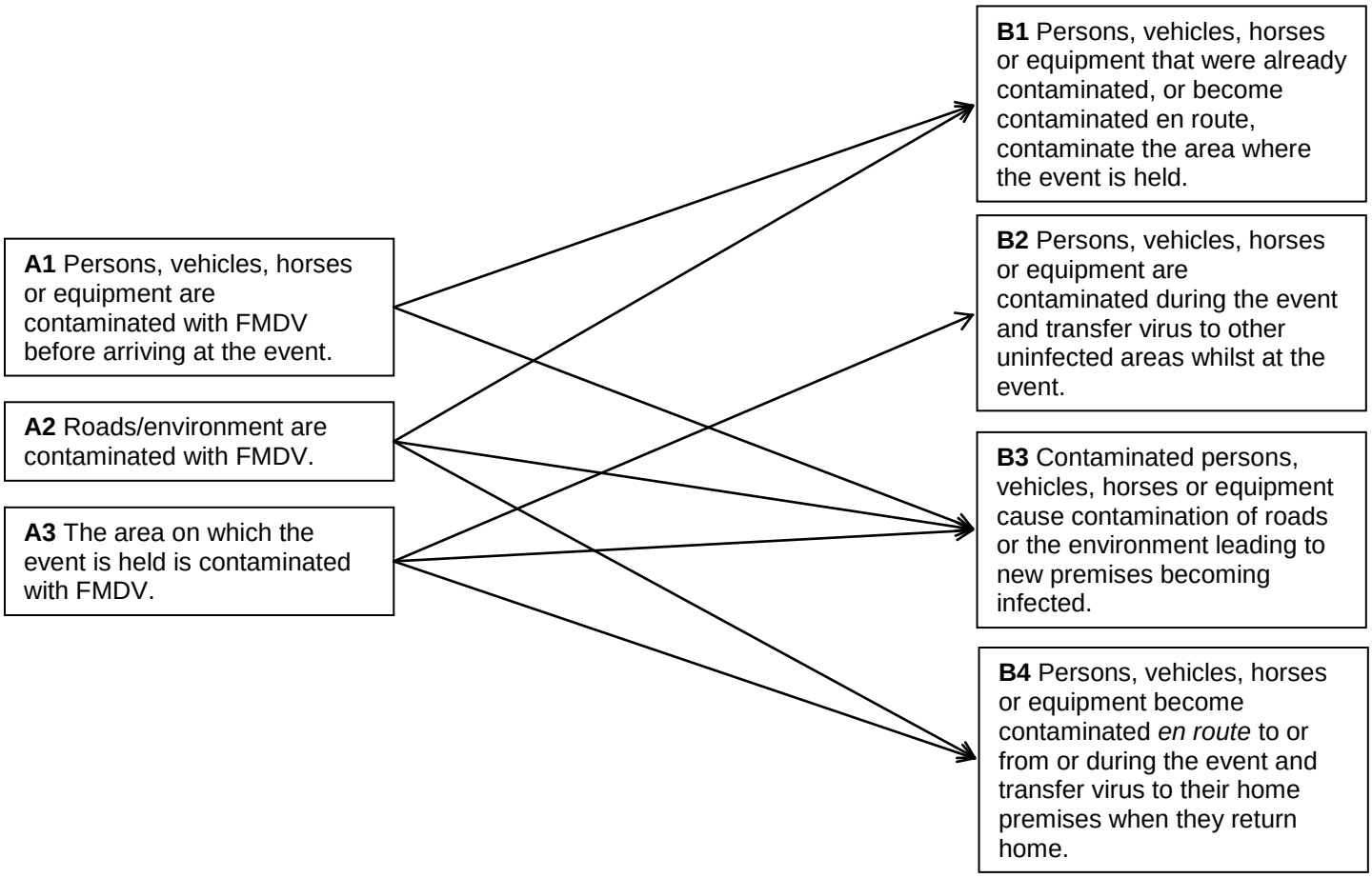
Disinfectants must be approved for use by the Diseases of Animals (Approved Disinfectants) (Scotland) Order 2008 as amended and be used at the FMD Order dilution.

3. HAZARD IDENTIFICATION

a) Hazard: FMD virus (FMDV)

b) Risk hypothesis:
During an FMD outbreak people attending or participating in events in the countryside may come into contact with FMDV or with susceptible livestock. There is a risk that FMDV will spread via people or other fomites and cause further disease outbreaks. Mixing of people, vehicles and horses at equestrian events increases the risk of further dissemination.

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 Persons, vehicles, horses or equipment are contaminated with FMDV before arriving at the event.**	
In general, risk of contamination is influenced by: • Proximity to a premises where FMD has been detected ("infected premises")	• Risk of transmission is highest adjacent or close to premises with FMD. Once a NMB is in place, most transmission occurs by local spread (<3k from premises with FMD) (Gibbens *et al.* 2001, Keeling *et al.* 2001, Haydon *et al.* 2003). • It is difficult to quantify relative risks associated with different transmission routes within local spread but indirect transmission via fomites and contamination of roads and environment around premises with FMD are likely to play an important role. • Risk of airborne transmission decreases rapidly with distance from the premises with FMD and is only likely to occur over significant distances if many infected animals (especially pigs) are present (Donaldson and Alexanderson 2001). • In a PZ there are known infected premises which may be at varying stage of diagnosis, slaughter, cleansing and disinfection. The risk of local transmission from detected infected premises is medium. • In a SZ, there are no detected infected premises. The smallest distance at which infected premises could be located would be 3km away. The risk of local transmission from detected infected premises is low. • In a RZ, there are no detected infected premises. The smallest distance at which infected premises could be located is 10km so the risk of local transmission from detected infected premises is negligible.
• Presence of animals with undetected or incubating FMD, or failure to report FMD	• In addition to premises where FMD has been detected ("infected premises"), there may be premises where FMD is present but has not yet been detected. • 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 *et al.* 2003, Orsel *et al.* 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 *et al.* 2002). In addition, sheep may be inspected less frequently/ thoroughly. There is therefore a higher risk of undetected infection on sheep-only premises. • The risk of undetected infection is highest in a PZ, followed by a SZ then a RZ. • The risk of undetected premises with FMD arising from spread over longer distances can be better quantified by analysis of movement data to identify movements of animals from areas where FMD has been detected, before the NMB.
• Stage of outbreak	• Early in the outbreak there is increased risk of undetected infection in all zones and lack of information on movements.
• Likelihood of detection and transmission is influenced by FMD virus strain	• 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 *et al.* 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.
Specific risks: Likelihood that vehicles are contaminated	
• Origin of vehicles	• The risk that vehicles are contaminated is influenced by the proximity of the home premises (or premises of despatch of transport, if different) to premises with FMD, and the presence of susceptible livestock with undetected infection at the home premises, as above.
• Movement history of vehicles	• Movement to other premises increases the probability of contamination.
• Cleansing and disinfection of interior and exterior of vehicles (especially horse-boxes)	• FMDV is very sensitive to approved disinfectants and good biosecurity will reduce risk of virus transfer via fomites such as personnel, vehicles and equipment.
• Length and duration of journey, number of stops en route and proximity of route to premises with FMD	• Longer journeys, multiple stops and proximity to premises with FMD increase risk that vehicles become contaminated en route. • Stopping at multiple premises for collection of horses increases the risk that the vehicle becomes contaminated. • Therefore shared transport or transport through a contractor may increase risk of FMD contamination.
Likelihood that people are contaminated (organisers, riders, grooms, other personnel, spectators)	
• Recent contact with infected livestock	• Risk is greatest if people have had contact with infected animals, and next greatest if they have been to premises with FMD. • The likelihood and amount of contamination varies with species, stage of infection, degree of contact and cleansing and disinfection.
• Occupation	• Likelihood and amount of contamination increases with potential occupational exposure to FMD (e.g. farmer, vet).
• Cleansing and disinfection prior to arrival	• Risk of contamination decreases if clean clothing worn and cleansing and disinfection of outerwear has been undertaken.
• Presence of other non-susceptible animals	• People may also bring dogs, which may be contaminated with FMDV. The likelihood of contamination is similar to people/horses and will be highest if dogs have had access to infected livestock.
Likelihood that horses are contaminated before arriving at the event (horses cannot be infected with FMDV but may carry the virus mechanically, for example on their hooves)	
• Proximity to premises with FMD	• See above • Risks are highest in the PZ, followed by the SZ then RZ.
• Presence of livestock with undetected infection at home stables	• The risk that horses are contaminated is greatest is infected animals are present. Risk can be reduced by inspecting susceptible livestock regularly for signs of FMD and preventing horses coming into contact with livestock.
• Location of stable facilities and exercise areas	• Risk increases with increasing proximity to premises with

	FMD.
• Movement history of visitors and stable personnel	• Risk is greatest if persons have had contact with infected animals, and next greatest if they have been to premises with FMD. Visitors such as vets and farriers may present a risk. • The risk can be reduced by limiting visitors and ensuring appropriate cleansing and disinfection.
• Movement history of horses prior to the activity	• Movement to other premises, particularly if there is a high risk of undetected infection, increases the probability of contamination.
• Source of feed and bedding	• Feed and bedding from premises with undetected infection may be contaminated. FMDV has been recorded surviving for 3 months on hay (Bartley *et al.* 2002).
• Cleansing and disinfection	• Equipment used for horses which has been exposed to susceptible livestock or potential contamination can be cleansed and disinfected. Horses' hooves should be picked out.
Likelihood that equipment is contaminated	
• Previous use in contaminated areas without cleansing and disinfection	• There is a risk of transmission through equipment such as tack, driving carriages, that has been used in other areas and become contaminated. The risk is reduced by ensuring equipment is cleansed and disinfected before arriving at the event.
***Infection source:* A2 Roads/environment are contaminated with FMDV**	
• Proximity to premises with FMD, presence of undetected or incubating infection, stage of outbreak, strain differences	• Roads close to premises with FMD represent the highest risk.
***Infection source:* A3 The area on which the event is taking place is already contaminated**	
• Proximity to premises with FMD, extent and timing of movements of susceptible animals from or close to premises with FMD and stage of outbreak	• See A1.
• Presence and density of susceptible livestock at the location where the event is held	• The risk that the environment is contaminated is greatest if livestock with undetected infection are present in the area. • Since FMDV can survive in the environment, risk is also increased if the area has been used for grazing livestock within the last month (longer if cold weather).
• Level of use of land where event is held	• The risk that the environment is contaminated increases with increasing level of use.
• Wildlife in locality	• In other parts of the world, wildlife can play an important role in FMD transmission (Ward *et al*. 2007). • All British deer species are susceptible to infection and can transmit virus to domestic livestock experimentally (Gibbs *et al.* 1975). Wild boar are also susceptible (Elbers *et al.* 2003, Hartley 2010). • However in Western Europe post-outbreak serosurveys and diagnostic testing of animals with suspicious clinical signs have never revealed positive animals (Elbers *et al.* 2003, Mouchantat *et al.* 2005) and there is no evidence that deer or boar have played a role in FMDV spread in UK. • The density of wild boar in the UK at present is likely to be too low for boar to be of importance in transmission (Hartley 2010). • The risk of disease spread through infected deer or wild boar is therefore negligible, but this risk could change if ecological factors change, such as deer and boar densities or contact patterns. Ideally risks should be

	assessed using up-to-date information for a specific location. • Other species can be infected, such as hedgehogs, but are unlikely to be important in transmission. • Wildlife can also move FMDV mechanically if they become contaminated (for example scavengers such as seagulls, crows or foxes). • Overall, the risks of further spread of FMDV associated with wildlife are very low but any activity which causes disturbance to wildlife does increase this risk, especially close to premises with FMD.
• Meteorological conditions	• Favourable conditions will increase the probability of survival and thus probability of contamination being present. • FMD can survive on pasture for a few days in hot weather, and up to 2 to 3 months in bovine faeces at 4^{o}C. Survival duration increases with decreasing temperatures, increasing relative humidity and presence of organic material and varies with virus strain (reviewed by Bartley *et al.* 2002).
Risk of transmission: **B1 Persons, vehicles, horses or equipment that were already contaminated, or become contaminated *en route*, contaminate the area where the event is held**	
• Contact between vehicles and susceptible livestock	• Movement of vehicles onto land where susceptible livestock are or will be present increases the risk of transmission if vehicles are contaminated. This can be reduced by ensuring cars are parked on hard standing in areas that susceptible livestock do not access. • Cleansing and disinfection of wheels and undercarriage can eliminate the risk if done properly. This requires facilities but may be appropriate depending on the level of risk and size of the event.
• Total numbers of horses and people involved	• Higher numbers increase the risk that some will be contaminated. • Equine events and shows may involve large number of horses, riders, personnel and spectators.
• Number of contaminated horses and people	• Increasing numbers increases the total probable amount of FMDV that would be released, if present.
• Proximity of the area where the event is held to susceptible livestock	• The greatest risks are associated with the presence of susceptible livestock in the area where the event is being held. • Susceptible livestock on adjacent premises are also at increased risk. • Since FMDV can survive in the environment, there are also risks for livestock which are later moved onto to an area where contamination has been introduced. • If the activity is taking place in areas which are not agricultural land and are never used for grazing susceptible livestock or growing feed or bedding for susceptible livestock, the risks are negligible.
• Contact between people and horses and susceptible livestock	• Any potential contact with susceptible livestock increases the risk of transmission. • The risk can be reduced by ensuring that people and horses only have access to limited areas, maintaining good perimeter security and ensuring any event routes are clearly marked.
• Area covered	• The potential area that could be contaminated increases with area covered by the event.

• Unrestrained dogs	• If dogs have access to susceptible livestock, or by covering larger distances are able to access contaminated areas, there is an increased risk that they will contaminate an area with FMDV or become contaminated. • Dogs may also disturb wildlife, increasing the risk of virus dissemination by infected or contaminated wildlife.
• Removal of bedding/feed or other equipment from horse-box	• Increases the probability of FMDV contamination to the site of the meet.
• Cleansing and disinfection before starting activity	• FMDV is very sensitive to approved disinfectants and good biosecurity will reduce risk of virus transfer via fomites such as personnel, vehicles and equipment. • Disinfectant foot baths can be effective at reducing contamination, as long as foot wear are also cleaned and disinfectant is regularly replenished. Picking out horses hooves and ensuring equipment is clean help to reduce risks.
• Contamination via on site stabling facilities	• Appropriate cleansing and disinfection of stables between batches of horses reduces the risk the FMDV contamination passes to new horses. • Manure, bedding and feed from on site stables should be disposed off safely.
Risk of transmission: **B2 Persons, vehicles, horses or equipment are contaminated during the event and transfer virus to other uninfected areas visited whilst at the event**	
• Contact with infected livestock or contaminated areas, number of people and horses, size of group	• See B1.
• Area covered, number of premises covered	• See B1 plus if the event takes place on land comprising more than one premises, there is an increased risk of transferring FMD between premises.
Risk of transmission: **B3 Contaminated persons, vehicles, horses or equipment may cause contamination of roads or the environment leading to new premises becoming infected**	
• Failure to disinfect vehicle, personnel and equipment before outgoing and return journey, in particular inside and outside of horse boxes.	• Appropriate cleansing and disinfection reduce risk of contamination.
• Length and duration of journey, number of stops en route and proximity of route to susceptible animals	• Longer journeys and multiple stops increase risk of contaminating roads or environment. • Release of fomites in contaminated food, bedding or vermin presents a risk of release of virus on route. Risk can be minimised by only carrying the necessary amounts of food and bedding. • Proximity to high densities of susceptible animals increases risk of disease outbreak if contamination does occur.
Risk of transmission: **B4 Persons, vehicles, horses or equipment are contaminated during the event and transfer FMDV to their home premises when they return home**	
• Presence of susceptible livestock at home premises	• Direct or indirect contact with susceptible livestock provides opportunity for transmission, if contamination is present.
• Failure to disinfect vehicles, personnel and equipment before entering home premises	• Appropriate cleansing and disinfection reduce risk of contamination.

6. CONSEQUENCE ASSESSMENT

Spread of FMD to uninfected premises.

7. RISK MANAGEMENT OPTIONS

The movement of horses and spectators to and from equestrian events does carry a risk of spreading FMD to uninfected farms due to contamination of roads and environment. Indirect transmission of FMDV via fomites is an important source of infection, and any vehicles, people, equipment etc. which come into contact with FMDV risk passing disease to any livestock they come into contact with. However there is little information on the real importance of countryside access in FMD spread, meaning it is difficult to quantify this risk accurately. The risks associated with access to the countryside during an FMD outbreak are predominantly influenced by the likelihood that people/horses will already be contaminated or that they will come into contact with contaminated land or infected but undiagnosed livestock whilst in the countryside. The highest risks are therefore associated with people who have had contact with infected livestock, or people who come into contact with livestock or livestock grazing areas at the event. The risks are higher in the PZ and SZ (to a lesser extent) than the RZ since there are likely to be undetected premises with FMD , and people and other fomites are more likely to have come into contact with infected livestock.

Given that horses are not susceptible to FMDV, and all else being equal, there appears to be no reason why the probability of a horse or transportation unit carrying the virus (as a fomite) should differ to the probability that a spectator would carry the virus. However, the assumption is made, based on expert opinion, that a sizeable proportion of horse stables will be closely associated with other livestock enterprises in various ways (e.g. sheep grazing on nearby premises etc), so horses have a higher probability of carrying FMDV. Equestrian events present a higher risk than horseracing because of the different nature of events, which are held on agricultural land or in parkland.

Potential risk management options:
(i) Do not permit equestrian events to be staged in any zone.
(ii) Permit staging of equestrian events in the RZ but not in the very early stage of an outbreak, i.e. only after day 8.
(iii) Permit staging of equestrian events in the RZ from the early stages of an outbreak, under certain conditions such as:
- a) Confine events to non-agricultural land until FMD has been eradicated.
- b) Allow events only on agricultural holdings where there are no susceptible livestock.
- c) Allow events on holdings with livestock, but take precautions to limit the risk.

Although option (i) is the lowest risk option, it is also the most costly to local economies and unlikely to be necessary in areas where the risks of premises with FMD are low. In the early stage of an outbreak there is a higher risk of undetected premises with FMD in all zones so option (ii) is preferred to option (iii).

The risk is:

	PZ	SZ	RZ
With no mitigation measures	medium/high	medium	low/medium
With mitigation measures below	medium	low/medium	low

These risk levels were 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

The risk levels given in section 7 assume that the follow risk mitigation measures are followed:

A. Before movement

At premises of origin, including gallops and other exercise area:
(i) If susceptible livestock are present,
- ensure physical separation from horses and land used by horses, and
- inspect susceptible livestock regularly for evidence of FMD.

(ii) Ensure that feed and bedding are from FMD-free sources.
(iii) Vehicles used to carry horses should not have been used to transport susceptible livestock.
(iv) Disinfect horses feet (and groom), transport vehicle and personnel, and carriages used for driving, before leaving home and before re-entry.
(v) Prohibit horses whose home premises are within a PZ from entering an event.
(vi) Horses are not susceptible to FMD and, provided other premises are not visited *en route*, no additional precautions are necessary during transport. If other premises are visited they should comply with the same standards as the home premises (above).

B. At premises where event is held

(i) Equestrian events held on agricultural land should either be authorised by and under the control of the British Equestrian Federation or an affiliated organisation, or be approved by the AHVLA office responsible for the area, to whom an application must be made in writing.
(ii) Horses should not be allowed entry to an equestrian event if they originate from or have visited a stables or exercise area in the PZ in the past 7 days.
(iii) Participants should not have visited an infected premises or any premises within the PZ where susceptible livestock are kept within the past 7 days.
(iv) Ensure effective perimeter security to avoid contact between horses, dogs and people and susceptible livestock.
(v) Ensure that susceptible livestock are not present on land used for the event. If the land used for the event has been grazed by sheep or cattle, it should not be used for an equestrian event for at least 28 days after the last animal was removed, and the land should be kept free of livestock for at least 28 days thereafter.
(vi) Entry for horse transporters, horses and carriages must be by a designated disinfection point, where cleaning and disinfection should be carried out under supervision.
(vii) Pedestrian entrances for spectators and participants must be via an approved disinfectant footbath or pad.
(viii) Horses should be accompanied by an owners declaration that

- They are from premises outside the PZ,
- They have had no contact with susceptible livestock,
- If there are susceptible livestock on their premises of origin, these have been inspected prior to loading and no evidence of FMD was found,
- They have been transported in dedicated horse transport which has not been used to carry susceptible livestock, and which was cleaned and disinfected before the horse(s) were loaded.

(ix) Clean and disinfect any stabling at end of each event and before reuse.
(x) As far as possible, manure, bedding and feed should be contained and disposed of either at the site of the event or at the home premises once the home journey is complete. If there are multiple drop offs, disposal of manure, bedding and feed at multiple premises should be avoided.

9. SOURCES OF EXPERT ADVICE

This VRA included information from the following VRA:
VRA 2001 #12 (AHVLA) “What is the risk of causing new outbreaks of FMD by staging a specific equestrian event on agricultural land?” Authors Dr Wooldridge, L Gallagher, Dr Kelly, C Livesey, C Proudman, J Woods, P Kitching, KC Taylor, A Turnbull.

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12. NOTES

None