

VRA 27 - What are the risks of causing a new outbreak of foot and mouth disease (FMD) by allowing provision sheep shearing and sheep dipping services in a Restricted Zone, Protection Zone or Surveillance Zone ?

1. SUMMARY OF OVERALL RISK & RECOMMENDED ACTION

VRA27 was compiled according to terms of reference provided by the Scottish Government

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 options for mitigating the risks associated with the specified activity, and which could form the basis of licence 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 **Low in the Protection Zone and Surveillance Zone.**

RISK MANAGEMENT OPTIONS/ADVICE (SEE POINT 8).

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 will be put in place (TCZ) surrounding the suspect premises. On confirmation of disease, a national movement ban (NMB) will be enforced by introducing a national Restricted Zone (RZ). A 3 km Protection Zone (PZ) and 10km Surveillance Zone (SZ) will be 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, SZ and PZ shearing and dipping of sheep may be carried out by the occupier of the premises or the occupier's employee. These activities can only be carried out by someone other than the occupier or employee under the authority of a licence granted by an inspector (FMD (Scotland) Order 2006, Schedule 4, paragraph 4 and Schedule 6, paragraph 7).

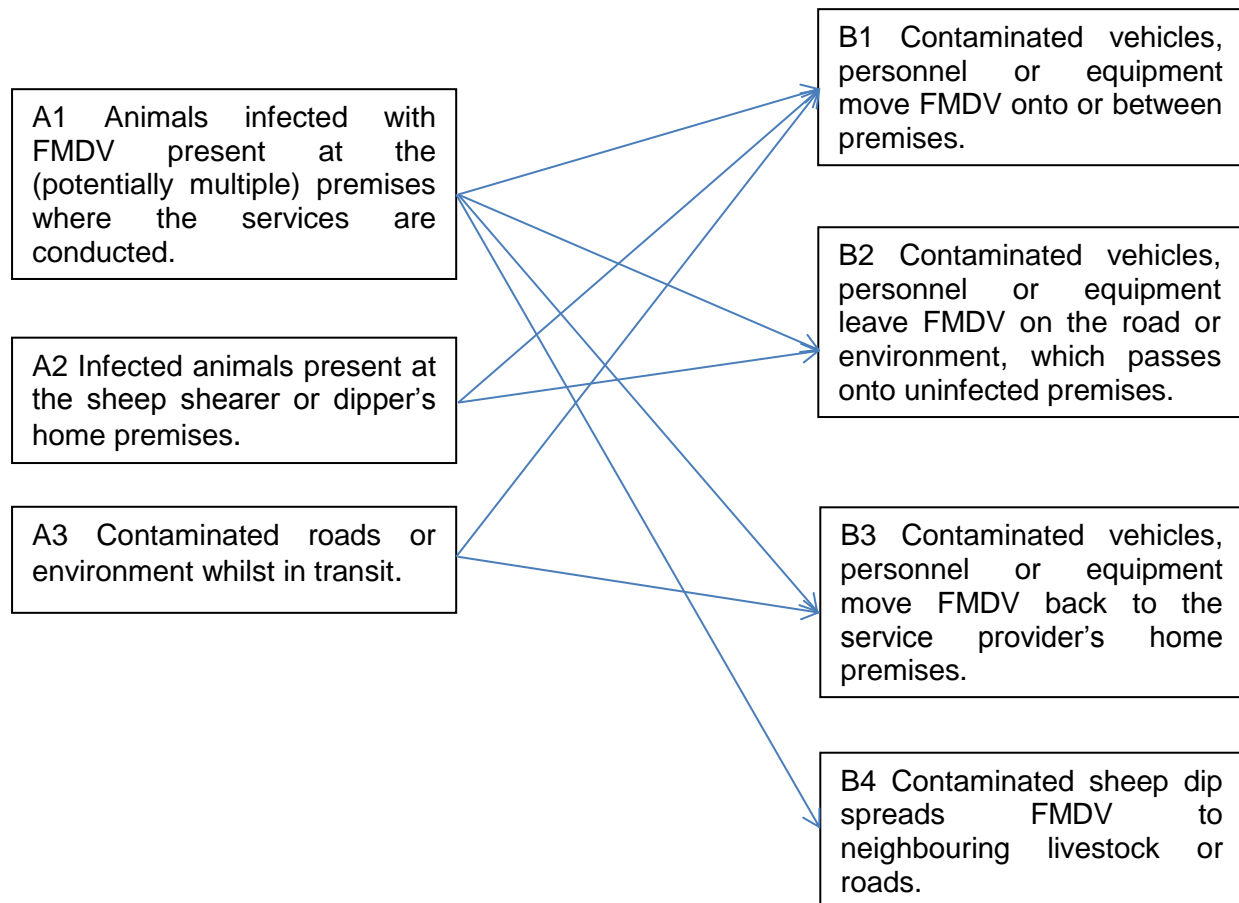
3. HAZARD IDENTIFICATION

(a) **Hazard:** FMD virus (FMDV)

(b) **Specific risk:** Movements of personnel and equipment between premises during a FMD outbreak increase the risk of spreading FMDV to premises that were previously uninfected.

However, shearing and dipping of sheep would have a significant impact on management, health and welfare of sheep if they were not carried out.

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 Animals infected with FMDV present at the (potentially multiple) premises where the services are conducted	
<ul style="list-style-type: none"> Requires animals with undetected or incubating FMDV infection, or failure to report FMD 	<ul style="list-style-type: none"> 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. Whilst transmission is most likely around the time of or shortly after the appearance of clinical signs (Charleston et al. 2011), infected livestock may excrete FMD virus for several days before the appearance of clinical signs, potentially leading to transmission or contamination prior to disease detection, particularly in cattle and pigs (Burrows et al. 1968, Orsel et al. 2009).

	<ul style="list-style-type: none"> • FMD in sheep can be difficult to detect clinically as not all animals show clinical signs. Clinical signs are usually mild and short lived (Hughes <i>et al.</i> 2002). There is therefore a higher risk of sheep spreading infection. • Inspecting livestock before the arrival of the livestock service provider will reduce the risk of undetected infection.
<p>Risk that FMDV is present on premises depends on:</p> <ul style="list-style-type: none"> • Proximity to an infected premises 	<ul style="list-style-type: none"> • Risk of a premises being infected is highest if it is adjacent or close to infected premises. Once a national movement ban (NMB) is in place, most transmission occurs by local spread (<3km from an infected premises) (Gibbens <i>et al.</i> 2001, Keeling <i>et al.</i> 2001, Haydon <i>et al.</i> 2003). • Risk of airborne transmission decreases rapidly with distance from the infected premises and is only likely to occur over significant distances if many infected animals (especially pigs) are present (Donaldson and Alexanderson 2001). • Infected premises may be already detected, or as yet undetected. • In a RZ, there are no detected infected premises. There is a risk of as yet undetected infected premises but overall the risk of local transmission is low. • In a PZ, there are confirmed infected premises. There is a risk of as yet undetected premises with FMDV. Overall the risk of local transmission between premises is Medium. • In an SZ, there are confirmed infected premises within 10km but >3km. There is a risk of as yet undetected premises with FMDV. Overall the risk of local transmission is Low.
<ul style="list-style-type: none"> • Extent and timing of movements of susceptible animals from high risk areas 	<ul style="list-style-type: none"> • Requires movements of infected animals before the NMB, or movements of animals with undisclosed infection by licence prior to declaration of a PZ/SZ. • Likelihood of movements having taken place is influenced by type of premises, for example finishing units are likely to move animals in on a regular basis, whereas closed high-security units would represent the lowest risk. • In a RZ transmission is most likely to result from movement of animals with undetected infection before the NMB. • In a PZ or SZ transmission is most likely to result from direct or indirect contact with infected animals on premises with FMDV. Indirect contact may be via fomites or airborne spread. • Airborne spread of FMDV has been documented over tens of km but is more commonly responsible for local spread only (<3km) (Gibbens <i>et al.</i> 2001), so is more likely to occur within the PZ than within the SZ. • Identifying the number and nature of livestock

	<p>movements from high risk areas using livestock movement databases and tracings would allow better quantification of the risk.</p> <ul style="list-style-type: none"> • Completion of tracings from all infected premises in the PZ would also give greater certainty.
<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 and lack of information on movements and links to infected premises. • Conversely the risk of local spread decreases with time from the last confirmation of disease in a PZ or SZ
<ul style="list-style-type: none"> • Likelihood of detection and transmission is influenced by FMD virus strain 	<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"> • Number and species of susceptible livestock 	<ul style="list-style-type: none"> • Larger numbers of animals increase the risk that some may be infected, and increases the number that would be exposed if infection were present. • Cattle and pigs (if present on the premises) produce more virus, and present a higher risk of disease transmission during the incubation period, but disease can readily be detected. • Whilst virus production in sheep is lower, disease in sheep can be difficult to detect (Hughes <i>et al.</i> 2002), meaning that the disease can often spread more widely before detection. • Sheep shearers or dippers should have no contact with any livestock other than the sheep they are shearing or treating
<p>Infection source: A2 Infected animals present at the sheep shearer or dipper's home premises</p>	
<ul style="list-style-type: none"> • Presence of susceptible livestock 	<ul style="list-style-type: none"> • If susceptible livestock are kept at the livestock service provider's home premises, there is a risk of transmission to the other premises visited. • Preventing contact with resident livestock and parking vehicles and trailers away from livestock premises would reduce this risk.
<ul style="list-style-type: none"> • Cleansing and disinfection of vehicle, trailer, personnel and equipment on leaving premises 	<ul style="list-style-type: none"> • FMDV is very sensitive to suitable disinfectants and good biosecurity will reduce risk of virus transfer to roads via fomites such as personnel, vehicles and equipment.

Infection source: A3 Contaminated roads or environment whilst in transit	
<ul style="list-style-type: none"> Proximity to infected premises 	<ul style="list-style-type: none"> Risk of contaminated roads is high if route passes close to infected premises. Risk is greater on routes through PZ or SZ
<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 suitable 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"> Presence of susceptible wildlife species 	<ul style="list-style-type: none"> 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) but the density of wild boar in UK is very low. However, in Western Europe post-outbreak serosurveys and diagnostic testing of animals with suspicious clinical signs have never revealed deer or wild boar carrying FMDV antibodies or FMDV (Elbers et al. 2003, Mouchantat et al. 2005) and there is no evidence to suggest that deer or boar have played a role in FMDV spread in UK. Other wildlife species can carry FMDV mechanically but this is very unlikely to be important except close to infected premises. Overall the risks of wildlife causing contamination of roads or the environment in the RZ and SZ are negligible, and very low in the PZ
<ul style="list-style-type: none"> Survival of FMDV on road 	<ul style="list-style-type: none"> FMD 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 et al. 2002).
Risk of transmission: B1 Contaminated vehicles, personnel or equipment move FMDV onto or between premises	
<ul style="list-style-type: none"> Cleansing and disinfection of vehicle, trailer and equipment before entering premises 	<ul style="list-style-type: none"> As above.
<ul style="list-style-type: none"> Number of premises visited 	<ul style="list-style-type: none"> Increasing number of premises visited per day increases risk of contact with infected animals and increases risk of FMDV transmission to uninfected premises. Number of premises visited will generally be small. Dipping and in particular shearing involve close contact with sheep increasing the importance of good personal biosecurity if multiple premises visited.
<ul style="list-style-type: none"> Number of animals exposed to sheep shearers or dippers. 	<ul style="list-style-type: none"> Risk of exposure to infected animals is influenced by number of livestock contacted. Sheep shearing or dipping will usually involve contact with the whole flock. Undetected infection most likely in sheep. Contact with other species on the premises, which may produce more virus in the incubation period, should be avoided.
<ul style="list-style-type: none"> Ability to cleanse and disinfect personnel, equipment and vehicles between premises 	<ul style="list-style-type: none"> Since personnel will be handling livestock, the highest risks of transmitting FMDV between premises are associated with personnel and equipment. Cleansing and disinfection of outer garments

	<p>and hands, and changing clothing between premises reduces the risk. There is evidence for FMDV transmission even with these precautions, but only for some FMDV strains, and from clinically infected pigs. This risk was removed by showering (Amass et al 2003, Amass et al 2004).</p> <ul style="list-style-type: none"> • The risk of FMDV transmission on equipment will be reduced or eliminated if equipment can be thoroughly cleansed and disinfected, or if possible disposed of on the premises. • Preventing contact will reduce risk, but will not be possible for e.g. portable dippers. • Cleansing and disinfection of vehicle will reduce risks of passing FMDV to roads or other premises.
Risk of transmission: B2 Contaminated vehicles, personnel or equipment leave FMDV on the road or environment, which passes onto uninfected premises	
<ul style="list-style-type: none"> • Cleansing and disinfection of vehicles, personnel and equipment on leaving premises 	<ul style="list-style-type: none"> • Cleansing and disinfection will reduce risks of contamination
Risk of transmission: B3 Contaminated vehicles, personnel or equipment move FMDV back to the service provider's home premises	
<ul style="list-style-type: none"> • Number of premises visited, number of susceptible animals contacted, infection risk of each premises 	<ul style="list-style-type: none"> • As above.
<ul style="list-style-type: none"> • Cleansing and disinfection of vehicles, personnel and equipment 	<ul style="list-style-type: none"> • Cleansing and disinfection will reduce risks of contamination.
<ul style="list-style-type: none"> • Contact between vehicles, trailers and equipment and susceptible livestock 	<ul style="list-style-type: none"> • Preventing contact by parking on non-livestock premises will reduce risk.
B4 Contaminated sheep dip spreads FMDV to neighbouring livestock or roads.	
<ul style="list-style-type: none"> • Disposal on farm 	<ul style="list-style-type: none"> • Reduces potential for spread, or spillage on roads • Risk of aerosol reduced by downward spray • Disposal away from neighbouring livestock reduces likelihood of aerosol spread
<ul style="list-style-type: none"> • Treatment of dip to inactivate active ingredients 	<ul style="list-style-type: none"> • Treatment with acid or alkali/lime (in accordance with manufacturers guidance) may destroy FMDV
<ul style="list-style-type: none"> • Disposal off site 	<ul style="list-style-type: none"> • Must be in leak proof transport due to chemical hazard as well as potential for spread of FMDV. • Disposal off site (on premises approved by SEPA) negates risk to neighbouring livestock

6. CONSEQUENCE ASSESSMENT

Spread of disease to uninfected premises

7. RISK MANAGEMENT OPTIONS/ADVICE

Shearing and dipping of sheep require operatives and equipment to come into direct contact with livestock and travel between premises with their equipment. This presents a risk of moving FMDV between premises if undisclosed infection is present. Highest risks are

associated with visiting multiple premises, as sheep may harbour undetected infection, and insufficient cleansing and disinfection between premises may allow transfer of FMDV.

Risk management options:

- (i) Do not allow clipping or dipping of sheep to resume
- (ii) Allow resumption of clipping and dipping of sheep essential to welfare or management under certain conditions, allowing single visits only, or insisting on mandatory periods between visiting different premises.
- (iii) As above but allow multiple visits per day.

Clipping and dipping of sheep present an unnecessary risk in the very early stages of the outbreak when option (i) must be followed... Alternatives to dipping sheep, such as pour on or injectable treatments should be considered. Timing of shearing is not so critical in animal welfare terms, but it cannot be delayed indefinitely. Once the risk of undetected premises has reduced and data on movements and livestock tracings is available, the risk can be better quantified. If the risk is perceived to be low, these livestock services can resume in the RZ. Option (iii) is likely to be the most appropriate at this stage, as long as appropriate cleansing and disinfection are carried out to reduce the risk of transmission between premises. In the PZ and SZ the likelihood of undisclosed infection is higher. Option (ii) is most appropriate, with a single visit per day in the SZ or PZ. If preceding visits have been made in the RZ this must be the last visit of the day.

8. RECOMMENDED RISK MITIGATION MEASURES

Before allowing the resumption of sheep shearing and dipping that is considered essential for welfare or management reasons, livestock movement and tracings data should be collected and analysed to assess the risk that undisclosed infection is present in the area of interest. If the risk is low shearing and dipping of sheep represent a low risk and can be permitted under a general licence. It would be anticipated that for the PZ and SZ that at least one incubation period would have elapsed since the last infected premises in the relevant PZ before issue of a general licence. The following conditions apply:

A Before arrival

- (i) Visits should be limited to those considered essential for management.
- (ii) Animals should be checked for signs of FMD before the sheep shearers or dippers arrive or are allowed onto the premises.
- (iii) Arrangements for dip disposal on the premises, or arrangements with an approved waste contractor must be in place with appropriate SEPA consent

B Whilst at the premises

- (i) On arrival at any premises, all trailers and vehicles must be cleansed and disinfected with an Approved disinfectant at FMD Order dilution.
- (ii) If possible, livestock service providers should park their vehicles at the premises entrance and take onto the premises only the equipment needed.
- (iii) Clean protective clothing must be worn that can be cleansed and disinfected between visits, or else new protective clothing worn on each occasion.
- (iv) All equipment used must be cleansed and disinfected before work starts with an Approved disinfectant at FMD Order dilution.
- (v) Livestock to be handled on the premises must consist only of the animals to be treated.

C Dip Disposal

- (i) Where possible and compatible with manufacturer's recommendations acid or alkali treatment to inactivate dip should be used.

- (ii) If disposed of on farm used dip should not be sprayed within 100m of neighbouring susceptible livestock, or within 20m of roads. A downward pointing spray should be used to reduce aerosol.
- (iii) If transported off site for disposal ensure that waste sheep dip is securely contained within the transport outfit and that all chances of spillage are minimised. Dip must not be re-used on other premises.

D On leaving premise

- (i) All equipment used must be cleansed and disinfected at the end of a premises visit with an appropriate disinfectant. Any clothing equipment that cannot be cleansed and disinfected adequately, or used equipment for disposal should be disposed of on the premises.
- (ii) Sheep shearers should where possible shower before leaving the premises, and in any case before visiting other premises.
- (iii) Sheep shearers or dippers must not contact or care for other livestock for 24 hours after last visit.
- (iv) Vehicles and trailers should be kept on non-livestock premises when not in use.

E Multiple Visits

- (i) Multiple visits may be made in any one day provided all conditions are met.
- (ii) Only one visit to premises in a PZ or SZ may be made per day, and must be the last visit of the day.

9. SOURCES OF EXPERT ADVICE

This VRA is substantially based on: VRA8, which was compiled by Harriet Auty and Lisa Boden (EPIC CEADO) Date: 10/02/2012.

10. AUTHORS

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11. REFERENCES

Amass SF, Pacheco JM, Mason PW, Schneider JL, Alvarez RM, Clark LK, Ragland D (2003) Procedures for preventing the transmission of foot-and-mouth disease to pigs and sheep by personnel in contact with infected pigs, *Veterinary Record* 153, pp137-140.

Amass SF, Mason PW, Pacheco JM, Miller CA, Ramirez A, Clark LK, Ragland D, Scheider JL, Kenyon SJ (2004) Procedures for preventing transmission of foot-and-mouth disease virus (0/TAW/97) by people, *Veterinary Microbiology* 103, pp143-149.

Bartley LM, Donnelly CA, Anderson RM (2002) Review of foot-and-mouth disease virus survival in animal excretions and on fomites *Veterinary Record* 151, 22, pp667-669.

Burrows R (1968) Excretion of foot-and-mouth disease virus prior to the development of lesions, *Veterinary Record* 82, pp387-388.

Charleston B, Bankowski BM, Gubbins S, Chase-Topping ME, Schely D, Howey R, Barnett PV, Gibson D, Juleff ND, Woolhouse MEJ (2011) Relationship Between Clinical Signs and

Transmission of an Infectious Disease and the Implications for Control, *Science* 332, 6030, pp726-729.

Defra, (2011) Qualitative analysis of the risk of introduction of Equine Infectious Anaemia (EIA) into Great Britain from an EIA endemic area through temporary movement of UK origin horses (Roberts, H. & Paterson, A.) Veterinary Science Team, 17 Smith Square, London, SW1P 3JR, United Kingdom. Version 1.0, Released 20 June 2011, p15.

Donaldson AI, Alexanderson S (2001) Relative resistance of pigs to infection by natural aerosols of FMD virus. *Veterinary Record* 148, 19, pp600-602.

Gibbens JC, Sharpe CE, Wilesmith JW, Mansley LM, Michalopoulou E, Ryan JBM, Hudson M (2001) Descriptive epidemiology of the 2001 foot-and-mouth disease epidemic in Great Britain: the first five months. *Veterinary Record* 149, 24, pp729-743.

Gloster J, Doel C, Gubbins S, Paton DJ (2008) Foot-and-mouth disease: Measurements of aerosol emission from pigs as a function of virus strain and initial dose, *Veterinary Journal* 177, 3, pp374-380.

Haydon DT, Chase-Topping ME, Shaw DJ, Matthews L, Friar JK, Wilesmith J, Woolhouse MEJ (2003) The construction and analysis of epidemic trees with reference to the 2001 UK foot-and-mouth outbreak. *Proceedings of the Royal Society of London Series B-Biological Sciences* 270, pp121-127.

Hughes GJ, Mioulet V, Kitching RP, Woolhouse MEJ, Alexanderson S, Donaldson AI (2002) Foot-and-mouth disease virus infection of sheep: implications for diagnosis and control, *Veterinary Record* 150, 23, pp724-727.

Keeling MJ, Woolhouse MEJ, Shaw DJ, Matthews L, Chase-Topping M, Haydon D, Cornell SJ, Kappey J, Wilesmith J, Grenfell BT (2001) Dynamics of the 2001 UK foot and mouth epidemic: Stochastic dispersal in a heterogeneous landscape, *Science* 294, 5543, pp813-817.

Kitching RP, Hughes GJ (2002) Clinical variation in foot and mouth disease: sheep and goats, *Revue Scientifique et Technique de l'Office International des Epizooties* 21, 3 pp505-512.

OIE (2004) Handbook on Import Risk Analysis for Animals and Animal Products: Introduction and qualitative risk analysis, Vol.I. OIE Publications, Paris.

Orsel K, Bouma A, Dekker A, Stegeman JA, de Jong MCM (2009) Foot and mouth disease virus transmission during the incubation period of the disease in piglets, lambs, calves, and dairy cows, *Preventive Veterinary Medicine* 88, 2, pp158-163.

Sanson RL (1994) The epidemiology of foot-and-mouth disease: Implications for New Zealand, *New Zealand Veterinary Journal* 42, 2 pp41-53.

12. NOTES

None