

DPI Primefact

Foot and Mouth Disease Investigations – Using Timelines

July 2022, Primefact 1413, second edition

Author: Animal Biosecurity

Timelines

Timelines are a useful tool for epidemiological investigations of Foot and Mouth Disease (FMD). They determine the most likely infection and transmission period on the property and the possible date of introduction. It also helps to determine the highest risk period of spread so animal and other tracing can be prioritised. Timelines give:

- A time window for introduction of the virus (based on the incubation period)
 - A time window for spread to other units (using the period of virus excretion)
-

Investigating an FMD outbreak

The first priorities when investigating an outbreak are to establish:

- Is it likely to be FMD?
 - How long has the virus been on the premises?
 - Where did the virus come from?
 - Where might the virus have spread to?
 - The magnitude of problem: number of cases, epidemiological units and population at risk.
 - A timeline helps answer many of these questions.
-

Essential information

- **Lesion ageing** – as a rough guide, with lesions up to 5 days old in cattle and sheep it is possible to be accurate to with +/- 1 day. Ageing becomes less accurate in lesions 5-7 days old, and it is impossible to accurately age lesions over 7 days old.
- **Incubation period** – the incubation period represents the time from infection (virus enters the animal) to disease (the animal shows clinical signs of infection).
 - Incubation period can range from 1-14 days
 - The incubation period is more likely to be 2-5 days
- **Transmission period and Species Difference in Virus Excretion** – cattle and pigs may excrete virus 1 day (pigs) to 2 days (cattle) prior to clinical signs but the main infectivity is when vesicles are present (i.e. for 3-4 days). Virus can be detected in milk up to 4 days before the appearance of clinical signs in

cattle. Sheep will excrete virus 2 days before clinical signs and for a shorter time afterwards (2-3 days).

How to make a timeline

1. The oldest lesion on the premises must be identified and accurately aged.
2. This will involve examining as many animals on the premises as possible.
3. Know the incubation period and virus excretion periods for species (this is already in the template).
4. Use the template - [Timeline template](#).
5. Follow the instructions below.

How to use the timeline

Example scenario- FMD suspected in a dairy herd

- The vet visits a dairy farm on 31st August.
- Owner noticed milk drop and lethargy in some animals yesterday.
- Oldest lesion detected is 4 days old in a calf.

Age of oldest lesion (days)												1	2	3	4	5
Day of visit:																
Date:								23/08/15	24/08/15	25/06/15	26/08/15	27/08/15	28/08/15	29/08/15	30/08/15	31/08/15
Start of clinical signs																
Incubation period																
Most likely infection period																
Transmission period																
Transmission in milk																

You will need to enter on the template:

1. the age of the oldest lesion (highlight the relevant box in row 2) (*The oldest lesion is 4 days*)
2. the date the farm was visited - this date will coincide with the column for the oldest lesion (*The date is the 31st August*)

It is not necessary to enter any further data. The timeline will give you the following information:

- a. the start of clinical signs (*the date is 27th August*)

- b. **the incubation period (range)** - incubation period range is 1-14 days
- Earliest possible date of infection is 4 days (age of lesion) +14 days (max incubation period) (*the date is the 13th August*)
 - Latest possible date of infection is 4 days (age of lesion) +1 (min incubation period) = 5 days (*the date is the 26th August*)
- c. **the most likely infection period** – is likely to be 2-5 days before the appearance of clinical signs (peak incubation period). (*This gives a most likely infection period of the 22-25 August*)
- d. **the transmission period (range)** - Transmission can begin 2 days before clinical signs in cattle, so the earliest transmission is 2 days plus 4 days (age of lesion)= 6 days ago (*The date is the 25th August*)

NB If an adult cow was infected, excretion of virus in milk could have begun 4 days prior to clinical signs (*The date would be the 23rd August*)

- e. **the peak transmission period for this animal** - Peak transmission in cattle occurs from day 0-4 after appearance of clinical signs. (*The date of transmission is 27th August and may still be infectious at the time of visit on day 4*).

NB Transmission is likely to be ongoing- given multiple animals on the premises are now likely to be infected and the end of the transmission period cannot be calculated.

3. Use the timeline for source and spread tracing

- **Prioritise any contacts** during the time period for infection (*22-25 August*) as they are the most important risk
- **Prioritise type of contact** – the highest risk contacts are pigs, larger premises, livestock hubs, premises with regular animal movements, direct animal contacts, and neighbours with FMD susceptible animals.
- See Primefact - [Guidelines for Prioritisation of Foot and Mouth Disease Tracings](#)

More information

Animal.biosecurity@dpi.nsw.gov.au

Acknowledgments

EuFMD e-Learning

References

Alexanderson S., Zhang, Z., Donaldson A.I. and Garland A.J. (2003). The pathogenesis and diagnosis of foot-and-mouth disease. *Journal of Comparative Pathology* 129(1) 1-36 [Available here](#).

Burrows R. (1968) Excretion of foot and mouth disease virus prior to the development of lesions. *Veterinary Record* 82 387-8

Charleston B. and Rodriguez L.L (2011). Understanding Foot-and-Mouth Disease Virus Early Pathogenesis and Immune Responses. *Transboundary and Emerging Diseases*. 58(4) 1865-1682. [Available here](#).

Charleston B. et al. (2011) Relationship between clinical signs and transmission of an infectious disease and the implications for control. *Science*.332(6030):726-9 [Available here](#).

Cottam, E.M. et al (2008) Transmission pathways of foot-and-mouth disease virus in the United Kingdom in 2007. *PLoS Pathogens* 18 4,4. [Available here](#).

Guide to Lesion Ageing produced by DEFRA, UK

[INT15/7785[v2]]

© State of New South Wales through Regional NSW 2022. The information contained in this publication is based on knowledge and understanding at the time of writing July 2022. However, because of advances in knowledge, users are reminded of the need to ensure that the information upon which they rely is up to date and to check the currency of the information with the appropriate officer of the Regional NSW or the user's independent adviser.