



Animal &  
Plant Health  
Agency

# **An Epidemiology report detailing the investigation of an outbreak of EVA virus on two connected premises in Dorset and Devon in March / April 2019**

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The Animal and Plant Health Agency (APHA) is an executive agency of the Department for Environment, Food & Rural Affairs, and also works on behalf of the Scottish Government and Welsh Government.

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# 1. Introduction

## Background

Equine viral arthritis is occasionally detected in the UK in stallions which are tested for pre-breeding or for export purposes; the last confirmed case was in 2012. Under the EVA Order (1995) the disease is only notifiable in stallions and in mares which have been mated or inseminated in the past 14 days.

Infection with equine arteritis virus (EVA) was confirmed by PCR testing of semen samples from three non-thoroughbred dressage stallions kept on one premises in Dorset, and a single stallion on a second premises in Devon.

The infections were initially disclosed as a result of routine, private, pre-breeding ELISA-based serology testing, as recommended by the Horserace Betting Levy Board (HBLB) Code of Practice for EVA. These tests returned non-negative results in a private laboratory, which were subsequently notified to APHA under the EVA Order 1995 and official samples confirmed the seropositive results and that semen tested positive with two different PCR tests. One semen sample also tested positive by virus isolation.

The single positive stallion in Devon has had close contact with the positive Dorset stallions, and the two infected premises could be considered to be functionally one epidemiological group in the context of equine viral arteritis. Clinical signs were not observed in any of the four positive stallions, or signs of acute infection reported in other horses on either of the infected premises.

Horses from the Dorset and Devon premises had regular, prolonged contact when travelling together to take part in events and shows, when they often shared transport, and where they are usually stabled close together. Horses have also moved between the two premises for breeding purposes, and one of the infected stallions travelled to an artificial insemination (AI) stud in Staffordshire for semen collection.

## Descriptions of the premises

- (1) The Dorset premises - is a small commercial stud farm and dressage training facility. At the time of the initial disease investigation there were 35 horses present in total, including liveries.

(2) The Devon premises - is located close to a leisure facility in Devon. The centre provides recreational riding and lessons to visitors, using resident horses only; other horses do not visit the centre. At the time of the initial disease investigation there were 45 horses present on site.

## 2. Hypotheses for the source of infection

### Most likely sources of infection

EVA can be transmitted through a respiratory route between horses in close contact, through sexual transmission and through fomites (contaminated equipment). None of the four stallions had been mated recently with the same mare and in two cases the stallions had never been used for mating before. Therefore the respiratory route was considered the most likely source of infection and potentially a route for spread.

EVA is present in several other EU Member States, including Spain and there are no requirements under trade rules for animals to be vaccinated, or pre-movement tested, prior to entry into the UK, although vendors and purchasers may agree to private testing. The stud farm in Dorset had imported three horses from Spain in December 2018, and the two stallions in that consignment tested negative on arrival; the third, a mare, was not tested at that time.

Tracings revealed that the same premises of origin sent a third stallion to the UK in July 2018 and this is currently resident in Staffordshire. It is under investigation after testing positive by ELISA for EVA antibodies and is subject to breeding restrictions. It has provided an initial semen sample that has tested negative by PCR, and is awaiting a decision on the necessity of a second semen sample for testing.

There were multiple occasions throughout 2018 when all four affected stallions attended equine gatherings, such as shows or events in the UK, which presented the opportunity for both acquiring and spreading the disease. None attended any shows outside England, but there were horses from other Member States (Spain) present. Three of these 2018 gatherings are considered to be offering a distinctly higher likelihood of being the source of infection compared to the others investigated, due to: (i) stabling with enclosed, shared airspaces, (ii) the potential for close, nose-to-nose contact, and (iii) in the case of two of the shows, the significant proportion of horses attending from EU Member States with a known higher prevalence of EVA infection.

The movement of two stallions from Spain to the Dorset holding is not considered to be a likely source of the infection, as both tested seronegative EVA, when post-

movement tested, and were recently confirmed negative by official SNT serology testing on 15/04/2019.

A mare that accompanied these stallions tested negative by private serological testing for EVA by a private laboratory on 05/06/2019 and 21/06/2019, and was consequently ruled out as a source. However when the other mares and geldings were tested at the Dorset premises, eleven mares, one gelding and four colts all tested seropositive, indicating at some point in the past year respiratory infection had occurred at the establishment but the source of infection could not be confirmed. .

## Estimated date of introduction of disease onto the Dorset and Devon premises

One of the current hypotheses for the source is that one or more of the stallions was infected at one of the shows / events attended in 2018, as a result of direct contact, aerosol or fomite transmission from either:

1. A non-UK stallion with undisclosed infection and shedding of EVA virus (most likely at one of the three higher risk shows identified between 25/07/2019 and 07/10/2019), or
2. A UK based stallion with undisclosed infection and shedding of EVA virus.
3. A UK, or non-UK-based stallion, mare or gelding, with undisclosed acute EVA infection and shedding EVA virus via the respiratory route.

The infection was spread from the primary case to the other infected stallions through close contact, aerosol or fomite transmission. There is currently no evidence that natural service has been a factor as the source of infection.

Alternatively, the source of infection was the presence of circulating virus at the Dorset premises over the summer period. The other horses tested positive were checked for date of arrival at the premises and whether the mares had been mated to home stallions and if the offspring were also positive. From this analysis it was determined that infection arrived on the premises after April 2018 at the very earliest but had stopped circulating by December 2018.

The most probable source window for the non-UK stallion hypothesis, based on the tracings data currently available is from 25/07/2018 to 07/10/2018, which covers attendance at the three higher risk equine events, or shows, in Devon, Bedfordshire and Buckinghamshire.

## 3. Hypotheses for the spread of infection

### Natural service or artificial insemination

There is currently no evidence to suggest that natural service or AI has been a factor in the spread of infection on the premises, or to additional premises. Spread via infected AI semen can be ruled out due to the negative PCR results on samples taken from all four ejaculates from the only stallion at either of the infected premises from which semen was collected and stored.

### Direct tracings to Scotland, Wales or Northern Ireland

There are currently no direct tracings to Wales, or Northern Ireland. One straw of semen was despatched from the AI stud in Staffordshire to inseminate a mare located in the St. Andrews area in Scotland. The mare did not become pregnant to this insemination and it is important to note that this batch of semen has been confirmed negative by two consecutive PCR tests on samples from all four ejaculates. Two mares had moved off the Dorset premises to Scotland since the risk period, but given the time which had elapsed since the possible respiratory transmission window no further action was taken.

### Spread between the Dorset and Devon premises

The two infected premises are functionally one epidemiological group due to frequent close, direct and indirect contact, both during transportation, and at shows or events. Aerosol spread (via respiratory and / or urinary secretions) is possible due to: (i) any co-located horses (not just stallions) within the stable block, (ii) within vehicles and trailers taking horses to events and (iii) while at events. There were a large number of equine events attended, which provide the potential to both acquire and spread the virus.

**Details of the three highest risk events visited as part of the tracings exercise have been summarised in annex 1,**

Table 2. Considerable uncertainty exists about the potential for contact between horses at the events listed, however there is confidence in the prolonged and repeated mutual exposure of the four EVA seropositive stallions during transport.

Spread via fomite contamination at the yard is possible in both premises, because cleaning, grooming and feeding equipment is shared throughout, and so this risk pathway cannot be excluded.

There are no reports of abortions, and therefore the risk posed by aborted material does not exist.

One mare which was mated to one of the positive stallions at Dorset was moved back to Devon but has not been tested, however she has subsequently given birth to a healthy colt foal.

## Spread to other EU Member States

There was no travel to other EU member States in the period 2018 to 2019 by any of the stallions confirmed to be EVA positive, except for one of the stallions which returned to Spain with agreement of the Spanish Authorities.

## 4. Official testing of traced horses

Hampshire - A stallion stabled in Hampshire that had attended one of the higher risk events, but was not considered to be a high risk contact was privately tested with a non-negative serology result, and no history of vaccination. This stallion was placed under movement and breeding restrictions and a first semen sample submitted for official PCR testing and this tested negative on 17/06/2019. Three further attempts have been made to collect a second semen sample and these have all been unsuccessful as of 30/07/2019.

East Sussex - A stallion stabled in East Sussex that had attended one of the higher risk events, but was not considered to be a high risk contact was privately tested with a non-negative serology result, and no history of vaccination. This stallion was placed under movement and breeding restrictions and a first semen sample



submitted for official PCR testing and this tested negative on 17/06/2019. Two further attempts have been made to collect a second semen sample and these have all been unsuccessful as of 30/07/2019.

## 5. Private surveillance testing

Increased stakeholder engagement and increased public awareness, aided by an offer of subsidised testing by the Animal Health Trust, Newmarket, UK has led to an increase in private testing.

Dorset – the owner voluntarily blood tested all the remaining horses present at the premises, in accordance with the HBLB Codes of Practice. Eleven mares, four colts and one gelding all tested positive and there was no vaccination history. All four colts were gelded on 24 June 2019. The four uninfected stallions had been placed under restriction, tested negative and then vaccinated in accordance with the vaccine manufacturers recommendations.

Staffordshire - a stallion based in Staffordshire was identified as a potential tracing, but was assessed as being a lower risk; however, the owner became aware of the outbreak as a result of personal contacts and the increased stakeholder engagement, and as a result of this, the owner's private veterinary surgeon submitted a blood sample for testing at a private laboratory. This initial blood sample was tested and found to be positive by SNT on 15/04/2019, with no history of vaccination. A subsequent semen sample was submitted for official testing and was confirmed negative by PCR on 07/05/2019.

## 6. Remaining uncertainties and outstanding investigations:

There is a significant level of uncertainty due to the lack of detailed movement records (both at the infected premises and at the equine events attended), clinical records and limited routine, pre-breeding EVA testing. This has created extended source and spread windows.

## 7. Conclusions

Source - the current hypotheses for the most likely source are that one or more of the stallions was infected at either the premises in Dorset or at any of the shows /

events attended in 2018, as a result of contact / aerosol or fomite transmission from the primary case that was either:

1. A non-UK stallion with undisclosed infection and shedding of EVA virus (most likely at one of the three higher risk shows identified between 25/07/2019 and 07/10/2019), or
2. A UK based stallion with undisclosed infection and shedding of EVA virus.
3. A UK, or non-UK, based stallion, mare or gelding with undisclosed acute EVA infection and shedding EVA virus.

Spread - There is currently no evidence to suggest that natural service or AI has been a factor in the spread of infection on the premises, or to additional premises. Spread via infected AI semen can be ruled out.

## 8. Annex 1: Details of the tracings identified

**Table 1: Summary of tracings activities**

<b>Activity</b>	<b>No:</b>
Total number of confirmed EVA positive cases	4
Number of seropositive EVA cases pending confirmatory testing	3
Total premises involved with confirmed cases	2
Total number of tracings required	67
Number of tracings completed	67
Number of tracings pending results	0
Number of tracings in progress	0

**Table 2: Progress on the High Risk Tracings from the three shows (as of 08:00 on 27/06/2019)**

	Event / show in Devon	Event / show in Buckinghamshire	Event / show in Gloucestershire	TOTAL
Number of horses to trace	13	26	28	67
England	11	20	25	56
Scotland	0	0	1	1
Wales	2	6	1	9
Unknown/Other	0	0	1	1
<b>TOTAL</b>	<b>13</b>	<b>26</b>	<b>28</b>	<b>67</b>
Telephone Tracings Inquiries Resolved	13	26	28	67
Telephone Tracings Inquiries Outstanding	0	0	0	0
<b>TOTAL</b>	<b>13</b>	<b>26</b>	<b>28</b>	<b>67</b>
Number of Geldings	3	11	11	25
Number of Mares	0	0	0	0
Number of Stallions	10	15	17	42
Unknown/Other	0	0	0	0
<b>TOTAL</b>	<b>13</b>	<b>26</b>	<b>28</b>	<b>67</b>
Visit Requested	10	15	14	39
Restrictions Served	9	14	13	36
Visits Completed	10	15	13	*38
Samples Taken	7	13	7	27
Sample results - Negative	7	12	6	25
Sample results - Non Negative	0	1	1	2
Restrictions Lifted	9	14	12	35

\* One visit not completed as horse in Spain

## 9. Annex 2: Test results for official testing carried out and reported as of 30/07/2019

Table 3: Test results for official testing carried out and reported as of 30/07/2019

Disease Reference	Location	Serum SNT	Semen PCR 1	Semen PCR 2	Semen Genotyping	Virus Isolation
EVAD 2019 01	Dorset	-	-	-	-	-
EVA 2019 04	Dorset	POSITIVE 25/02/2019	INCONCLUSIVE 28/3/2019	POSITIVE 15/04/2019	POSITIVE 15/04/2019	
EVA 2019 05	Dorset	POSITIVE 25/02/2019	POSITIVE 28/3/2019	POSITIVE 02/04/2019	POSITIVE 02/04/2019	
EVA 2019 06	Dorset	POSITIVE 25/02/2019	POSITIVE 28/3/2019	POSITIVE 02/04/2019	POSITIVE 02/04/2019	POSITIVE 02/04/2019
	Dorset	NEGATIVE 15/04/2019				
	Dorset	NEGATIVE 15/04/2019				
	Dorset	NEGATIVE 15/04/2019				
	Dorset	NEGATIVE 15/04/2019				

Disease Reference	Location	Serum SNT	Semen PCR 1	Semen PCR 2	Semen Genotyping	Virus Isolation
<b>EVA 2019 07</b>	Devon	POSITIVE 25/03/2019	POSITIVE 3/05/2019	POSITIVE 10/05/2019	POSITIVE 10/05/2019	
<b>EVA 2019 08</b>	Staffordshire	POSITIVE 15/04/2019	NEGATIVE 7/05/2019			
<b>EVA 2019 11</b>	Hampshire	POSITIVE 20/05/2019	NEGATIVE 14/06/2019			
<b>EVA 2019 12</b>	East Sussex	POSITIVE 24/05/2019	NEGATIVE 11/06/2019			

## 10. Annex 3: Description of the Dorset Premises

The Dorset premises is a small commercial stud farm and dressage training facility. As at 03/04/2019 there are 35 horses present in total, including liveries. Also seven sheep, three alpacas and a flock of twelve birds, including chickens and ducks.

The stable block is occupied by the stallions, some of the mares and the livery horses - it is considered to be a shared air space, and cleaning equipment is normally shared. There is no grazing shared with other holdings, nor use of common grazing. There are no known linked premises.

Seven stallions are housed in the American barn-style stable block, without access to grazing, at all times whilst on site.

Twenty mares are permanently at grazing during the summer, but housed in a large loose barn over winter. There is also a mare section of the stable block used to house mares when expecting to foal and preparing mares for riding out or for eventing etc. Sheep and alpacas are grazed with the mares.

Three geldings reside within the stable block, and are grazed separately to other horses.

Five foals are at grazing in the summer and spend the winter in their own dedicated barn. One of the group is a livery foal who the owner decided to have privately EVA tested recently – the result is reportedly negative.

24 horses on the premises were subject to private EVA screening on 05 June which disclosed 16 seropositive results (11 mares, 1 gelding and 4 yearling colts). Resampling on 19/21 June 2019 demonstrated that all previously seronegative horses remained seronegative and the previously seropositive mares, colts and gelding showed stable titres in the second sample. The 4 seropositive yearling colts were castrated on 24 June 2019.

### Overview of biosecurity:

The owner takes sole responsible for the care of animals if they become sick and follows a quarantine protocol for new horses arriving at the yard. This protocol varies depending on time of year and availability of stables - no written documents exists. Alcohol hand gel and dedicated equipment were cited to be available when the quarantine protocol is active.

The owner reports that thorough cleaning and disinfection (using Jeyes fluid) of the stables is performed as part of the normal cleaning routine as well as when setting stables up for use as quarantine facilities. Spring water is automatically piped to the stable troughs and food buckets are dedicated to each horse, as are the rugs, head collars and tack. The stables have a deep clean and re-paint annually in the summer, last performed summer 2018. A rodent problem was successfully addressed in 2017 and further problems have not been noticed.

The yard and buildings are generally tidy, but there is no defined biosecurity employed and cleaning equipment is shared.

## Vaccinations

The owner does not have an EVA vaccination protocol, and is not aware that any of the resident or livery horses have been vaccinated for EVA. The owner advises that 'flu and tetanus vaccinations are up to date only for those horses that require it for events/travel.

## Breeding Practices

Resident stallions are used to naturally serve resident mares. In addition, during August 2018, one stallion intentionally served a mare that was brought onto the site for a three week period from a premises in Devon. Afterwards, the mare returned to her normal residence at the Devon premises where she remains. The other two mares in foal to this stallion remain on site in Dorset.

Semen is collected from some stallions at a specialist centre in Shropshire, stored and used for artificial insemination by third parties. This AI Centre is regarded as following high standards and best practice. Good records have been provided to APHA to enable tracings of the semen. There have been no reported reproductive issues such as abortions.

## Movements

Up to 20 of the owners horses, including stallions, attend events, competitions and training premises in the UK and mainland Europe during the year, although no international trips were noted for the stallions in 2018 or 2019. The owner books the venues in advance and the horses stay at the venue for the duration of the event if it is not possible to return home the same day. There have also been regular visits to a water treadmill in Somerset for exercise.



Movements have been well documented by the owner and have enabled a comprehensive timeline to be produced. However, in the latter half of 2017, one stallion attended very few events, as he was suffering from a prolonged lameness issue. The owner could not recall which events he attended.

## Imports

On 14/12/2018, one mare and two stallions were imported from Spain. All three of horses remain in residence, and all three horses have tested EVA seronegative since being imported.

## Transport

The owner has a horse box with capacity for three animals and will make multiple journeys, or hire a professional transporter, if moving more than three horses. The stallions regularly share transport to events with a stallion usually kept at the Devon premises, where one of the mares is kept.

## Visiting Horses

There is a farrier based on site, but horses do not visit the premises for this purpose. The site sees horses arrive to use the arena, but these animals are unloaded from their transporter in the yard, taken directly to the arena and returned to the lorry afterwards. There is no contact with any of the resident horses.

## Description of surrounding area and other known susceptible livestock in locality

The owner reports there are no other horses in the vicinity and therefore nose-to-nose contact with neighbouring horses is not possible. Local knowledge of the area is supportive of this.

## Annex 4: Description of the Devon premises

The Devon premises is located next door to a leisure facility in Devon, but the two businesses operated independently of one another. The centre provides recreational riding and lessons to visitors, using resident horses only; other horses do not visit the centre. The centre's five staff do not have regular contact with other horses at other locations. The current owner has been established at this location since 1999 and is unaware of any other horses in the immediate vicinity.

### Details of all horses resident at the Devon premises

45 horses are currently associated with the Devon premises, there are no foals. The details are as follows:

- 38 horses, including one stallion and one mare mated to one of the positive stallions from Dorset.
- 2 horses at the main stable yard are on very long-term livery, and are essentially resident.
- 5 owned are currently not at the main stable yard. Full details of these are given in table 4 below:

**Table 4: Details of horses currently not resident at the main stable yard.**

Name of horse off-site	Date horse left the site	Reason moved off-site
Horse 1	Spring 2018	On loan
Horse 2	Spring 2018	Grazing with horse 5
Horse 3	Sept 2018	On loan
Horse 4	Autumn 2018	On loan
Horse 5	Autumn 2018	Grazing with horse 2

**Table 5: Details of additional six horses not described in Table 4**

	Name of horses not on PDF list	Notes
1	Horse 6	Gelding, purchased 02/04/19 from a private owner via a market.
2	Horse 7	Gelding, purchased 02/04/19 from a private owner via a market.
3	Horse 8	Gelding, long term livery owned by a third party. ~26 y/o.
4	Horse 9	Mare, on site >3yrs
5	Horse 10	Mare, approximately 7 y/o. On site since Autumn 2018.
6	Horse 11	The only stallion, EVA seropositive 12/03/2019.

## Contact between horses

There is no separation of horses in stables according to gender / type – mares and geldings are distributed across the site, throughout the various stable blocks. The owner advises that resident horses ordinarily have no contact with any non-resident equines, with two notable exceptions:

1. One of the stallions when attending events.
2. A mare that was served on 30/08/2018 and 31/08/2018 at the Dorset premises by one of the resident stallions that was confirmed by APHA to be EVA positive on 04/04/2019.

## Breeding activity

No breeding activity is undertaken on the premises.

The mare that was served at the Dorset premises has been at grazing with another mare since returning from the Dorset premises. Neither were tested for EVA.

It is important to note that the Devon stallion has never been used for natural service, or provided any semen for artificial breeding purposes, therefore no semen straws originating from this stallion are in existence.

## **Vaccination history**

None of the horses are vaccinated against EVA. Influenza and tetanus vaccines are only kept up-to-date for horses which require them in order to attend events. The PVS last visited the stallion in February 2019 to provide 'flu and tetanus vaccination.

## **Description of the surrounding area and other known susceptible livestock in locality**

The current owner of the business has been established at this location for approximately 20 years and is unaware of any other horses in the immediate vicinity.