Ministry for Primary Industries
Manatū Ahu Matua

Equine Biosecurity Workshop

EQUINE INFLUENZA

21 MAY, 2019

Introduction

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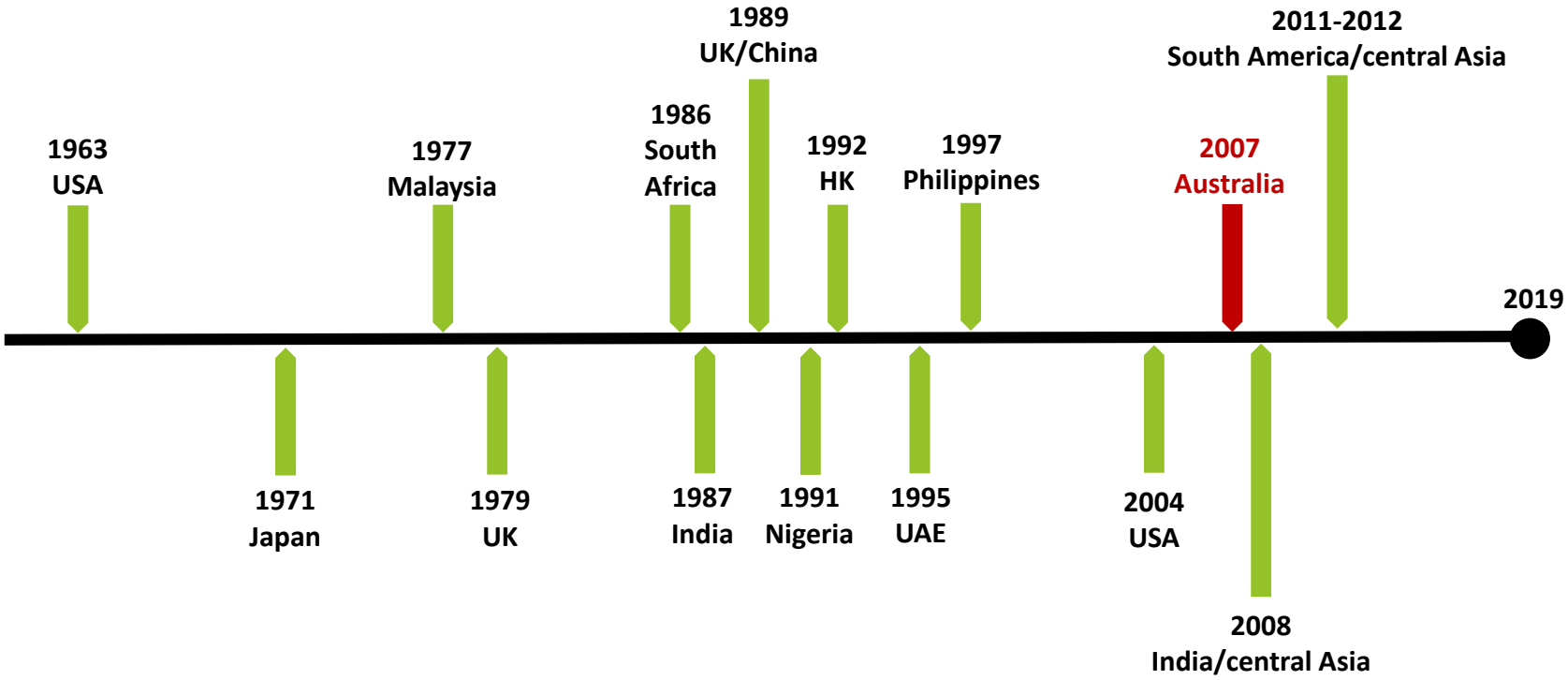
Introduction

What is equine influenza?

- AKA: Horse flu
- EI = equine influenza; EIV = equine influenza virus
- EI is a common, highly contagious respiratory disease of equids
- The primary focus of prevention has been on domestic horses, but EIV is transmissible to all equids, including feral and wild herds
- EI is endemic in horses in the US and much of the world, with the exception of New Zealand, Australia, and Iceland

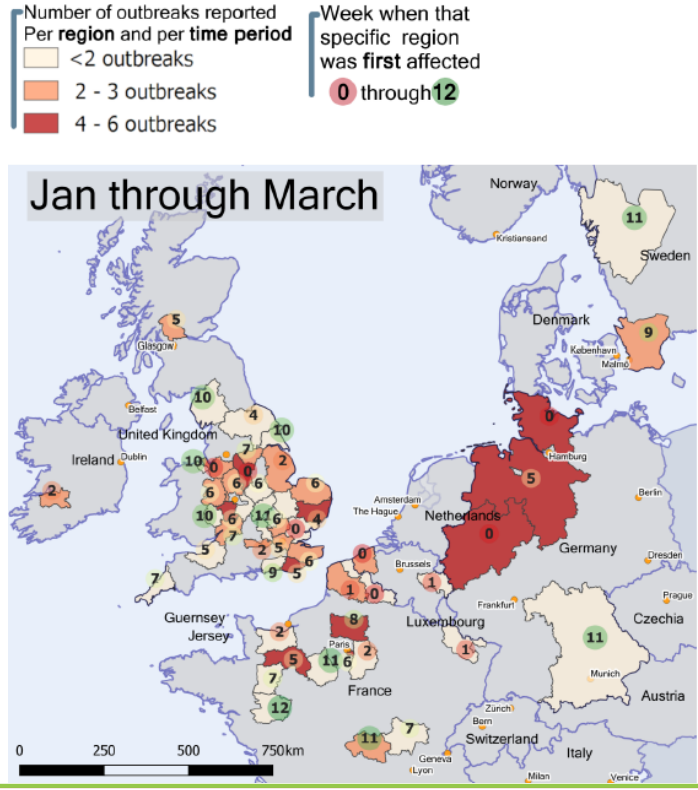
Some major EI outbreaks



Current outbreaks

Europe

- An increased number of outbreaks have been reported across Europe since December 2018.
- Outbreaks have predominantly involved unvaccinated horses, but outbreaks involving vaccinated horses have also been reported.
- Risk factors for outbreaks occurring include; unvaccinated horses and new arrivals to a premises.



Current outbreaks

Africa

- Outbreaks of disease in donkeys (and horses when resident in a region) have been reported since December 2018 across seven countries in West Africa. There have been reports from UK based charities and OIE of outbreaks in Burkina Faso, Ghana, Mali, Nigeria, Niger and Senegal.
- In Nigeria, as of 20 February 2019, more than 3000 equines have been reported to be infected and there have been 270 deaths.
- In Senegal, as of 16 March 2019, more than 37,000 cases have been reported in draught horses and donkeys and there have been 2701 deaths.

What's the big deal?

- EI is the most economically important cause of respiratory disease in horses because of its highly contagious nature
- Costs associated directly with the outbreak – millions to billions of dollars could be spent to control or eradicate.
    - Cancellation of equestrian events and sales
    - Loss of wagering
    - Loss of jobs
    - Restriction on international trade and competition
    - Welfare of people and animals
- Initial and continuing cost to the equine industry if it becomes endemic


International horse movement is the single most important factor contributing to the global spread of equine infectious disease.

Australia outbreak 2007

- EI-free country with naïve population
- Australia's most serious animal emergency disease it has experienced in recent history
- Major impacts for the equine industry

https://images.app.goo.gl/df9PKY9rKJF5zHHD6

Australia outbreak 2007

Australia currently imports from these countries:

- Austria
- Belgium
- Canada
- Denmark
- Finland
- France
- Germany
- Greece
- Iceland
- Italy
- **Japan**
- Luxembourg
- Macao
- the Netherlands
- New Caledonia
- New Zealand
- Portugal
- Republic of Ireland
- Singapore
- Spain
- Sweden
- Switzerland
- UAE
- UK
- **USA**

https://geology.com/world/australia-satellite-image.shtml

Around the world in August 2007

Epidemiological investigations suggest USA as the origin of the Japan outbreak

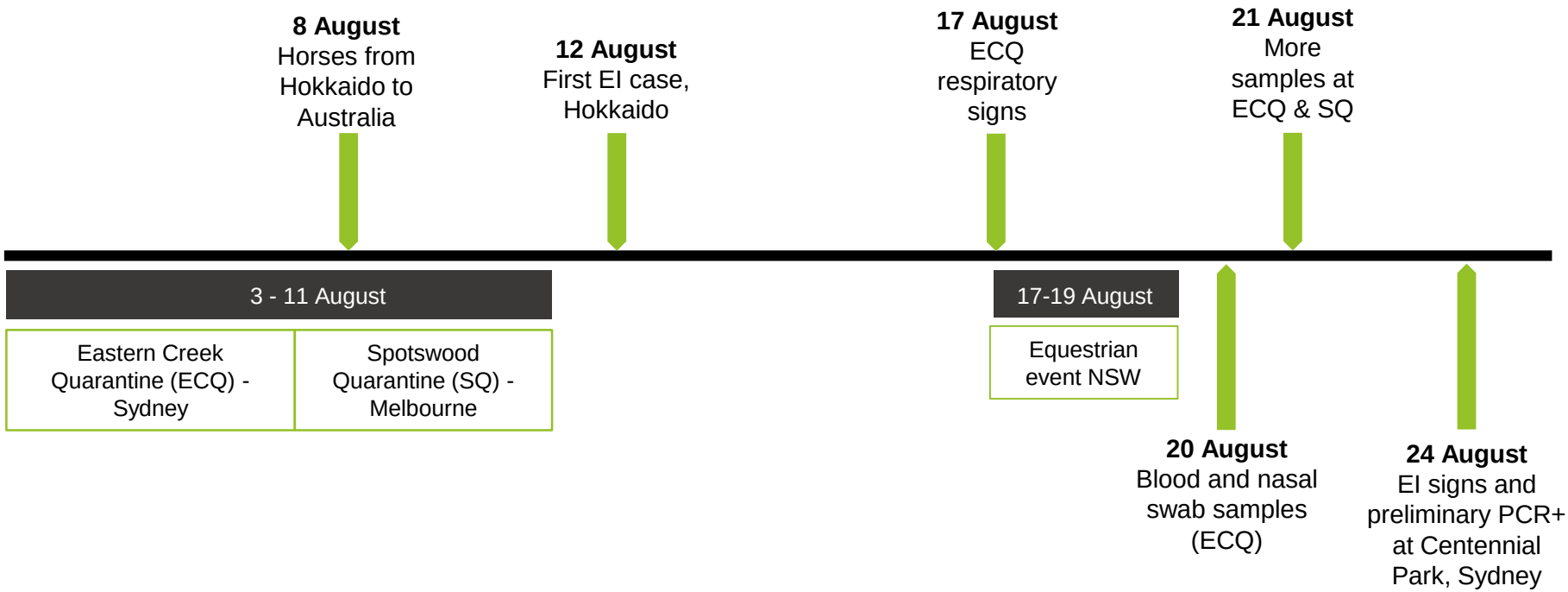
EI outbreak officially reported to OIE on 28 August 2007

Australia outbreak 2007

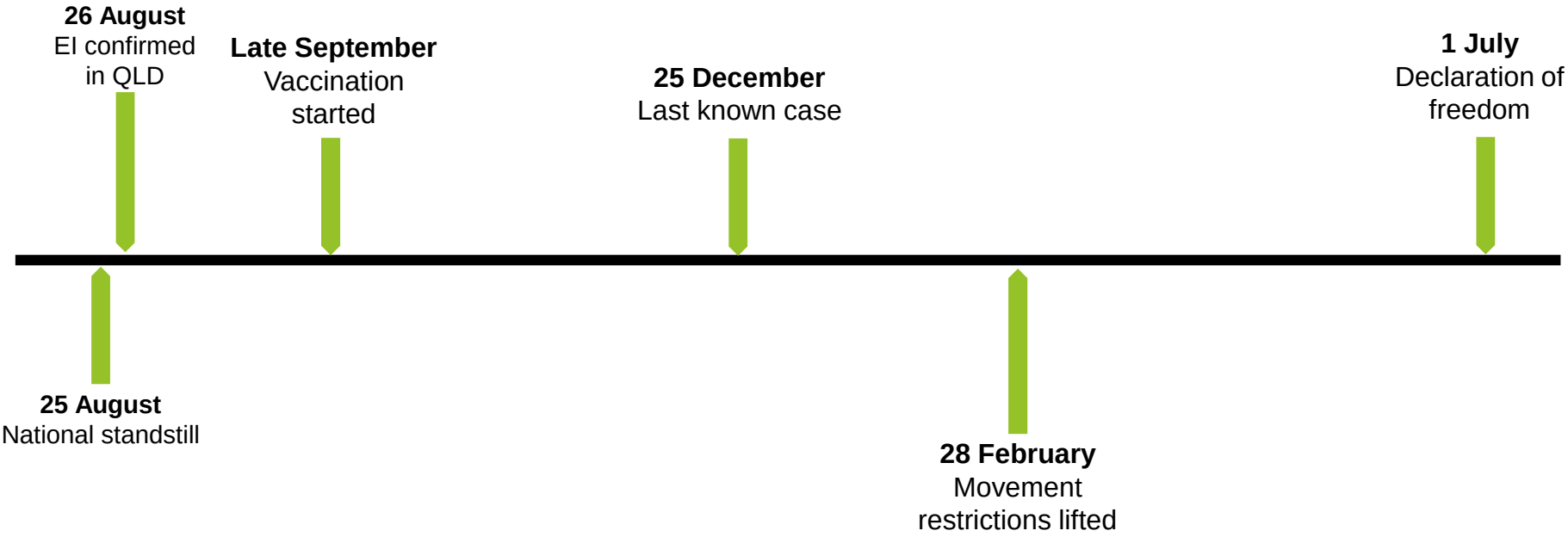
- Horses undergo 21 or 14 days PEI prior to export
- Followed by 14 days PAQ
- On arrival into PAQ all horses have a blood sample collected and held in the National Serum Bank
- Baseline for serological analysis in event of a disease occurrence


https://images.app.goo.gl/uag4Bfn5h6LVUGWU6

Timeline of dates of disease outbreak



Timeline of dates of disease outbreak

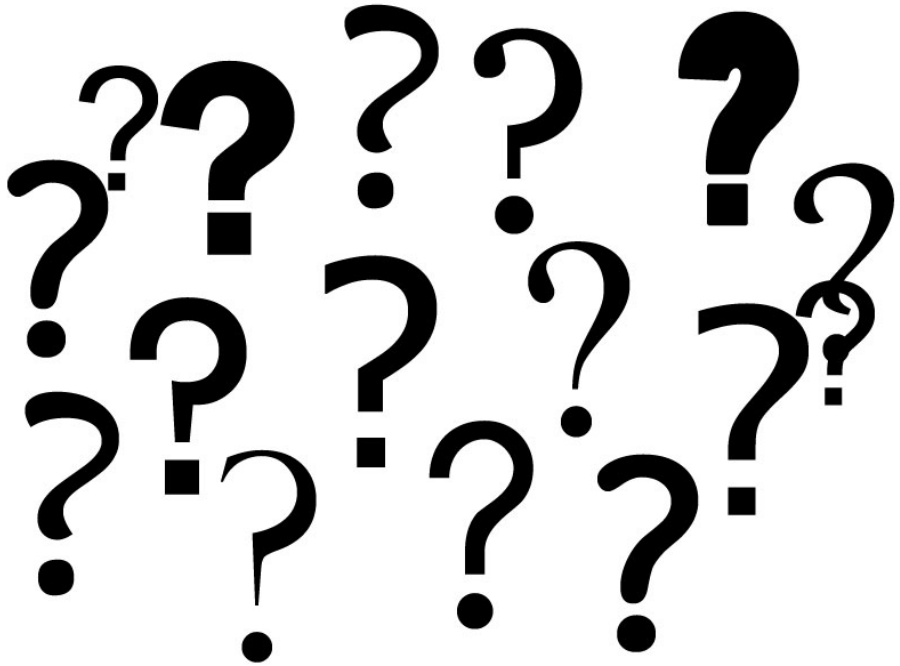


Australia outbreak 2007

- Opted for eradication
- December 2007 – Success
- Over 8000 properties infected
- Over 150,000 horses declared infected
- Estimated costs to government: AU$390 million
- Estimated costs to industry: AU$400 million

https://images.app.goo.gl/4cDnohgfkG1nMaS77

So how did this happen?



Australia outbreak - 2007

- Increasing imported horses into Australia, without repeated risk assessment
- Protocols were adequate, but implementation of protocols had not been achieved
- Suspected lack of communication and collaboration between the two government agencies below

Australian Government
Australian Quarantine and Inspection Service

Operational enforcement of quarantine requirements

Government of South Australia
Biosecurity SA

Risk analysis and policy development

EI and New Zealand

- NZ has never had an EI outbreak and our equine population is naïve to infection.
- The 2007 EIV outbreak in Australia demonstrated the economic impact the virus can have when introduced into a previously unexposed equine population
- The Australian outbreak provided a stimulus to consider the possible implications for the NZ equine industry - The NZEHA is part of the GIA partnership

EI and New Zealand

- Rosanowski et al. (2019) performed a study that modelled different EI control strategies and economic analysis in order to economically justify any future decision to eradicate or manage EI.
- Based on previous modelling work to evaluate the efficacy of control programs. Out of various strategies evaluated for control of this disease, vaccination combined with complete movement restriction was found to be very effective.

Eradication strategies

- Nine alternative scenarios and two baseline strategies starting at three time points to reflect the commercial breeding cycle.
- Baseline - movement restriction applied from the first day of detection
- The three vaccination strategies were:
    1) Suppressive
    2) Protective
    3) Targeted

Economic losses

- Incursion response
- Impact to the commercial racing industry (breeding, sales, and racing)
- Horse morbidity and mortality
- Compensation to industry participants

https://www.nzherald.co.nz/personal-finance/news/article.cfm?c_id=12&objectid=12217853

EI and New Zealand

- The median duration was 88, 92, 136, and 178 days for suppressive, protective, targeted, and baseline strategies, respectively.
- Median number of infected properties ranged from 793 for the suppressive strategy to 3136 for the baseline strategy
- Median number of vaccinated properties was 1653, 2726, and 4502 for suppressive, protective, and targeted strategies, respectively

https://images.app.goo.gl/pyXtzup8iKbMuHgQ8

The cost to New Zealand

Scenario	Breeding cycle	Vaccination	Income loss*	Cost of vaccination*	Net benefit*	B/C ratio
Breeding season	Baseline	None	$225.5			
August to October	Suppressive	3 km radius	$129.2	$24.8	$96.3	4.89
	Protective	7 to 10 km radius	$136.1	$27.0	$89.4	4.31
	Targeted	20 km radius	$205.4	$36.6	$20.1	1.55
November to January	Suppressive	3 km radius	$146	$24.8	$79.5	4.21
	Protective	7 to 10 km radius	$153.4	$27	$72.1	3.67
	Targeted	20 km radius	$213.9	$36.6	$11.7	1.32
Non-breeding season	Baseline	None	$174.9			
February to July	Suppressive	3 km radius	$112.8	$24.8	$62.1	3.50
	Protective	7 to 10 km radius	$118.7	$27	$56.2	3.08
	Targeted	20 km radius	$171.4	$36.6	$3.5	1.10

*millions NZD

Income loss

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Net benefit

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Benefit cost ratio

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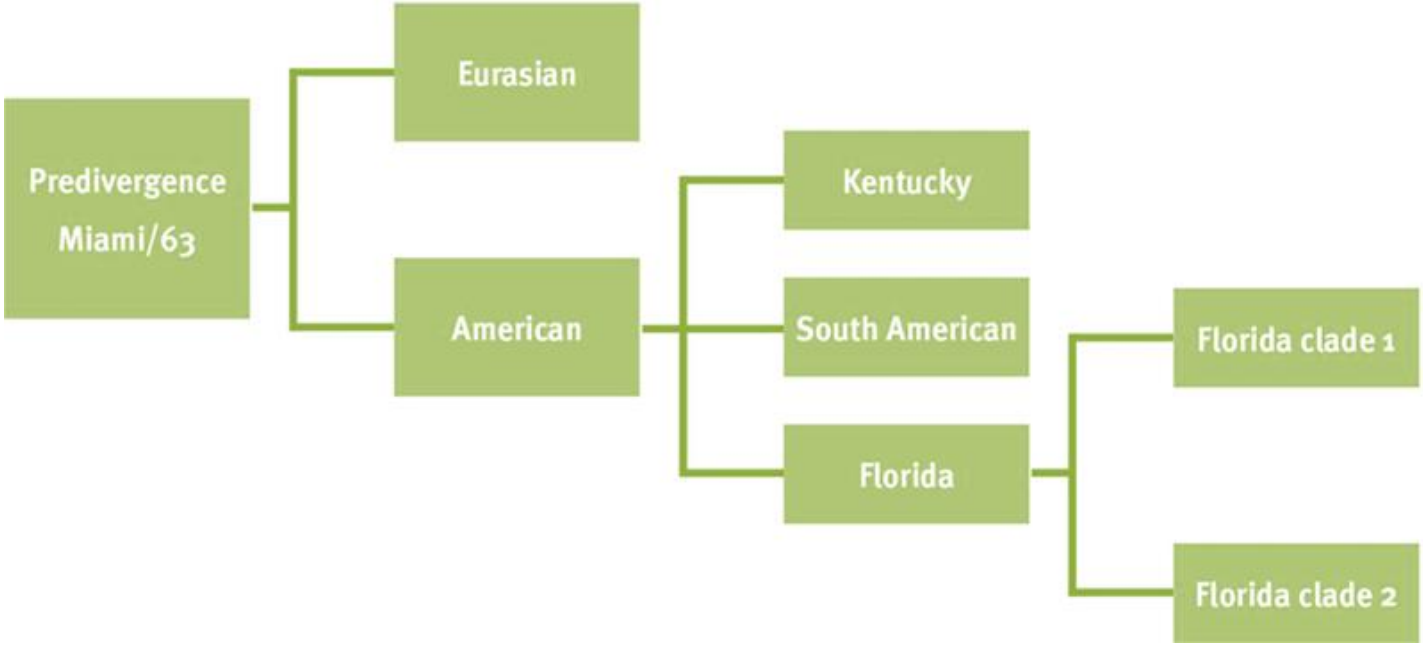
Infection with equine influenza virus

Equine influenza virus (EIV)

- There are two subtypes of equine influenza
- The H7N7 subtype was first identified in the 1950s and has not been isolated for 20 to 30 years
- The H3N8 subtype was first seen in the 1960s (prototype strain: A/eq/Miami/1/63) and is the only currently circulating subtype

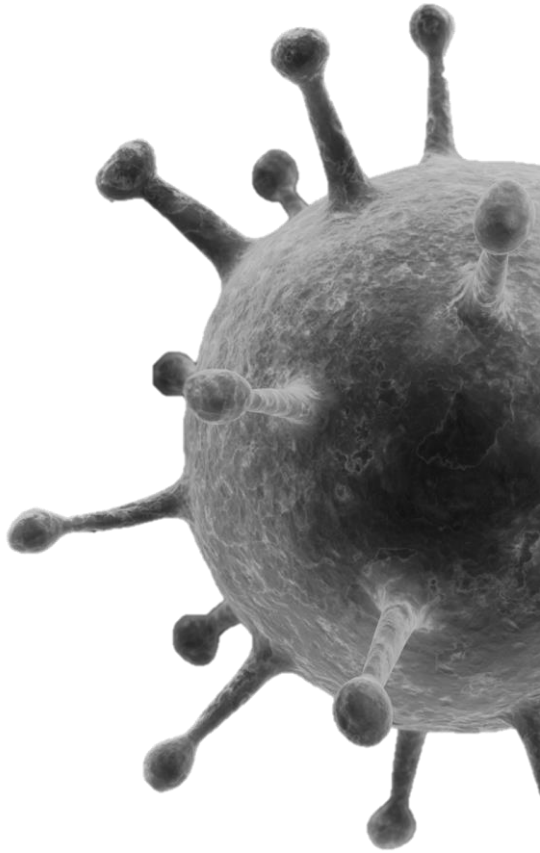
Equine influenza virus (EIV)



https://veterinaryrecord.bmj.com/content/182/25/710

Equine influenza virus (EIV)

- Virus has surface proteins - HA and NA, (haemagluttinin and neuraminidase)
- The immune system responds by producing antibodies to these surface proteins
- As the virus circulates, it undergoes antigenic drift, which involves a series of mutations that enable the virus to evade host immunity
- Can also undergo antigenic shift, producing new strains



https://www.id-hub.com/2018/01/17/can-previous-influenza-virus-exposure-enhance-susceptibility-subsequent-infection/

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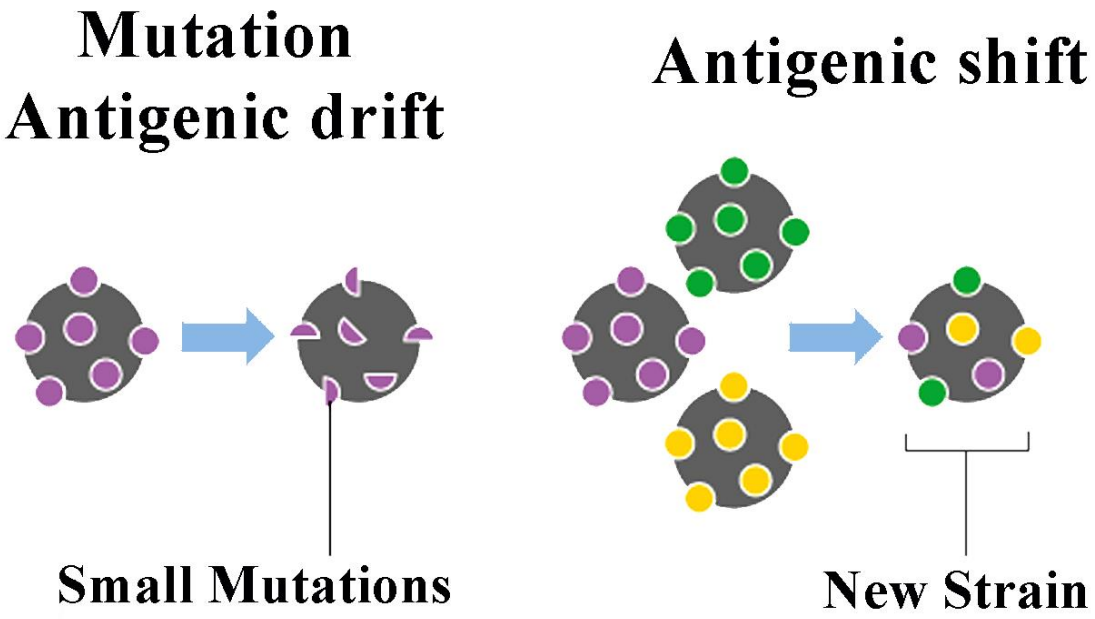
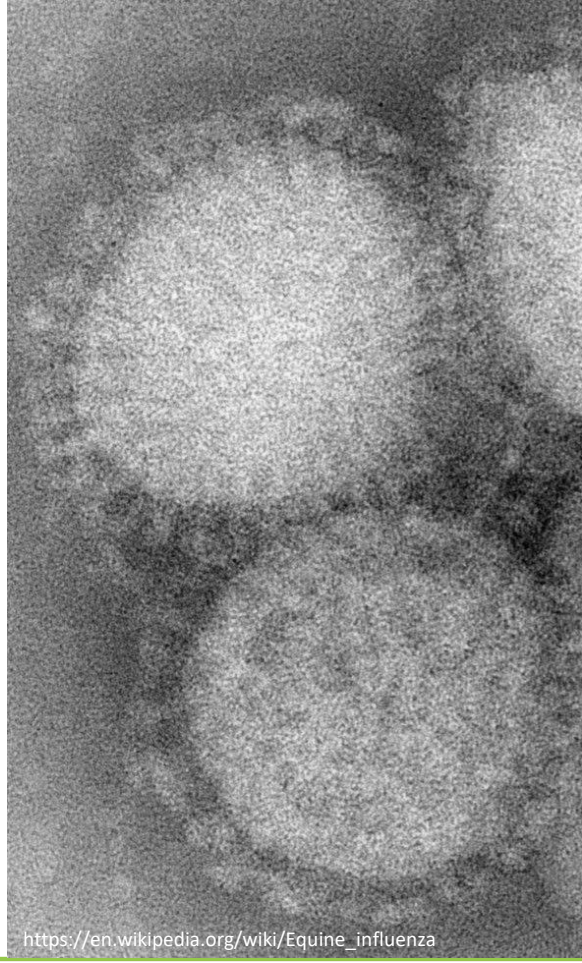


https://www.quora.com/What-is-meant-by-antigenic-shift-or-drift-in-influenza-virus

Equine influenza

- All equids are susceptible
- Incubation period is 1-3 days
- Virus can be shed up to 10 days via nasal discharge
- Infectious period is 21 days
- Virus infects epithelial cells of respiratory mucosa
- Clinical signs resolve in 1-3 weeks



https://en.wikipedia.org/wiki/Equine_influenza

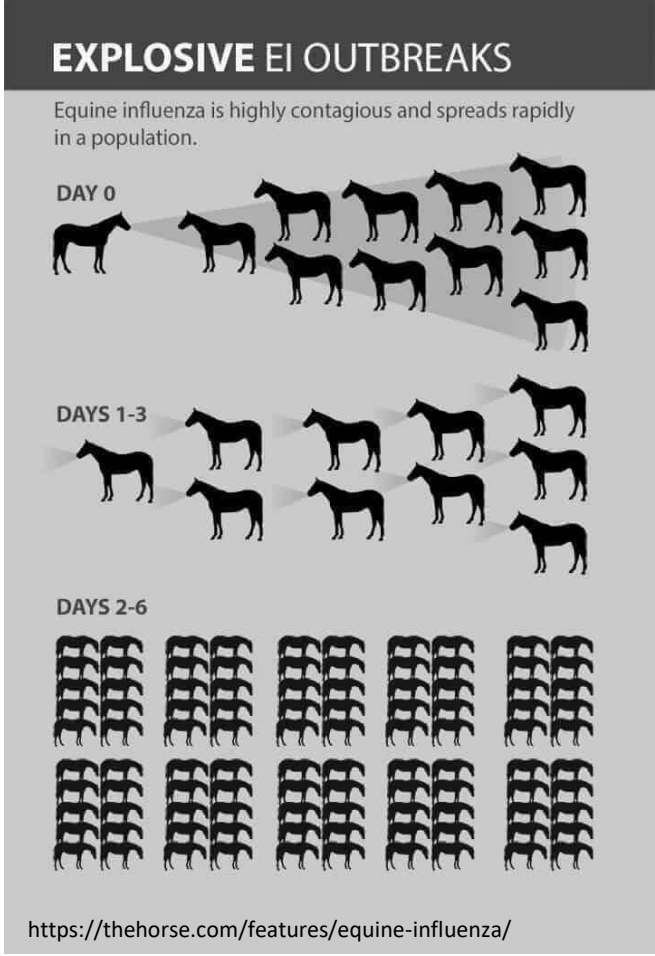
Clinical signs

- Harsh dry cough
- Watery (serous) nasal discharge (may become mucopurulent if a secondary bacterial infection occurs)
- Fever up to 41°C
- Lethargy
- Not eating or little interest in feed
- Enlarged lymph nodes
- Signs may be mild in vaccinated horses

https://www.horsejournals.com/horse-care/illness-injury/diseases/heaves-your-horse-risk

Transmission

- Highly infectious
- Rapid transmission especially when it enters a large previously unexposed population
- Spread by horizontal transmission - direct contact, aerosol, fomites and personnel
- Estimated that one infectious horse can infect 10 other fully susceptible horses
- Vaccinated horses can still shed virus



https://thehorse.com/features/equine-influenza/

Environmental transmission

- Research is clarifying the role of the environment and weather on EIV transmission
- During the 2007 outbreak in Australia, wind speeds >30 km/h from the direction of infected horses correlated with an increased risk for infection for horses downwind
- Further analysis in Queensland, Australia, found east to west spread of EIV with distances of 1–2 km consistent with wind patterns

https://thehorse.com/features/equine-influenza/

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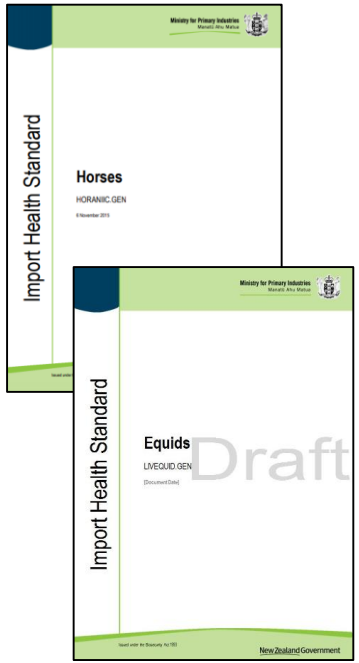
Preventing equine influenza from entering New Zealand

Import Health Standard (IHS)

- Import health standards are legal documents issued under the Biosecurity Act 1993.
- Based on import risk analyses which assess biosecurity risks that are supported by scientific principles and international standards.
- The IHS outlines all requirements that an equid must meet in order to be imported into New Zealand.



IHS requirement for EI

1) The horses were:

(a) Kept since birth or for at least the 21 days before export in a country, zone or compartment free of EI as described in the OIE Code;

OR

2) The horses were:

(a) Kept for at least the 21 days before export in premises where no case of EI was reported during that time.

(b) Kept in PEI premises for at least the 21 days before export and showed no clinical signs of EI during that time.

(c) Subjected to an agent identification test as described in the document MPI-STD-TVTL. Samples were collected on two occasions, the first taken 5-7 days after entry into PEI and a second sample taken not less than 5 days later;

(d) Were subjected to a vaccination for EI (excludes foals less than 6 months of age if accompanied by documentation showing equivalent vaccination of their dam):

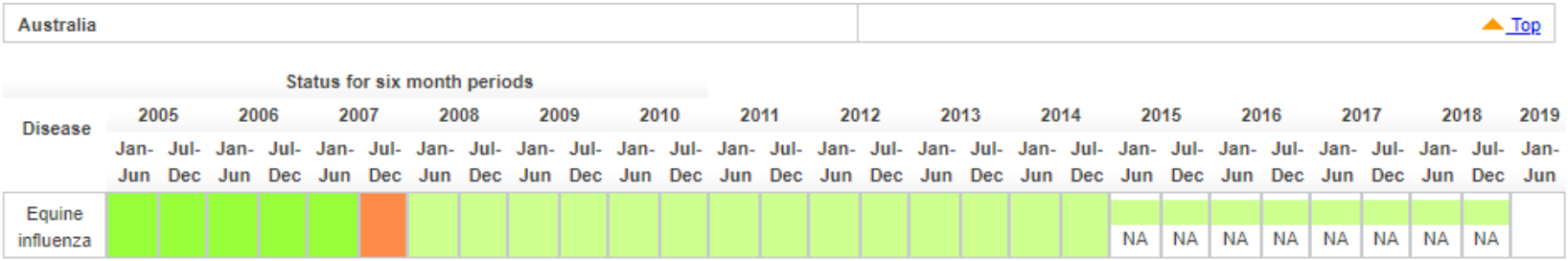
(i) With either a primary course or booster administered not less than 35 days before export and not more than 90 days before export.

(ii) Administered as described in the manufacturer's instructions.

(iii) Containing equivalent strains of EI virus as recommended by the OIE expert surveillance panel for EI vaccines or otherwise approved by MPI.

Country/zone/compartment free from EI

The only currently approved country that is recognised as free from EI is Australia.



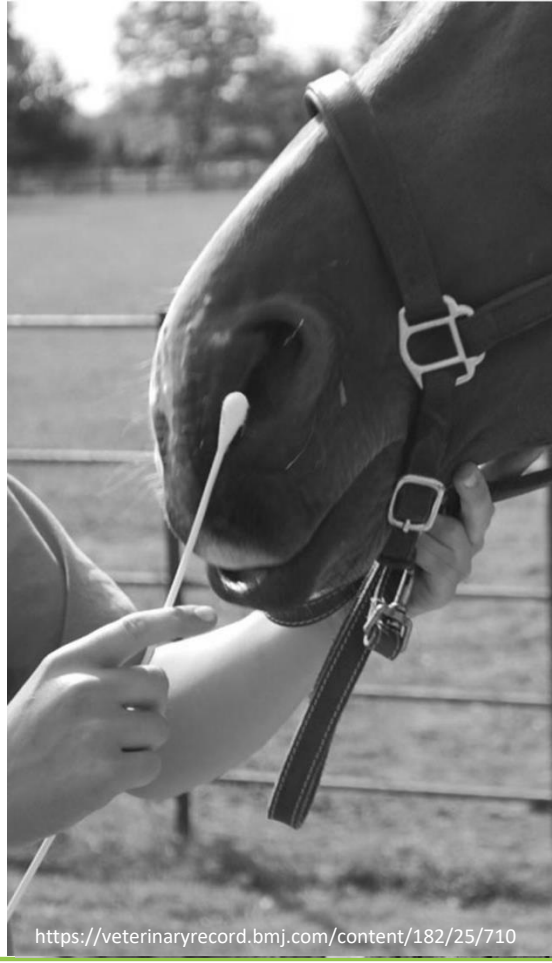
Pre-export isolation

- Equids from EI endemic countries are required to undergo a 21 day PEI period in the exporting country
- Based on the infective period of EI which the OIE Code considers to be 21 days
- Assuming a worst-case scenario of an infected horse moving into isolation and infecting an in-contact horse, the newly infected horse is likely to be finished shedding virus within 21 days of isolation.

https://www.thesprucepets.com/designing-a-stable-for-your-horse-1886937

Agent identification testing

- Sufficiently sensitive to detect virus from horses that have passed the acute phase of infection.
- It can also detect virus in seropositive **sub-clinically infected horses.**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Agent identification testing

- Polymerase chain reaction (PCR) testing on a nasopharyngeal swab
- Nasopharyngeal swab yields more density of virus than the nasal swabs
- Even though viral shedding is 7 to10 days, viral RNA can be detected for 15+ days by PCR

Agent identification testing

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- Nasopharyngeal swab yields more density of virus than the nasal swabs
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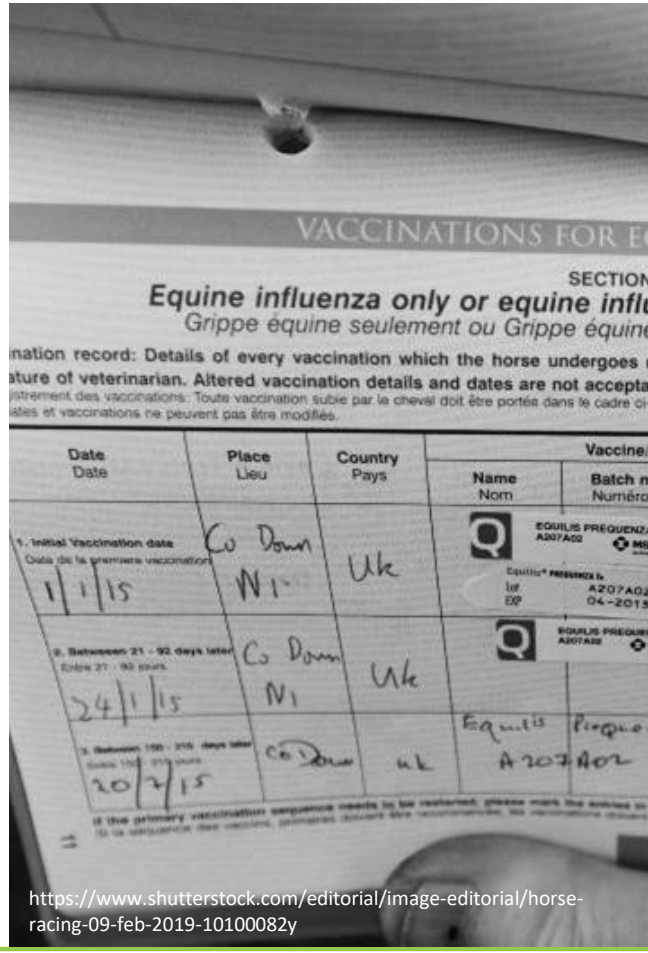
The role of vaccination

- Plays a major part in controlling infection, particularly for horses that travel widely, mix with other horses, or take part in events.
- Vaccination does not produce sterile immunity, it reduces the clinical signs of EI and virus shedding after infection; vaccinated horses may shed virus and contribute silently to the spread of the disease.
- Individual variation in response to vaccination

Vaccination protocols

- The primary vaccination schedule must be regarded as unique to a specific vaccine, but typically manufacturers recommend two doses 4 to 6 weeks apart, with a booster 5 to 6 months later.
- After primary series vaccination, annual booster
- The choice of vaccine is extremely important to optimise protection, reduce virus shedding and prevent epidemics.



https://www.shutterstock.com/editorial/image-editorial/horse-racing-09-feb-2019-10100082y

Vaccination protocol for export

- Equids for export must either finish a primary course or have a booster administered not less than 35 days before export and not more than 90 days before export.
- This will change to not less than **21 days before export** and not more than 90 days before export based on OIE Code recommendations.
- This Code chapter is currently under review.

Recommended vaccines

- The OIE reference laboratories and other laboratories around the world collect data on outbreaks of equine influenza and virus strain characterisation.
- Reviewed annually by an Expert Surveillance Panel (ESP) which makes recommendations on the need to update vaccines.
- Since 2010 recommendations are that vaccines for the international market should contain a FC1 and FC2 sublineage virus.
- FC1 viruses circulate constantly in North America, but have caused large outbreaks in South America, Asia and Australia. They have also caused sporadic outbreaks in Europe where FC2 viruses predominate.

Vaccines


FOR ANIMAL USE ONLY/SLEGS VIR DIEREGEBRUIK
Equilis®
PREQUENZA
10 x 1 dose/dosis
MSD
Animal Health
PREQUENZA


Equine Influenza
Vaccine
Killed Virus
Vetera® EIVXP
10 Doses/10 mL
Boehringer
Ingelheim


Proteq Flu-Te
10X

Vaccination for foals?

- Why leave out foals <6 months of age?
- The vaccination of mares in the last 6 to 4 weeks of pregnancy is advisable to ensure protective levels of antibody in the colostrum for the foal.
- These maternal antibodies persist for 3 to 6 months and studies indicate that maternal antibodies inhibit the response to vaccination.

https://www.paulickreport.com/horse-care-category/vet-topics/upcoming-webinar-horse-will-focus-breeding-ones-mare/

Transitional Facility Standard (TFS)

- The TFS outlines all requirements for a quarantine facility to ensure potential diseases carried by imported equids do not get out of the facility.
- Split into two main parts:
    1. Physical and structural requirements
    2. Operational requirements

Physical and structural requirements

- Facilities need to be constructed so they can adequately contain horses and are easily and adequately decontaminated.
- Double stock-proof fence with a 100 metre wide buffer zone.

Entry and exit procedures

- Only staff members and other approved persons that are necessary.
- Maintaining a register of people entering the facility.
- Vehicles/machinery cleaned and disinfected prior to exiting facility
- Most materials are not permitted to enter or leave the facility during the PAQ period without MPI authorisation.


https://www.majesticfloats.co.nz/gallery/

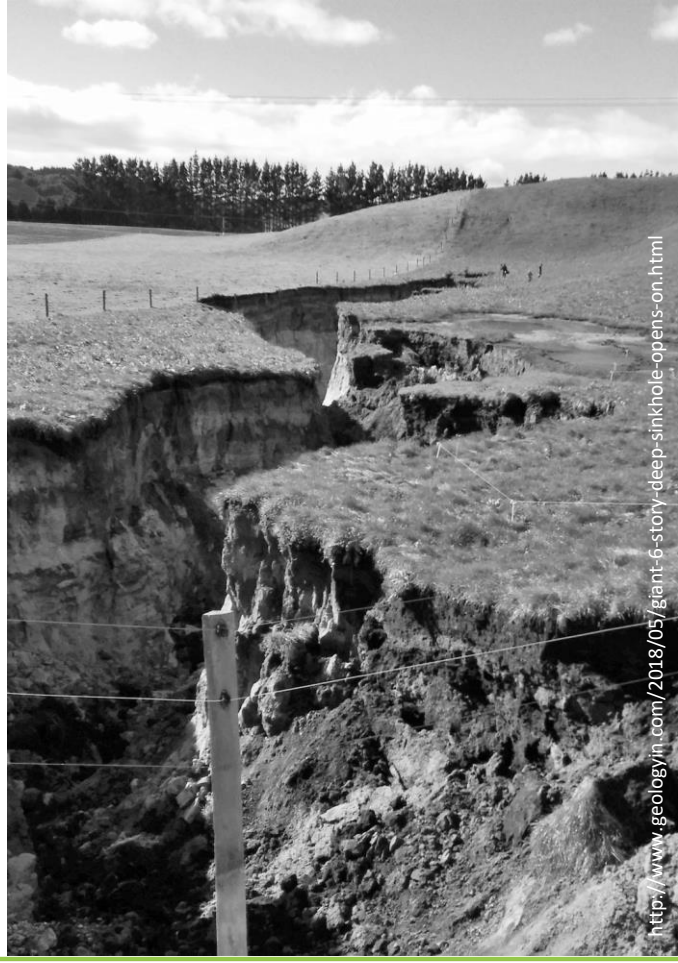
Operational requirements

- Receipt and movement of horses
  - Horses can only move from the place of first arrival to a TF or from on TF to another – must be authorised by MPI

- Segregation of uncleared horses
  - Quarantine is operated all-in/all-out
  - A subsequent shipment of horses can enter the TF but it restarts the PAQ period for all horses in the facility.

Contingency planning

- In place to manage any event which may compromise the biosecurity of uncleared horses
    - Suspected exotic disease
    - Vehicle breakdown
    - Significant injury or illness
    - Natural disasters
    - Security breaches
    - Loss of essential services



Record keeping

- Official documents
- BACCs
- Address of where the horse will go after PAQ
- Vet records and test results
- MPI inspections
- Daily monitoring records
- Entrance register and declarations
- Facility issues
- Training

Cleaning and hygiene

EIV is relatively easy to inactivate by washing with soap and water or detergents

Biggest problem:

Making sure all contaminated people and things are actually washed, EVEN *when disease is not suspected*

https://indianapublicmedia.org/amomentofscience/importance-hand-washing/

Pest control

- EIV infection is not limited to equids
- Sporadic spillover of EIV to dogs has been detected in the United Kingdom, Australia, and the US.
- Cats experimentally infected with EIV demonstrated respiratory signs and virus shedding with transmission to other cats

Disease surveillance and reporting

- If EI was diagnosed, the operator must notify MPI within 24 hours
- Call the Pest and Disease Hotline number **0800 80 99 66 and/or the MPI Inspector**
- The CTO will direct the management of disease control and may extend the period of quarantine (very likely)


https://images.app.goo.gl/LdjbQ7DvmZnnN8pV9

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Incursion investigation

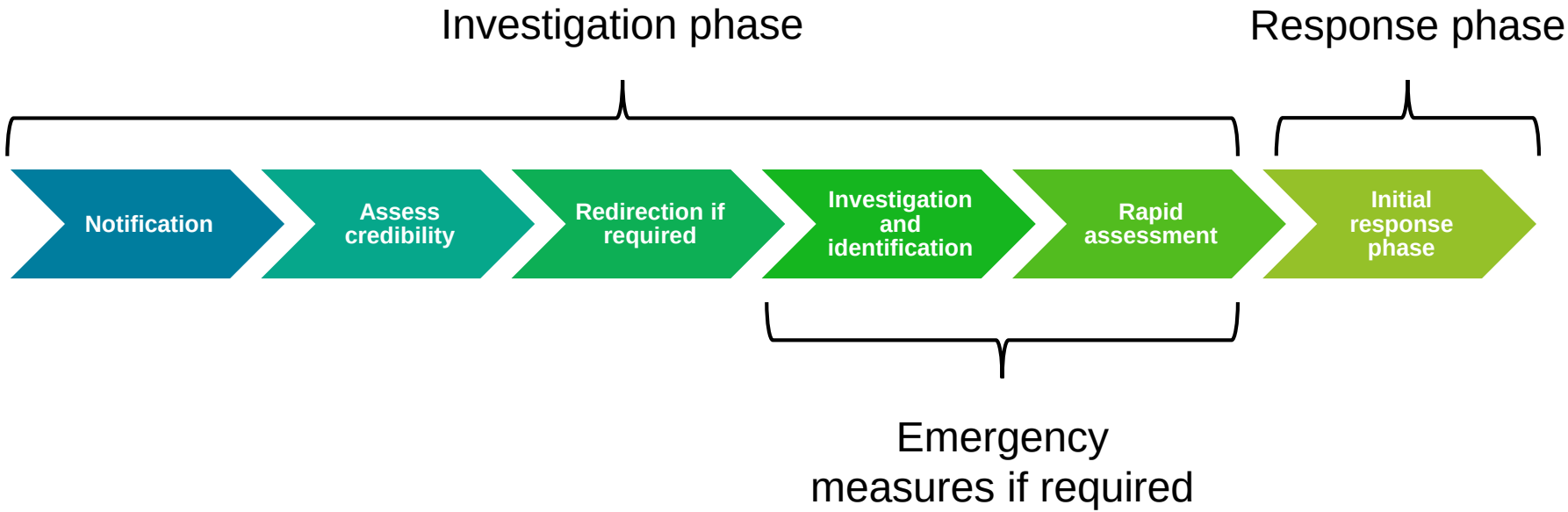
Incursion investigation

- Once the 0800 number is called you'll be put in touch with one of our MPI incursion investigators
- 5 veterinary incursion investigators
  - Registered veterinarians
  - Warranted Inspectors under Biosecurity Act
- Investigate potential post-border animal disease incursions (MPI funded, no cost to notifier)

Incursion investigation functions

- Investigate reports to a point of diagnosis
- Initiate urgent measures if needed (containment, control, organism management)

Process of initiating a response



Incursion investigation

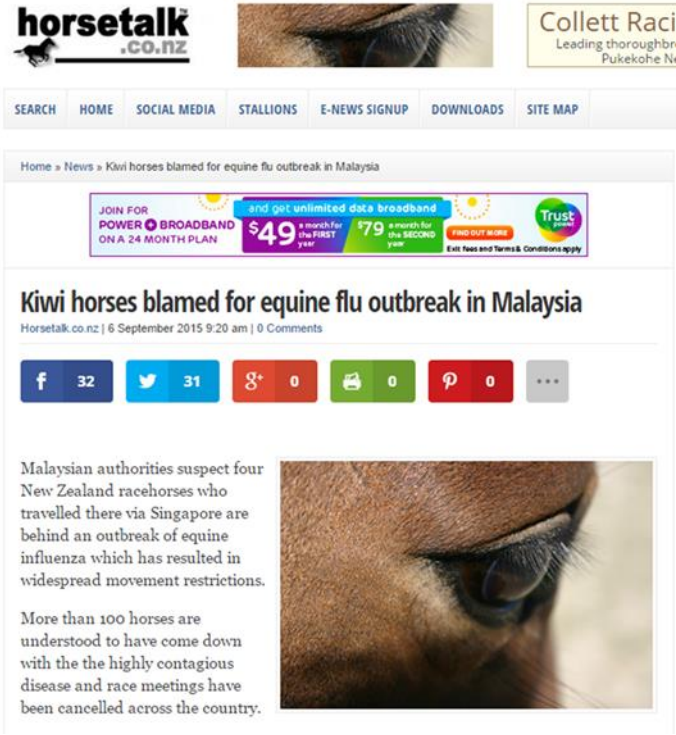
- Direction from MPI on sampling, procedures, restrictions, etc.
- PAQ period may need to be extended.
- In the event of a positive diagnosis of a specified risk organism, the chief technical officer (CTO) will direct the management of the disease control.

Equine influenza in New Zealand?

- In 2015, Malaysia had an EI outbreak after previously being free of the disease since 1977
- Two imported horses were found to be positive for EI
- “The source of infection could have originated from four horses imported from New Zealand via Singapore on July 31.”
  - Deputy Director-General of Malaysia’s Department of Veterinary Services

Equine influenza in New Zealand?

- 6 September 2015: Horsetalk article posted
- Repeated in ProMed on same day.



Equine influenza in New Zealand?

- New Zealand had never had a case of EI
- Important for MPI to clear up any potential confusion in the international community and provide extra assurance of New Zealand's EI freedom to our trading partners and the OIE.

Incursion investigation of possible EI

- MPI Incursion Investigators visited the 4 properties of origin (all Waikato)
- Horses on the property were examined for clinical signs.
- All properties were free of any current signs of respiratory illness, and none had had any recent illnesses of concern.
- Horses that had contact with the exported horses were identified and blood samples were taken.

Incursion investigation of possible EI

- Blood samples of in-contact horses were negative for antibodies to EI.
- The exported horses had tested negative for EI on nasopharyngeal swabs as part of export requirements
- Retained blood samples for exported horses were also tested and were negative for antibodies to EI.

Incursion investigation of possible EI

- Travel and quarantine periods of exported horses reviewed in relation to the incubation and infectious periods for EI.
- Total of 30 days' quarantine and travel before being released into Malaysia, during which they showed no sickness, and testing confirmed horses were not infected before travelling.
- Malaysian report describing EI-like nasal discharges at some unspecified time after release from PAQ. If true, would mean the horses were acutely sick with EI, and could only have become infected in Malaysia, either during quarantine or soon after release.

Conclusion

- The exported horses, which were naïve to an infection not present in New Zealand and not vaccinated against it, were stressed after air travel and quarantine, and then mixed with large numbers of horses post-quarantine, so they were among the first to be stricken with EI at the beginning of the Malaysian outbreak.

Still free from EI

- 12 September: MPI released a statement to ProMED-mail with a reply to the original posting including the assurance that New Zealand does not have EI, some details of the investigation, and information on the strict import controls to prevent the entry of this and other diseases.
- 22 September, Horsetalk rebuttal article posted

Turf clubs get equine flu all-clear

Published: 7 October 2015 11:14 AM

Despite not being given the full clearance to begin racing again the SLTC has pencilled in two race dates for November. – The Malaysian Insider file pic, October 7, 2015.

Selangor Turf Club (SLTC) has joined Penang Turf Club (PNTC) in receiving the all-clear from the Department of Veterinary Services (DVS), having tested negative for equine influenza (EI) in samples taken on September 28.

THANK YOU!

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