

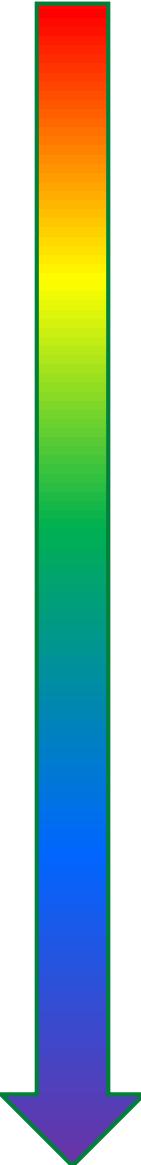
Molecular Epidemiology of human parechovirus in Australia & globally

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Human Parechovirus - History

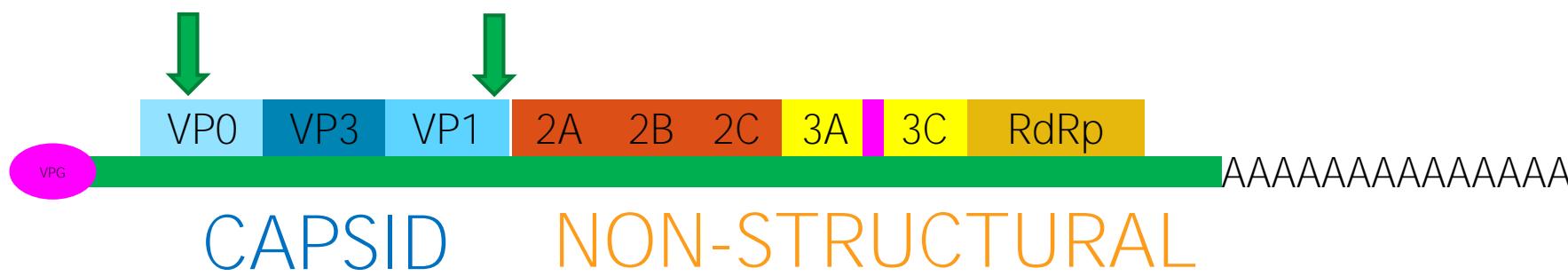


- 1956 - ECHO22 & ECHO23 USA
- 1956-61 - ECHO22/23 Europe/USA - aseptic meningitis
- c.1987 - HPeV-3 first circulating (Estimated)
- 1994 - Historical sample Netherlands HPeV-3
- 1998 - Historical sample Japan HPeV-3
- 1999 - ECHO22 > HPeV-1 ECHO23 > HPeV-2
- 2001 - HPeV-3 present Canada
- 2004 - HPeV-3 Detected Japan
- 2012 - HPeV-3 present Australia
- 2013 - 1st HPeV-3 outbreak Australia
- 2015 - 2nd HPeV-3 outbreak Australia
- 2017 - 3rd HPeV-3 outbreak Australia



Human Parechovirus

- Picornaviridae
- 30 nm
- Non-enveloped
- RNA genome 7.3kb



Parechoviruses

► Parechovirus A (HPeV's) Humans



► Parechovirus B (Ljungan Virus) Voles



By AnemoneProjectors [CC BY-SA 2.0], via Wikimedia Commons

► Parechovirus C (Sebokele virus) Mice

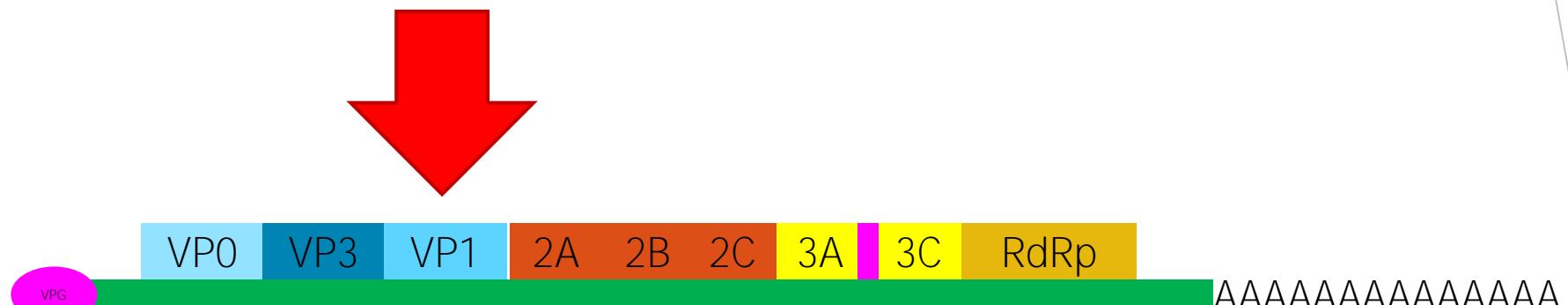


By Alfredo Gutiérrez [CC BY-SA 4.0], from Wikimedia Commons

► Parechovirus D (Ferret Parechovirus)

Human Parechovirus (HPeV)

- ▶ HPeV-1
- ▶ HPeV-2
- ▶ HPeV-3
- ▶ HPeV-4
- ▶ HPeV-5
- ▶ HPeV-6
- ▶ HPeV-7
- ▶ HPeV-8
- ▶ HPeV-9
- ▶ HPeV-10
- ▶ HPeV-11
- ▶ HPeV-12
- ▶ HPeV-13
- ▶ HPeV-14
- ▶ HPeV-15
- ▶ HPeV-16
- ▶ HPeV-17
- ▶ HPeV (Unclassified)



Different types of HPeV

- ▶ HPeV-1,3,6 - frequently associated with clinical disease
- ▶ HPeV-1,2 - gastrointestinal, respiratory occasionally CNS
- ▶ HPeV-3 causes most severe disease in infants < 3 months old
- ▶ HPeV-4 - Has infected pigs
- ▶ HPeV-4,5,6,12,14,15 - detected in monkeys

Human Parechovirus Type 3

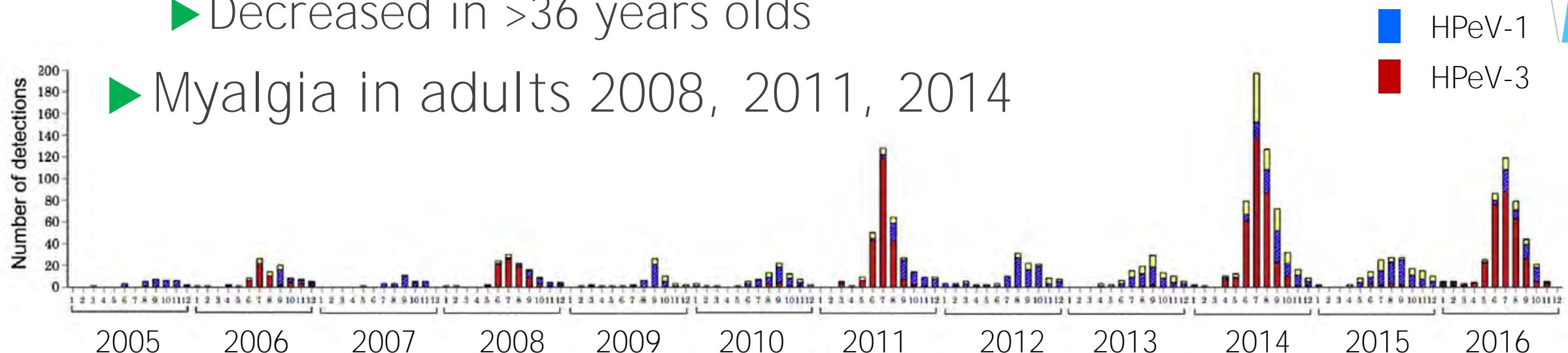


Epidemiology of HPeV-3

- ▶ Exposure commonly occurs when young <6 years
- ▶ HPeV-3's in Europe, Japan, North America belong to similar lineages
- ▶ Outbreaks in even years- Summer peak
- ▶ Older mother = Lower Maternal Ab's
- ▶ Disease more common in 2nd child
- ▶ Recent Sick/shedding family member

HPeV-3 in Japan

- ▶ Seroprevalence (Japan):
 - ▶ 15% in 1 year-olds
 - ▶ Peak @ 3-6 years of age: 80-85%
 - ▶ Decreased in >36 years olds
- ▶ Myalgia in adults 2008, 2011, 2014



National Institute of Infectious Diseases, Japan

https://www.niid.go.jp/niid/images/iasr/rapid/topics/parecho/160817/parecho1_161208.gif

HPeV-3 Oz Recombinant

Yamagata 2011 HPeV-3

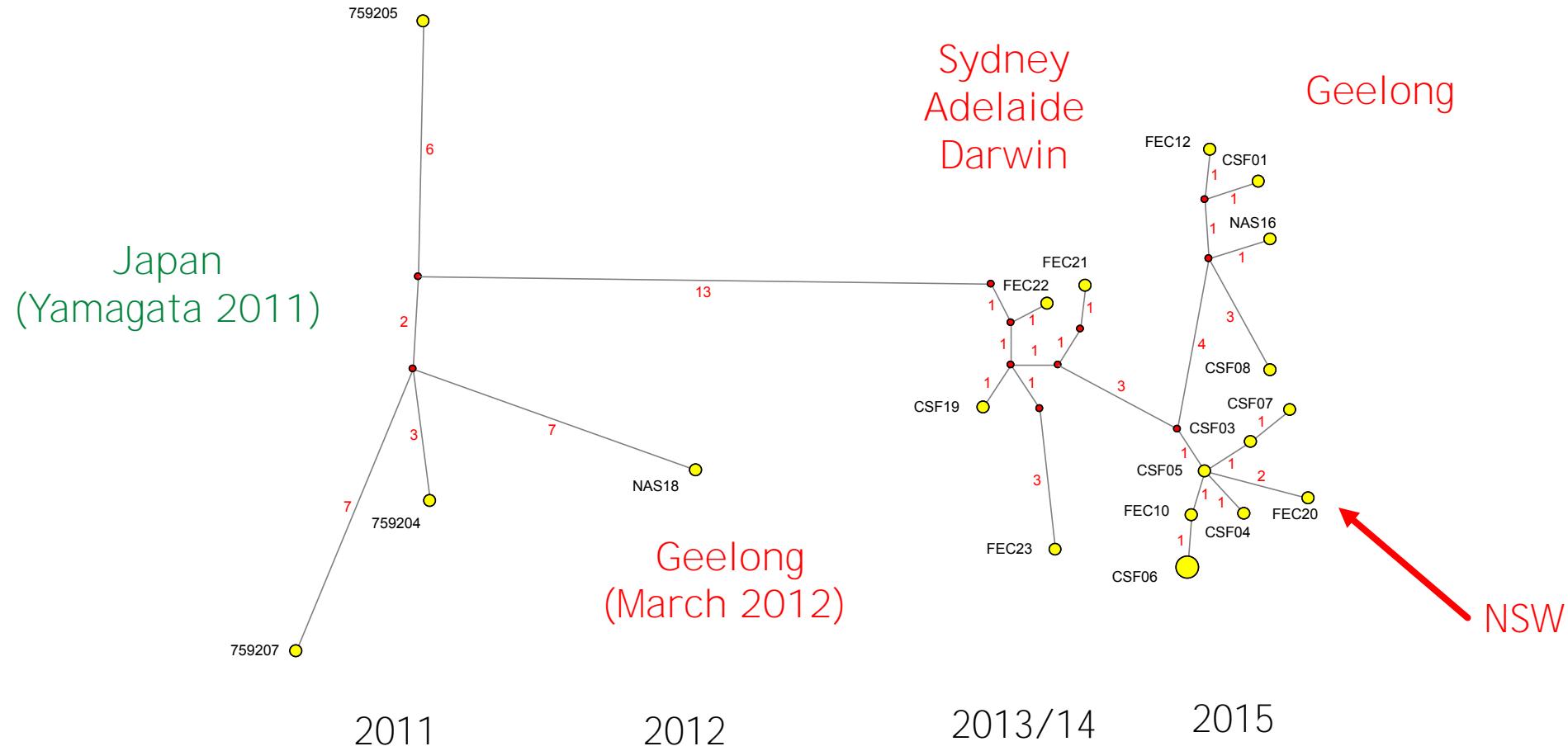


Oz Recombinant

Unknown HPeV? Virus



HPeV-3 Molecular epidemiology Oz



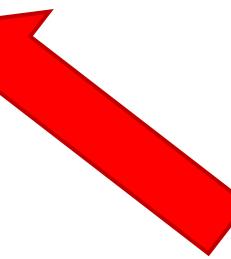
HPeV-3 Oz Recombinant



98.7% nt / 99.6% AA

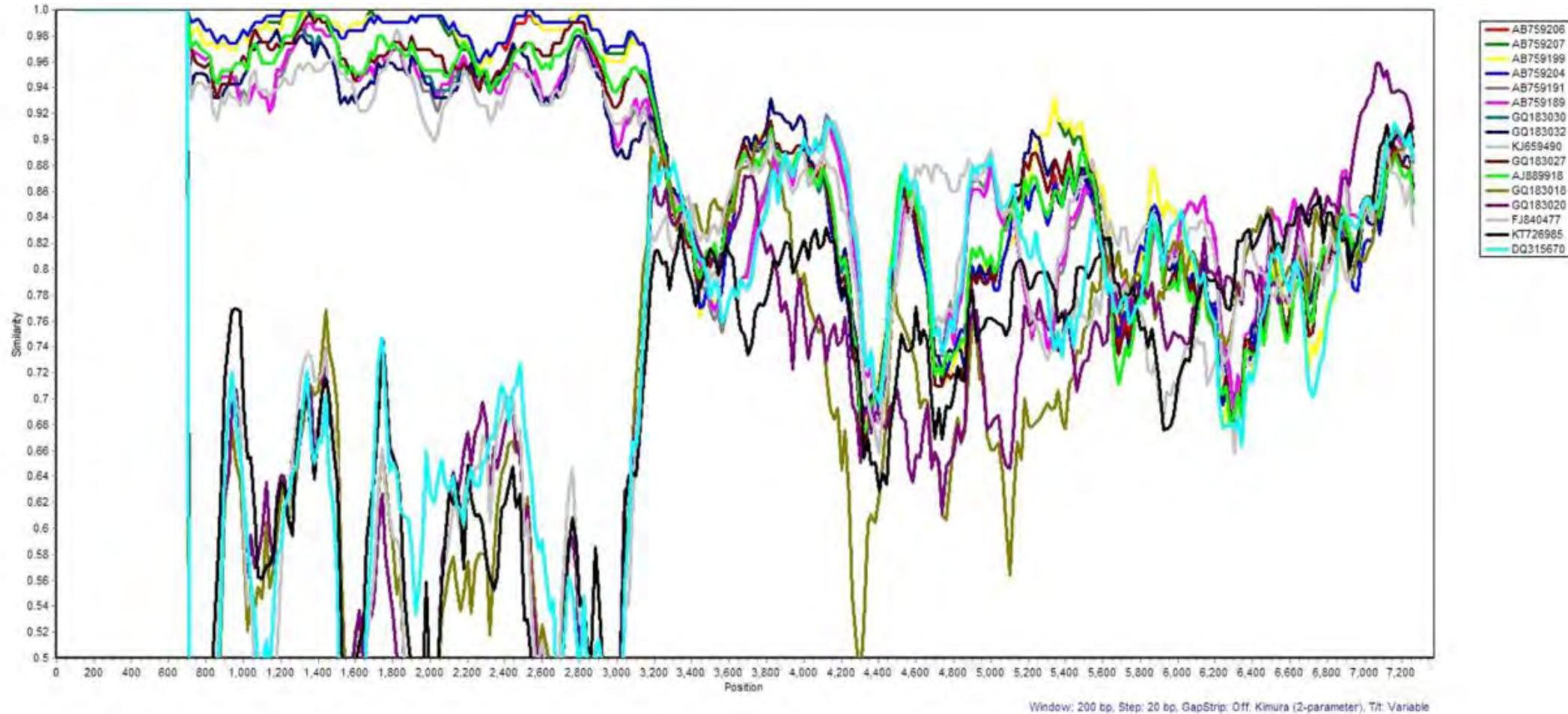
HPeV-3

Yamagata 2011

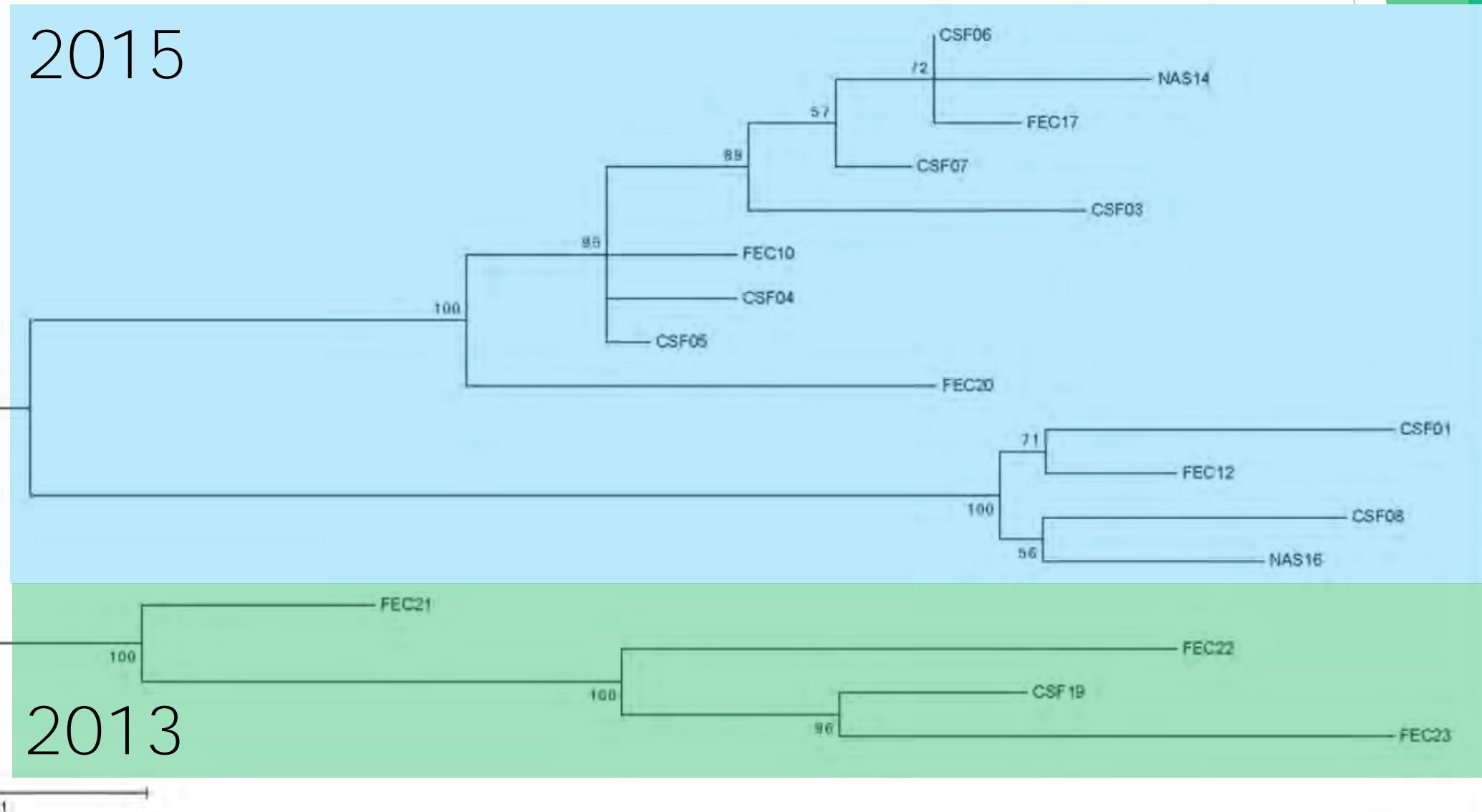


85% nt
HPeV 3?
1? 4? 5? 6?

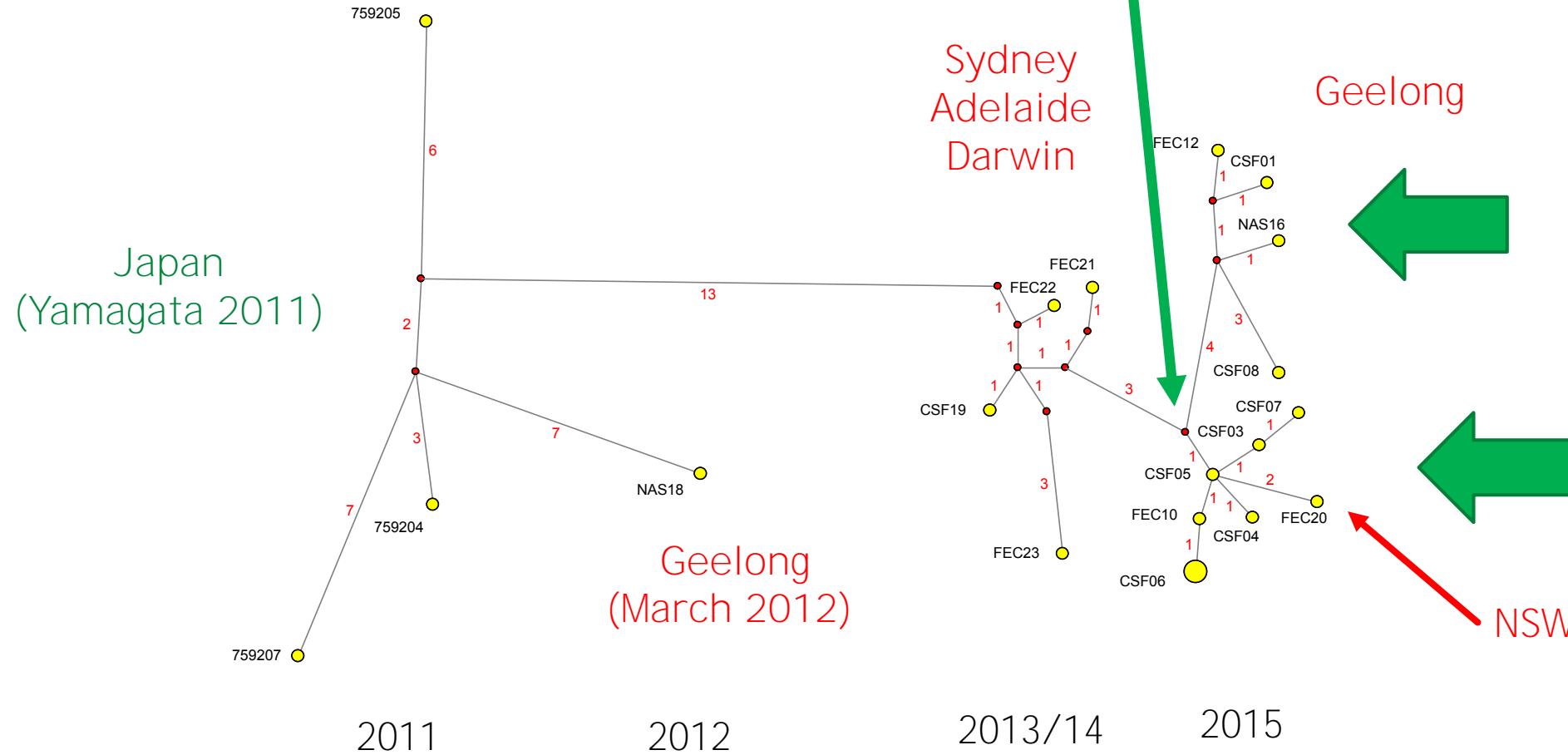
HPeV-3 Oz Recombinant



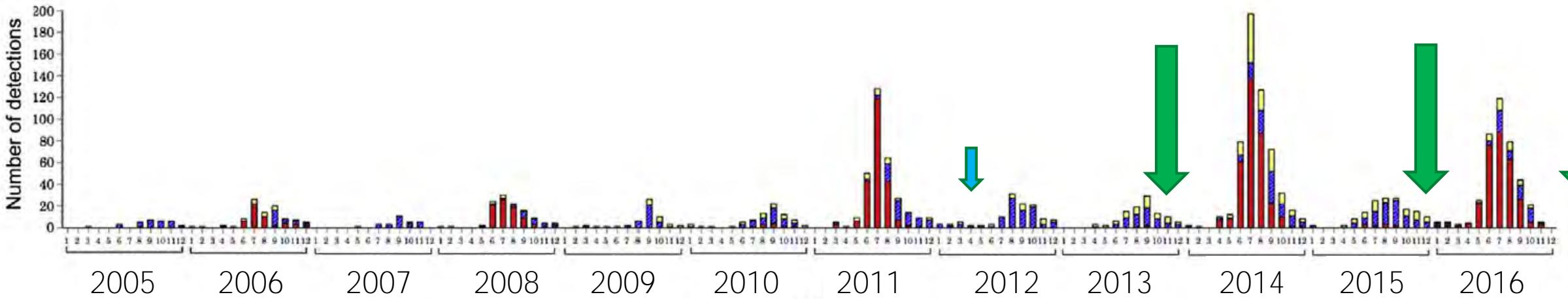
HPeV-3: Oz Recombinant Clusters



Oz Recombinant Clusters



Global Epidemiology



National Institute of Infectious Diseases, Japan

https://www.niid.go.jp/niid/images/iasr/rapid/topics/parecho/160817/parecho1_161208.gif

- Recent epidemics in Japan and Australia are different viruses
- Recirculating local origin HPeV-3's
- (recombinant HPeV-3 only detected in Oz to date)

Going forward: Research Questions

- ▶ Do 2017 HPeV-3's belong to recombinant lineage?
- ▶ Are there different lineages in different parts of Australia?
- ▶ Are any associated with more severe clinical disease?

Going forward: Research Questions

- ▶ What is the seroprevalence of exposure in Oz?
- ▶ Serological test development?
- ▶ Given capsid stability of HPeV-3 in Australia could a vaccine be developed?

In the lab...

- ▶ Plan: WGS of clinical isolates
- ▶ AAHL - Serum neutralization
- ▶ VIC NSW QLD WA - molecular epi
- ▶ APPRISE HPeV project commencing 2018
 - ▶ Multisite Centre for Research Excellence (CRE)



Questions?

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