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Avian influenza 101
What's in the name?

Avian influenza “subtype”

- HA: H1-H16
- NA: N1-N9
- eg. H7N7
Low pathogenic
- all HA subtypes (H1-H16)
- common in wild birds
- no disease in wild birds
- occasional, mild disease in poultry

High pathogenic
- “bird flu”
- only H5 and H7 subtypes
- causes outbreaks in poultry
- associated with disease and death in poultry and wild birds

What’s in the name?

Enter poultry production
Genetic changes in the HA
Highly pathogenic H5 or H7
HPAI current situation
Global situation of HPAI

Outbreak notifications April 2020-September 2021

Global situation of HPAI

Outbreak notifications Sept 2021-June 2023

Avian influenza in seabirds: LPAI and HPAI
Seabirds are important hosts for low pathogenic avian influenza virus

Antarctic birds are important hosts for low pathogenic avian influenza virus

- H4N7
- H5N5
- H6N8
- H11N2

- Adelie Penguin
- Chinstrap Penguin
- Southern Giant Petrel
- Brown Skua
- Snowy Sheathbill
### HPAI outbreaks in seabirds

<table>
<thead>
<tr>
<th>Family</th>
<th>Confirmed HPAI</th>
<th>No HPAI</th>
<th>Total</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>Anatidae</td>
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<td>13/17</td>
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<td>Alcidae</td>
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<td>Laridae</td>
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<td>Sternae</td>
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<td>Stercoraridae</td>
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<td>Gaviidae</td>
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<td>Pelecanidae</td>
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<td>Sulidae</td>
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</table>

*Southern Giant Petrel, July 2023*

*Waved Albatross, July 2023*

Number of seabird species identified in WAHIS, June 2023
Notable HPAI outbreaks in seabirds
Substantial geographic range in single species, within short periods of time: Northern Gannets

Lane et al. 2023. High pathogenicity avian influenza in Northern Gannets. bioRxiv
Notable HPAI outbreaks in seabirds

Population level effects: Sandwich Terns

17% of European population of Sandwich Terns died
Almost 100% mortality of chicks in affected colonies

Knief et al. 2023. Highly pathogenic avian influenza causes mass mortality in Sandwich Tern breeding colonies across north Western Europe. bioRxiv
Notable HPAI outbreaks in seabirds

Population level effects: Great Skuas

1500 dead Skuas found, with a decrease of 60-70% in occupied territories

Camphuysen & Greer. 2022. Great Skuas and Northern Gannets on Foula, summer 2022. NIOOZ report
Notable HPAI outbreaks in seabirds

In Peru:
229,554 Peruvian boobies (Sula variegata)
201,047 guanay cormorants (Leucocarbo bougainvillii)
57,335 Peruvian pelicans (Pelecanus thagus)
5,573 Inca terns (Larosterna inca)

“40% of Peruvian Pelicans in Peru died due to HPAI”
Notable HPAI outbreaks in seabirds

3-4 introductions, starting ~Oct 2022

~6000km in < 6 months

First detection Tierra del Fuego, March 2022
Notable HPAI outbreaks in seabirds
Gateways to Antarctica: Africa

“By 17 January 2019, more than 200 penguin carcasses had been retrieved, several sick birds were seen on the island, and more carcasses were reported by tour boats in the surrounding waters.”

HPAI disease signs
HPAI disease signs in seabirds

– first bird found dead: 29.05.2022
– last bird found dead: 20.07.2022
– H5N1 confirmed

Cumulative number of dead birds found:

- N = 510
- of which 327 of known sex and age

@CommonTern
Banter See in Wilhelmshaven

days since the 1st dead bird
HPAI disease signs in seabirds

Rijks et al. 2022. Mass mortality caused by highly pathogenic avian influenza virus in sandwich terns, the Netherlands, 2022. EID
HPAI disease signs in seabirds

• Neurological signs such as loss of coordination and balance, trembling head and body, or twisting of the neck

Lethargy and depression, unresponsiveness, lying down, drooping wings, dragging legs,

• Closed and excessively watery eyes, possibly with opaque cornea or darkened iris (new symptom associated with current outbreak),

• Respiratory distress such as gaping (mouth breathing), nasal snicking (coughing sound), sneezing, gurgling, or rattling,

• Sudden and rapid increase in the number of birds found dead between visits,
HPAI in mammals
HPAI in mammals

EFSA. 2023. Avian Influenza overview, May – June 2023
First Mass Mortality of Marine Mammals Caused by Highly Pathogenic Influenza Virus (H5N1) in South America


Eating infected birds

Flu-like illness

ataxia

HPAI in South American SeaLions
Risk to humans
HPAI is zoonotic

Avian and human cases of HPAI H5Nx since October 2020

USA
H5N1
1 case

UK
H5N1
3 cases

Spain
H5N1
2 cases

Russia
H5N8
7 cases

China
H5N6
61* cases
H5N1
2 cases

Ecuador
H5N1
1 case

Chile
H5N1
1 case

Nigeria
H5N1?
3 cases

Laos
H5N6
1 case

Cambodia
H5N1
2 cases

Viet Nam
H5N1
1 case

Wille, Barr, Klaassen. 2023. Pursuit
HPAI is zoonotic

In the event of emergence in humans:

- The WHO has a candidate vaccine virus selected, but no vaccine production yet.
- All influenza antivirals on the market (Tamiflu, Baloxavir, Zanamivir etc) work against this virus

HPAI is a category 3 pathogen = requires PPE and proper level 3 laboratory facilities