What to expect, collect and investigate

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Definitions

- Wildlife = all “non owned” species (e.g. feral)
  - Includes wild birds
  - Includes feral species such as feral pigs or goats

- Disease = any condition negatively impacting the health of animals, including:
  - Infectious diseases
  - Toxins (e.g. botulism)
  - Other causes (cancer, genetic disease, etc.)

Wildlife Outbreak Investigation

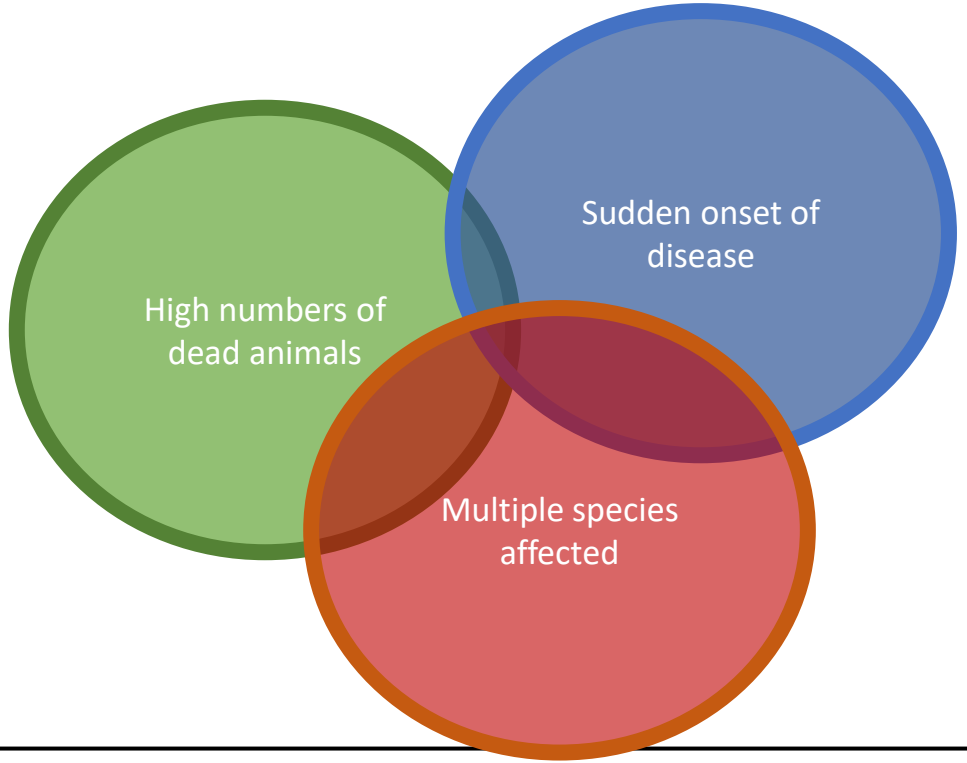
- What is an outbreak?
  - A disease **outbreak** is the occurrence of cases of disease in excess of what would normally be expected in a **defined** community, geographical area or season (as defined by the World Health Organisation)

  - E.g. high pathogenic avian influenza
    - N=1 could represent an “outbreak”

How can a wildlife outbreak look?

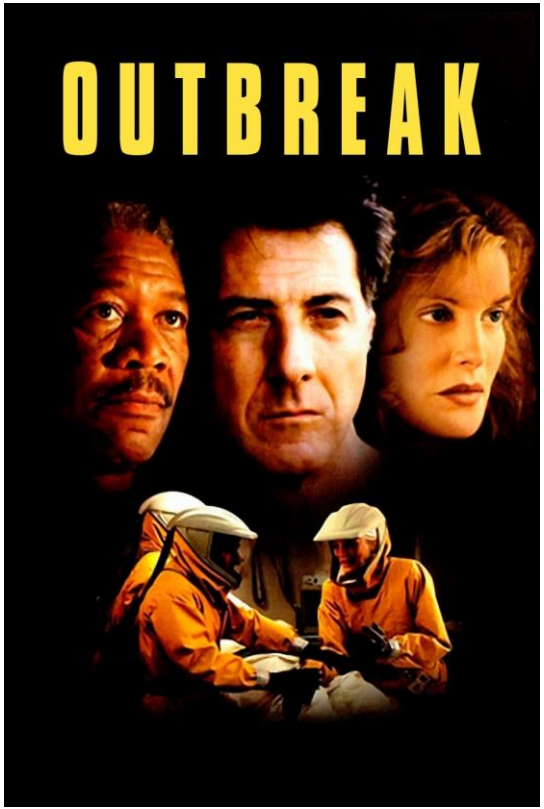
- These are important factors to consider

- Other factors include:
  - Significant deaths over a long time
  - Spread to humans (zoonotic)



Human health

- Outbreaks of disease in animals should ALWAYS be considered a potential threat to human health
- During examination of live or dead animals, ensure you and others take precautions and wear proper PPE, this may include:
  - Ensuring good ventilation
  - Wearing rubber gloves
  - Mask and/or goggles
  - An apron or outer clothing you can wash after you have finished your examination



Why do we care about disease outbreaks in wildlife?

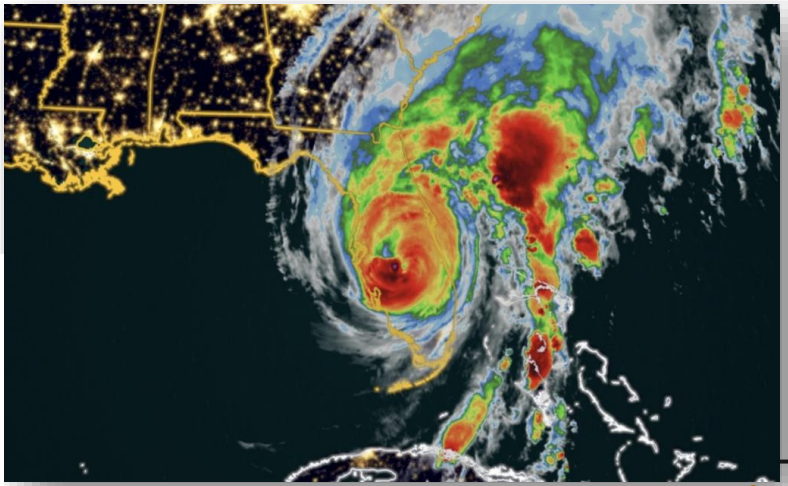
- Outbreaks may impact the health of wildlife populations
  - Causing decline or extinction
- Outbreaks may impact human health (e.g. Avian influenza, Ebola)
- Outbreaks may indicate a new pathogen has entered the country
  - New pathogens may affect domestic animals as well as humans and wildlife

In California, the first sign of West Nile Virus was dying birds.
The disease progressed to cause disease in horses and humans.

https://www.msmosquito.org/west-nile-virus

Major causes of wildlife outbreaks

- Toxicity
- Infectious disease
- Environmental factors (starvation, heat, dehydration, weather events)
- Idiopathic



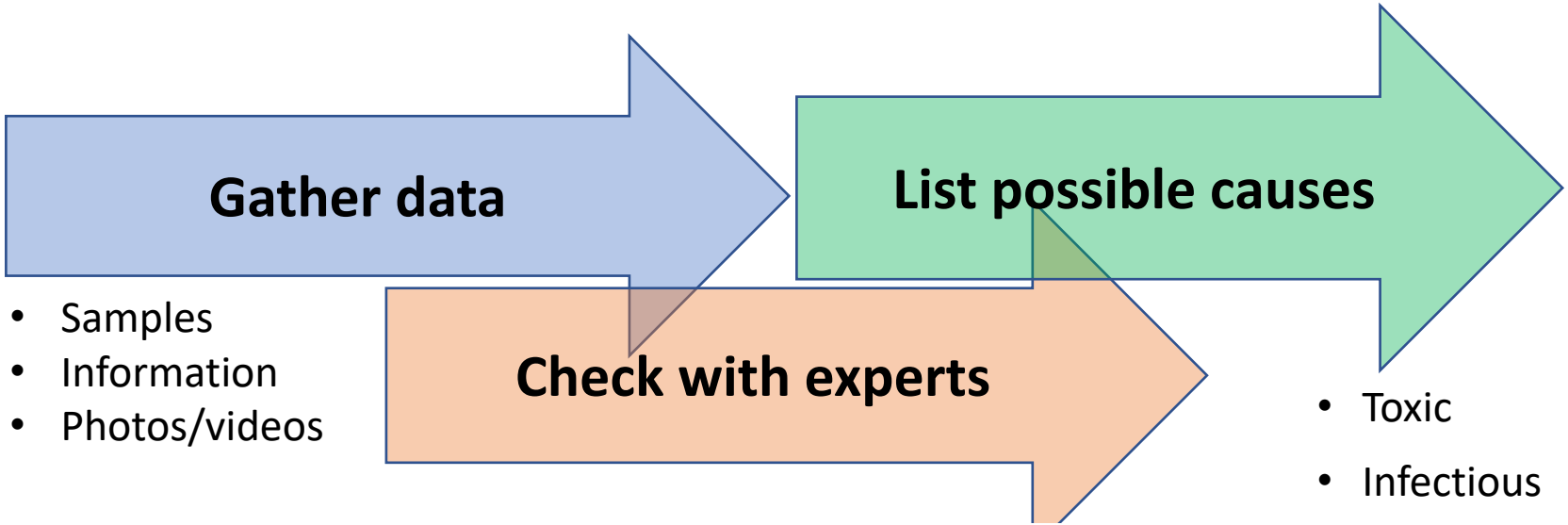
Map of Hurricane Ian that recently hit the US Gulf.

https://www.weatherwatch.co.nz/content/live-storm-tracker-historic-hurricane-ian-hits-florida-worst-in-100yrs-for-western-fl

Infectious diseases

- Avian influenza (highly pathogenic - HPAI)
- Newcastle disease (caused by Avian Paramyxovirus-1)
- Botulism (toxicity with botulinum toxin)
  - Can also be considered a toxicity
- Others are possible

Help, I have an outbreak! Now what?



- Samples
- Information
- Photos/videos

- Local people – is this normal? Have they seen this before?
- Scientists in country and overseas – what could be causing this?

- Toxic
- Infectious
- Weather
- other?

What to collect

- Photographs
- Videos
- Map location (use GPS and phone map if possible)
- Description of the outbreak
  - Numbers affected
  - Clinical signs of dying birds/wildlife
  - Location
  - Etc.
- Bodies – pick the FRESHEST
  - Refrigerate if possible
  - Freeze if refrigeration is not available

A “Case Definition” can be useful

- **Demographic**
  - Species, age, sex, population
- **Place**
  - Location
- **Time**
  - Can be a defined period of time or seasonal (e.g. algal blooms in summer)
- **Clinical features**
  - Simple, concise, easy for others to interpret in case they suspect the same disease
- **Pathological features**
  - Photos of autopsies
  - Tissues saved in formalin and/or frozen

Establishing a **case definition**

- A vital part of outbreak investigation
- A case definition helps to:
  - Clarify the problem in your mind
  - Communicate the problem to others
  - Define possible causes
  - Determine what to sample
- Not fixed in stone – can be adjusted as your understanding grows

Hundreds of dead birds in a pond at the end of summer. This is a typical picture for botulism.

https://www.rnz.co.nz/news/national/382315/avian-botulism-from-sewage-pond-kills-600-birds

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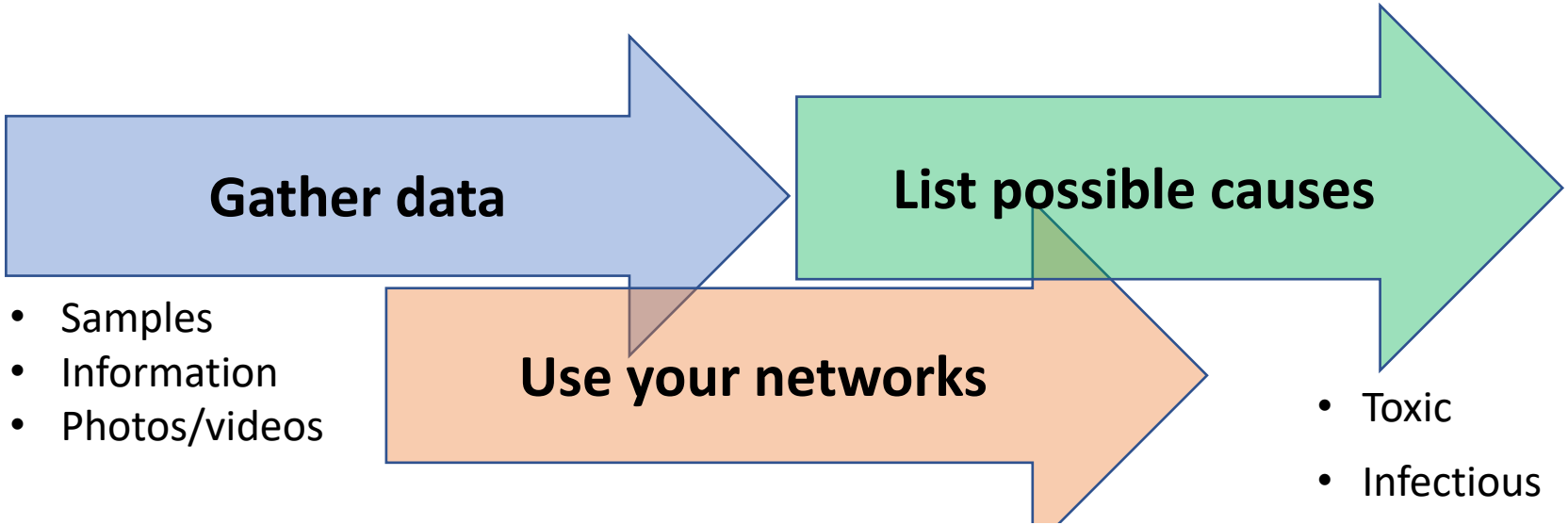

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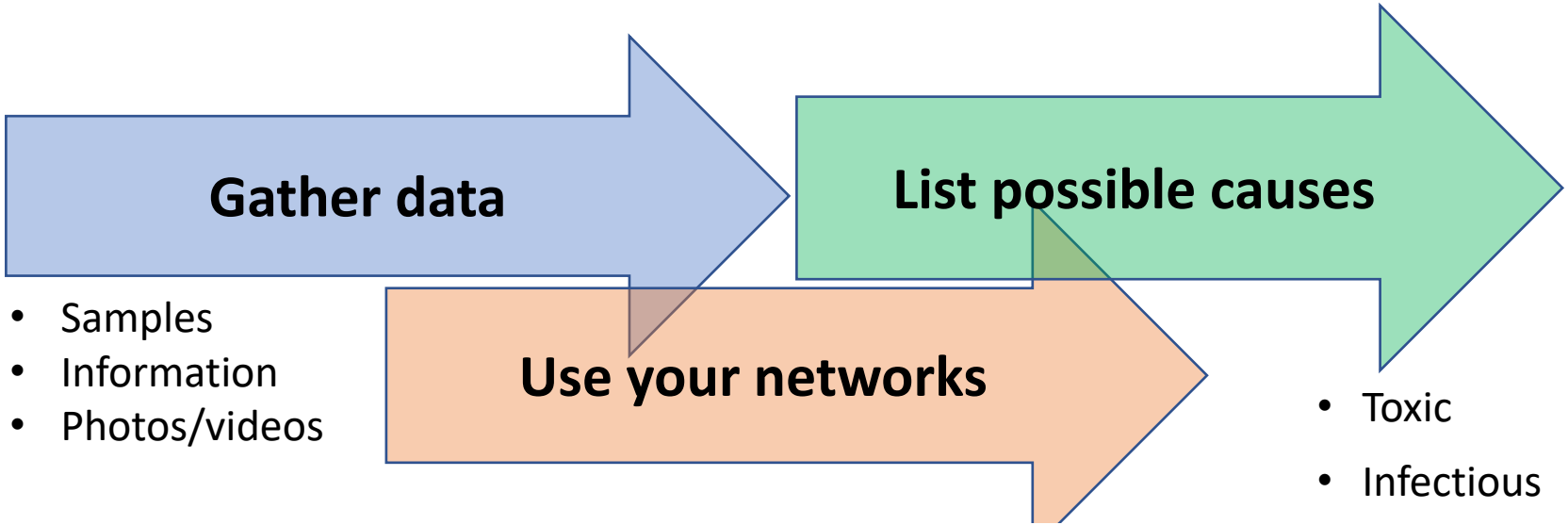
Use your networks!

- Locals and local experts
- WOAH (formerly OIE)
- Diagnostic assistance for disease investigations is available for WOAH-listed notifiable diseases
  - request to ACDP in Australia and AHL in NZ must be through the Government authority or nominated WOAH Delegate
  - All the data you collect (videos, photos, maps, descriptions) will help evaluate possible causes of the outbreak

Help, I have an outbreak! Now what?



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- other?

Steps 1 and 2 will help you make your list

- Toxicity
- Infectious disease
  - Avian influenza (highly pathogenic - HPAI)
  - Newcastle disease (caused by Avian Paramyxovirus-1)
  - Botulism (toxicity with botulinum toxin)
  - Bacterial (e.g. Salmonella?)
- Environmental factors (starvation, heat, dehydration, weather events)
- Idiopathic

Diagnostic challenges…

- Poor sample quality
  - Sample collection in the field/transport to lab
  - Rotten carcasses
  - Opportunistic sampling

Dead kiwi in Northland
(stuff.co.nz)

Diagnostic challenges…

- Test validation for wildlife species
- Funding for testing samples
  - Especially for rule-out of multiple diseases in a large number of animals
- Size of sample obtained (e.g. skinks and other tiny things)
- Limited availability of testing for some diseases
- Others

Wildlife outbreaks in New Zealand

- Annual botulism outbreaks
  - Usually associated with ponds
- Poisoning events
  - Black-backed gulls in Southland
  - Red-billed gulls
- Passerine die-offs (e.g. sparrows)
  - Bacterial infections
    - Salmonellosis
    - Yersiniosis
- Cyclone-related seabird “wreck” events (Prion wreck (2011))
- Rena oil spill (2011)

Broad-billed prion during rehabilitation (https://www.10000birds.com/a-wreck-of-prions.htm)

Dead birds during the Rena oil spill in 2011 (Photo: Colin Miskelly)

A few recent cases

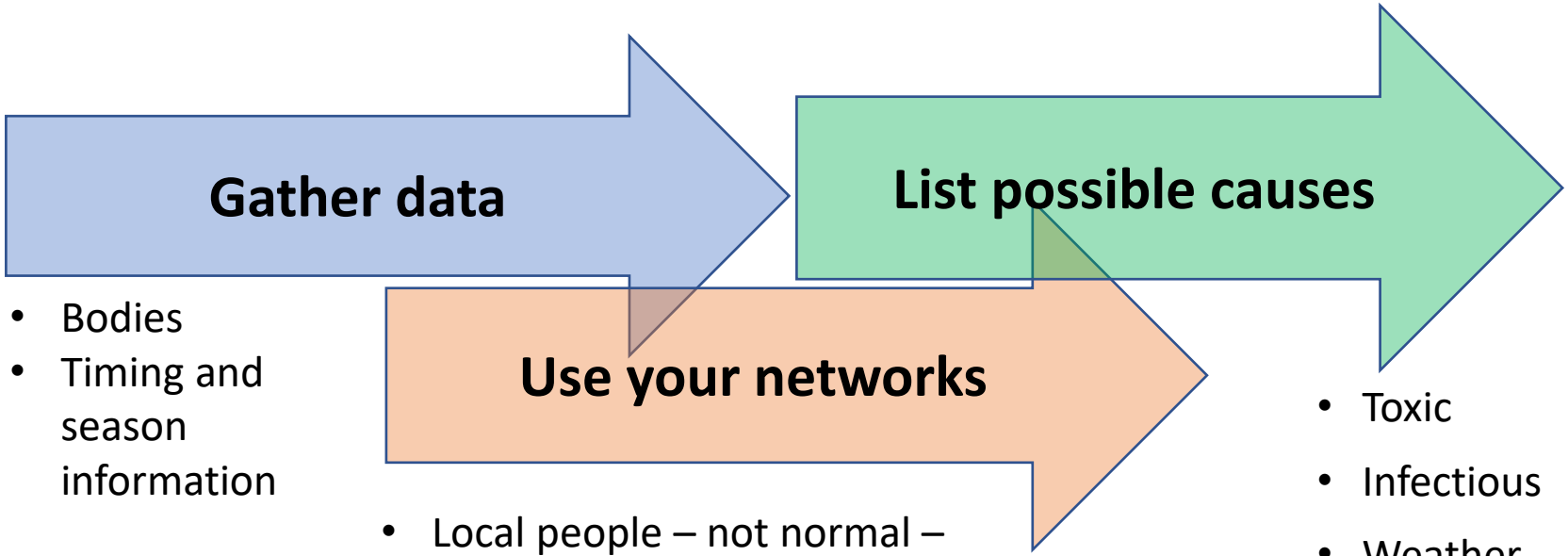
- Mass mortality in black swans
- Mortality in wax-eyes
- Seal mortalities

Mass mortality of swans

- Local Fish and Game official phoned MPI to report:
  - Dozens of dead black swans on a sewage treatment pond
- Further info:
  - Only one species affected
    - Ducks and eels okay
  - All deaths occurred over 1-2 weeks in late autumn

Black swans on a pond in New Zealand

Help, I have an outbreak! Now what?



- Bodies
- Timing and season information

- Local people – not normal – occasionally happens but not annually
- Scientists in country and overseas – most consistent with botulism, but also rule out exotic disease

- Toxic
- Infectious
- ~~Weather~~
- ~~other?~~

Mass mortality of swans

- Local fish and game official – “Not normal” for this time of year
  - Helped collect bodies in fridge, and ship to laboratory

- Talked to scientists at MPI’s Animal Health Laboratory
  - Confirmed sample types for the following:
    - Botulism
    - Avian influenza
    - Newcastle disease virus
    - Histology to check on underlying disease

Mass mortality of swans

- Results:
  - Exotic disease tests = NEGATIVE
  - Botulism…. Also NEGATIVE (need better samples?)
  - Histology – showed HIGH levels of parasites in the swans

- Final conclusion
  - Exotic disease was ruled out
  - Botulism still considered possible due to test sensitivity

Mortality of wax-eye birds

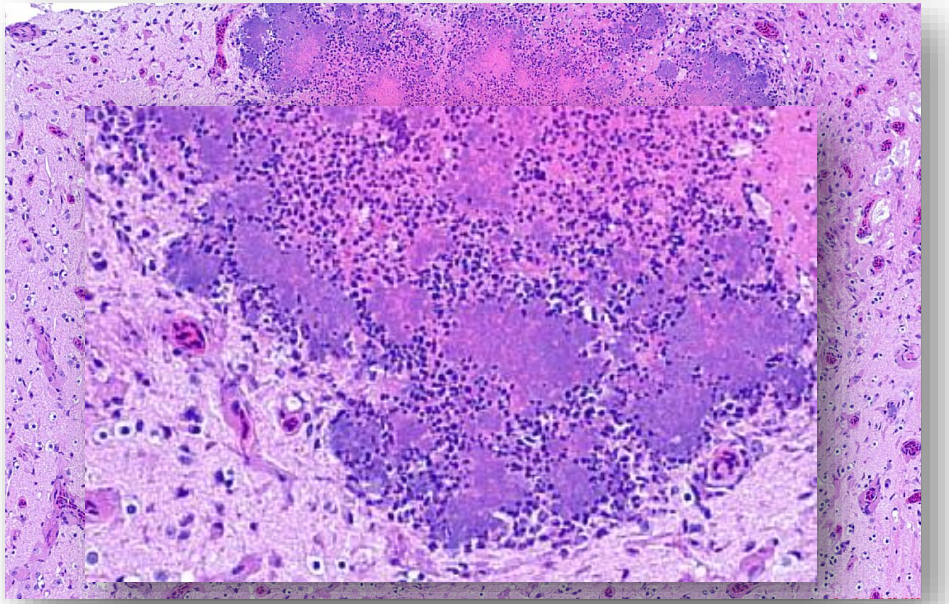
- Member of the public in Auckland phoned the MPI exotic pest and disease hotline
- Found 2-3 dead wax-eyes daily at his property for the past few weeks (around 50 dead total out of ~100)
- Had kept two very fresh bodies in freezer

A healthy wax-eye

https://www.doc.govt.nz/nature/native-animals/birds/birds-a-z/silvereye-or-wax-eye/

Mortality of wax-eye birds continued…

- Bodies were sent to a veterinary pathology laboratory
- Samples were taken for Avian Influenza, West Nile Virus and Newcastle Disease Virus
- Autopsy: nothing abnormal
- Histology: severe bacterial infection in both birds

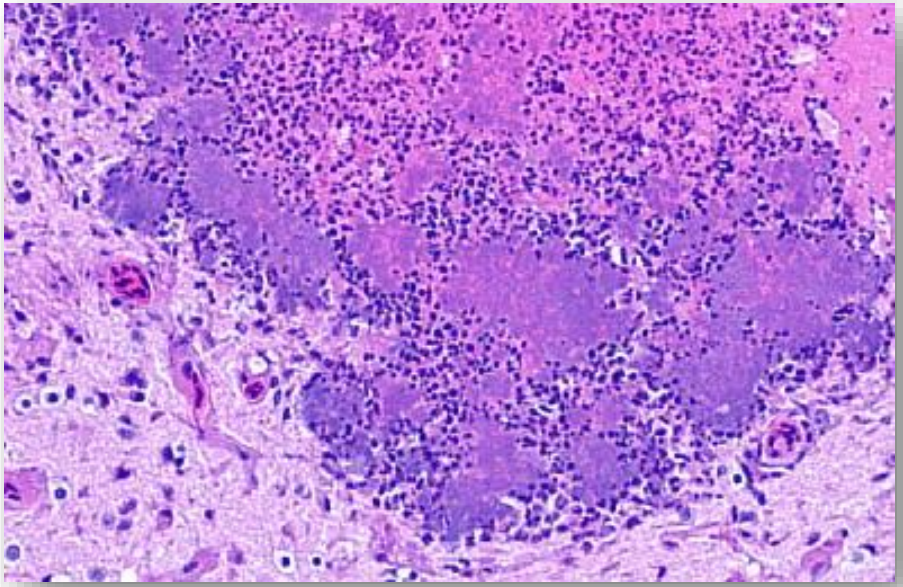


A very unhealthy brain!

(photo courtesy of Lisa Schmidt, SVS Laboratories)

Mortality of wax-eye birds continued…

- Diagnostic molecular testing:
  - All samples NEGATIVE for exotic viruses
- Pathology:
  - Severe bacterial infection
  - Bacteria resemble *Yersinia* spp. bacteria (*Y. pseudotuberculosis* or *Y. enterocolitica*, etc)
  - Confirmed on Gram stain (Gram negative)
- *Yersinia* infection in birds is common in the wintertime
  - The die-off represented an outbreak of a normal pathogen



Yersinia spp. bacteria in a brain lesion of a wax-eye

(photo courtesy of Lisa Schmidt, SVS Laboratories)

Seal mortality events

- Annual mortality events in winter
  - Starvation due to weaning, poor foraging
- Occasional traumatic injury
- MPI seeks to do surveillance on mortality events of 3 or more seals
  - Avian influenza and morbillivirus surveillance

Dead seals are occasionally reported to MPI

https://www.stuff.co.nz/national/crime/4426888/Seals-clubbed-to-death-on-Kaikoura-coast

Take-home messages

- Wildlife outbreaks are useful to investigate
- Collect as much information as possible
- “Phone a friend” if necessary
- Collect the FRESHEST samples possible
- Consider involving WOAH and local country experts (MPI, ACDP) for help

Resources for avian influenza

(basic facts, human health, etc.)

- Australia DAFF Biosecurity website

  https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/protect-animal-plant/bird-owners/avian_influenza_bird_flu

- USA Centers for Disease Control and Prevention (CDC)

  https://www.cdc.gov/flu/avianflu/h5/worker-protection-ppe.htm

- US Fish and Wildlife Service

  https://www.fws.gov/avian-influenza

Support from ACDP and New Zealand's AHL:

- Diagnostic assistance for disease investigations is available for WOAH Listed notifiable diseases and the request to ACDP in Australia and AHL in NZ must be through a request from the Government authority or nominated WOAH Delegate.
- Any testing for selected diseases would be dependent on the provision of (where available) clinical & epidemiological information, which would help inform the appropriate diagnostic testing (and, in particular, help determine if it is likely an infectious or non-infectious cause).
- Both happy to discuss cases prior to submission to assist with appropriate sample collection, transport and selection of appropriate diagnostics.

Thank you for your attention!

Questions?