

# Biosecurity and biosurveillance: the Singapore perspective

International Alliance for Biological Standardization (IABS)/ World Organisation for Animal Health (WOAH) 22-23 October, 2024

Dr Chua Tze Hoong  
Veterinary Health Division, National Parks Board

# Animal & Zoonotic Diseases at our Doorstep

**FMT**

## Malaysia records first incidence of African horse sickness

FMT Reporters · 04 Sep 2020, 09:59 AM

Investigations are ongoing to determine the source of infection in Terengganu.

143 SHARES

Total Views: 6



The five Terengganu horses were tested positive for African horse disease after a second sampling on Aug 31. (Bernama pic)

**THE STRAITS TIMES**

## Sarawak to go door-to-door to vaccinate more dogs against rabies

By Bruno J  
April 27, 2024 @ 12:45pm

Service no longer available



Since 2017, Sarawak has seen an outbreak of rabies, with 78 cases involving humans recorded, resulting in 71 deaths. - File Pic

November 16, 2021  
4:23 PM GMT+8  
Last Updated 5 months ago

Healthcare & Pharmaceuticals

## Japan confirms H5N8 strain in third bird flu outbreak in the country



Asia / Southeast Asia


## Bird flu kills 11-year-old girl in Cambodia, first human case in country since 2014

- The girl from rural Prey Veng became ill on February 16 and was sent to hospital in Phnom Penh, where she died on Wednesday
- Bird flu poses a high risk to children who may be feeding or collecting eggs, playing with the birds or cleaning their cages

## DVSS: Samples from pigs that died in Ng Ngungun confirmed positive for African Swine Fever

BY PETER BOON ON APRIL 16, 2022, SATURDAY AT 2:15 PM

SARAWAK



**THE STRAITS TIMES**

## Wild boar carcasses in more parts of Singapore test positive for African swine fever



## Lumpy Skin Disease confirmed in Sumatra, raising alert for Australia

Dr Ross Ainsworth, 03/03/2022



## Lion at Singapore Zoo tests positive for COVID-19; five lions now infected

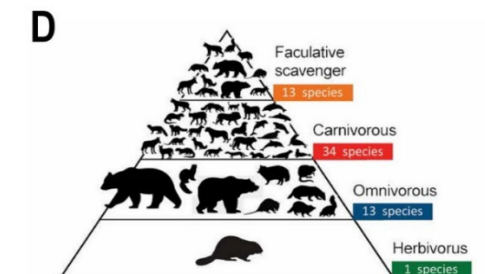
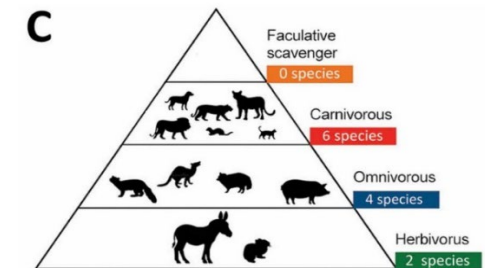
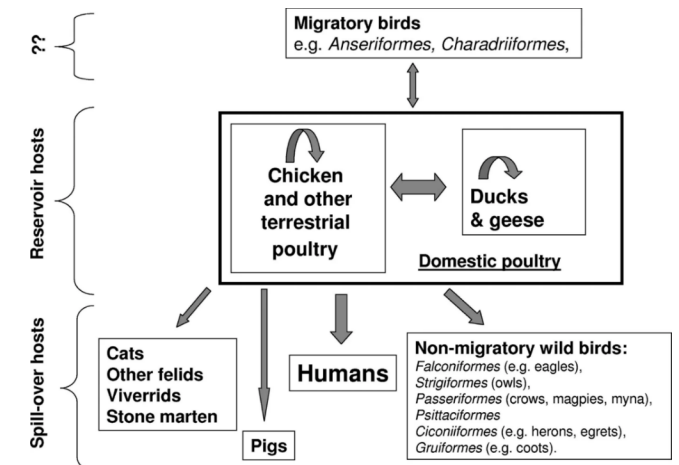


and its cub at the Singapore Zoo. (Photo: Facebook/Mandira Wildlife Reserve)

**Singapore has seen its first case of Lumpy Skin Disease (LSD) in March 2022, and African Swine Fever (ASF) in February 2023.**

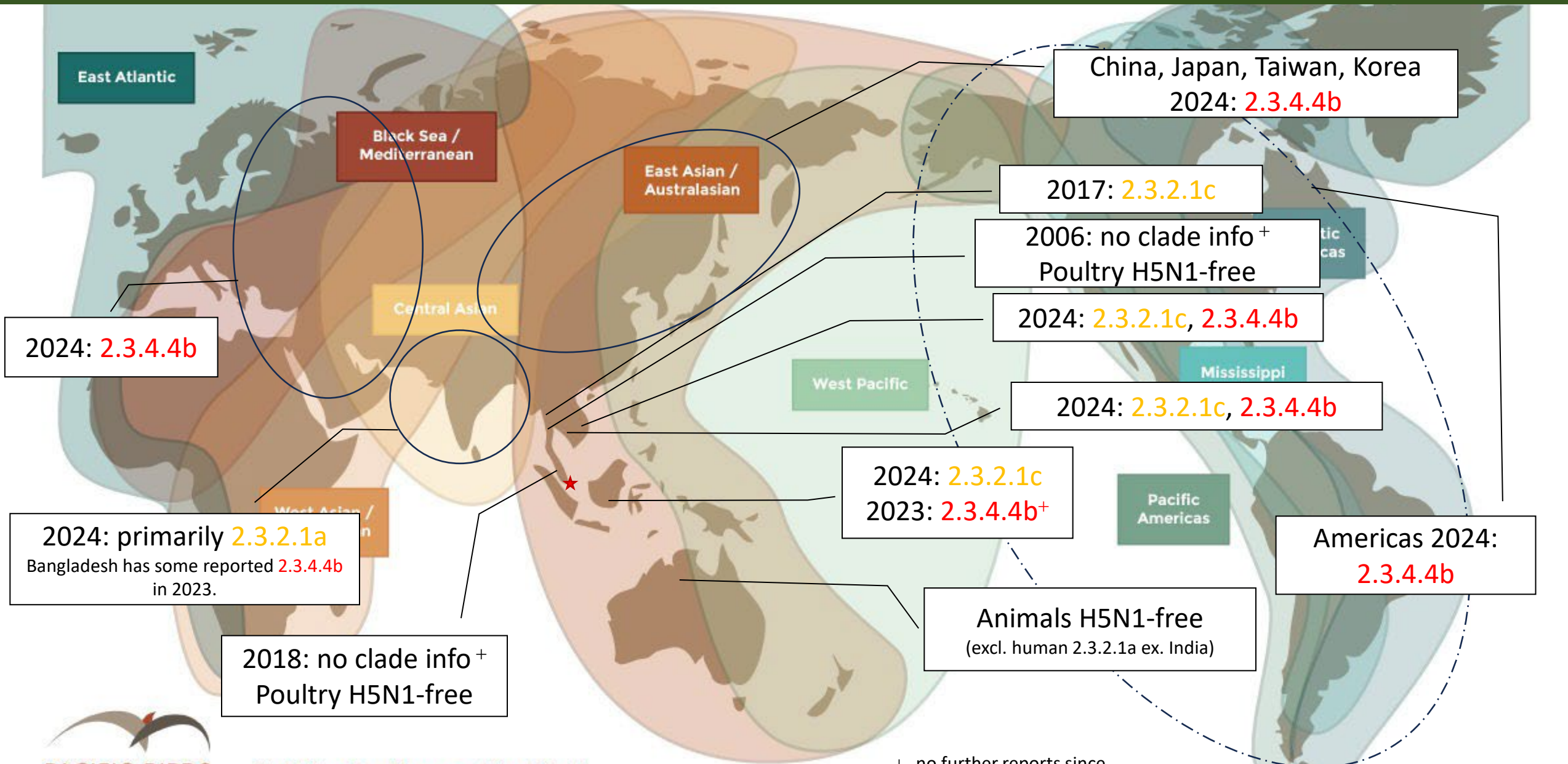
## Emergence of A(H5N1) 2.3.4.4b viruses

- In 2020, a specific lineage of A(H5N1) clade 2.3.4.4b emerged and began to spread worldwide
  - Panzootic from 2020-present
  - Within Jan 2022 – Sep 2023, over 17,000 outbreaks reported worldwide
- Unprecedented disease characteristics:
  - Rapid expansion of geographical range into new regions (Americas, Antarctica)
  - Widespread infection of wild birds
  - Significant expansion of host range to new avian species and even mammals
  - Outbreaks became year-round (previously seasonal)
- 2.3.4.4b is currently the dominant circulating lineage in most regions of the world



**C**, mammal species with reported infections 2003-2019; **D**, mammal species with reported infections 2020-2023. Figures adapted from Plaza et al. (2023)

# Global Avian Influenza Situation



Bird Migration Flyways of the World

+ no further reports since.

Strains reported to best ability via NextStrain and literature search.

Image by Pacific Birds Habitat Joint Ventures. Source: US Fish and Wildlife Service

# Multi-layer Approach to Ensure Animal Health

Layer

## Pre-Border

*Anticipate and assess upstream risks as part of forward defense*

## Border

*Safeguard border biosecurity during the import of live animals and animal products into Singapore*

## Post-Border

*Prevent, detect, respond, recover, and mitigate threats in local animal populations*

Risk Drivers

- 1 Singapore is a **transit point** for migratory wildlife, and import and export of animals and animal products.
- 2 Increased likelihood for disease due to **global risk drivers** (e.g., climate change, international trade and travel, including smuggling)
- 3 Increase in **animal/wildlife populations**, establishments, displacements and interactions
- 4 Scope for closer and enhanced **One Health collaboration**



Image Source: University of Nebraska

# Multi-layer Approach to Ensure Animal Health – HPAI example

## *Pre-border*

- Maintaining HPAI free imports through health certificates, source accreditation, zoning and compartmentalization arrangements
- Horizon scanning – for early detection of overseas disease events

## *Border*

- Border checks via inspection all imports of poultry, birds, eggs and avian products at the port of entry
- Working with border authorities to curb smuggling of birds and avian products, at borders and checkpoints
- Sampling and biosurveillance at border

## *Post-border: Farm biosecurity, biosurveillance, contingency plans, vaccination*

- Maintenance of farm biosecurity through licensing conditions and regular inspections
- Sampling and biosurveillance of local bird populations, including wild birds and migratory shorebirds
- HPAI contingency plans (e.g. stamping out)



# Key Biosurveillance Functions and Programmes

- Monitor diseases in local animal populations
- NParks centres also serve as sentinels for biosurveillance



**scientific** reports

**OPEN** **Shorebirds wintering in Southeast Asia demonstrate trans-Himalayan flights**

David Li<sup>1,2</sup>, Geoffrey Davison<sup>1</sup>, Simeon Lisovski<sup>2</sup>, Phil F. Battley<sup>3</sup>, Zhijun Ma<sup>4</sup>, Shufen Yang<sup>1</sup>, Choon Beng How<sup>1</sup>, Doug Watkins<sup>5</sup>, Philip Round<sup>6</sup>, Alex Yee<sup>1</sup>, Vupasana Srinivasan<sup>1</sup>, Clarice Teo<sup>1</sup>, Robert Teo<sup>1</sup>, Adrian Loo<sup>1</sup>, Chee Chiew Leong<sup>1</sup> & Kenneth Er<sup>1</sup>

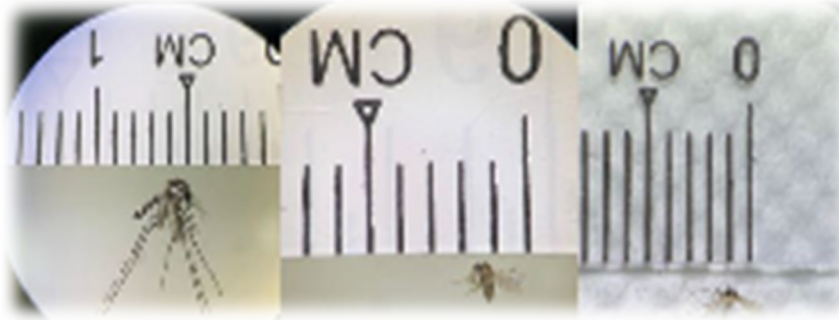
**CASE REPORT**

**Suspected clinical toxoplasmosis in a 12-week-old puppy in Singapore**

Audrey Chen<sup>1\*</sup>, Max Boulay<sup>2</sup>, Stacy Chong<sup>3</sup>, Kelvin Ho<sup>4</sup>, Amy Chan<sup>3</sup>, Jasmine Ong<sup>3</sup>, Charlene Judith Fernandez<sup>3</sup>, Siow Foong Chang<sup>5</sup> and Him Hoo Yap<sup>6</sup>

# Key Biosurveillance Functions and Programmes

Vector surveillance for ticks, midges, sandflies that transmit vector-borne diseases e.g. African Horse Sickness (AHS), leishmaniasis, lumpy skin disease



## INTEGRATED BIOSURVEILLANCE FOR EMERGING VECTOR-BORNE DISEASES: FIRST DETECTIONS OF CANINE LEISHMANIASIS IN SINGAPORE

Wendy Sng<sup>1</sup>, Cheong Huat Tan<sup>2</sup>, Stacy Chong<sup>3</sup>, Majhalia Tomo<sup>2</sup>, Kelvin Ho<sup>1</sup>, Denise Tan<sup>2</sup>, Hwee Ping Lim<sup>1</sup>, Jasmine Ong<sup>3</sup>, Darren Yeo<sup>3</sup>, Amy Chan<sup>3</sup>, Zhan Pei Heng<sup>1</sup>, Kelvin Lim<sup>1</sup>, Tze Hoong Chua<sup>4</sup>, Charlene Judith Fernandez<sup>3</sup>, Siow Foong Chang<sup>5</sup>, Him Hoo Yap<sup>6</sup>

<sup>1</sup>Biotic and Biosurveillance Branch, Animal and Veterinary Service (AVS), National Parks Board (NParks), 52 Jurong Gateway Rd, Singapore 608550; <sup>2</sup>Environmental Health Institute, National Environment Agency, 11 Biopolis Way, Singapore 138667; <sup>3</sup>Centre for Animal & Veterinary Sciences, AVS, NParks, 6 Perahu Rd, Singapore 718827; <sup>4</sup>Veterinary Health, AVS, NParks, 52 Jurong Gateway Rd, Singapore 608550; <sup>5</sup>Professional and Scientific Services, AVS, NParks, 52 Jurong Gateway Rd, Singapore 608550; and <sup>6</sup>Animal and Veterinary Service, NParks, 1 Cluny Road, Singapore Botanic Gardens, Singapore 259569



## EMERGING INFECTIOUS DISEASES®

ISSN: 1080-6059

EID Journal > Volume 28 > Number 12—December 2022 > Main Article

Volume 28, Number 12—December 2022

Research

Development of Differentiating Infected from Vaccinated Animals (DIVA) Real-Time PCR for African Horse Sickness Virus Serotype 1

Yifan Wang, Jasmine Ong, Qi Ming Ng, Tanput Sambasuri, Eileen Y. Koh, Jasha PS Wong, Kankwan Buranwinda, Charlene Judith

Fernandez, Taoq Huangfu, S.F. Ch Health Institute, [Cite This Article](#)

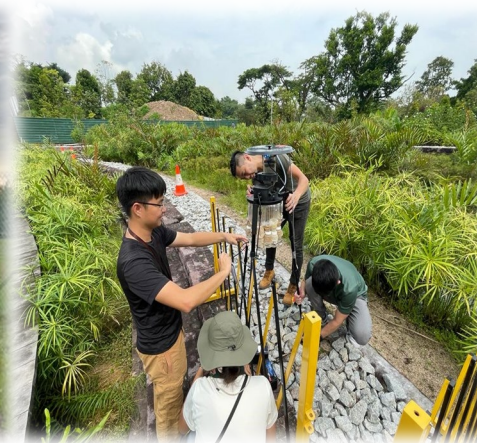
BRIEF REPORT

Open Access



## Detection of a novel *Babesia* sp. in *Amblyomma javanense*, an ectoparasite of Sunda pangolins

Stacy Q. Y. Chong<sup>1\*</sup>, Darren Yeo<sup>1</sup>, Nur Insyirah Aidil<sup>1</sup>, Jasmine L. Y. Ong<sup>1</sup>, Amy H. J. Chan<sup>1</sup>, Charlene Judith Fernandez<sup>1</sup>, Bryan T. M. Lim<sup>2</sup>, Max D. Y. Khoo<sup>2</sup>, Anna M. S. Wong<sup>2</sup>, Siow Foong Chang<sup>1</sup> and Him Hoo Yap<sup>1</sup>



# Disease Investigation and Response

- To detect and characterise emerging animal health threats in Singapore
- May be complemented with subsequent epidemiological and ecological modelling, and laboratory investigations to guide risk assessment and management measures



## Rabbit Haemorrhagic Disease

Rabbit haemorrhagic disease virus 2 from Singapore 2020 outbreak revealed an Australian recombinant variant

Eileen Y Koh, Jasmine Ong, Yifan Wang, Xinyu Teh, Charlene Judith Fernandez, Taoqi Huangfu, Baoyn H Hui, Stiffie Toh, Kelvin Lim, Wendy Sng, Hwei Ping Lim, Kelvin Ho, Siew Eung Cheng, Him Fan Yip

Emerging Infectious Diseases, Volume 29, Issue 1, 2023, e364029, <https://doi.org/10.1093/eid/ciag029>  
Published: 02 May 2023 Article history



## Newcastle Disease in Layer Chickens



## Lumpy Skin Disease in Dairy Cattle



## COVID-19

## Canine Parvovirus at animal facilities



## SARS-CoV-2 in Zoo Animals

### EMERGING INFECTIOUS DISEASES

Volume 29, Number 12—December 2021  
www.eidonline.org

Anthropogenic Transmission of SARS-CoV-2 from Humans to Lions, Singapore, 2021  
Yin Cheng-Guo, Yan, Adrian Tan, Jasmine Ong, Charlene Judith Fernandez, Chao Li, Wei Kwon Wong, Siew Eung Cheng, Him Fan Yip, and Kenneth D. L. Lee  
Author affiliations: National Animal Health Board, Singapore



## African Swine Fever in Wild Boars and Imported

### EMERGING INFECTIOUS DISEASES

Volume 29, Number 12—December 2021  
www.eidonline.org

Detection of African Swine Fever Virus from Wild Boar, Singapore, 2023  
Eileen Y Koh, Kelvin KS Tan, Baoyn Hui, Siew Eung Cheng, Siew Eung Cheng, Stiffie Toh, Jing Chen, Wei Hwei Wang, Delian Zhi Tan, Charlene He-Lee, Zhen Pei Tang, Ian Liang, Charlene Judith Fernandez, Siew Eung Cheng, and Kenneth D.L. Lee  
Author affiliations: National Animal Health Board, Singapore

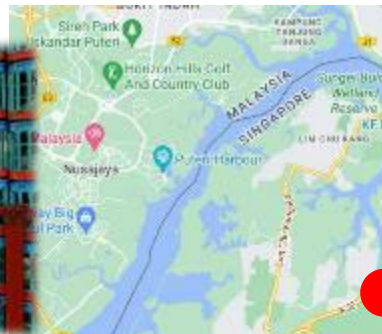


# Border Biosecurity

Safeguarding **border biosecurity** during the import of **live animals and animal products** into Singapore through import inspection and quarantine



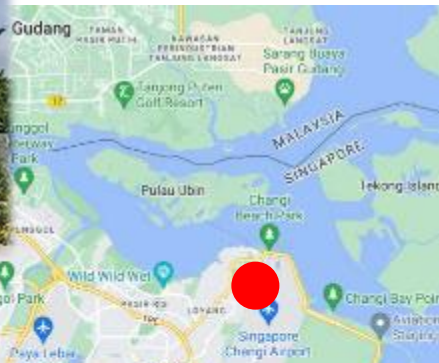
Tuas Checkpoint



Jurong Port and Buroh Lane Jetty



Animal Quarantine Centre



Changi Animal and Plant Quarantine @ Changi Airfreight Centre



## Animal Smuggling – Bypassing Import Measures

Man jailed for smuggling endangered birds into S'pore; many eventually died from cramped conditions



BY LOUISA TANG  
Published December 8, 2021  
Updated December 8, 2021

### Singapore

## IN FOCUS: How pet shops in Johor offer to smuggle animals into Singapore

It's illegal and puts the welfare of animals at risk, but some sellers in Johor Bahru say they're willing to smuggle pets into Singapore.

THE STRAITS TIMES

SINGAPORE

LOG IN

## Lorry driver who smuggled animals from Malaysia into S'pore gets jail; 19 dogs died



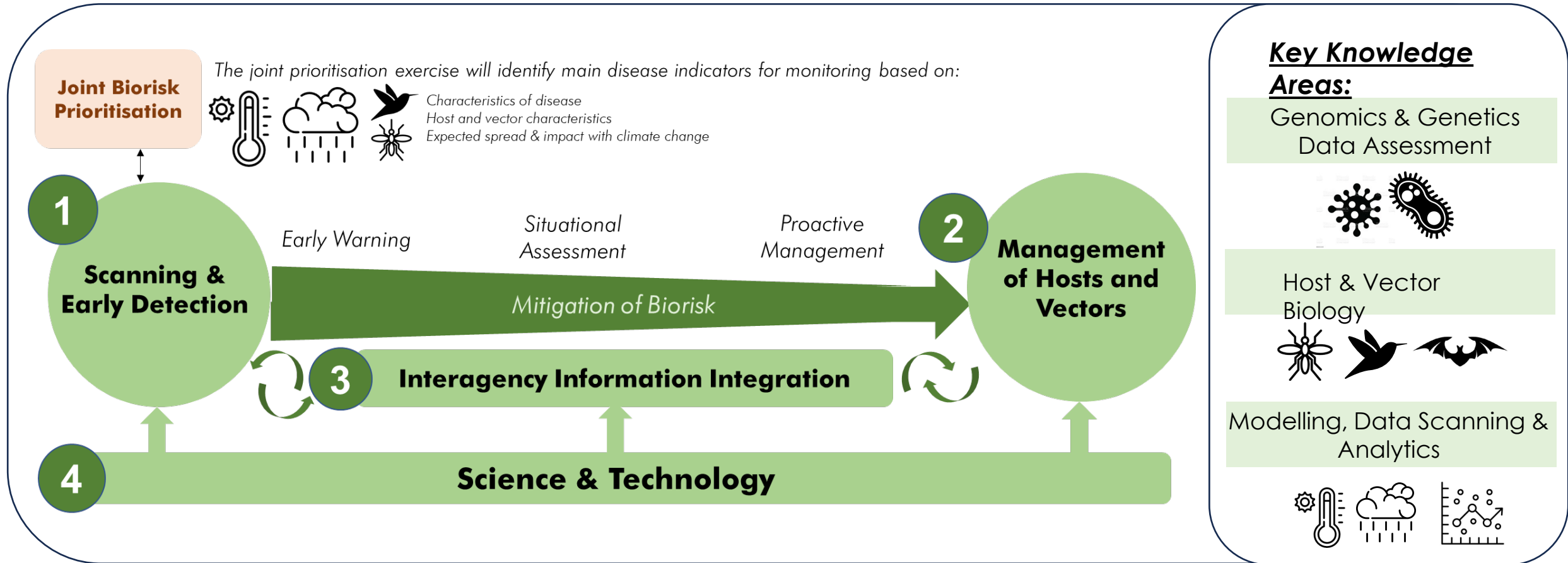
## Satellite tracking of migratory birds

- Improving understanding of wild bird migratory flyways
- Inform avian influenza viral migration pathways and potential risks to Singapore
- Augment avian influenza biosurveillance programmes



# Whole-of-Government (WOG) Biosurveillance

To monitor **upstream biorisks in the environment** & enhance Singapore's resilience to public health threats



Create an **early warning system** for animal health and zoonotic threats

## Biosurveillance – pathogens & vectors

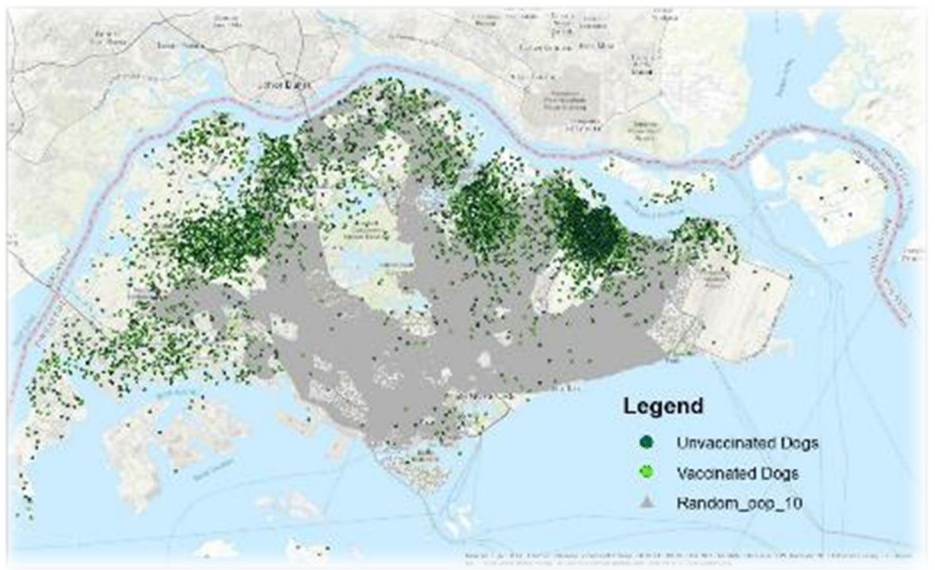
- Biosurveillance for early pathogen detection: host (migratory birds), faeces/water/air surveillance
- Targetted and risk-based sampling (e.g. dead birds, migratory seasons)
- Enhanced vector surveillance e.g. ticks
- Research and understanding local tick fauna, biting midges and sandflies



### Strengthen **animal host and emerging vector monitoring, control and disease management**







#### Examples of Initiatives

- Applied targeted field studies in animal hosts, insect vectors, and pathogens to enhance current understanding of disease transmission pathways
  - e.g. animal health and vector survey at animal establishments and quarantine sites
- Modeling of disease incursion, transmission and

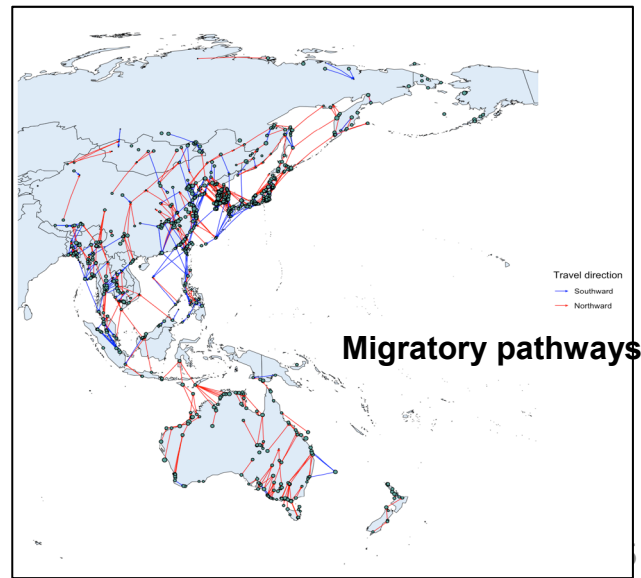


*Research Article*

#### **Modeling Singapore’s First African Swine Fever Outbreak in Wild Boar Populations**

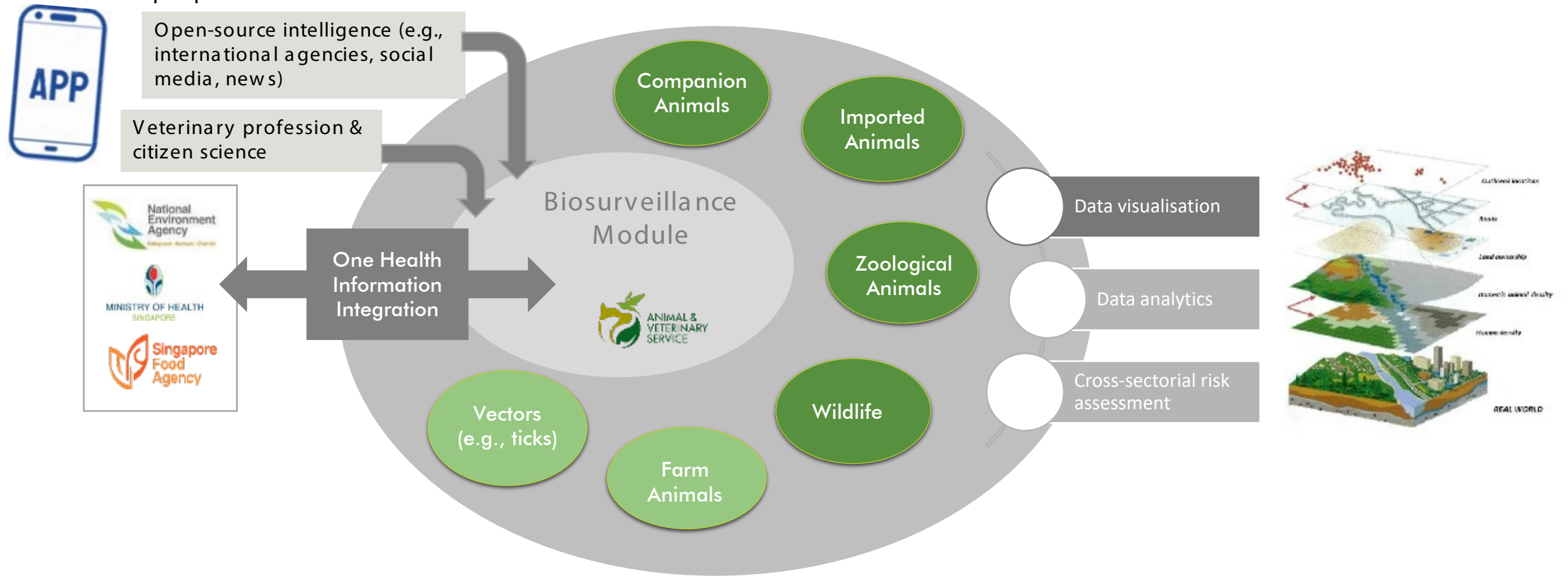
Rayson Bock Hing Lim , Zhan Pei Heng, Kelvin Ho, Kane Koh , Hwee Ping Lim , Kelvin Lim , Wendy Sng, Gordon Tan, Ernest Teo , and Tze Hoong Chua 

*Veterinary Health Division, Animal and Veterinary Service, National Parks Board, Singapore, Singapore*



# Development of Animal Health Information System

To deliver innovative information solutions and enhance digital connectivity with key animal stakeholders for improved traceability and monitoring of animal diseases and zoonoses in local animal populations



# Leveraging technology to strengthen border biosecurity

- Drones and CCTVs for remote inspections – an early warning system for detecting transboundary animal diseases like African Swine Fever.
- Smart IoT collars for home quarantine of dogs and cats
- CCTV / VA monitoring at quarantine centre



Animal Quarantine System

REGION : Asia and the Pacific

World Organisation for Animal Health  
Founded in 1924

RABIES  
**Preventing rabies and improving animal welfare thanks to technologies in Singapore**

OCTOBER 19, 2023

Share on social media: [f](#) [X](#) [in](#)

Singapore has implemented strict measures to maintain its rabies-free status. Dogs imported from lower rabies-risk countries are allowed to stay at the home of their owners during the quarantine. The Veterinary Services use radio frequency technology to monitor dogs, it has

AA rr-asia.woah.org



# Key Biosurveillance Functions and Programmes

## One Health collaboration

- One Health agencies for cross sectoral working relations to safeguard public health
  - Ministry of Health, National Environment Agency, National Parks Board, Singapore Food Agency and Singapore Water Agency
- Intelligence scans and joint risk assessments of emerging disease threats
- Zoonotic disease prioritization workshop to prioritise zoonotic diseases of greatest concern for Singapore for prevention and control.
- Vector Biosurveillance
- Disease investigation for leptospirosis
- Simulation exercises i.e. African Swine Fever, rabies and avian influenza.

### ONE HEALTH ONE HEALTH ZOOONOTIC DISEASE PRIORITIZATION WORKSHOP Singapore • 19 to 21 April 2023



#### Our Story: One Health in Singapore

Established in 2012 and governed by the inter-agency One Health Co-ordinating Committee (OHCC), Singapore's One Health Framework aims to build a transdisciplinary multi-agency working group that can integrate One Health efforts across human, animal, water and environment health sectors. The ultimate goal is to learn, prevent, prepare, and respond to cross-sectoral public health threats using an integrated and collaborative One Health approach. The One Health framework comprises five agencies in Singapore: the Ministry of Health (MOH), the National Environment Agency (NEA), the National Parks Board (NParks), the Singapore Food Agency (SFA) and PUB, Singapore's National Water Agency.

Since then, the One Health agencies have made significant progress in developing joint response protocols for priority diseases, training and capacity building, risk communications and implementing surveillance programmes. The framework was instrumental in bringing local outbreaks of vector-borne and food-borne diseases under control (e.g. Zika virus infection, and invasive

Issue 1: November 2022

In This Issue:

1. Manulaysan Multi-country Outbreak
2. Special Feature: Epidemic Intelligence from Open Sources (EIOS) Workshop for One Health Agencies



Report by the One Health Intelligence Team

#### Our Story: One Health Approach to Biosurveillance and Epidemic Preparedness in Singapore

Issue 2: September 2023

In this Issue:

1. Biosurveillance in Singapore
2. Risk Assessment on Avian Influenza A(H5N1)
3. Special Feature: One Health Zoonotic Disease Prioritisation Workshop in Singapore

<https://www.moh.gov.sg/resources-statistics/reports/situational-and-risk-assessment-report-for-one-health-hazards>

## Disease Contingency and Preparedness

To develop and review disease contingency and preparedness plans. To conduct table-top exercises and drills with internal stakeholders and external partner agencies.



*NParks-SFA tabletop exercise for Africa Swine Fever in 2021*



*NParks tabletop exercise for rabies in 2022*



*NParks-SFA exercises for HPAI in 2024*



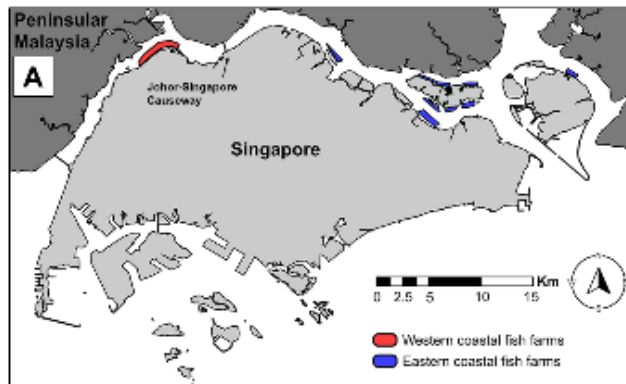
## Animal Health Outreach Programmes

To safeguard animal health and biosecurity through community partnership and stewardship

### An engagement and advocacy lesson for rabies prevention: Singapore's Trap-Neuter-Rehome/Release-Manage Programme (TNRM) and mass rabies vaccination

Kelvin Ho<sup>1</sup>, Evan Lin<sup>1</sup>, Anhui Lin<sup>1</sup>, Kelvin Lim<sup>1</sup>, Charlene J Fernandez<sup>2</sup>, Pamela Lim<sup>1</sup>, Hwee Ping Lim<sup>1</sup>, Hui Ling Lin<sup>1</sup>, Wai Kwan Wong<sup>1</sup>, Boon Han Teo, Xinyu Toh, Yifan Wang, Taoqi Huangfu, Tze Hoong Chua<sup>1</sup>, Siow Foong Chang<sup>1</sup>, Jessica Kwok<sup>1</sup>, Him Hoo Yap<sup>1</sup>

<sup>1</sup>Animal & Veterinary Service (AVS), National Parks Board



## Cat Management Framework

**Improves traceability of pet cats**

**Safeguards public health and animal welfare**

**Promotes responsible ownership and caregiving**

### Cat Ownership Limits

**During Transition Period**

License during this period to keep all existing pet cats\*

**After Transition Period**

<p><b>HDB Flats:</b> Up to 2 cats (and 1 dog of an approved breed)</p>	<p><b>Private Premises:</b> Up to 3 cats or dogs, or a combination of both</p>
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### Mandatory Licensing and Microchipping

- 🐾 Free licences with lifetime validity for sterilised cats during transition period
- 🐾 Free licences covering transition period for unsterilised cats\*\*
- 🐾 Complete pet ownership course before licence application

\* And ensure that the cats' health and welfare are taken care of  
\*\* Licensing fees apply after transition period

Scan to find out more!

<https://go.gov.sg/cat-framework>

Share your love for nature and animals at #NParksBuzz #Anim@BuzzSG

## About Bird Flu

### WHAT IS BIRD FLU?

Bird flu is an infectious disease in birds caused by avian influenza type A viruses. It may cause mild to severe illness or sudden death in birds. Domestic poultry like chickens are particularly vulnerable.

Avian influenza viruses do not usually infect humans but may sometimes be transmitted to humans who have contact with infected poultry and their secretions and faeces, or contact with contaminated surfaces.



### SIGNS IN INFECTED BIRDS

- Lack of energy and appetite
- Combs and wattles of chickens turn purplish
- There is discharge from the nose, and coughing and sneezing
- Diarrhoea
- Head region and legs swell

### HOW DOES BIRD FLU SPREAD BETWEEN BIRDS?

- Direct contact with nasal and respiratory secretions from infected birds
- Direct contact with infected bird faeces
- Contamination of feed and water
- Contact with contaminated equipment and humans

### KEEPING PET BIRDS SAFE

- Keep your pet birds away from wild birds and their droppings.
- Use a bird-proof cage or enclosure with fine wire mesh netting preferably with a roof over the aviary.
- Separate all new birds from existing ones for at least 21 days to monitor for signs of illness.
- Adopt hygiene practices such as washing hands thoroughly with soap after handling birds and their cage(s).
- Do not bring birds back to Singapore without a valid import permit from NParks/Animal & Veterinary Service.

### WHAT IF MY PET BIRD FALLS SICK OR DIES?

- Immediately bring your sick bird to see a vet.
- Keep it away from healthy birds.
- Wash and disinfect the cage regularly while wearing a mask and gloves.
- Wear a mask and gloves when disposing of dead birds. Place the bodies in a plastic bag tightly sealed with a rubber band or cable tie.
- Adopt hygiene practices such as washing hands thoroughly with soap and water after handling the bird and its cage.

### IS IT SAFE FOR ME TO COME INTO CONTACT WITH FREE-ROAMING CHICKENS IN SINGAPORE?

- As a precaution, please avoid touching or feeding free-roaming chickens.
- If you come into contact with free-roaming chickens, you should practise good hygiene habits and wash your hands thoroughly with soap and water.

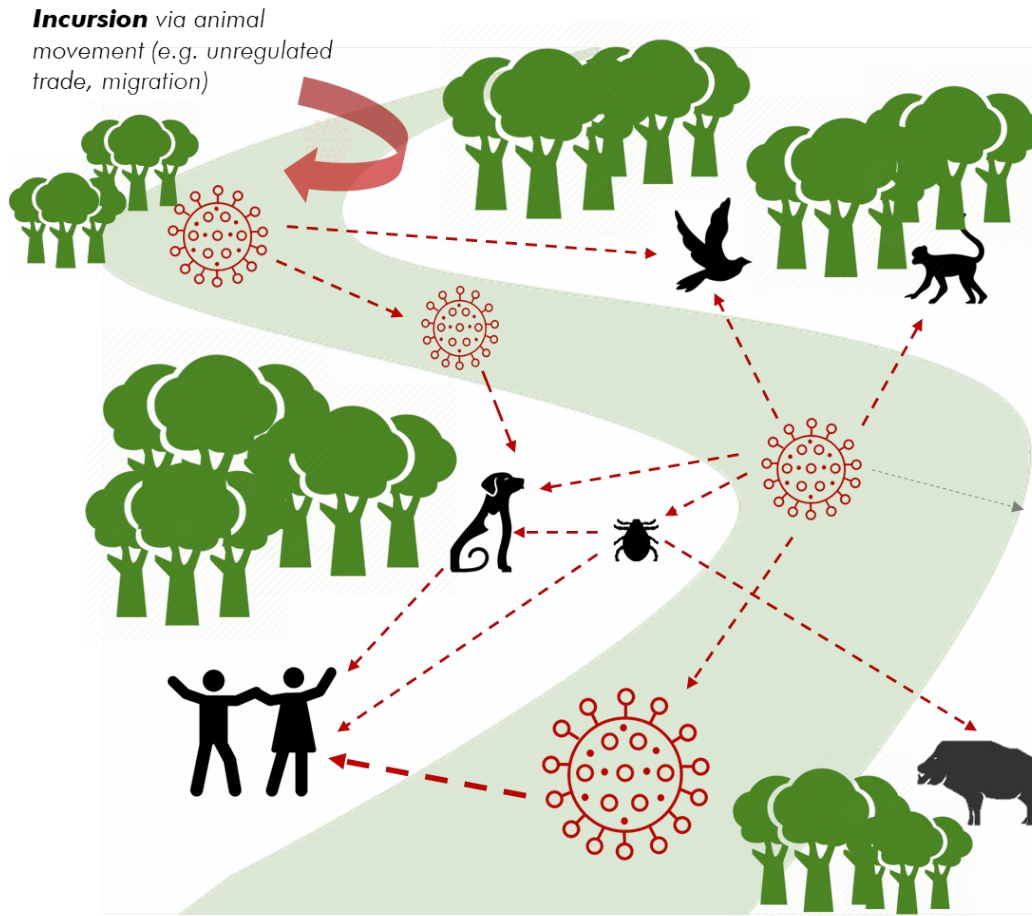
For more information on bird flu infection in humans, you may refer to the Ministry of Health's website: <https://www.moh.gov.sg/diseases-updates/avian-influenza>

Share your love for nature and animals at #NParksBuzz #Anim@BuzzSG



# Biosurveillance Research

The biosurveillance research funding initiative seeks to foster **transdisciplinary research collaboration through an One Health framework**, by studying key drivers of zoonoses at the **animal-human-environment interface** in two thematic knowledge areas:



## Genomics and Genetics

- Genome as the **critical link among pathogens, hosts and vectors**
- Generate insights into microbiome, genomic & genetic effects on diseases in animal hosts together with enhanced **invertebrate vector (iDNA)** and **environmental sampling (eDNA)** for animal pathogen detection and characterisation



## Ecological & Epidemiological Connectivity

- Going beyond pathogen discovery to linking pathogens to the wider urban ecosystem
- Clarify **ecological and epidemiological linkages** between animal hosts, vectors, environment and humans, and **environmental and anthropogenic\* influences** on zoonoses

supports



*\*Anthropogenic influences include socio-behavioural drivers of animal movement, including unregulated trade of pets and wildlife*

Develop and examine evidence-based **upstream mitigation strategies** for zoonoses



**Thank you**  
Email: [chua\\_tze\\_hoong@nparks.gov.sg](mailto:chua_tze_hoong@nparks.gov.sg)



# HPAI vaccination in Local Birds

- No H5 vaccination in farms and other avian establishments during peacetime
  - Biosecurity and regular biosurveillance remain the key measures
  - However, H9 vaccination allowed in poultry farms as part of production disease control
- Limited risk-based H5 vaccination for high-risk species (Galliformes and Anseriformes) kept in open exhibits
  - E.g., swans in the Singapore Botanic Gardens, peafowls at Sentosa
- H5 vaccines are stockpiled for emergency vaccination of local poultry farms if the threat of HPAI is imminent:
  - Facilitates more rapid elimination of the virus from the environment and increases the chance of breaking the infection cycle should there be an incursion
- AI vaccines are periodically reviewed for their effectiveness against H5



# HPAI vaccination for poultry farms – ongoing review

- Periodic review of H5 vaccination policy for local bird populations during peacetime and emergency
  - Changing HPAI risk with new emerging strains
  - Shifts in global attitudes towards vaccination
  - Biosecurity and culling alone may not be sufficient for the control of HPAI
- Principal considerations:
  - Impact of vaccination policy
    - Trade of poultry and poultry products
    - Food safety
    - Conservation of highly endangered species
  - Operationalisation feasibility
    - Industry acceptance e.g., cost-benefit
    - Availability of effective vaccines against predominant strains
    - Biosurveillance strategies to detect HPAI in vaccinated populations, including laboratory capabilities for DIVA



# HPAI vaccination for imported poultry and poultry products

- **Use of live or live-attenuated HPAI vaccines prohibited** in all imported poultry and poultry products
- **Use of other kinds of HPAI vaccines permitted for the following import situations:**
  - HPAI vaccines approved by exporting CA
  - Poultry products derived from HPAI-vaccinated poultry
  - Day-old chicks exported to Singapore or from HPAI-vaccinated breeders
  - Live broilers exported to Singapore, subject to exporting farm meeting key pre-export requirements, incl. routine biosurveillance and tests, WOH standards
- **Import of ornamental birds vaccinated against HPAI not allowed** due to limited information about HPAI vaccines suitable for non-poultry avian species
- **Temporary import restriction of poultry & poultry products for HPAI-infected premises** with our regionalisation arrangements between exporting countries and Singapore.

