Member experience on prevention and control for Vector Borne Disease

Singapore

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19 – 20 September 2024

Tokyo, Japan

World Organisation for Animal Health
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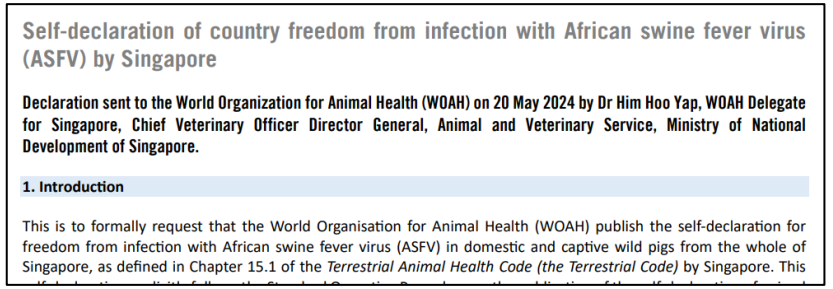
Vector Borne Disease situations

Tick-borne diseases

- **African Swine Fever** – first reported in Singapore in Feb 2022. No case of infection with ASF virus in wild boars and captive suids have been detected since April 2023. Singapore made a self-declaration for country freedom in domestic and captive wild pigs to WOAH in May 2024.
- Other diseases – *Babesia* spp., *Anaplasma* spp, *Ehrlichia* spp (Collela et al, 2020)



Self-declaration of country freedom from infection with African swine fever virus (ASFV) by Singapore

Declaration sent to the World Organization for Animal Health (WOAH) on 20 May 2024 by Dr Him Hoo Yap, WOAH Delegate for Singapore, Chief Veterinary Officer Director General, Animal and Veterinary Service, Ministry of National Development of Singapore.

1. Introduction

This is to formally request that the World Organisation for Animal Health (WOAH) publish the self-declaration for freedom from infection with African swine fever virus (ASFV) in domestic and captive wild pigs from the whole of Singapore, as defined in Chapter 15.1 of the *Terrestrial Animal Health Code (the Terrestrial Code)* by Singapore. This

Sandfly borne diseases

- **Leishmaniosis** – cases detected in imported and local dogs.

Mosquito-borne disease

- **Japanese encephalitis** – serological and genetic evidence suggests JEV's presence in the local fauna (Lim *et al*, 2022).
- Other diseases – zoonotic malaria (*Plasmodium knowlesi)* in macaques (Li *et al*, 2021).

Other diseases facilitated by vectors [e.g., flies]

- **Lumpy Skin Disease** – first reported in local dairy cattle in Mar 2022. No new cases as of Dec 2022.

Colella, V., et al (2020). Zoonotic Vectorborne Pathogens and Ectoparasites of Dogs and Cats in Eastern and Southeast Asia. Emerging infectious diseases, 26(6), 1221–1233.
Lim, M. J., et al (2022). Isolation and Genetic Characterization of Japanese Encephalitis Virus Two Decades after Its Elimination in Singapore. Viruses, 14(12), 2662.
Li, M. I., et al (2021). Prevalence of simian malaria parasites in macaques of Singapore. PLoS neglected tropical diseases, 15(1), e0009110.

Detection capabilities

Disease	Agent detection	Antibody detection
Leishmaniasis	PCR & sequencing, Real-time PCR	Rapid ELISA, IFAT
Piroplasmosis	PCR & sequencing (*Babesia/ Theileria/ Cytauxzoon* spp.)	IFAT, cELISA
Rickettsial diseases	PCR & sequencing, Real-time PCR (*Ehrlichia/ Anaplasma/ Rickettsia* spp.)	Rapid ELISA, IFAT
Lyme disease	Real-time PCR (*Borrelia burgdorferi sensu lato*)	Rapid ELISA
Malaria	PCR & sequencing	-
African Swine Fever	PCR & sequencing, Real-time PCR	ELISA
African Horse Sickness	Real-time PCR	ELISA
Bluetongue	Real-time PCR	ELISA
Lumpy Skin Disease	PCR & sequencing, Real-time PCR	-

Biosurveillance and Response to Vector Borne Diseases – *African Swine Fever*

EMERGING INFECTIOUS DISEASES®
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Volume 29, Number 12—December 2023

Research Letter

Detection of African Swine Fever Virus from Wild Boar, Singapore, 2023

Eileen Y. Koh✉, Adrian K.S. Tan, Darren Yeo, Clara Lau, Li Ying Tan, Oi Wing Ng, Jasmine Ong, Stacy Chong, Steffie Toh, Jing Chen, Wai Kwan Wong, Brian Z.Y. Tan, Christine He-Lee, Zhan Pei Heng, Ian Liang, Charlene Judith Fernandez, Siow Foong Chang, and Kenneth B.H. Er
Author affiliation: National Parks Board, Singapore

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*Gross examination of wild boar carcass (*Sus scrofa*)*

Two adult ticks (1 female (left) and 1 male (right)) were obtained from the wild boar carcass and identified as Dermacentor auratus *ticks by DNA barcoding*. ASFV was *detected in tick samples by real-time PCR but not by next generation sequencing.*

Significance of* D. auratus *tick in ASFV transmission in Singapore remains to be determined.

Investigation did not demonstrate evidence of involvement of *Ornithodoros* ticks in ASF transmission.

Table 2: Tick surveillance results conducted in 2023

Number of surveys traps	3
Number of ticks collected via flagging	51
Number of ticks obtained from carcasses of ASF-positive wild boar	27
Results (presented as number of ticks tested as *Ornithodoros* spp/ total number of ticks tested)	0/78
Results (presented as number of ticks testing positive for ASFV/ total number of ticks tested)	2/78

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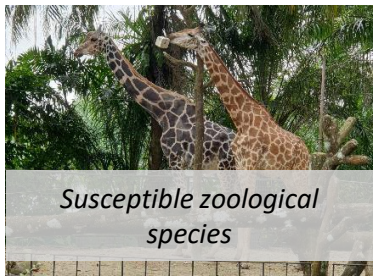
Biosurveillance and Response to Vector Borne Diseases – *African Horse Sickness and Lumpy Skin Disease*

Monitoring for biting midges at equine establishments

Vector proofing isolation stables

Preparedness measures during African Horse Sickness outbreak in Malaysia and Thailand (2021)

Index case of lumpy skin disease in dairy farm



Susceptible zoological species

Stomoxy calitrans

Environmental control and monitoring of susceptible animal populations during Lumpy Skin Disease outbreak (2022)

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Biosurveillance and Response to Vector Borne Diseases – *Canine Tick-Borne Diseases*

Biosurveillance in Free-Roaming Dogs and Multi-Animal Establishments

Multi-Animal Establishments

- **Annual tick survey** of external facades of animal establishments and common areas (e.g., grass patches)

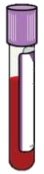
- **Pilot survey in 2023 in 5 establishments** – random sampling of resident dogs

Free-Roaming Dogs

- Random sampling of dogs under the **Trap-Neuter-Release/Rehome-Manage Programme**, admitted into the NParks' animal shelter

Tick pools

Blood



DNA extraction

(Qiagen DNeasy® Blood and Tissue kit)

PCR

Sanger sequencing

GenBank

***Babesia* spp.**
***Ehrlichia/ Anaplasma* spp.**
A. phagocytophilum

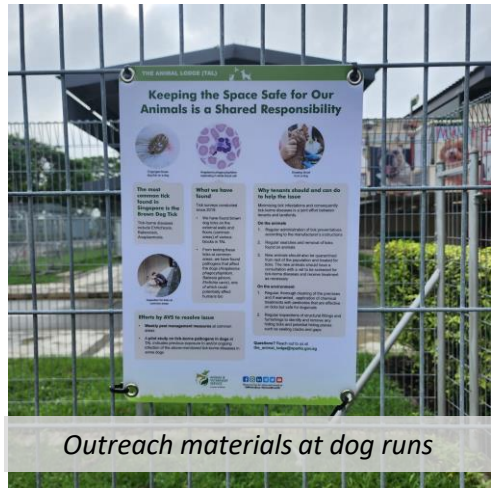
Molecular methods

SNAP® 4Dx® rapid ELISA

- ***Ehrlichia* spp. antibodies**
- ***Anaplasma* spp. antibodies**

Serological methods

Prevention Measures



Outreach materials at dog runs

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Biosurveillance and Response to Vector Borne Diseases – *Emerging diseases*

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

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

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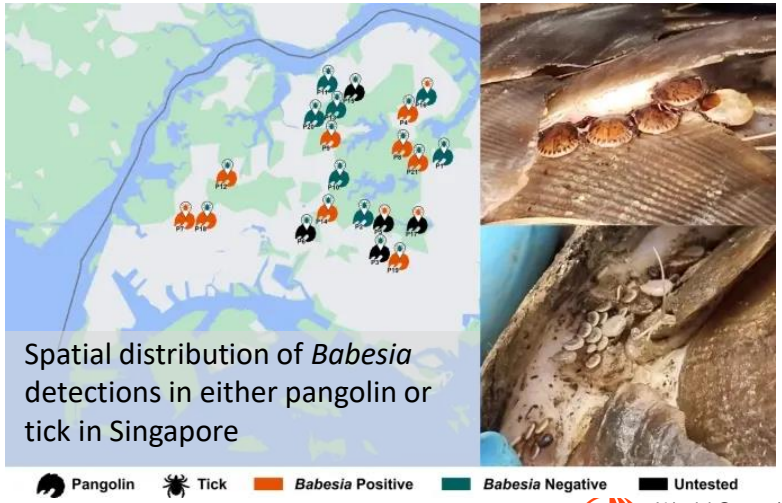
Sandfly surveys at sites where infected free-roaming dog was located (left) and nature reserve (right)

Brief Report | Open access | Published: 22 November 2023

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

Stacy Q. Y. Chong, Darren Yeo, Nur Insyirah Aidil, Jasmine L. Y. Ong, Amy H. J. Chan, Charlene Judith Fernandez, Bryan T. M. Lim, Max D. Y. Khoo, Anna M. S. Wong, Siow Foong Chang & Him Hoo Yap

Parasites & Vectors **16**, Article number: 432 (2023) | Cite this article



Spatial distribution of *Babesia* detections in either pangolin or tick in Singapore

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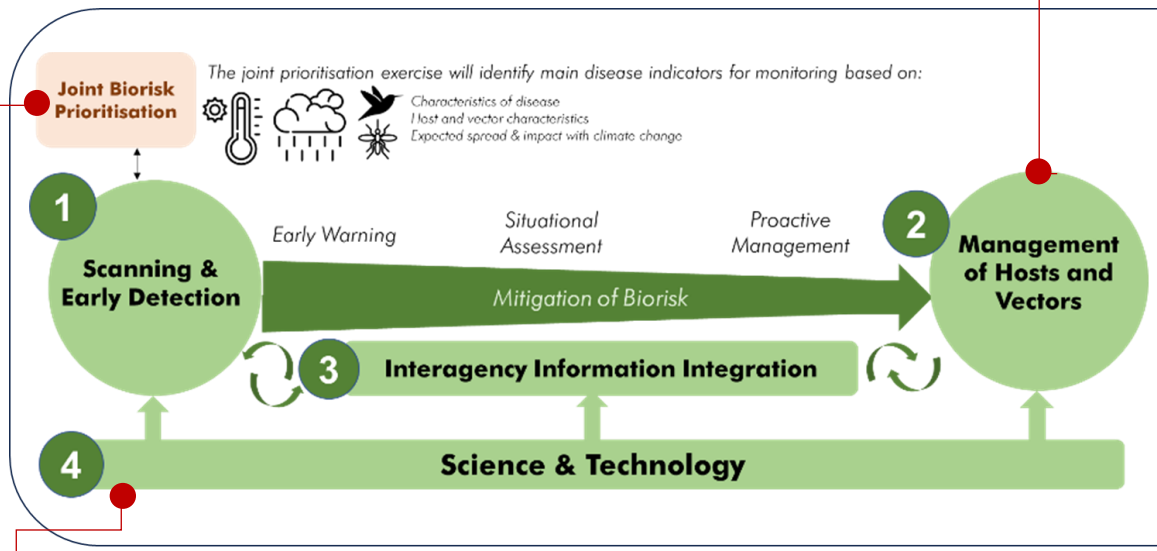
Challenge and possible solutions

Challenges for VBD biosurveillance and response	Possible solutions
Insufficient local capabilities in vector biology (incl. taxonomy) and ecology, particularly for emerging vectors such as ticks, sandflies and biting midges	• Collaborating with overseas researchers, including establishing a regional network • Enhancing local research ecosystem • Capability building in staff
Insufficient awareness in stakeholders (e.g., medical and veterinary) in emerging vector-borne diseases	• Enhancing stakeholder engagement and education, including citizen engagement
Insufficient integrated monitoring of vectors and vector-borne diseases with environmental risk drivers (e.g., climate change, land use changes) to allow better forecasting and planning	• Enhancing interagency One Health collaboration • Collaborating with research institutes for basic and applied research

Collaboration with other sectors under One Health approach

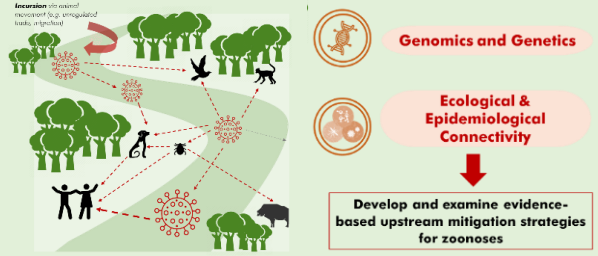
The **Whole-of Government Biosurveillance Framework** was developed in 2022 with other One Health Agencies, to monitor upstream biorisks in the environment and to enhance Singapore's resilience to public health threats arising from climate change and other risk drivers. **Vector biology** is one of the areas identified to build up capability in.

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



Key Knowledge Areas:

- Genomics & Genetics Data Assessment
- Host & Vector Biology
- Modelling, Data Scanning & Analytics



Biosurveillance Research Programme under the Research, Innovation and Enterprise 2025 Plan, *leveraging interdisciplinary research to track pathogens and study their behaviour in animal hosts and vectors*

Continued collaboration in integrated biosurveillance *for vector-borne diseases and vectors*

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Challenge and possible solutions to strengthen the collaboration

Challenges for One Health collaboration	Possible solutions
• Cross-sectoral data sharing and integration (e.g., human-animal-environment)	• Establishing common frameworks, protocols, and use cases for horizon scanning, surveillance or research among One Health agencies • Creating platforms for knowledge sharing and curation among One Health agencies
• Intersectoral response for vector-borne diseases	• Establishing and refining joint response plans • Conducting joint simulation exercises

Thank you

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