

# Rabies Accessible Genomic Epidemiology (RAGE)

Kirstyn Brunker

*RAGE workshop, SCENE, University of Glasgow*

26-30<sup>th</sup> June 2023

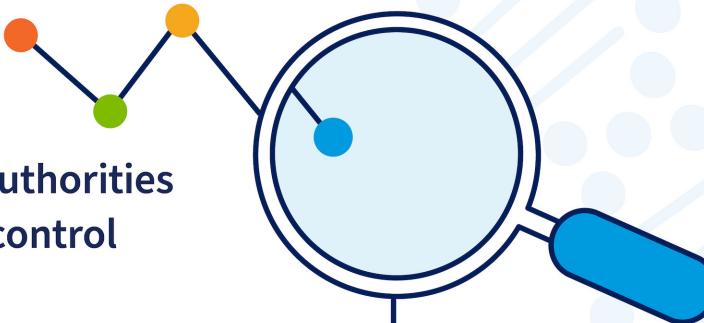


# What is genomic surveillance?

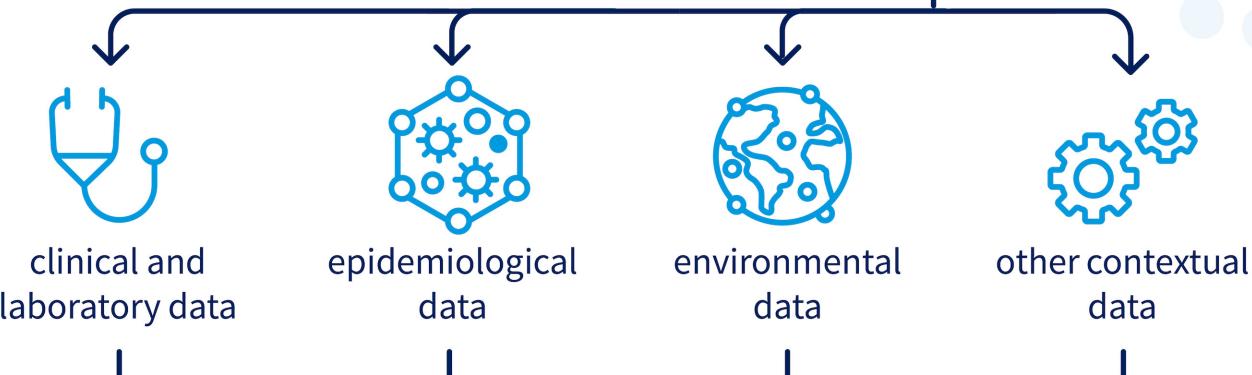
Monitoring and analysing genetic data from pathogens to understand how they're changing, where they're spreading, and how to stop them from causing more harm.



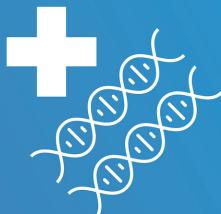
# Why is GENOMIC SURVEILLANCE important?



Disease detectives and health authorities need different types of data to control outbreaks, including:



By adding genomic data, they can more quickly understand how a pathogen behaves and how to control it.



This is a powerful tool in public health surveillance.



# How is it used?

Tracking disease outbreaks

Detecting and monitoring genetic variants

Understanding transmission dynamics

Drug resistance monitoring

Vaccine development and efficacy monitoring

Understanding pathogen evolution

Tailor interventions and public health measures



# From Academic Luxury to Indispensable Tool

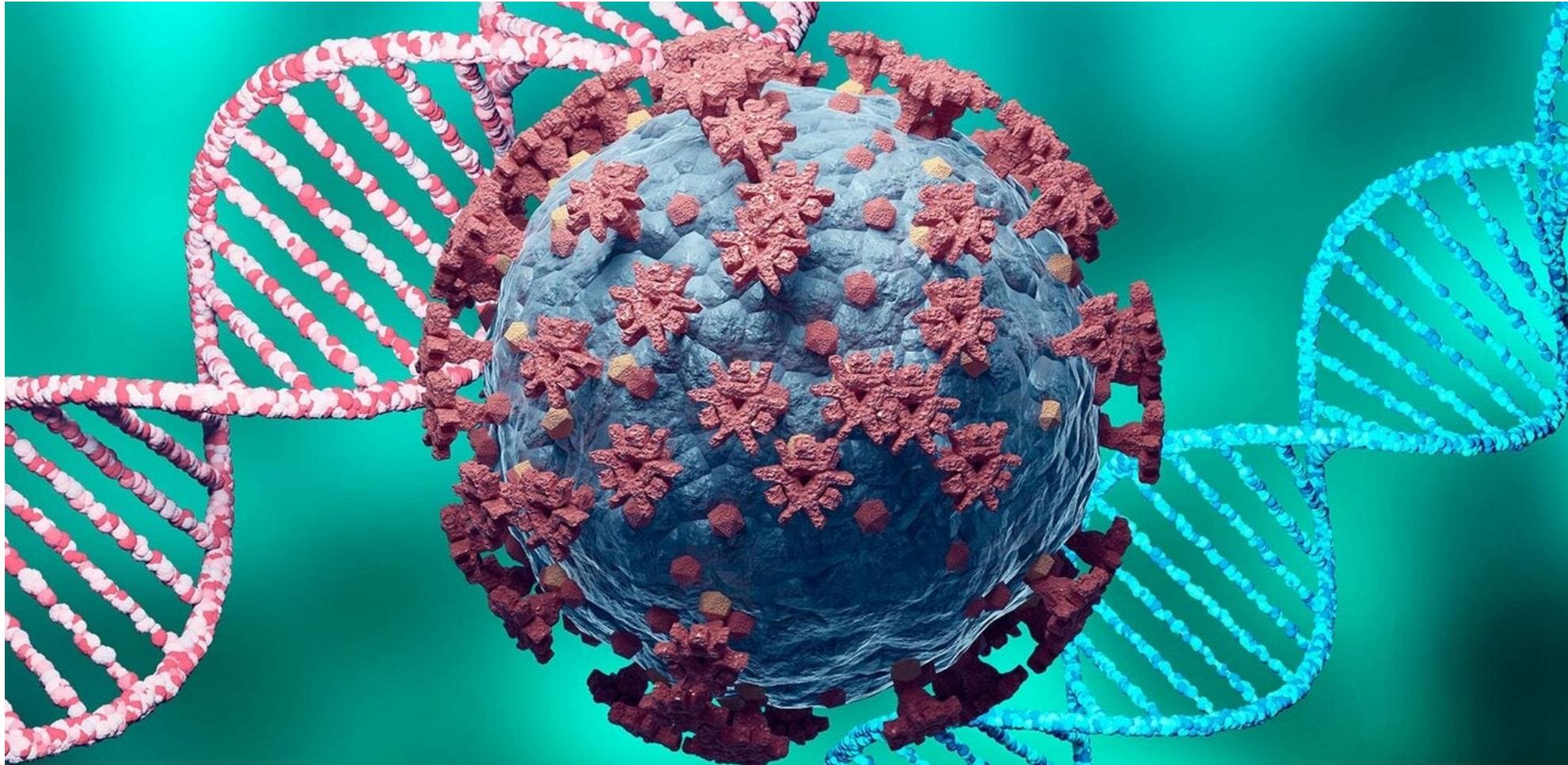


Image: PAHO

# Neglected tropical diseases



What about  
us?

“indiscriminate weapons of mass destruction in slow motion”

Picado & Amuasi,. (2021) ‘Neglected tropical diseases are the landmines of global health’, *Guardian*, [Wed 14 Apr 2021](#)

# Repurposing genomic surveillance capacity

## Endemic zoonoses in the tropics: a public health problem hiding in plain sight

Halliday et al (2015), VetRecord



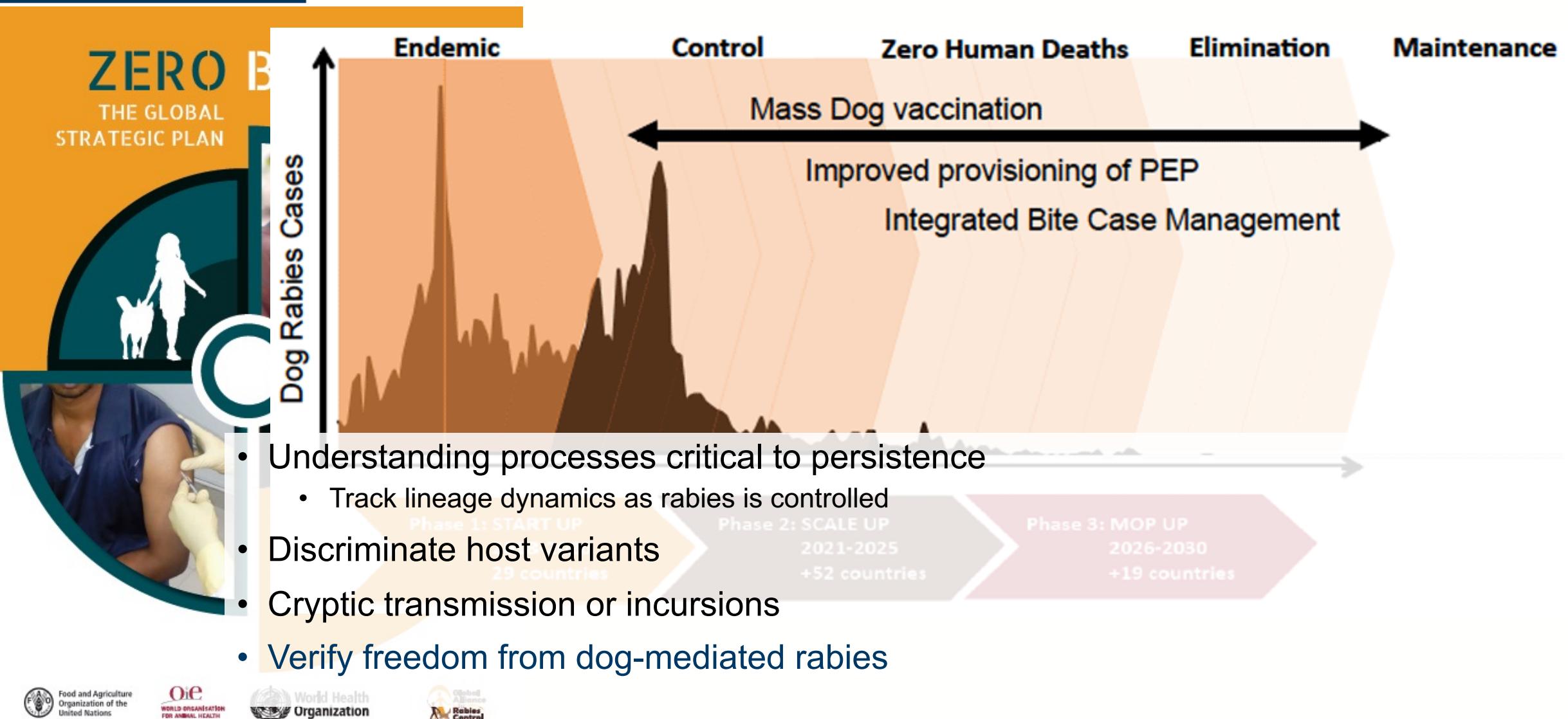


University  
of Glasgow

# Rabies



# The road to elimination: how genomics can help

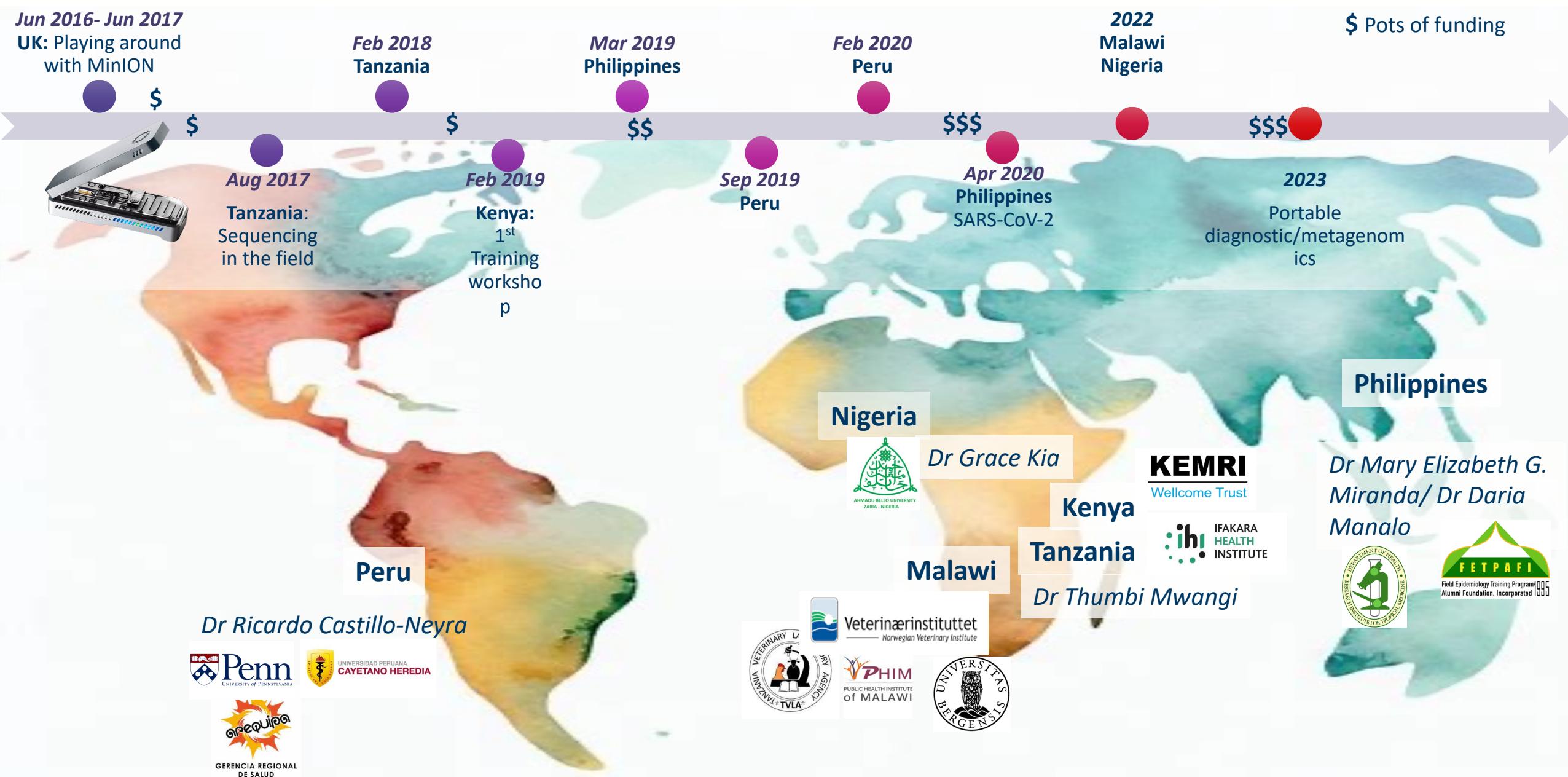




# RAGE

## Rabies Accessible Genomic Epidemiology

# Implementation



# Sequencing rabies virus in practice

Pre-2016:

- Expensive & slow
- No local sequencing capacity



Now:

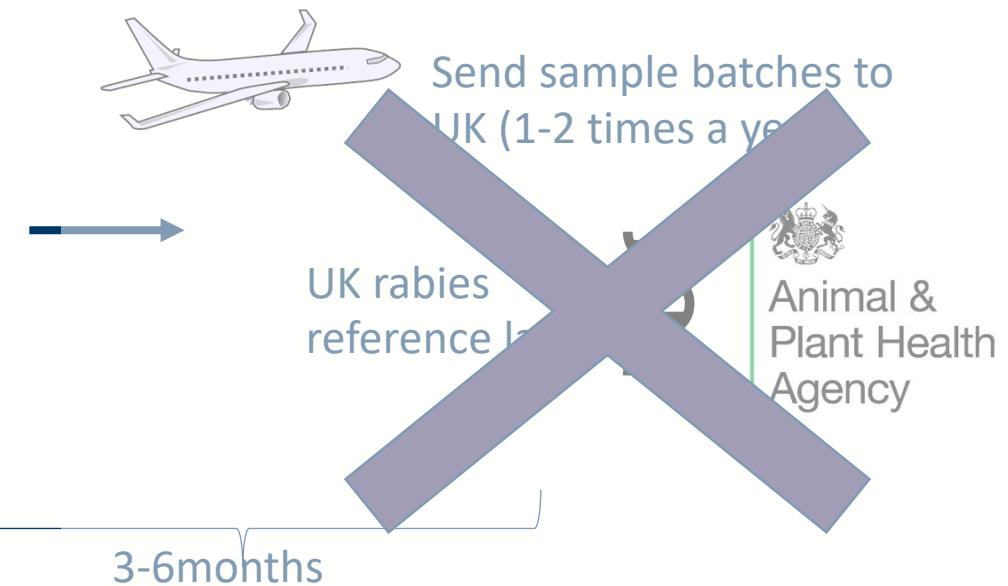
The MinION is a gamechanger!

- More cost-effective
- Rapid & actionable results
- Local sequencing capacity
- Sustainable



Local sequencing

2days



# In-country capacity

- Accessible/ flexible sequencing platform
- Training local scientists



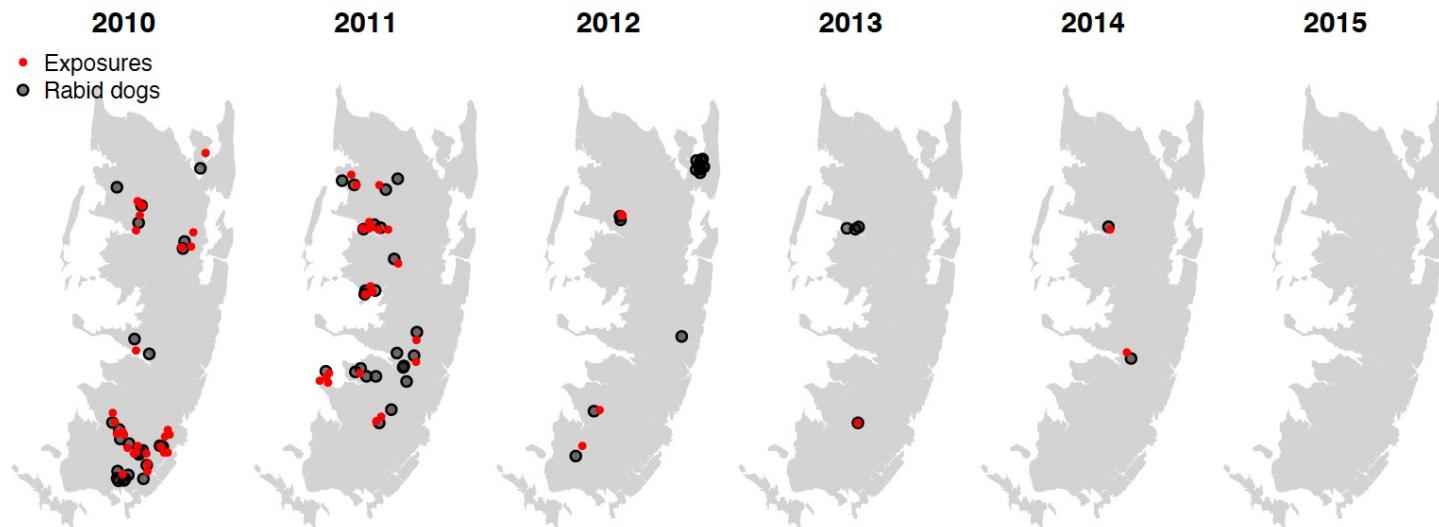


# Real insights



# Rabies on Pemba Island

## Cryptic transmission or incursion?



10 km  
~4,000 dogs



Rapidly sequenced outbreak cases  
in-country

Lushasi *et al* (2023), *Elife*



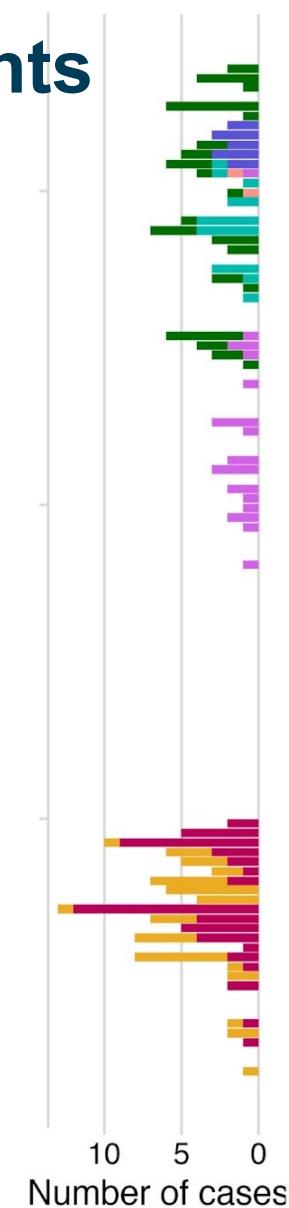
# Genomic insights

Pre-2016: lots of RABV diversity

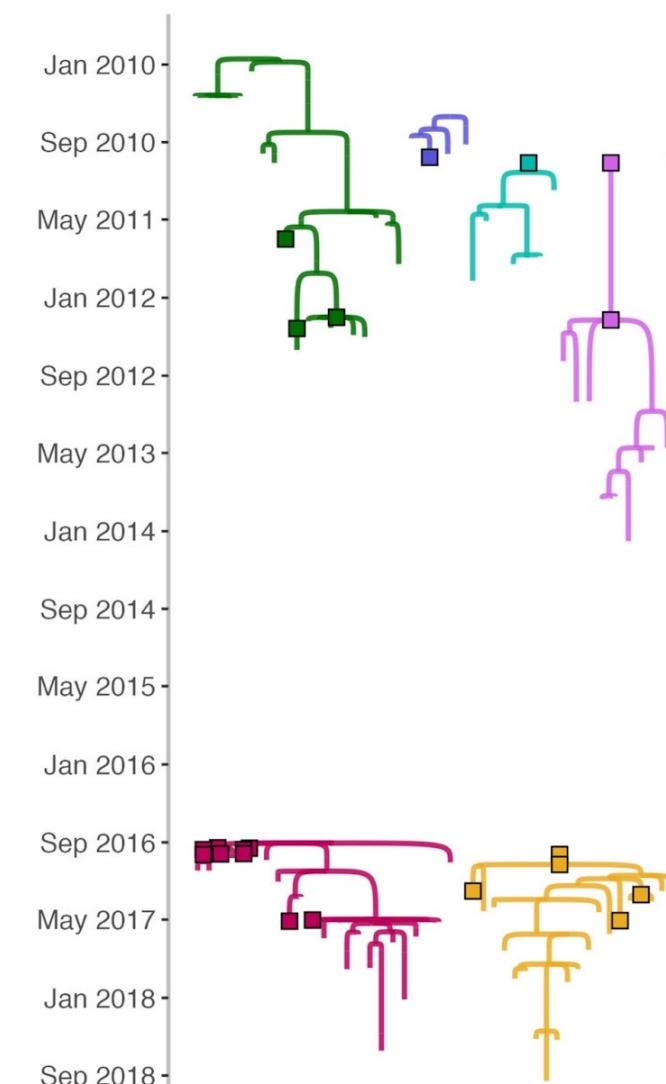
No cases for nearly 2 years

Incursions!

A

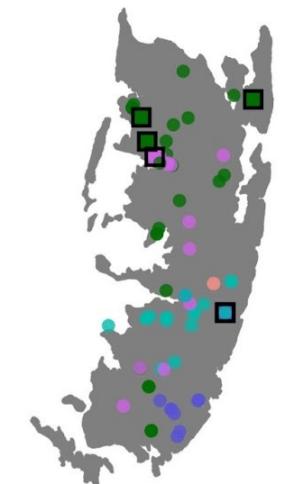


B

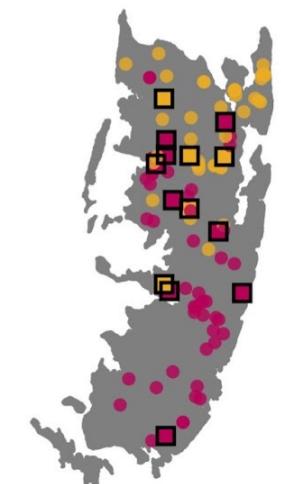


C

2010 - 2016



2016 - 2020





University  
of Glasgow

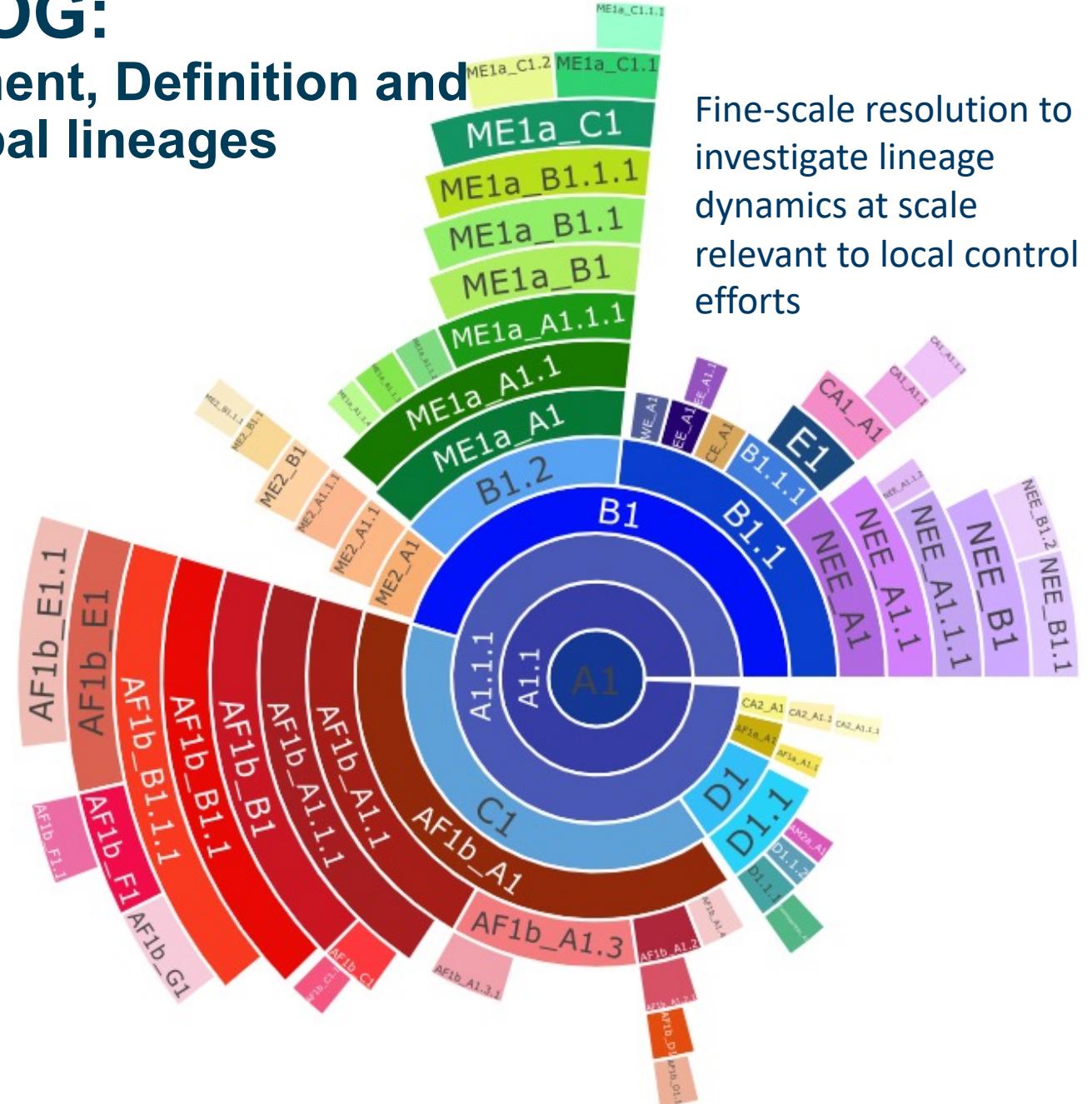
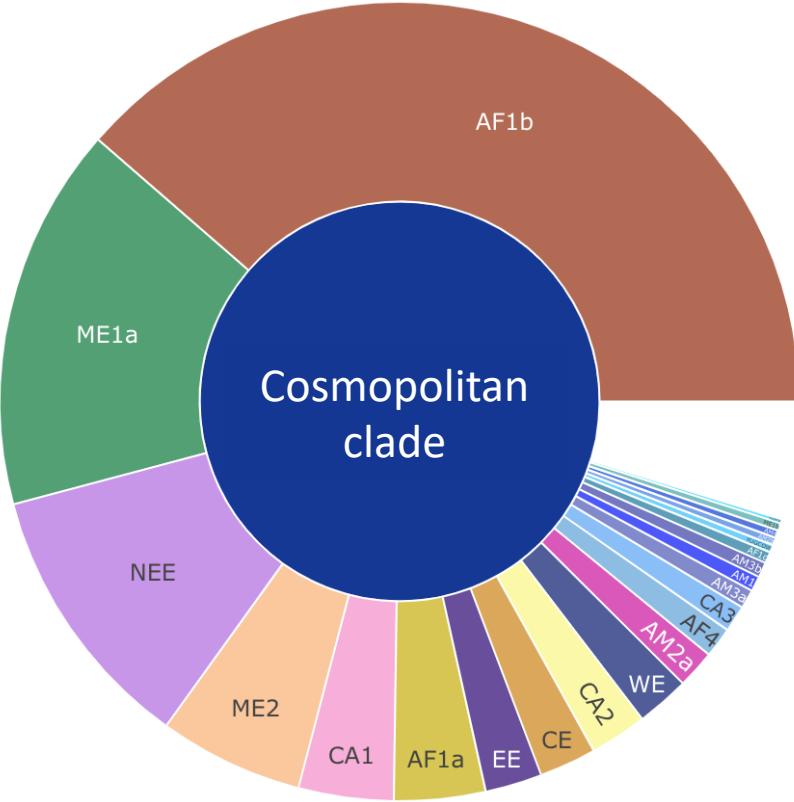
# Rabies re-emergence





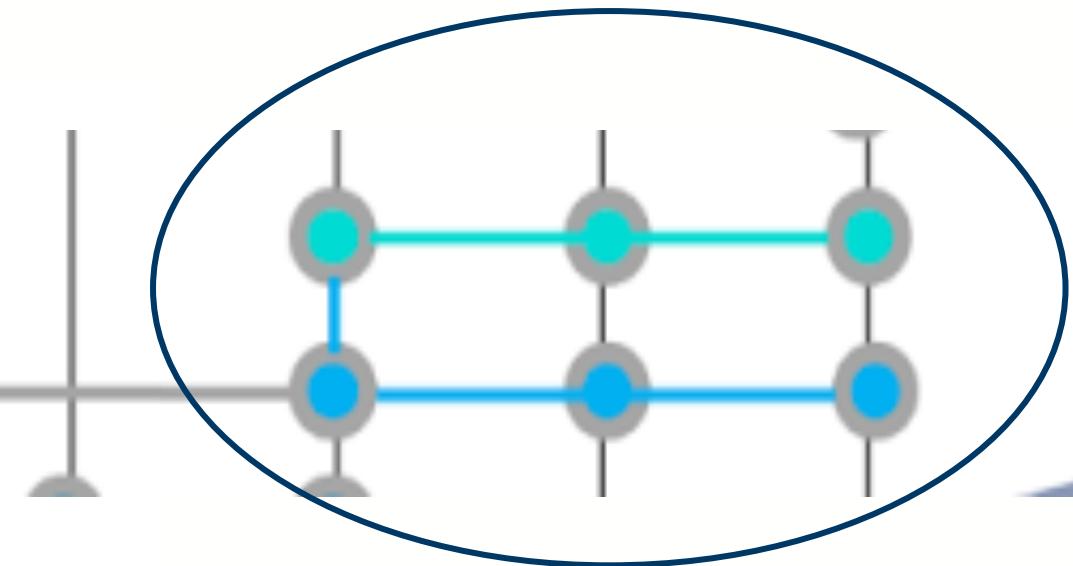
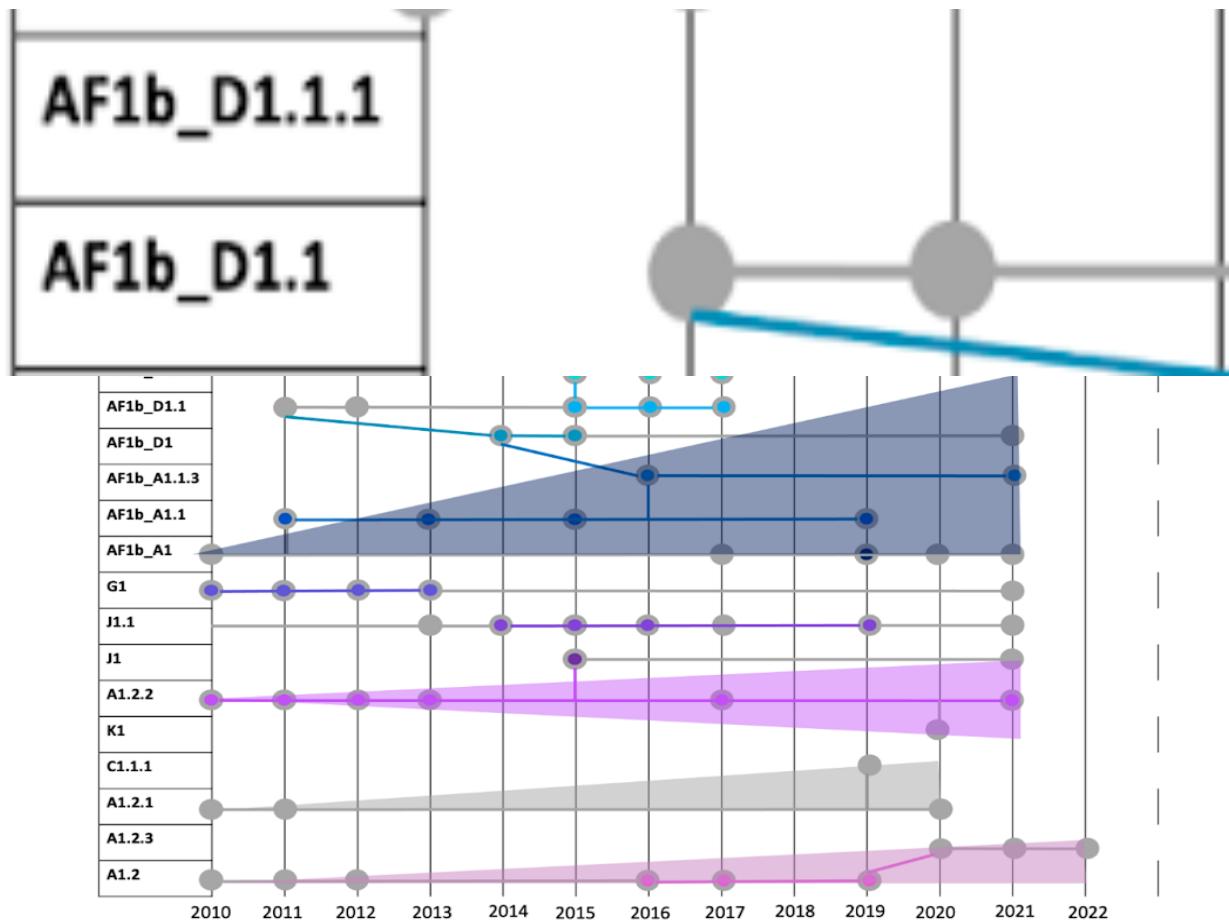
## PhD student: Kathryn Campbell

# Rabies MAD DOG: Method for Assignment, Definition Designation Of Global lineages





# Lineage dynamics in Serengeti District



## Summary



Genomics can “level up” traditional surveillance efforts



Provide fast and clear practical recommendations



Benefit existing public health problems whilst ensuring preparedness & resilience to emerging threats

**University of Glasgow**

Katie Hampson  
Kathryn Campbell (PhD student)

**MRC-University of Glasgow Centre for  
Virus Research**

Rob Gifford  
Josh Singer  
Joseph Hughes

**UK-Philippines MRC-SPEEDIER**

Betsy Miranda  
Daria Manalo  
Nai Rui Chng

**RITM, Philippines**

Criselda Bautista (PhD student)  
Inez Medado  
Tim Dizon  
Dodge Lim  
Catalino Demetria  
Mayan Lumandas  
Paco Polotan

**KEMRI-Wellcome Trust/  
Washington State University, Kenya**

Thumbi Mwangi

**UNITID, Nairobi**

# Acknowledgements

**Tanzania rabies team**

Gurdeep Jaswant (IHI, Uni Nairobi/Glasgow) (PhD student)  
Kennedy Lushasi (IHI)  
Anna Czupryna  
Ahmed Lugelo (SUA)  
Joel Changulanga IHI)

**GEMVI**

James Nokes

**Nelson Mandela African Inst of Science & Tech**

Joram Buza  
Beatus Lyimo

**Tanzania Veterinary Lab Agency**

Chanasa Njeleja  
Julius Mwanandota

**Ifakara Health Institute  
Sokoine University of Agriculture**

**Animal & Plant Health Agency (OIE Rabies Reference Lab)**

Denise Marston  
Daisy Jennings

**Ahamadu abello University of Zari /Nigeria**

Grace Kia

**University of Pennsylvania/Universidad Peruana Cayetano Heredia**

Ricardo Castillo-Neyra  
Renzo Salazar Sanchez  
Melina Vargas Maquera  
Claudia Chipana Ramos

**Gerencia Regional de Salud de Arequipa**

Ynes Monroy  
Edith Zegarra

**ARTIC network**



**Medical  
Research  
Council**