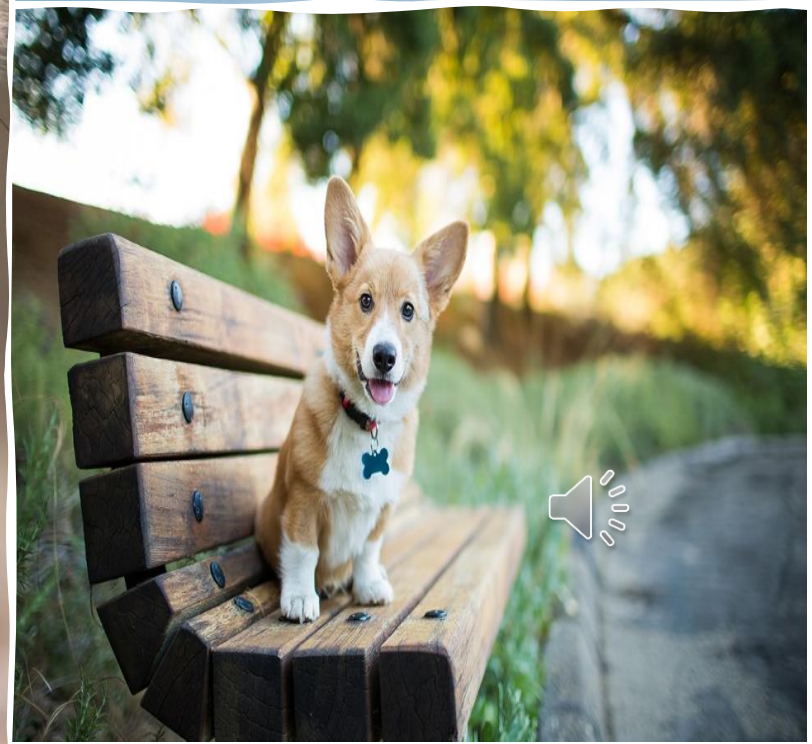
Rabies in Wildlife and Domestic Dogs: One Health in Action from the Middle East



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WOAH

INTRODUCTION

One Health Problem → One Health Solution

- Zoonotic viral disease
- Primarily affects the central nervous system: progressive encephalopathy and death if not treated promptly with post-exposure prophylaxis.
- Classical One Health Problem
  - Humans
  - Domestic animals: domestic dogs, cats, ferrets, cattle, horses, domestic fowl (Baby et al 2015), and others.
  - Wild animals: foxes, raccoons, skunks, bats, deer, and others
- Thus, a collaborative One Health Solution is the need of the hour

One Health Epidemiology of Rabies

Understanding the One Health epidemiology of rabies is crucial for:

- Identifying key reservoir species
- Assessing disease transmission dynamics
- Implementing effective control measures
- Designing effective and targeted interventions

RABIES

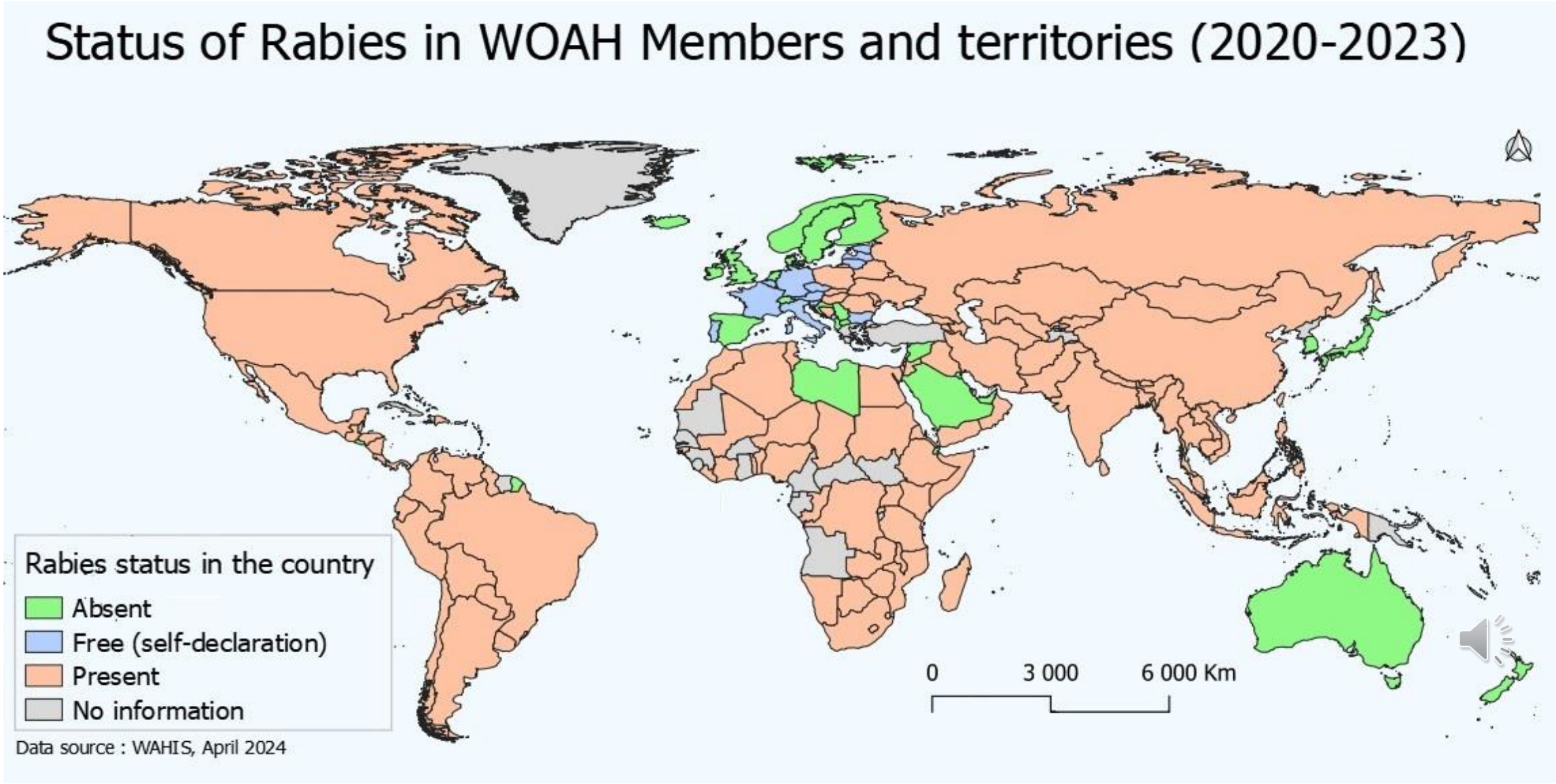
ONE HEALTH EPIDEMIOLOGY

Status of Rabies around the world

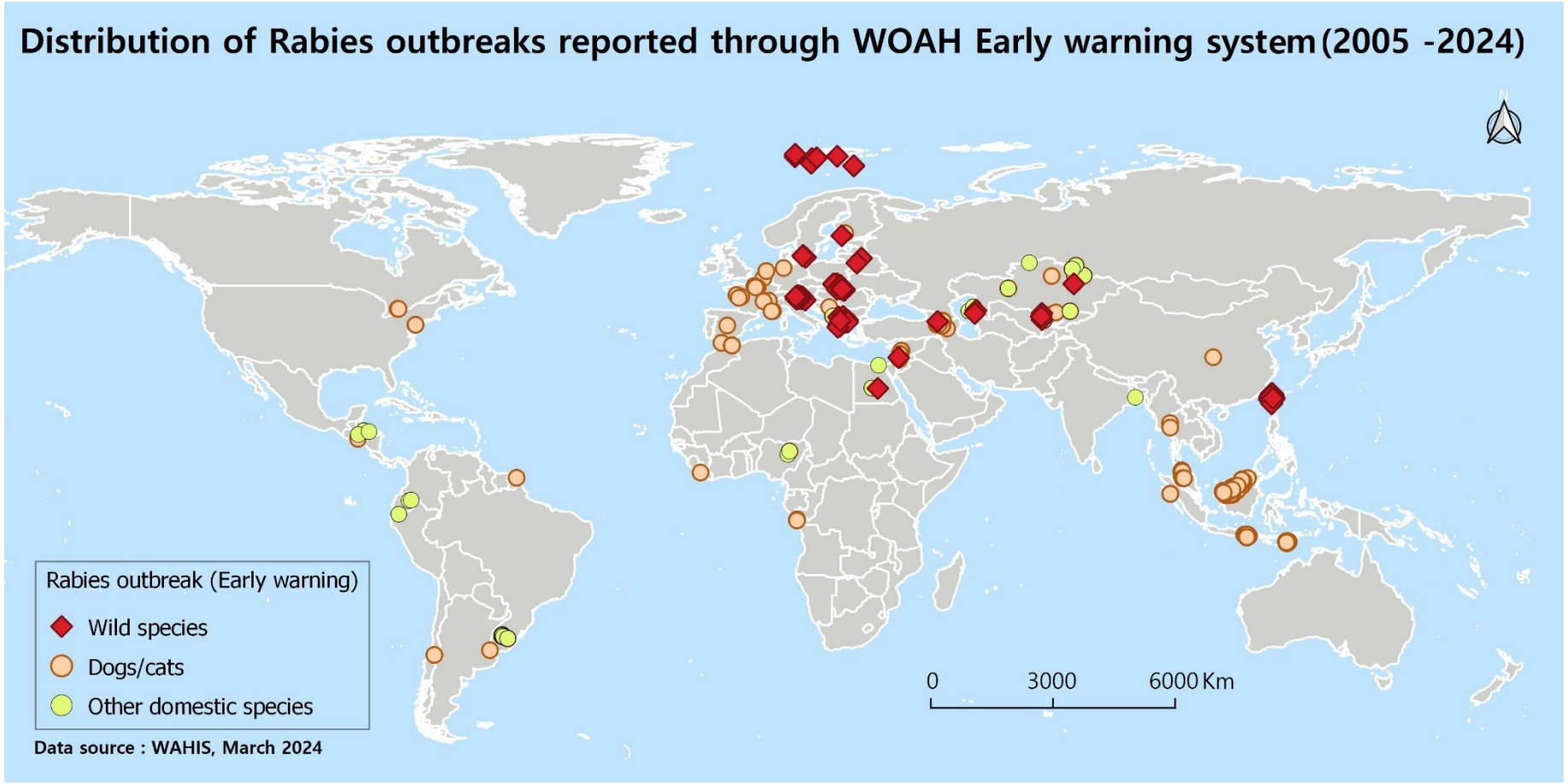
Rabies is present around the world, except in some isolated locations like Australia and Antarctica (Singh et al 2017)

Rabies is endemic in many parts of the world

WOAH Reporting - WAHIS



Status of Rabies in Wildlife around the World (Reported to WAHIS – WOAH)



- 650 outbreaks reported over the 5 past years through Ealy warning module from 20 countries across the world (of which 28 in wildlife)
- No EW outbreaks reported from the 7 countries in the GCC

Reservoir Hosts and Transmission Dynamics - 1

- Lyssaviruses, including rabies virus, have unique and in several cases, cryptic enzootic transmission cycles and reservoir hosts (Fooks and Jackson 2020)

- Lyssaviruses, including rabies viruses, are neurotropic viruses that cannot be detected until onset of clinical illness and have diverged to circulate within a wide variety of reservoir mammalian populations with near-global distribution (Fooks and Jackson 2020)

- The reservoir host communities and the related transmission dynamics are likely to vary from place to place, and situation to situation. E.g.: urban versus sylvatic cycle

Reservoir Hosts and Transmission Dynamics - 2

- It is suspected that species from the orders Carnivora (like domestic dogs and foxes) and Chiroptera (bats) are usually maintenance or reservoir hosts, while the great majority of mammals, including humans, though susceptible to rabies, are considered dead-end hosts (Fooks and Jackson 2020; Chapter 6 by Muller and Freuling)

- Domestic dog is the primary rabies virus reservoir species responsible for human infections; however, there are over 30 recognized rabies virus reservoir species globally and many more are presumed to be unrecognized due to poor-quality surveillance infrastructure (Fooks and Jackson 2020; Chapter 6 by Muller and Freuling).

- The epidemiology, including reservoir host communities and transmission dynamics, from the Middle East needs to be understood better.

Reservoirs and Rabies transmission in the Middle East - 1

The epidemiology, including reservoir host communities and transmission dynamics, from the Middle East needs to be understood better and from a local perspective

The One Health epidemiology is likely to be complex, particularly in the culturally and politically diverse Middle East Region (Horton et al 2015)

In the Middle East, Rabies is characterised by 4 genetically distinct clades with separate origins, indicating regular and multidirectional trans-boundary movements with some areas experiencing relative isolation (Horton et al 2015).

Reservoirs and Rabies transmission in the Middle East - 2

The main reservoirs for rabies in the Middle East are suspected to be domestic animals, particularly dogs, with wildlife such as red foxes and golden jackals also implicated in the transmission (Seimenis et al 2008). It could vary from country to country.

Wildlife species, particularly carnivores, play a principal role in the epidemiology of rabies in the region, with the disease affecting population dynamics (Macdonald et al 1993)

The Middle East faces significant challenges in rabies prevention and control due to its transcontinental nature and diverse political, cultural, and economic landscapes, with a severe lack of comprehensive rabies surveillance data (Baghi et al 2018)

Significance of Foxes in the Region with respect to Rabies

Foxes could play a significant role in the wildlife ecology of rabies in the region

They might be reservoir species or be involved in the transmission of the disease to other animals, including to and from domestic dogs and humans.

Wild canids like foxes can transmit the virus through bites or saliva.

One Health Impact of Rabies

- Approximately 59,000 worldwide human deaths annually (Hampson et al 2015)
- Greatest risk in the poorest regions of the world (Hampson et al 2015)
- 3.7 million disability-adjusted life years (DALY's) and 8.6 billion USD in economic losses each year (Hampson et al 2015).
- Despite being preventable, rabies remains a disease of neglect, with inadequate investment in dog vaccination and accessibility to post-exposure prophylaxis (Hampson et al 2015).
- Poses a direct threat to wildlife conservation, particularly for species at risk of extinction (Stuchin et al 2018)

Wildlife Impact of Rabies

- Threat to wildlife conservation and biodiversity
- Species conservation: Rabies outbreaks can have detrimental effects on vulnerable wildlife populations, impacting species conservation efforts.
- Disease transmission: Infected wildlife can transmit rabies to other animals, including domestic dogs and other wildlife species.
- Biodiversity Loss: The loss of wildlife due to rabies can disrupt ecosystems and contribute to biodiversity loss.

CONTROL AND MITIGATION STRATEGIES

Strategies for Wildlife - 1

- If there are sympatric dog populations in the geographical area, large-scale vaccination efforts and dog population control is key to preventing rabies transmission and reducing the disease burden on wildlife.

- Improved Surveillance and Reporting to improve our understanding of reservoir hosts and transmission dynamics, and also, to inform interventions

- Vaccination of reservoir or transmission hosts. E.g.: oral vaccines for foxes and other terrestrial mammals

Strategies for Wildlife - 2

Monitoring and targetting wildlife reservoir species to reduce disease burden.

Collaboration with local authorities and wildlife organizations.

Strengthening collaboration between veterinary and public health sectors.

Vaccination and Population Control Strategies

Importance of Large-Scale Vaccination Efforts, primarily aimed at sympatric dog populations.

Large-scale vaccination efforts are crucial in preventing the transmission of rabies.

Vaccinating a significant portion of the dog population helps create a barrier to the spread of the disease.

Controlling the dog population is another important measure in preventing rabies transmission.

Reducing the number of stray dogs, or unvaccinated stray dogs, helps minimize the risk of rabies outbreaks.

CHALLENGES AND SOLUTIONS

Challenges

Wildlife Reservoir Species: Understanding the role of wildlife reservoir species in rabies dynamics, particularly with respect to domestic dogs, is crucial for effective control and mitigation.

Wildlife Conservation: Recognizing the threats posed by rabies to wildlife is important for species conservation and biodiversity.

Surveillance and Control: Enhancing surveillance systems and implementing effective control measures are essential for early detection and prevention of rabies outbreaks.

Solutions

Strengthening Collaboration: Foster collaboration between wildlife conservation organizations, veterinary authorities, and public health agencies to develop comprehensive strategies for rabies control.

Enhanced Surveillance: Implement advanced surveillance techniques, including molecular epidemiology and geographic information systems (GIS), to monitor and track rabies cases in wildlife and domestic dog populations.

Community Engagement: Educate communities about the importance of responsible pet ownership, rabies prevention, and the benefits of vaccination.

Capacity Building: Provide training and resources to veterinary professionals and wildlife conservationists to enhance their skills in rabies prevention and control.

CONCLUSION

Rabies is a neglected zoonotic disease with One Health implications

Reservoir hosts and transmission dynamics need to be understood better.

Large-scale vaccination efforts and dog population control have been emphasized as important measures in preventing rabies transmission.

Rabies is a preventable disease. Improved knowledge and well-funded control measures are the need of the hour.

To effectively control and mitigate rabies, you could continue:

Surveillance	Vaccination	DPM	Awareness
Strengthening surveillance systems to detect and monitor rabies cases in both wildlife and domestic dogs.	Conducting targeted vaccination campaigns to protect domestic dogs and prevent the spillover of the virus to wildlife.	Implementing effective dog population control measures, such as sterilization and responsible pet ownership programs.	Enhancing public awareness and education programs to promote responsible pet ownership and rabies prevention.

By taking these actions, we can make significant progress in reducing the burden of rabies on human, domestic animal, and wildlife populations in the Middle East.

Thankyou

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