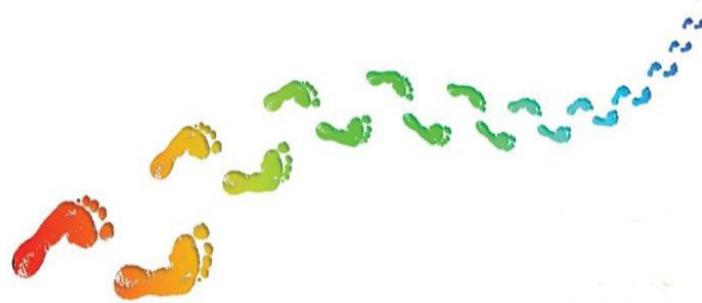




From Virus Hunting To Vaccine Design; Steps To Prepare For Future Epidemics Or Pandemics



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Chair of Animal Care Committee. Canadian Food Inspection Agency. Government of Canada
Adjunct Professor, Department of Biological Sciences, University of Lethbridge



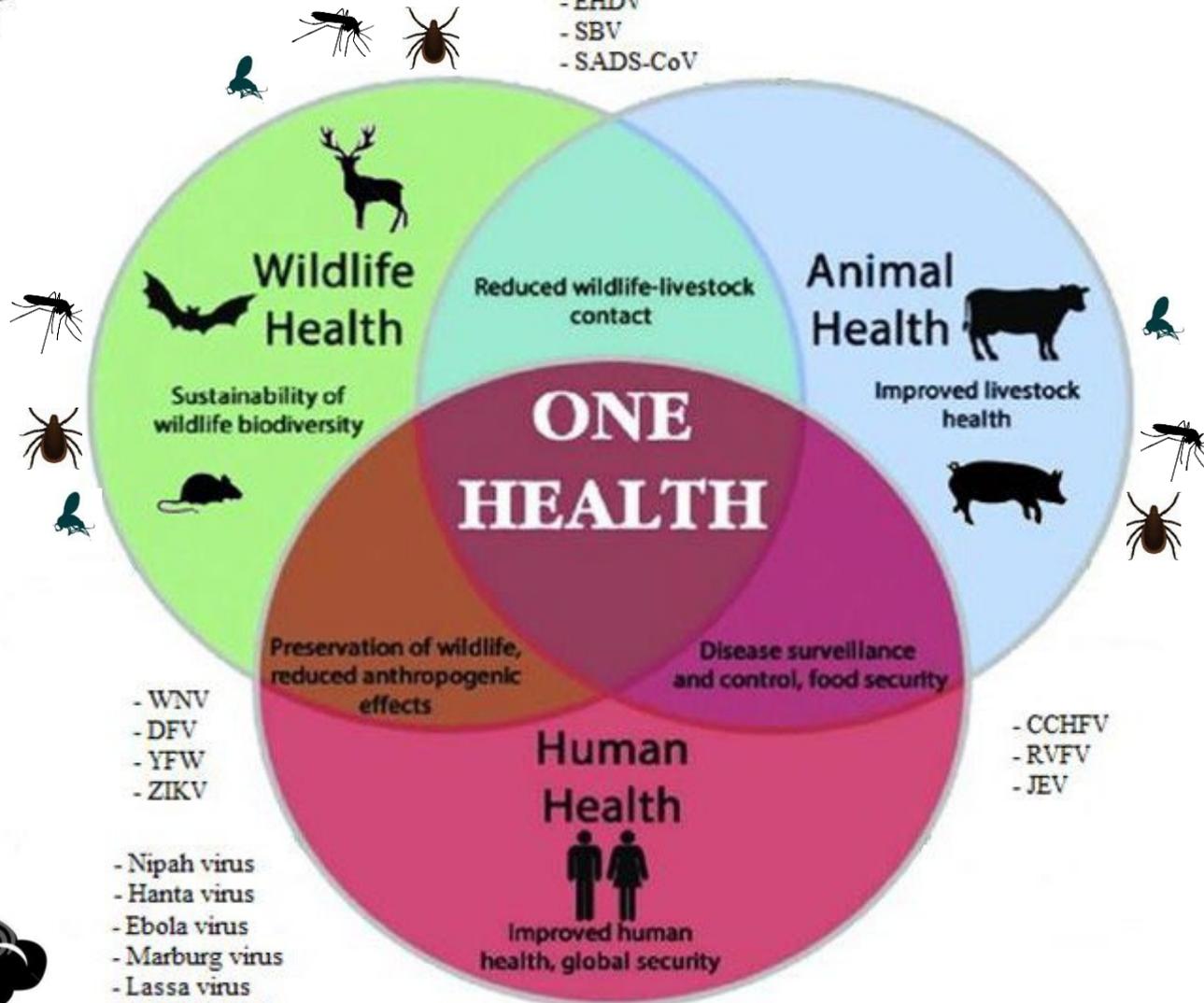
22nd Annual BC One Health and Zoonoses Symposium
November 29, 2023







- ASFV
- BTV
- EHDV
- SBV
- SADS-CoV



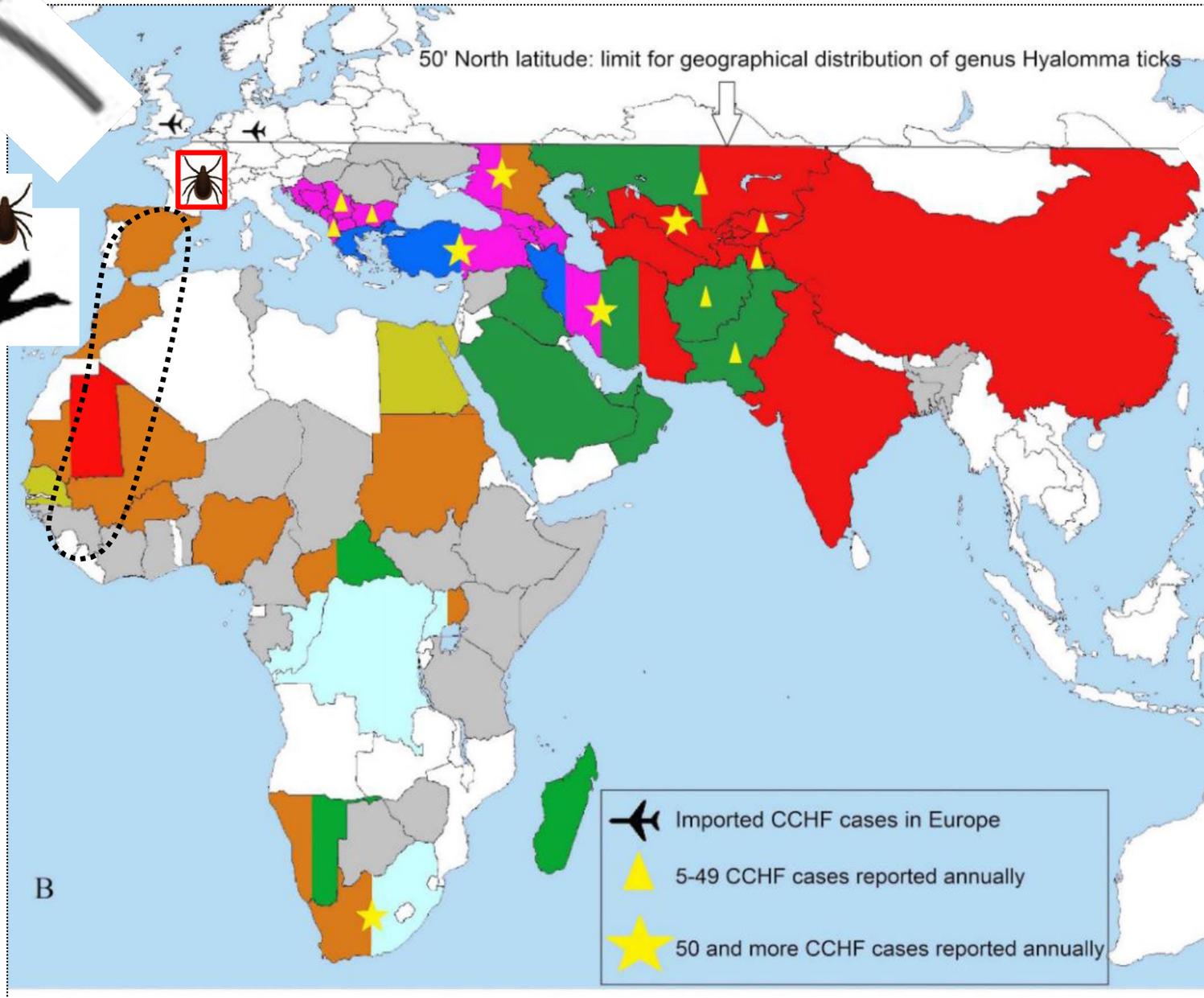
- WNV
- DFV
- YFW
- ZIKV

- Nipah virus
- Hanta virus
- Ebola virus
- Marburg virus
- Lassa virus
- SARS-CoV-2

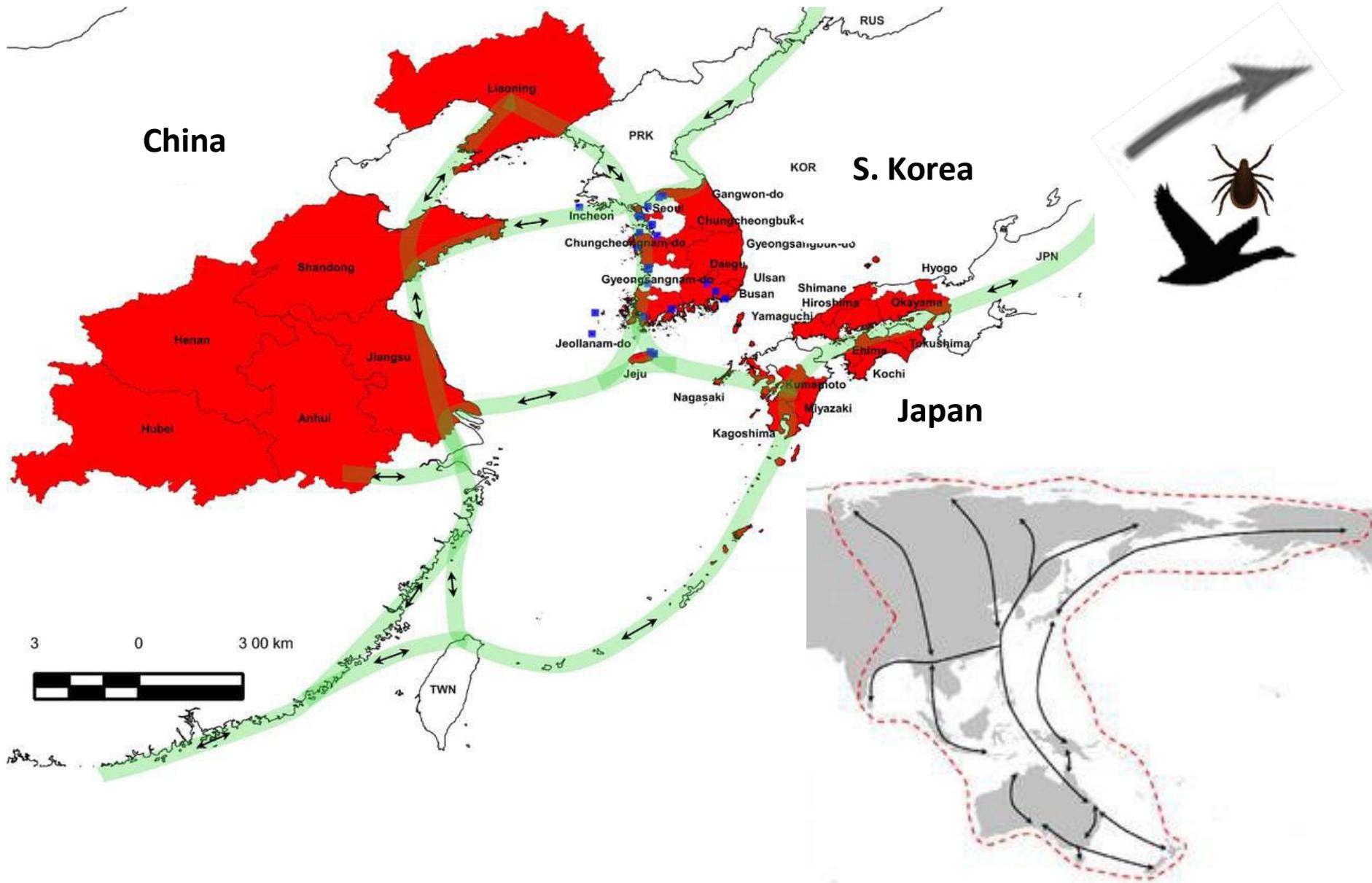
- CCHFV
- RVFV
- JEV



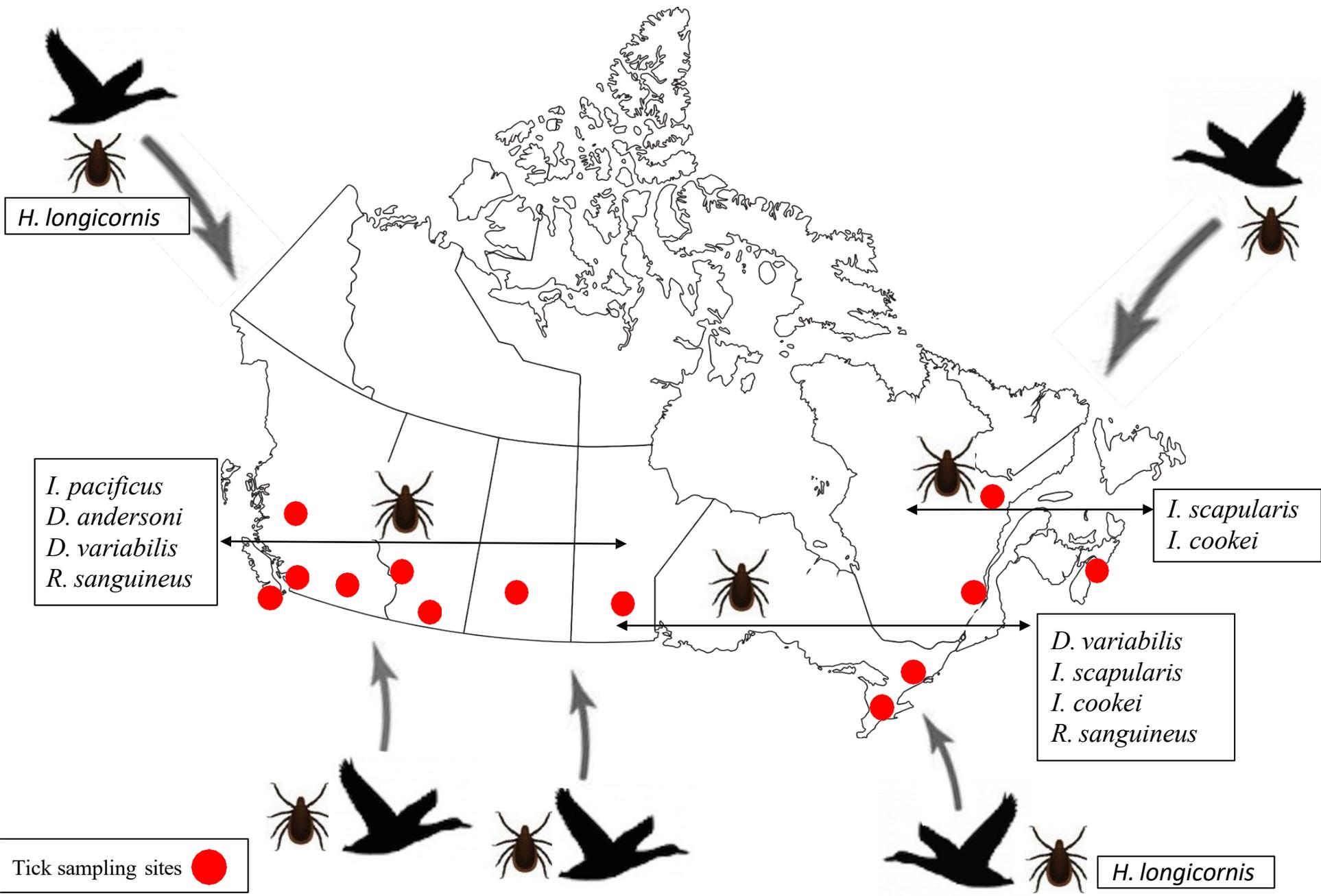
Emergence of tick-borne diseases on the rise due to climate change



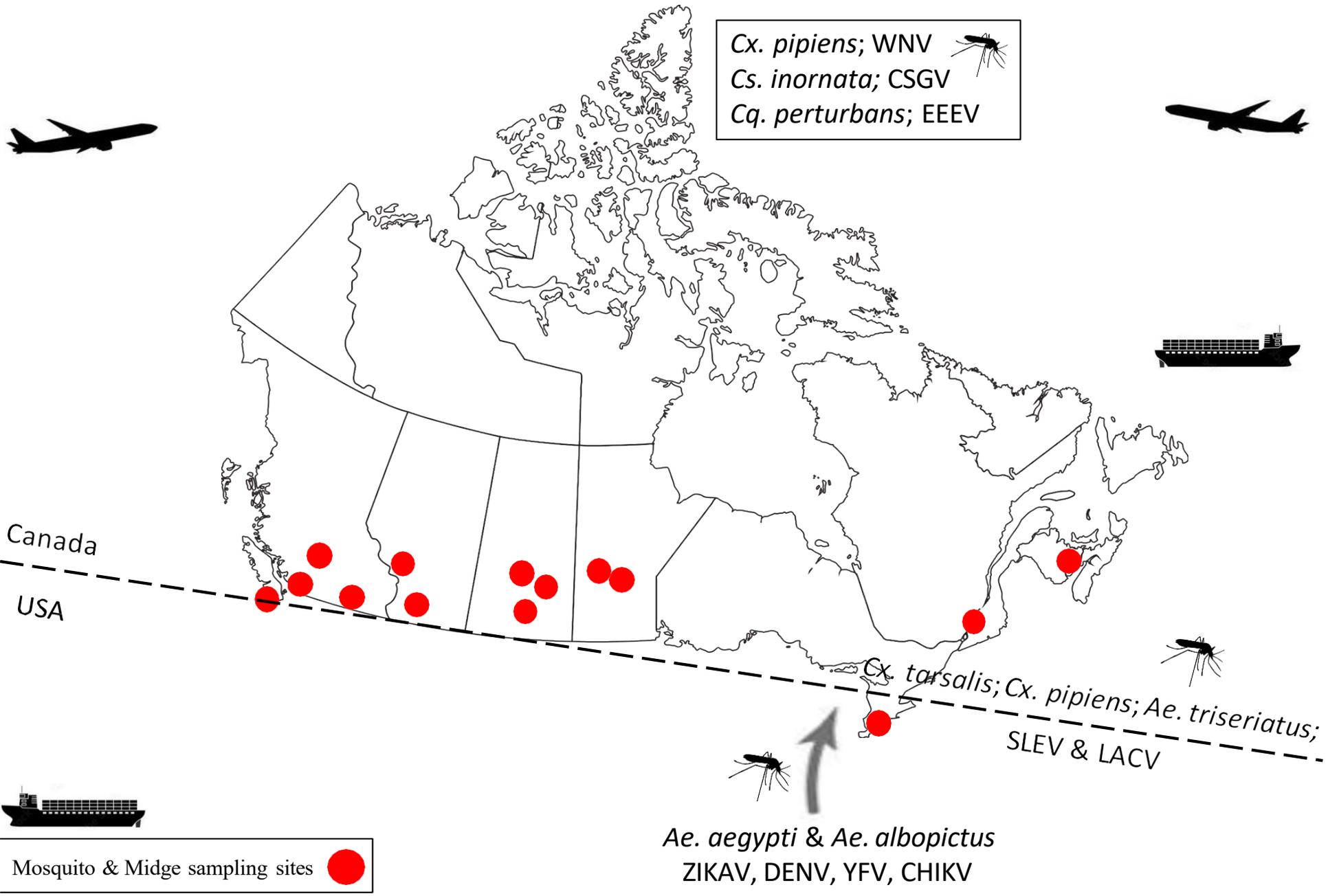
Emergence of tick-borne diseases on the rise due to climate change



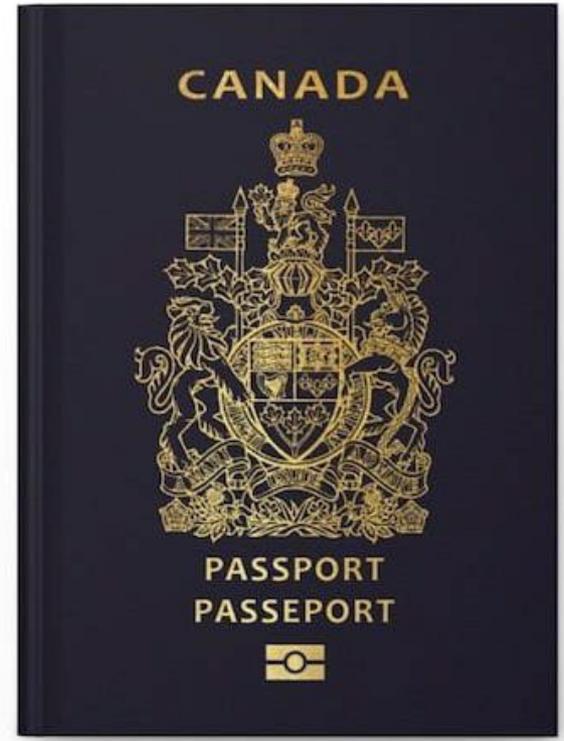
Potential scenarios for introduction of exotic tick-borne diseases into Canada

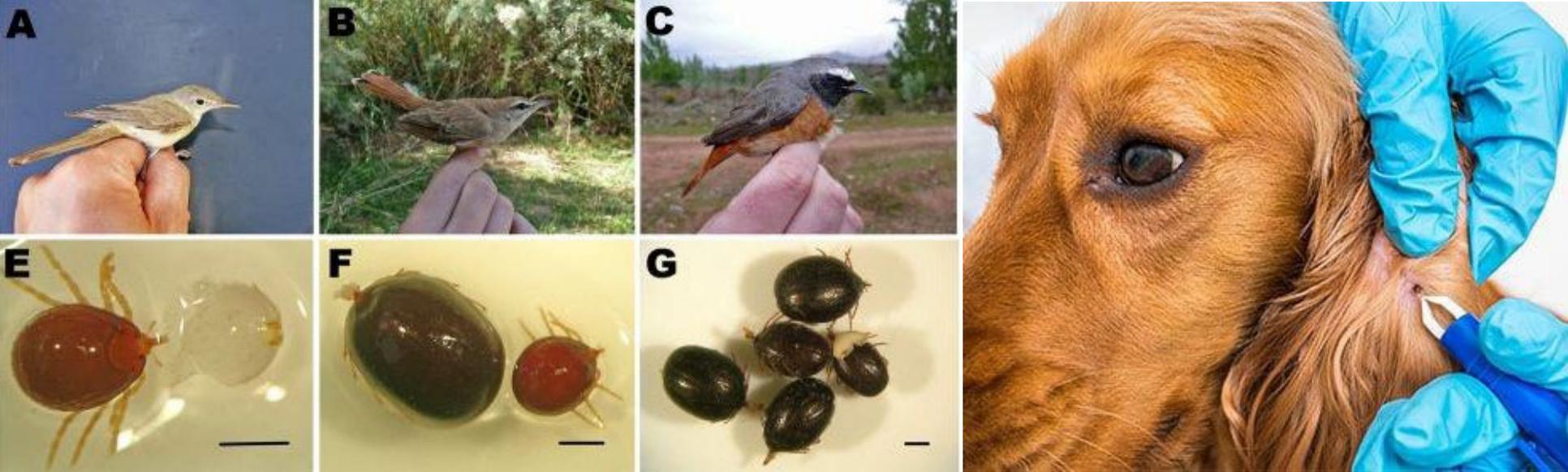


Potential scenarios for introduction of exotic mosquito-borne diseases into Canada



Travel without restriction

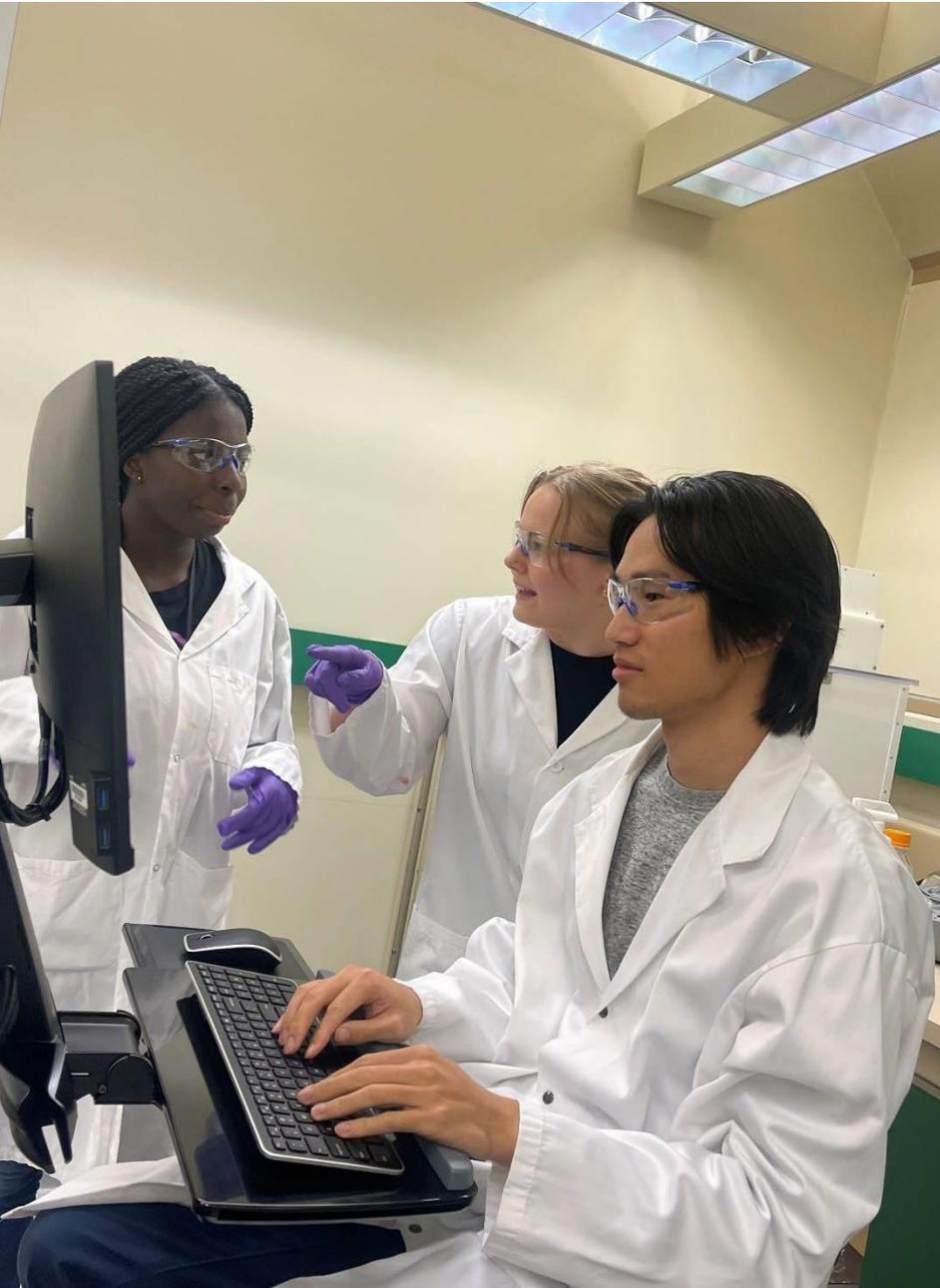




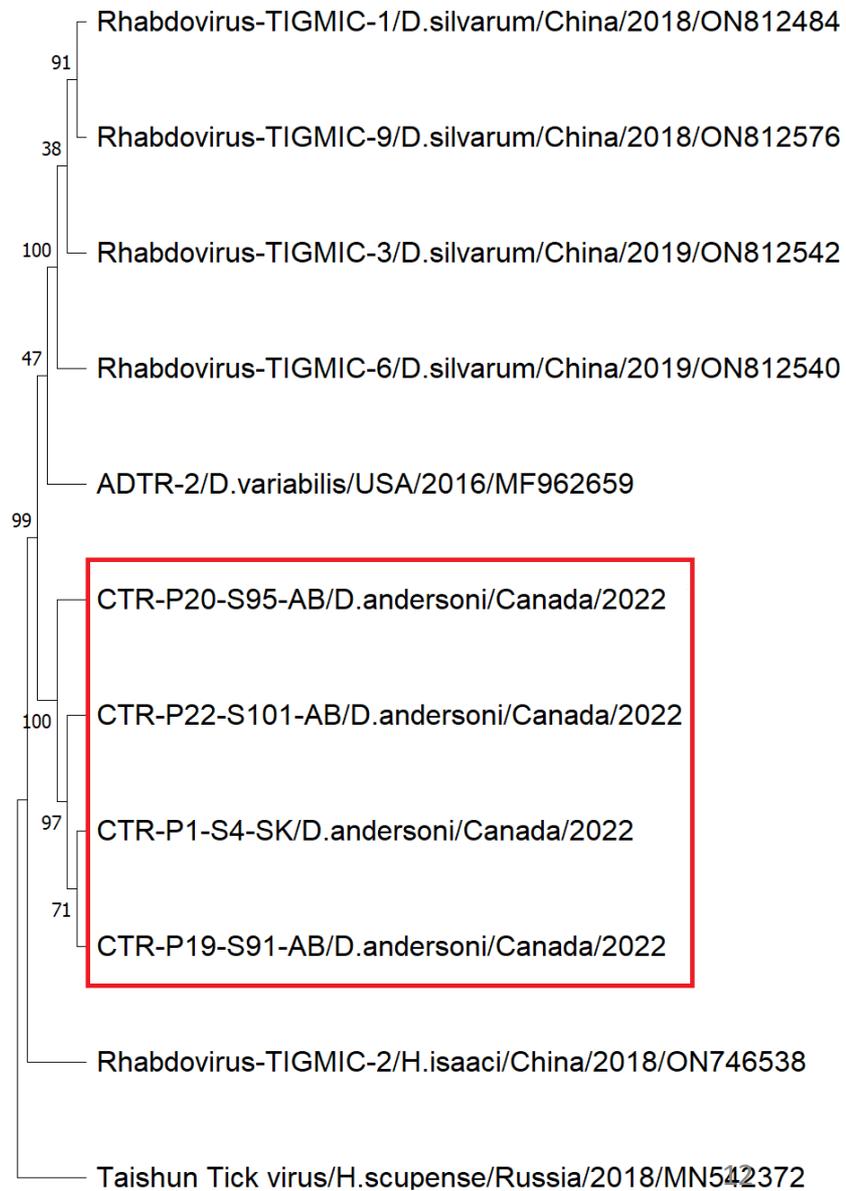
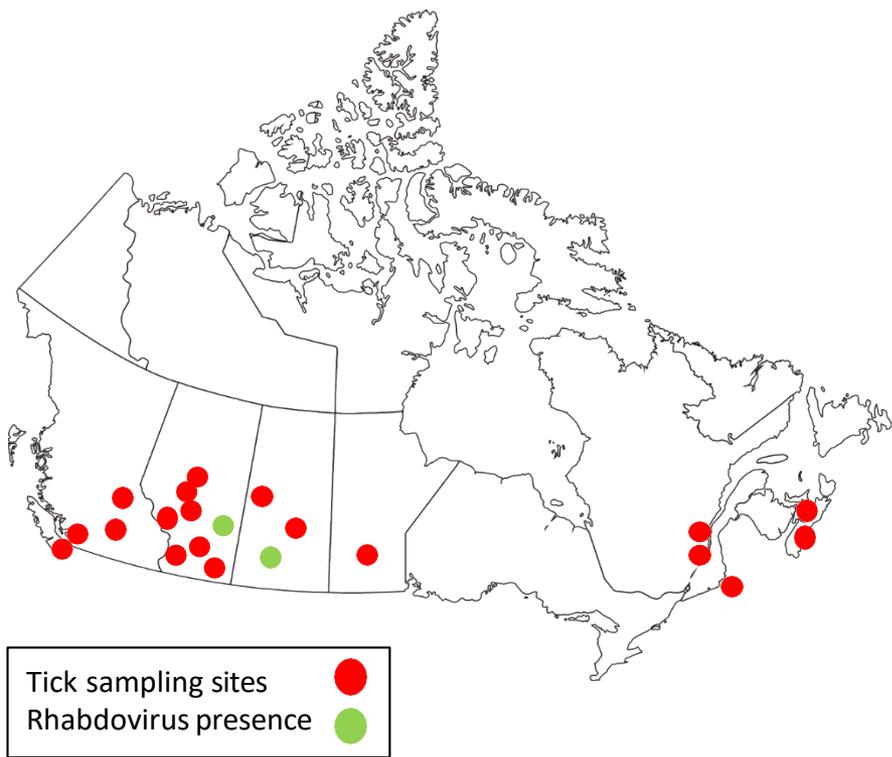
How to prepare for future outbreaks of Zoonotic and Vector-Borne Diseases?



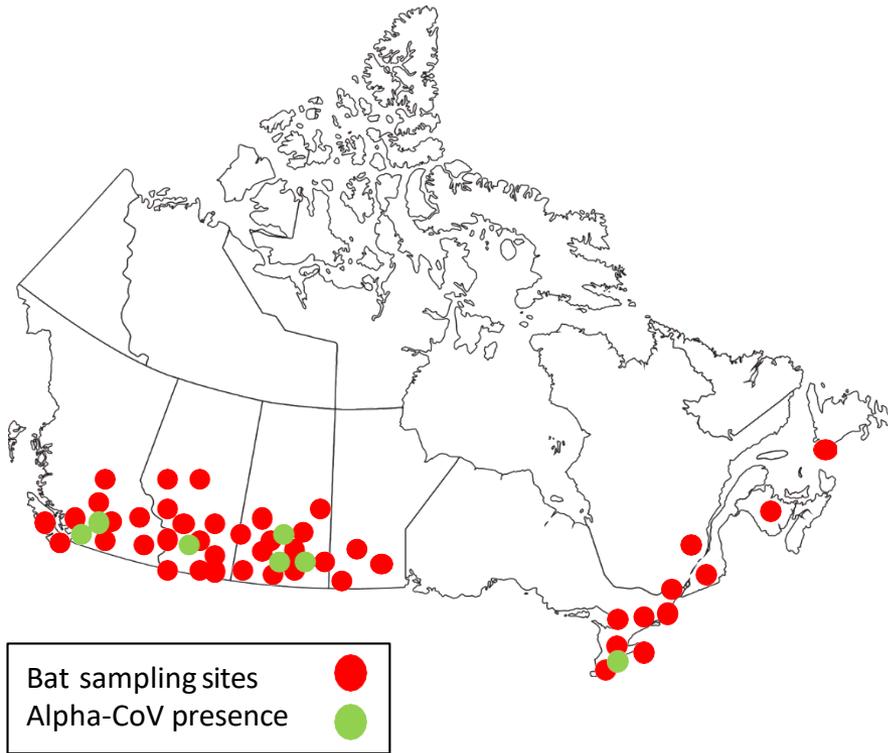
Metagenomics for novel/emerging pathogen discovery and characterization



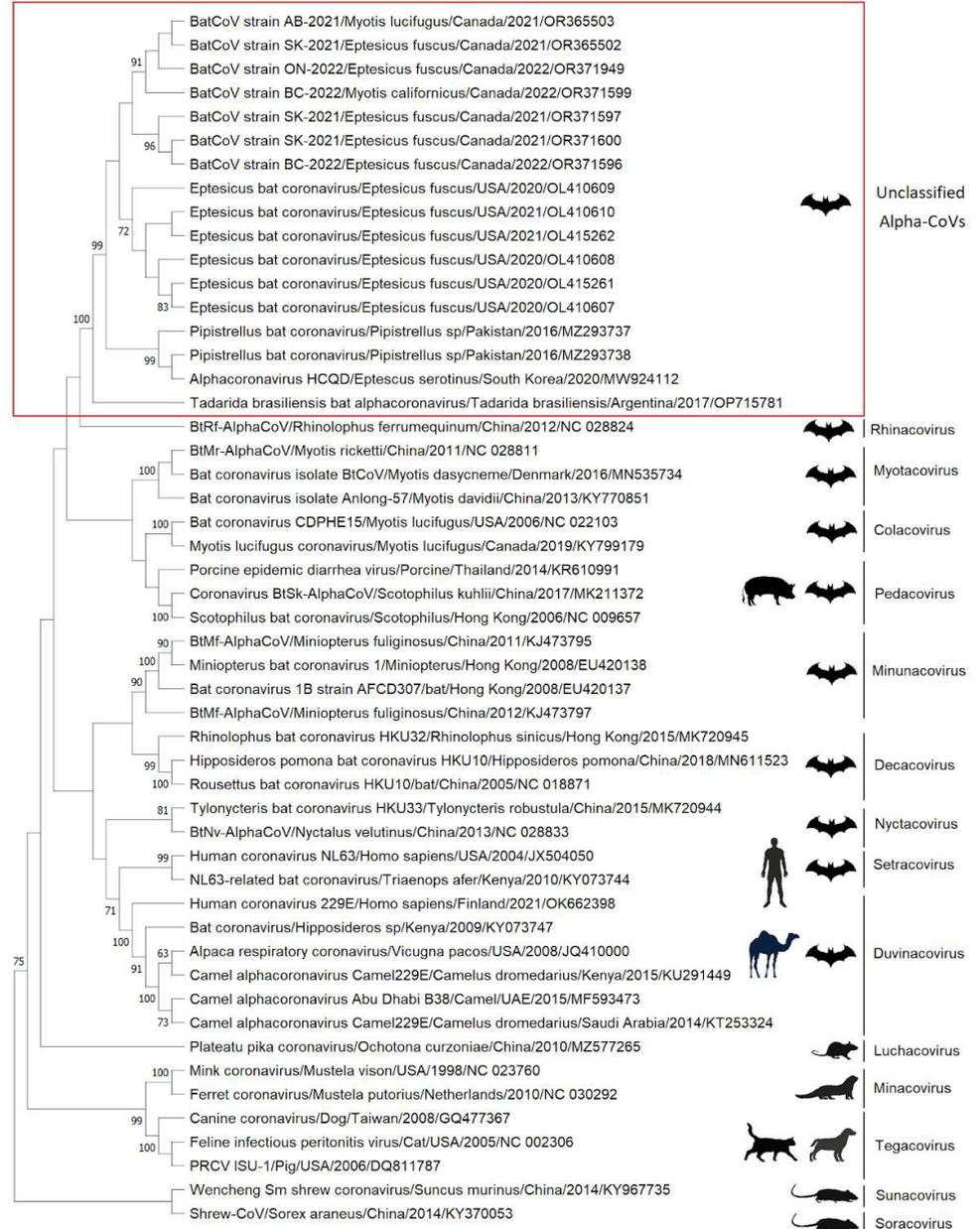
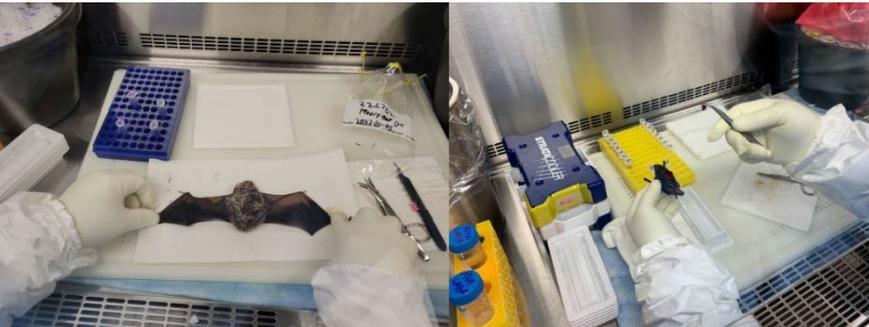
Characterization of a novel Rhabdovirus from ticks in Canada



Characterization of an unclassified Coronavirus in bat samples in Canada

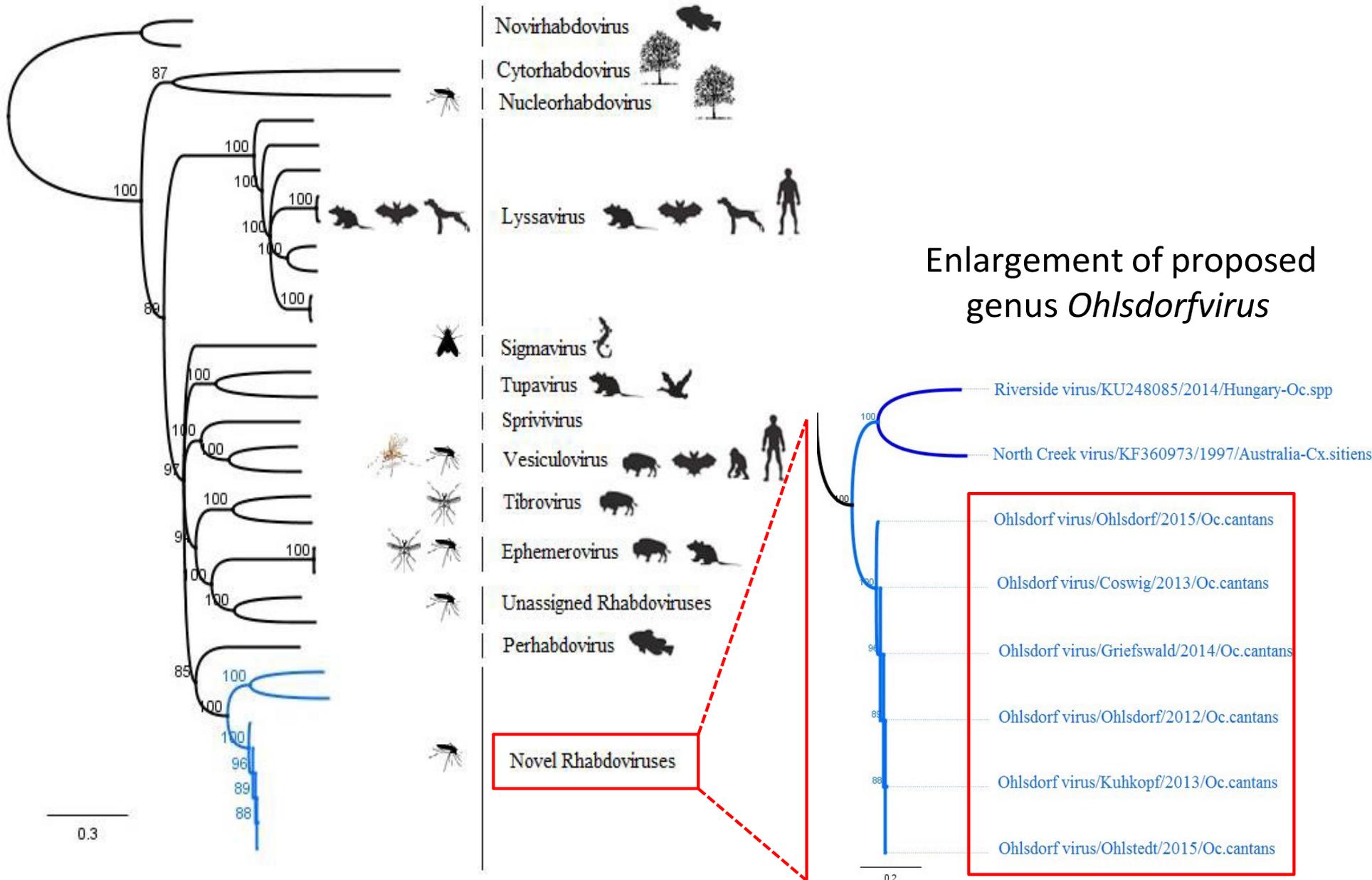


Bat sampling sites ●
Alpha-CoV presence ●

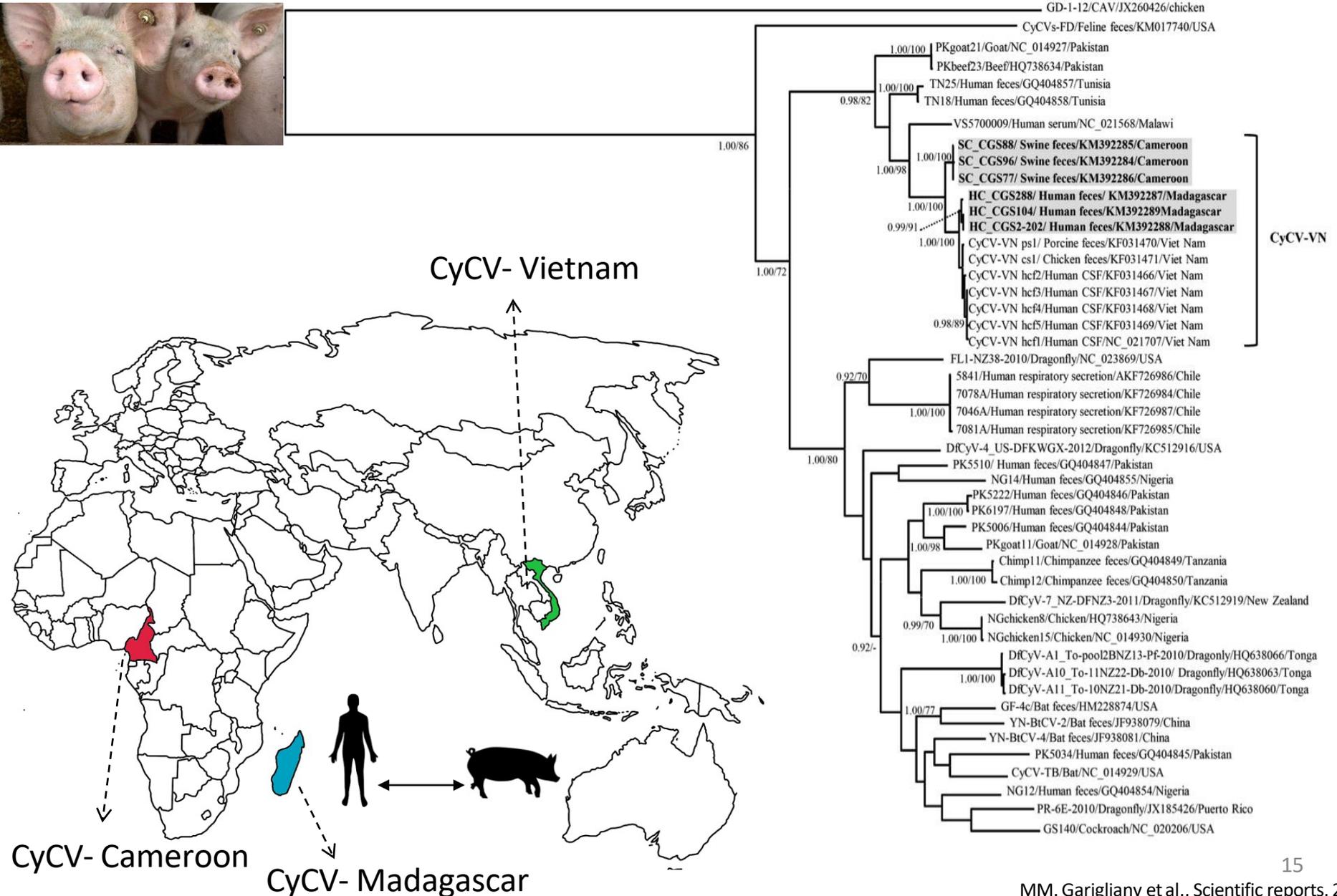
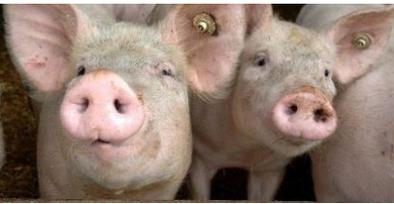


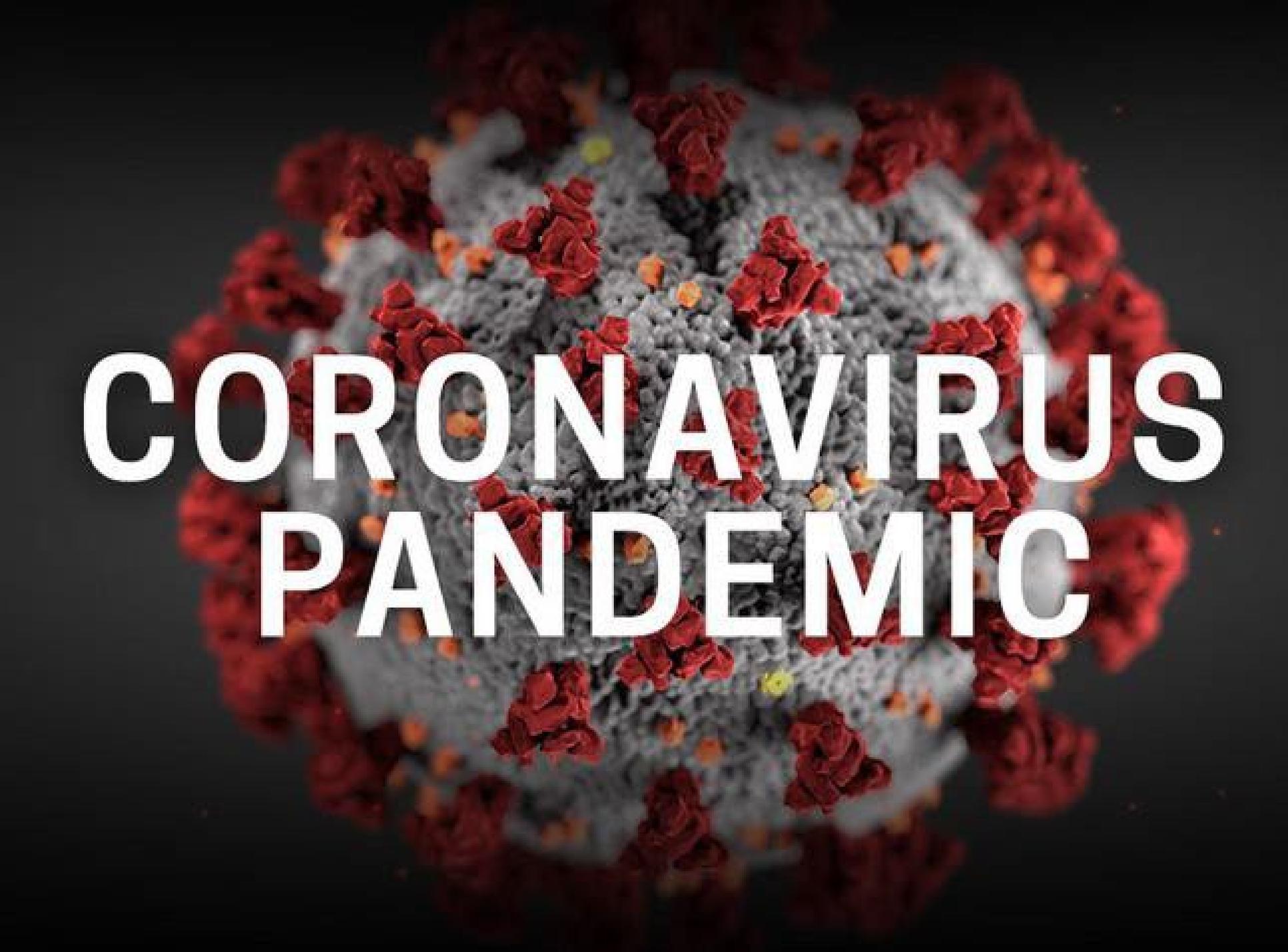
B) Alpha-CoVs

Characterization of a novel Rhabdovirus from mosquitoes in Germany



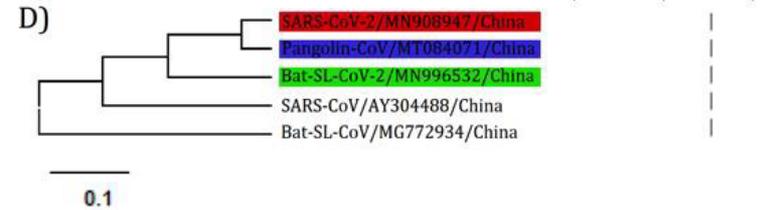
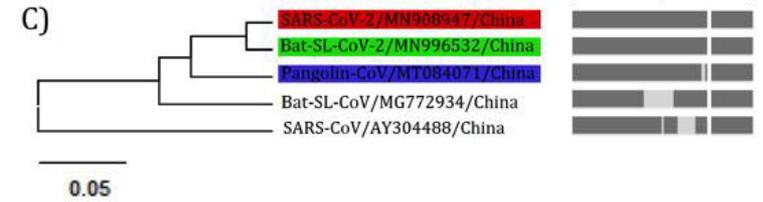
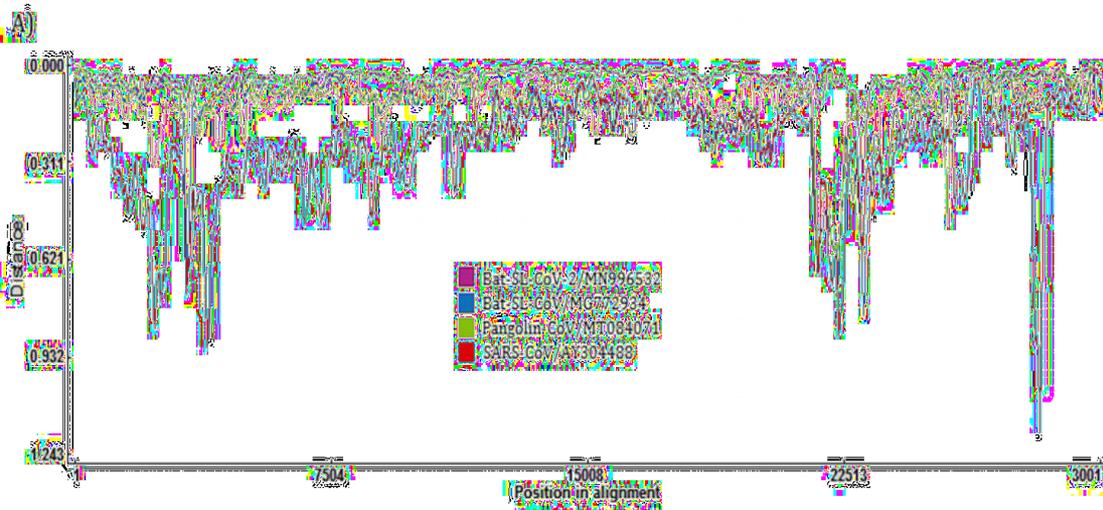
Characterization of an exotic pathogenic Cyclovirus in human and pigs in Africa





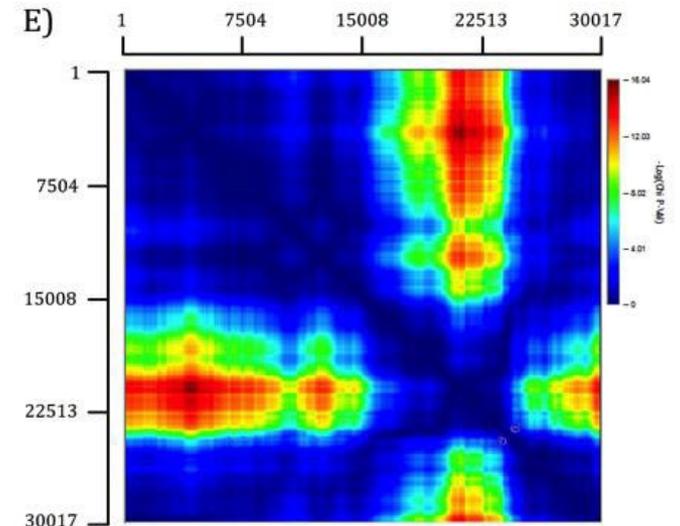
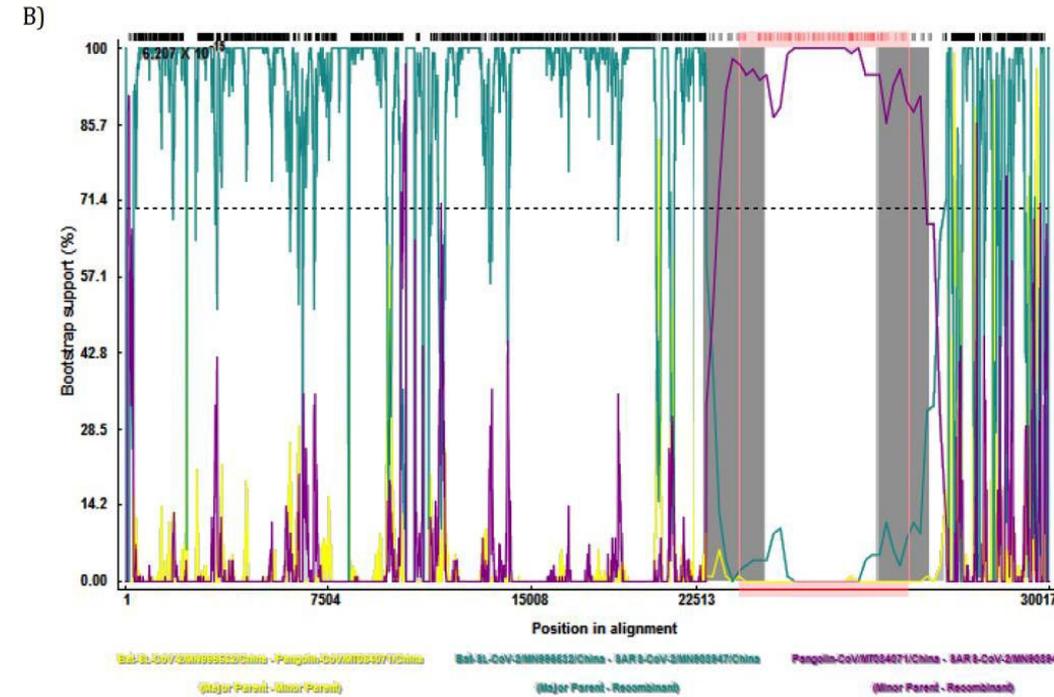
CORONAVIRUS PANDEMIC

SARS-CoV-2 spillover transmission due to recombination event



■ Potential recombinant
■ Potential minor parent
■ Potential major parent

Considered nt sites
 Ignored nt sites

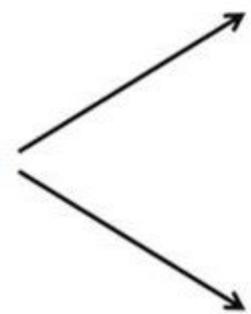


MaxChi breakpoint matrix (1.00 X zoom)

Major parent

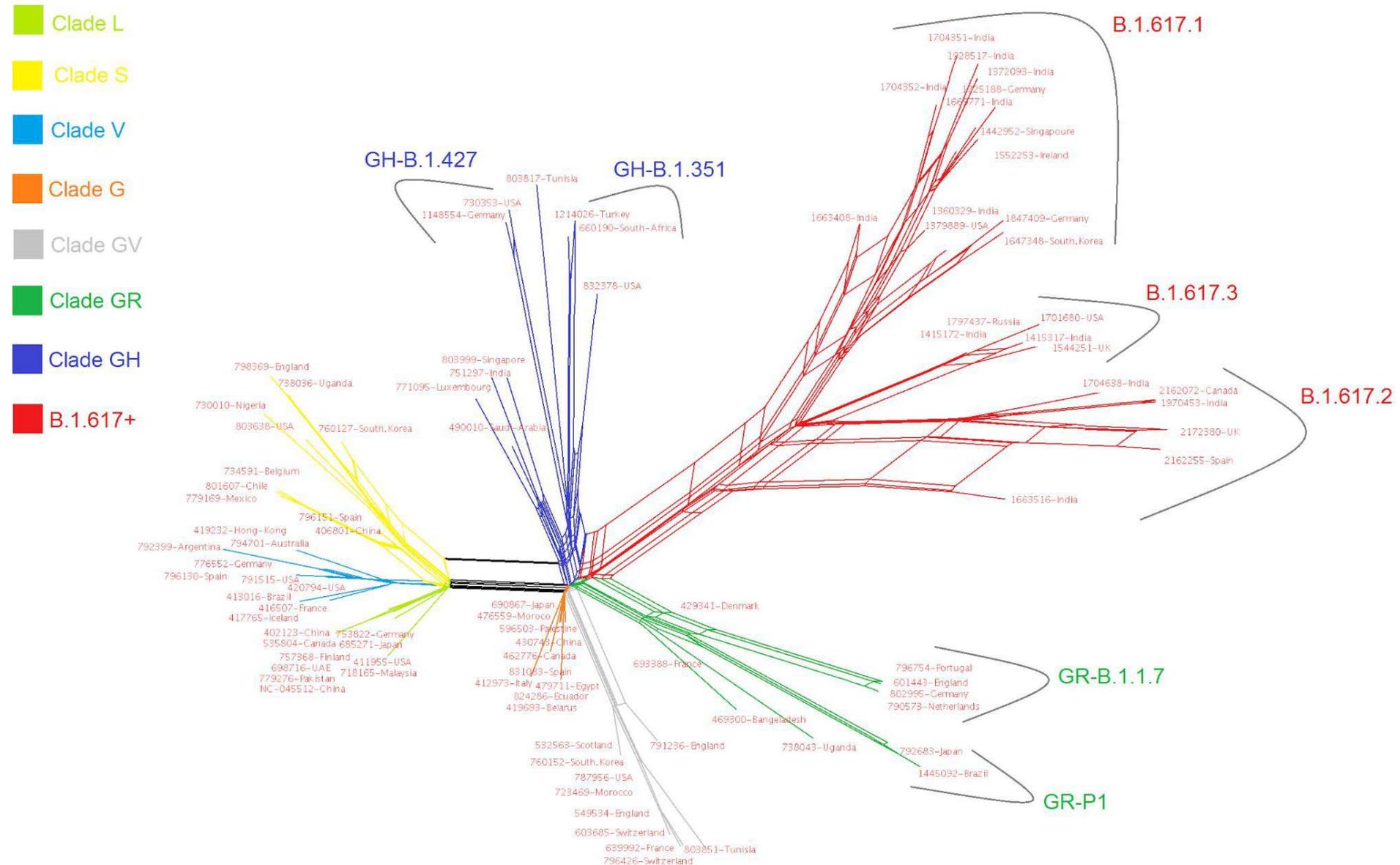


Recombinant coronavirus

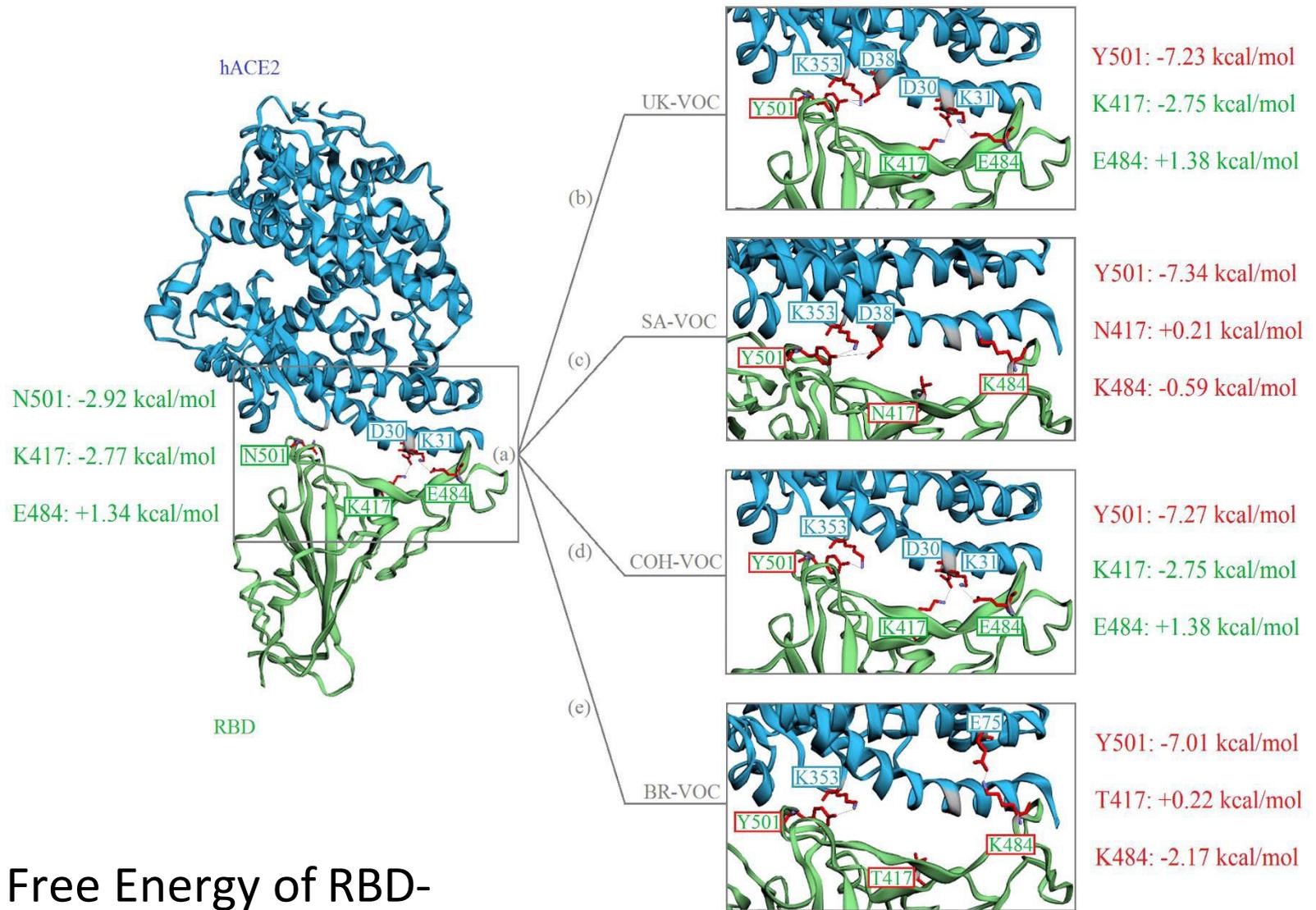


Minor parent

Split Tree of SARS-CoV-2 Variants of Concern

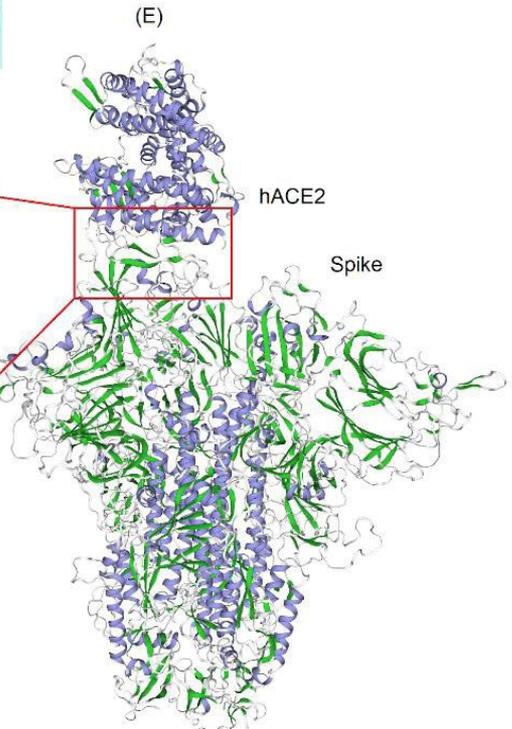
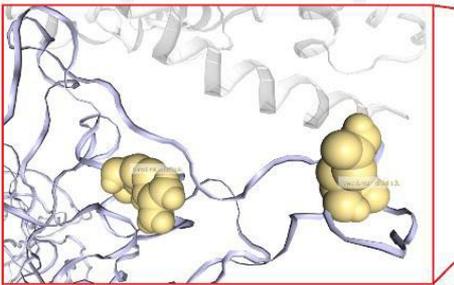
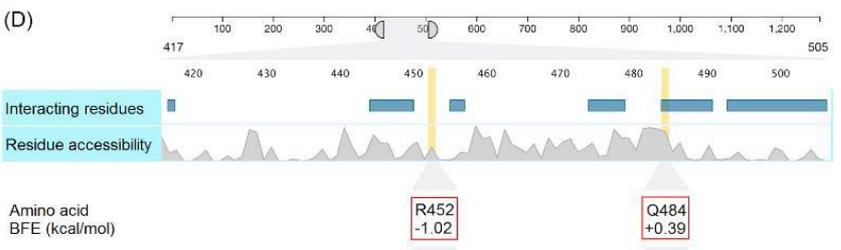
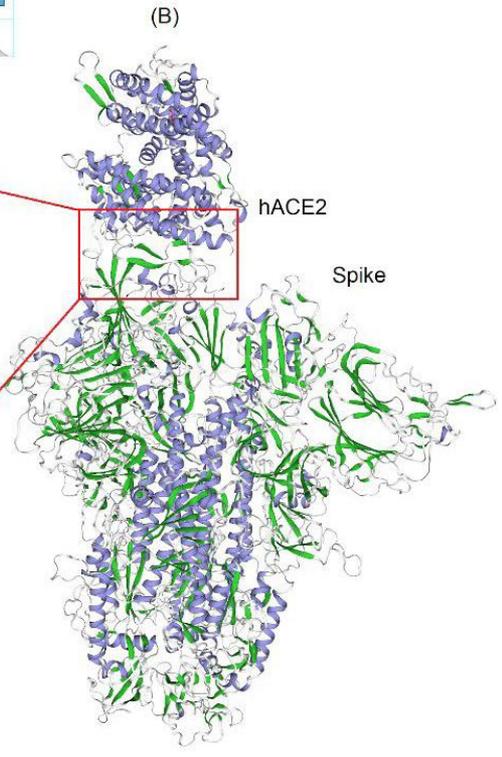
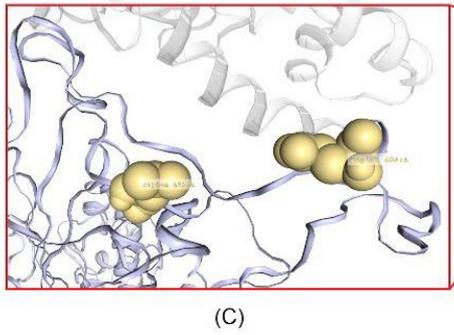
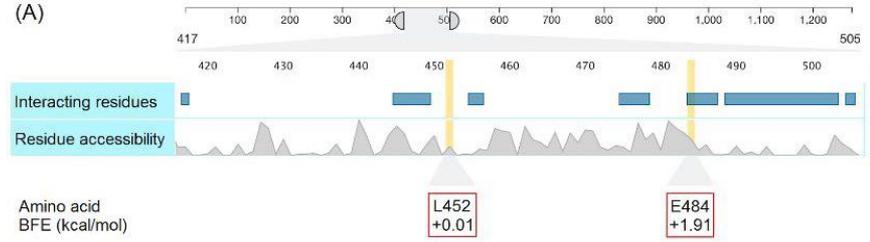


In Silico Docking of Novel SARS-CoV-2 Variants of Concern



Binding Free Energy of RBD-hACE2 Docked Complexes

The interacting residues
and residue accessibility
(WT; A, Delta variant; D)



Structures of hACE2
docked with WT (B) and
Delta variant (E)

Development of two DNA vaccines for SARS-CoV-2

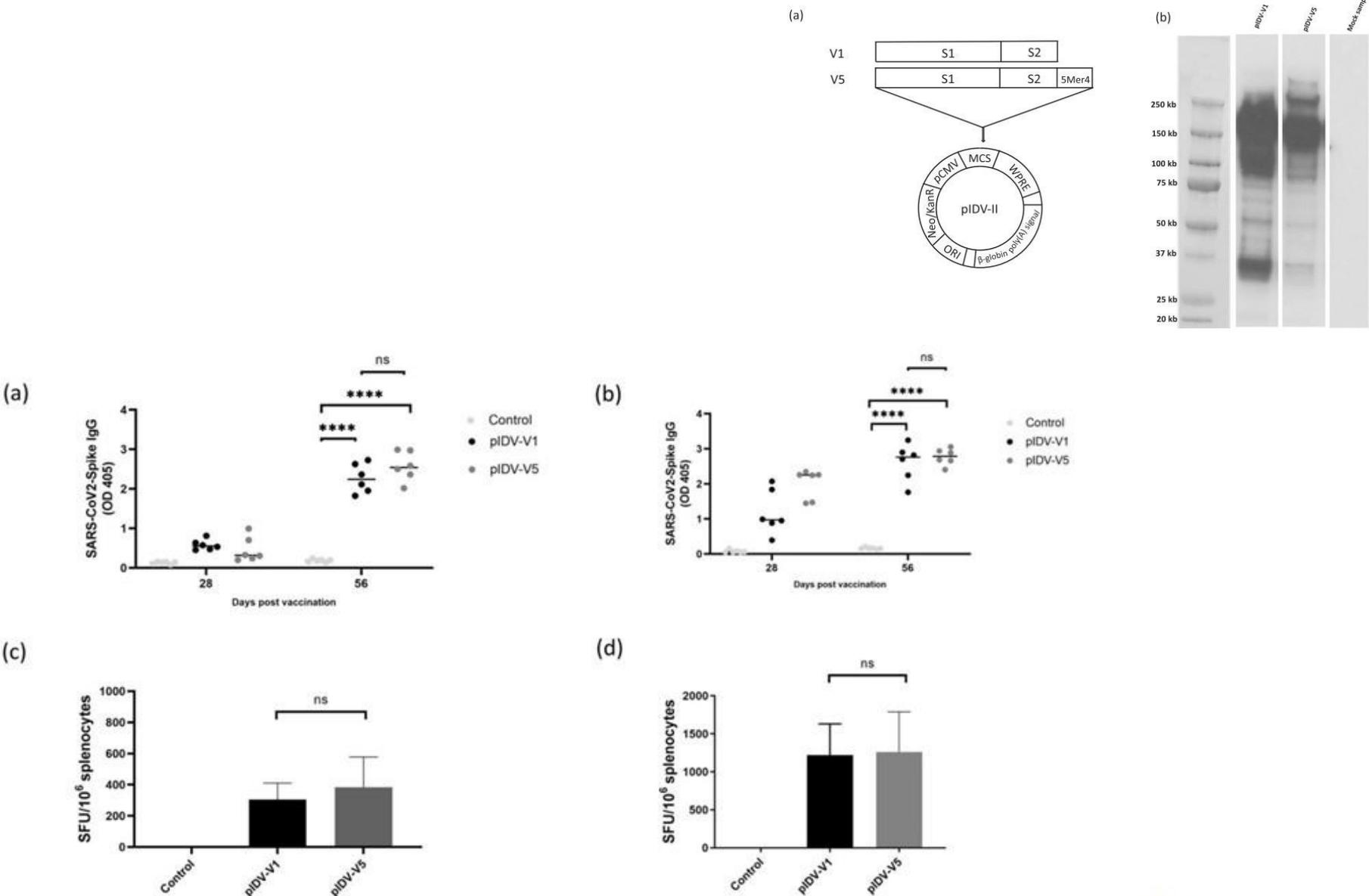


Fig. 2 Humoral and cell-mediated responses in vaccinated mice. a BALB/c and b C57BL/6 mice were immunized with pIDV-II-SARS-CoV2- Spike-Vectors 1 and 5

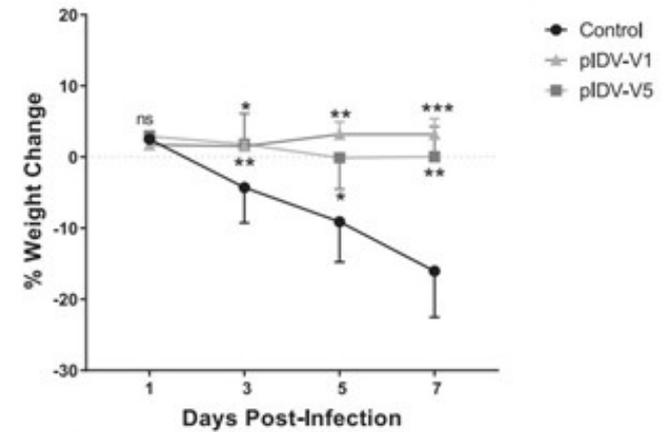
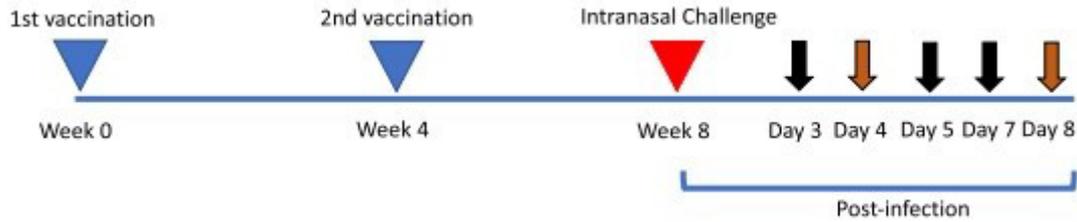


Fig. 3 Weight loss in animals following virus challenge.

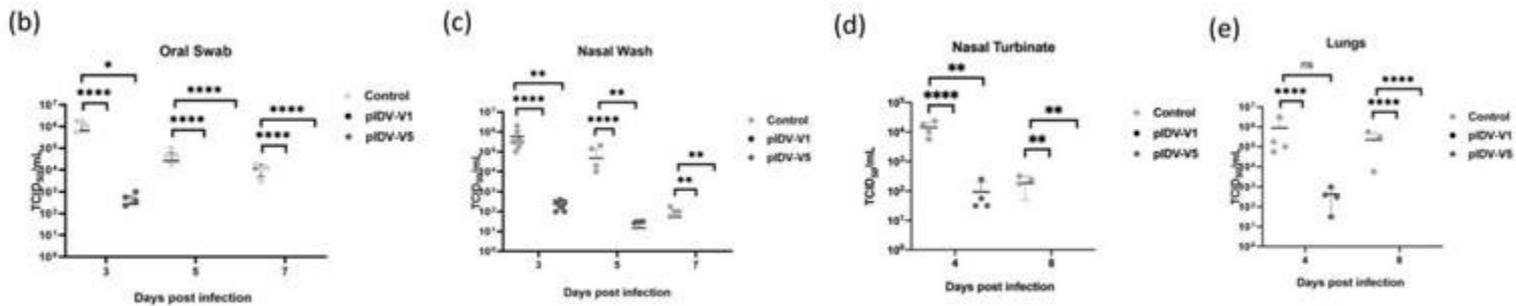


Fig. 4 Vaccination reduces viral shedding and viral RNA load in SARS-CoV2 challenged hamsters.

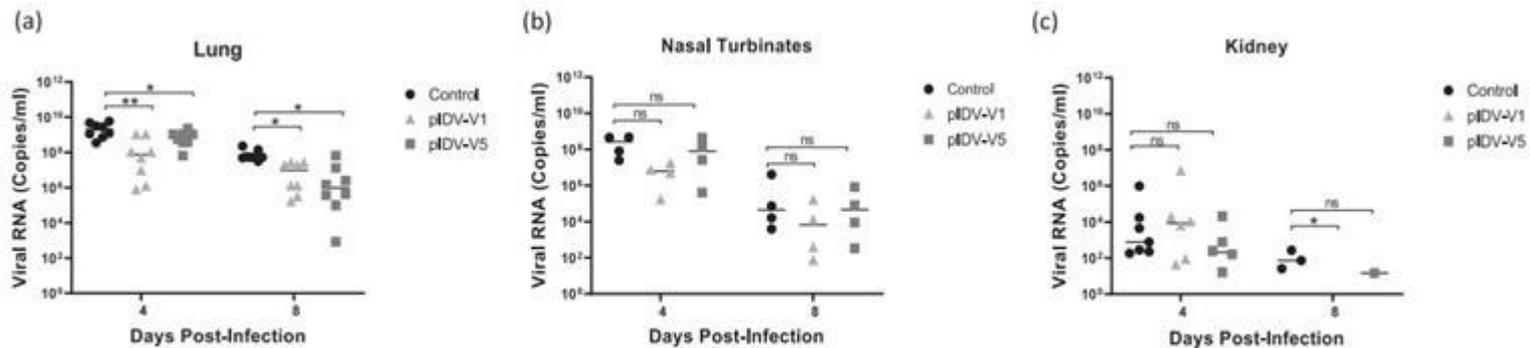


Fig. 5 Comparison of SARS-CoV-2 viral load in different tissues.

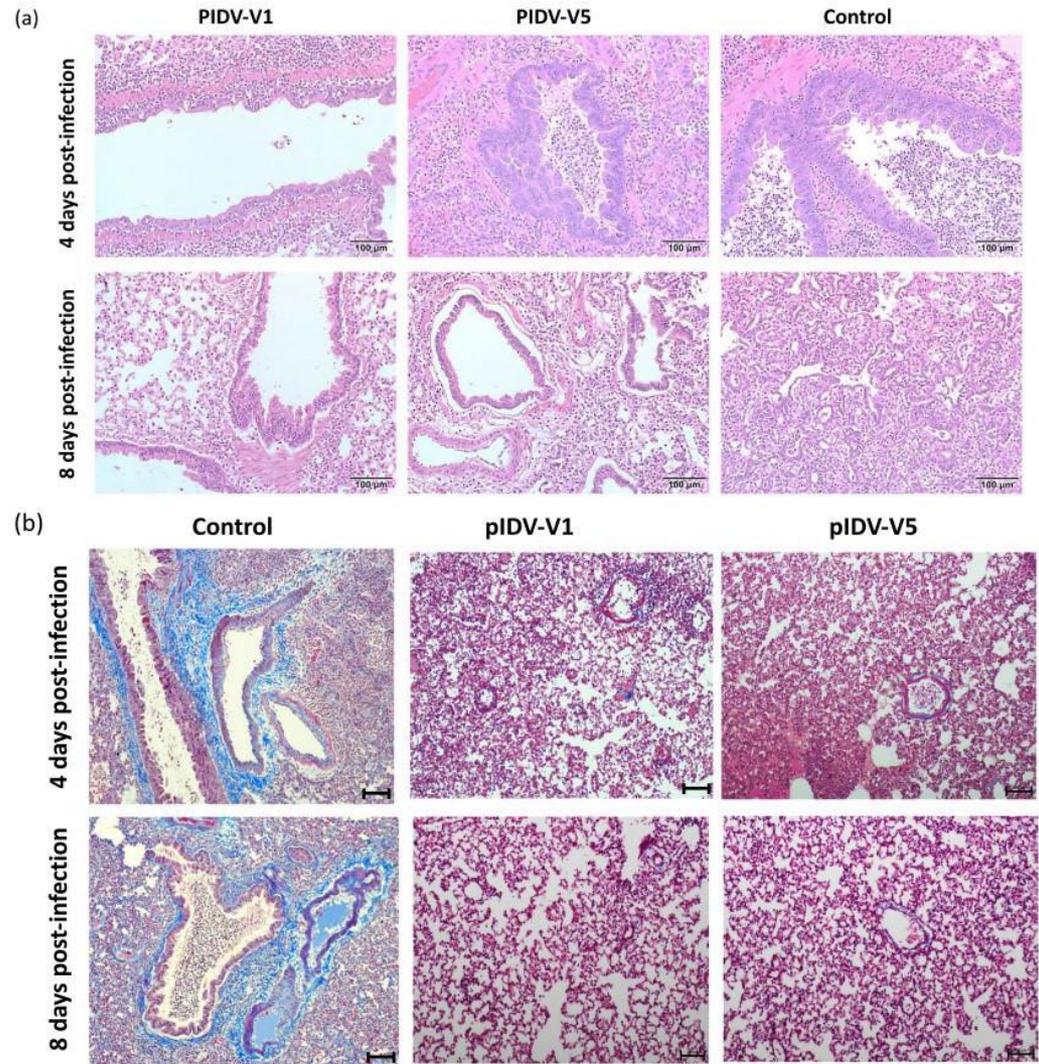
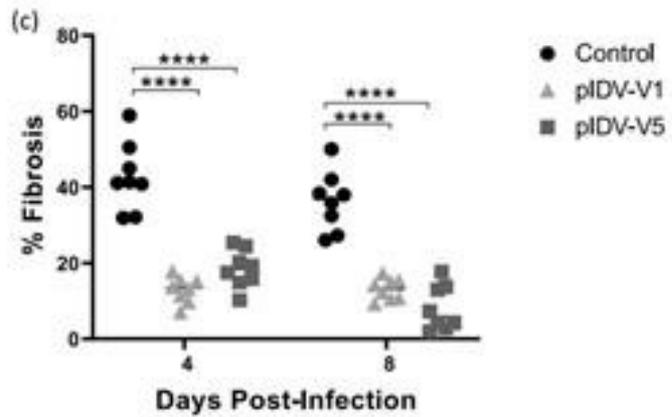


Fig. 6 Lung pathology in vaccinated and unvaccinated hamsters.



Acknowledgement



Thank you for your attention!

The New York Times

OPINION

What if the Next Pandemic Happens Tomorrow?



Questions?