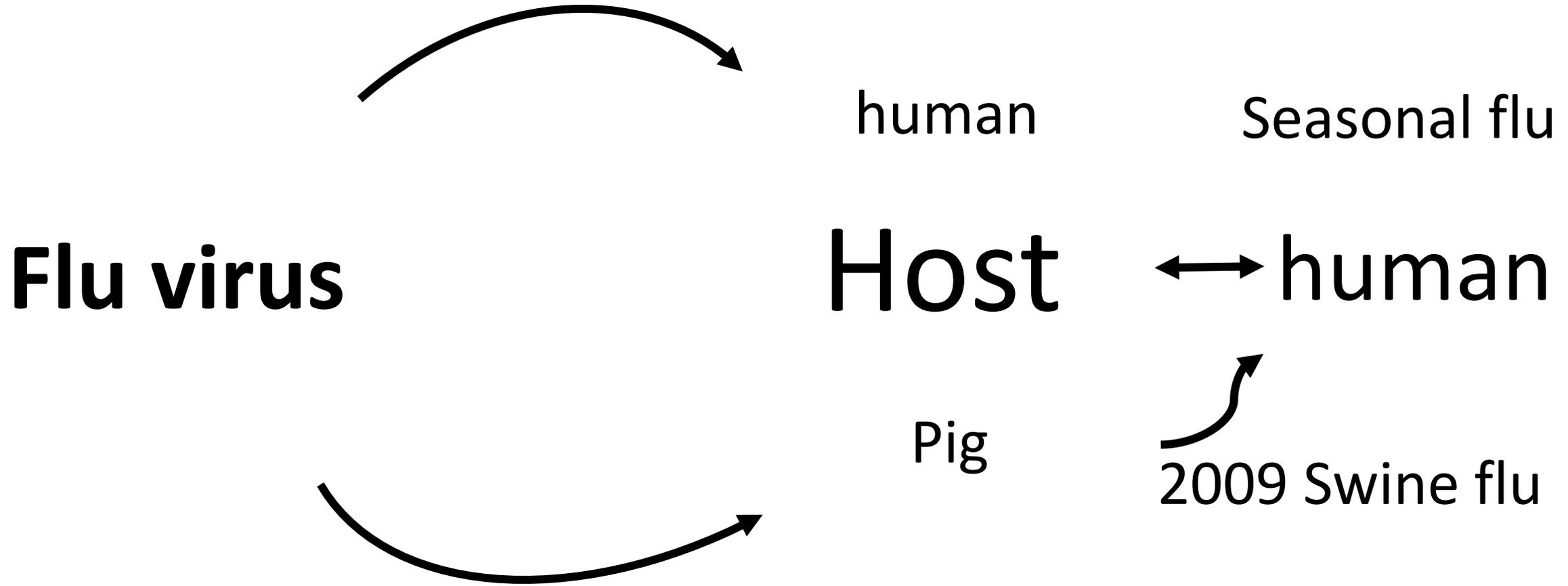


# Coronavirus discovery in Hong Kong

Department of Microbiology  
The University of Hong Kong

# What is a virus?



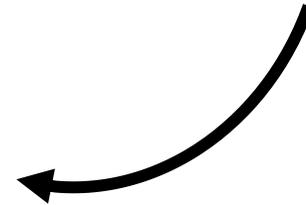
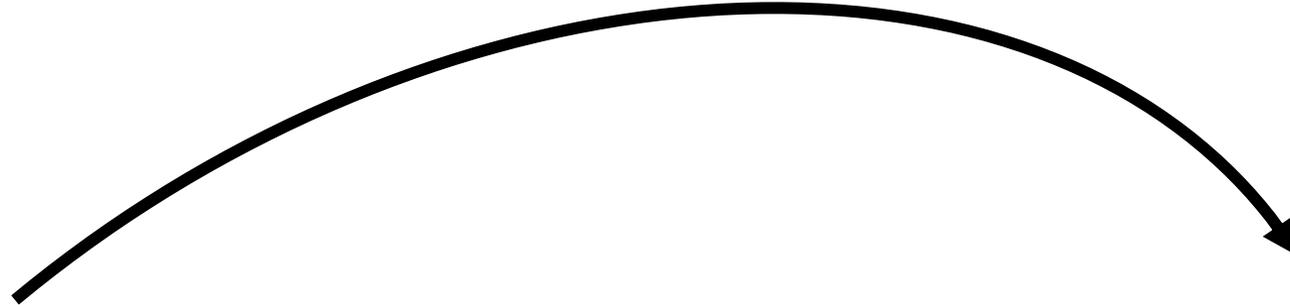
# What is a virus?

Microcephaly  
**Zika virus**

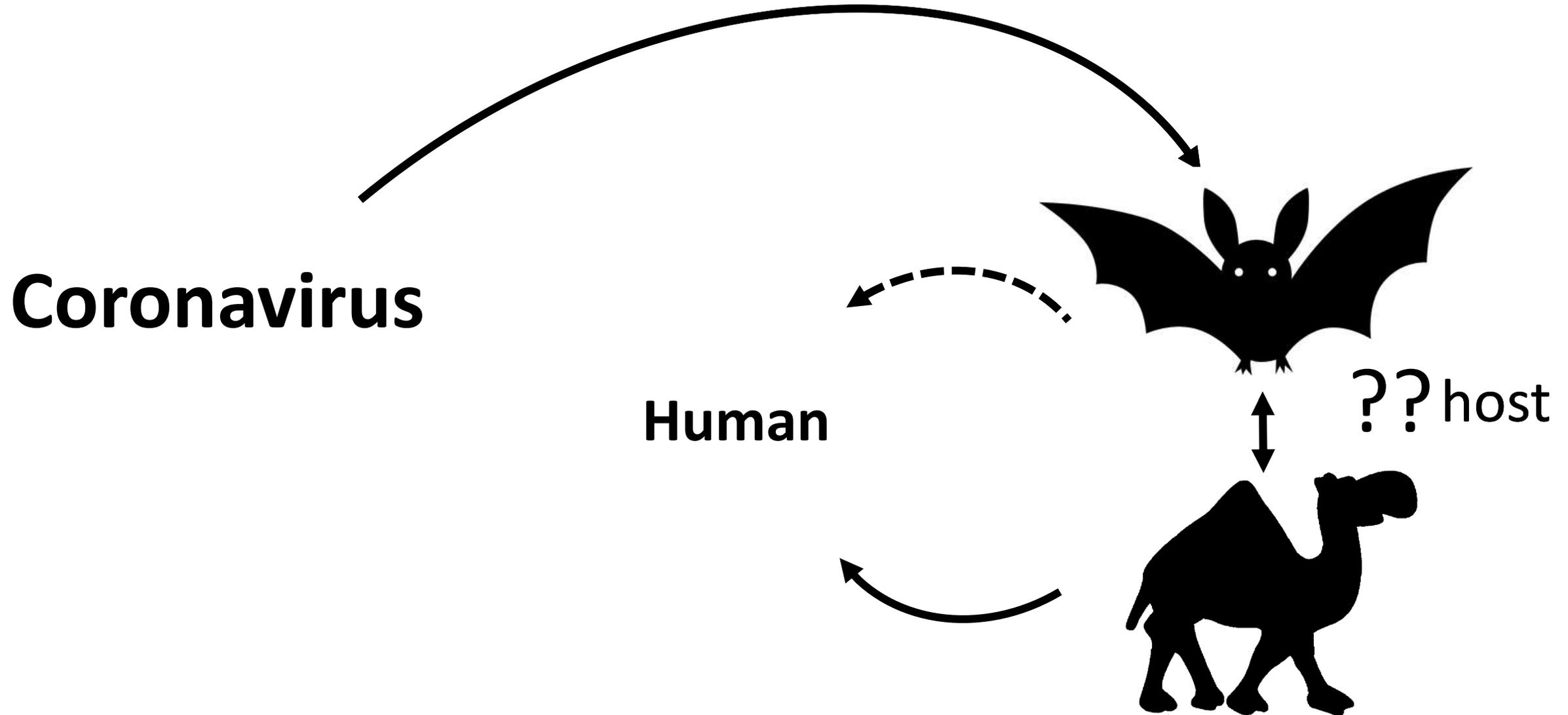


reservoir

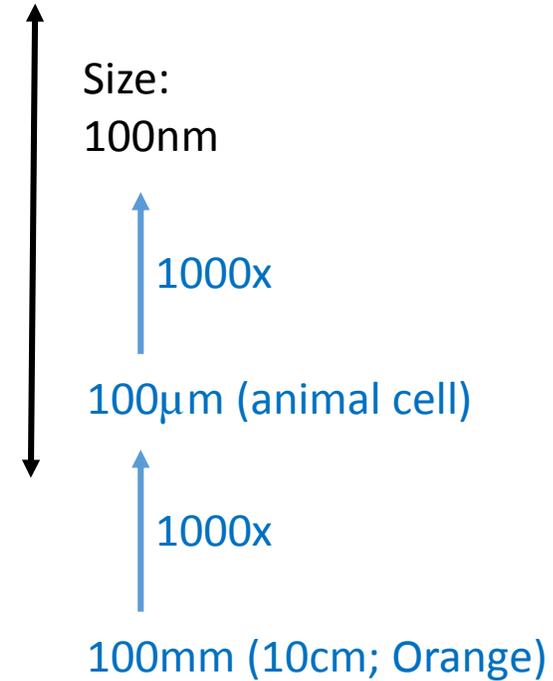
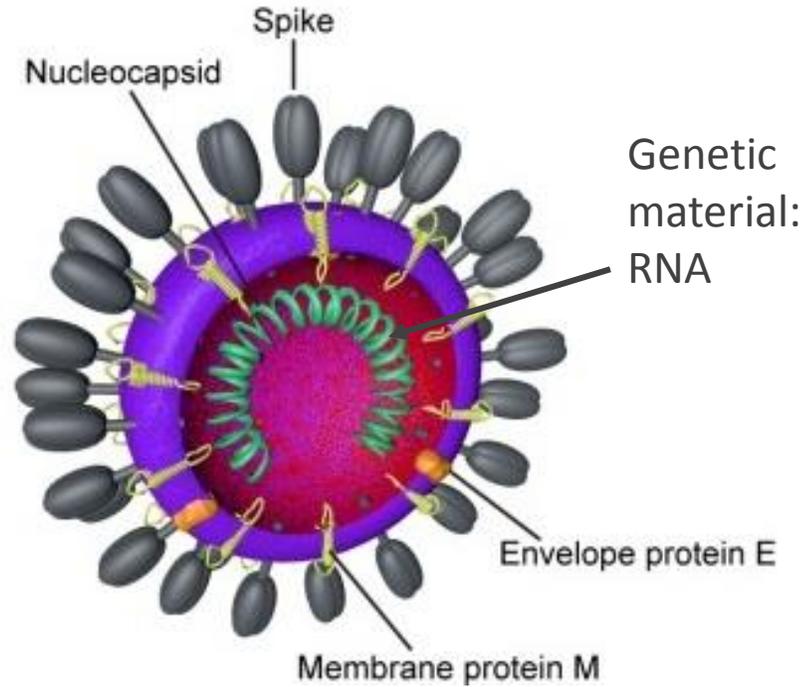
**Human**



# What is a virus?



# What is a coronavirus?



<https://en.wikipedia.org/wiki/Coronaviridae>

# Virus classification

Viruses

```
graph TD; Viruses[Viruses] --> DNA_virus[DNA virus]; Viruses --> RNA_virus[RNA virus]; Viruses --> Retrovirus[Retrovirus];
```

DNA virus

e.g. Herpesvirus

RNA virus

e.g. **Coronavirus**  
e.g. Influenza virus

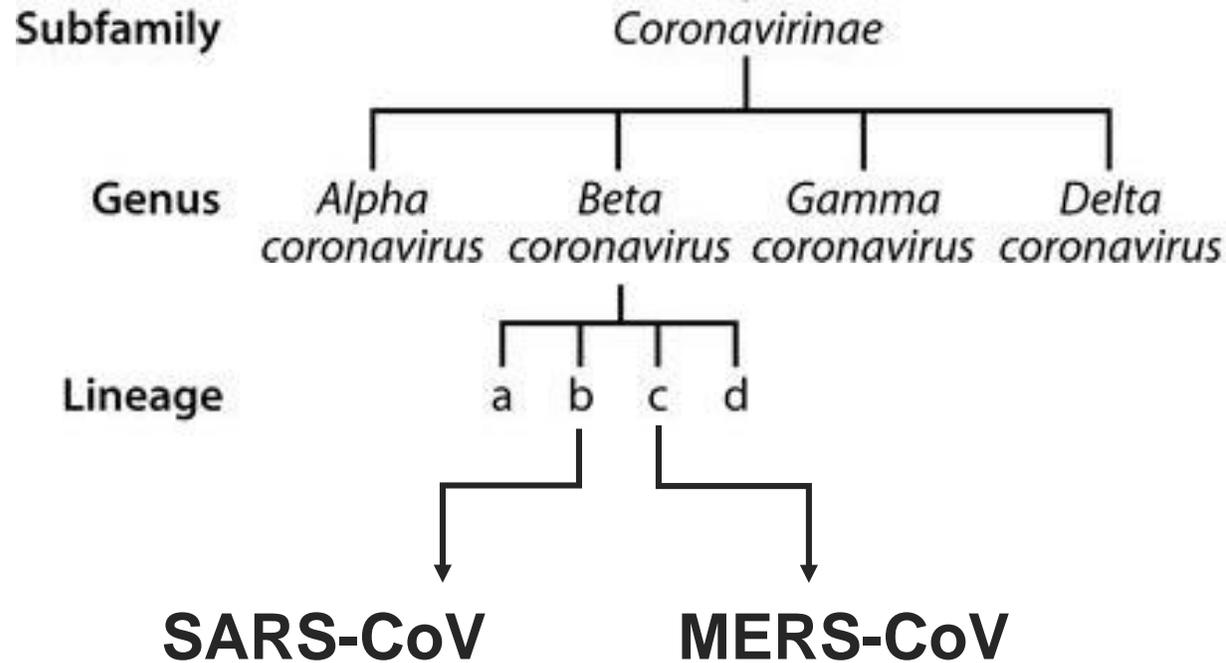
Retrovirus

e.g. Lentivirus  
human immunodeficiency virus

# Virus classification

RNA virus

Coronavirus

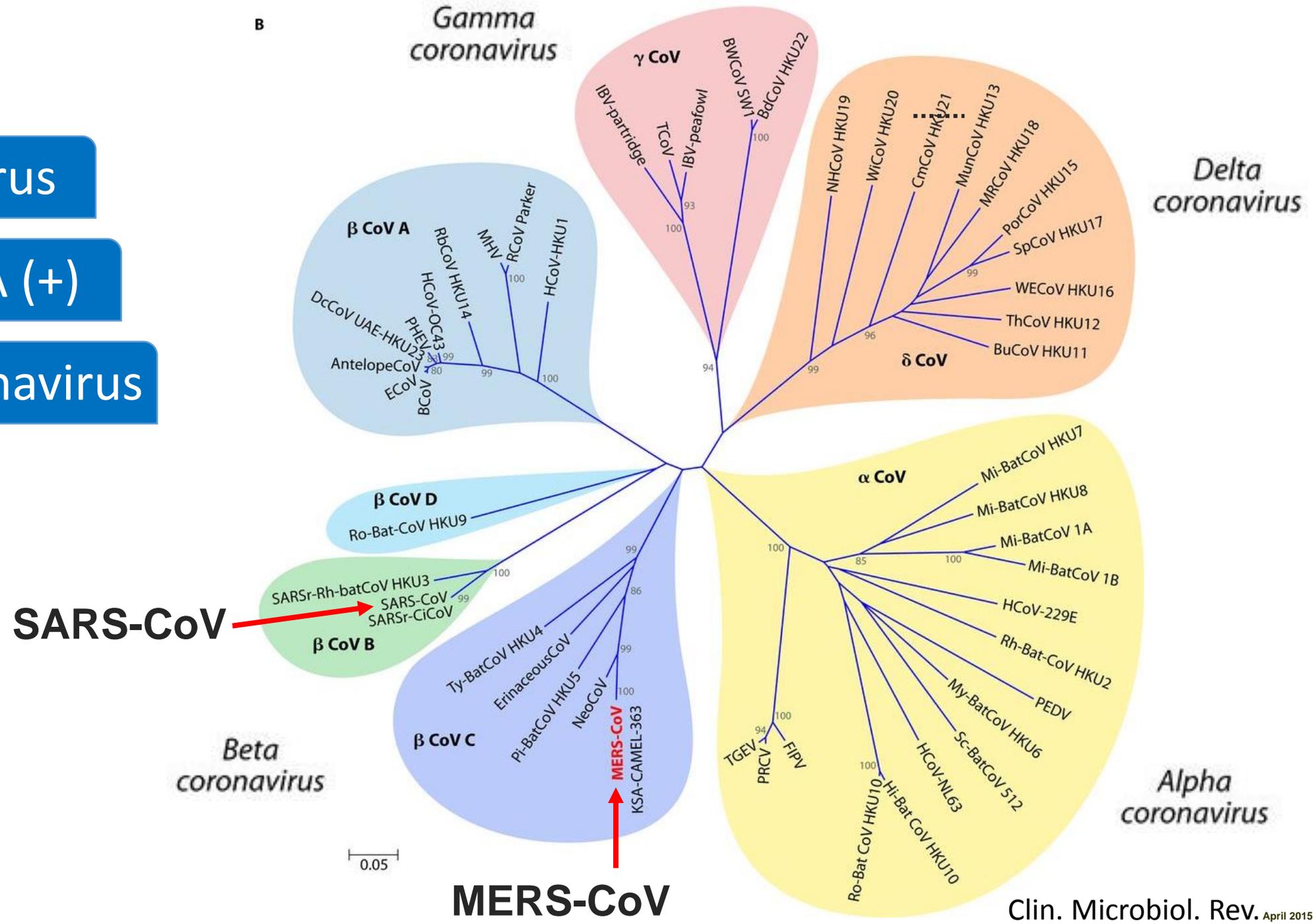


**SARS-CoV:** Severe acute respiratory syndrome-coronavirus

**MERS-CoV:** Middle East Respiratory Syndrome-coronavirus

RNA virus  
 ssRNA (+)  
 Coronavirus

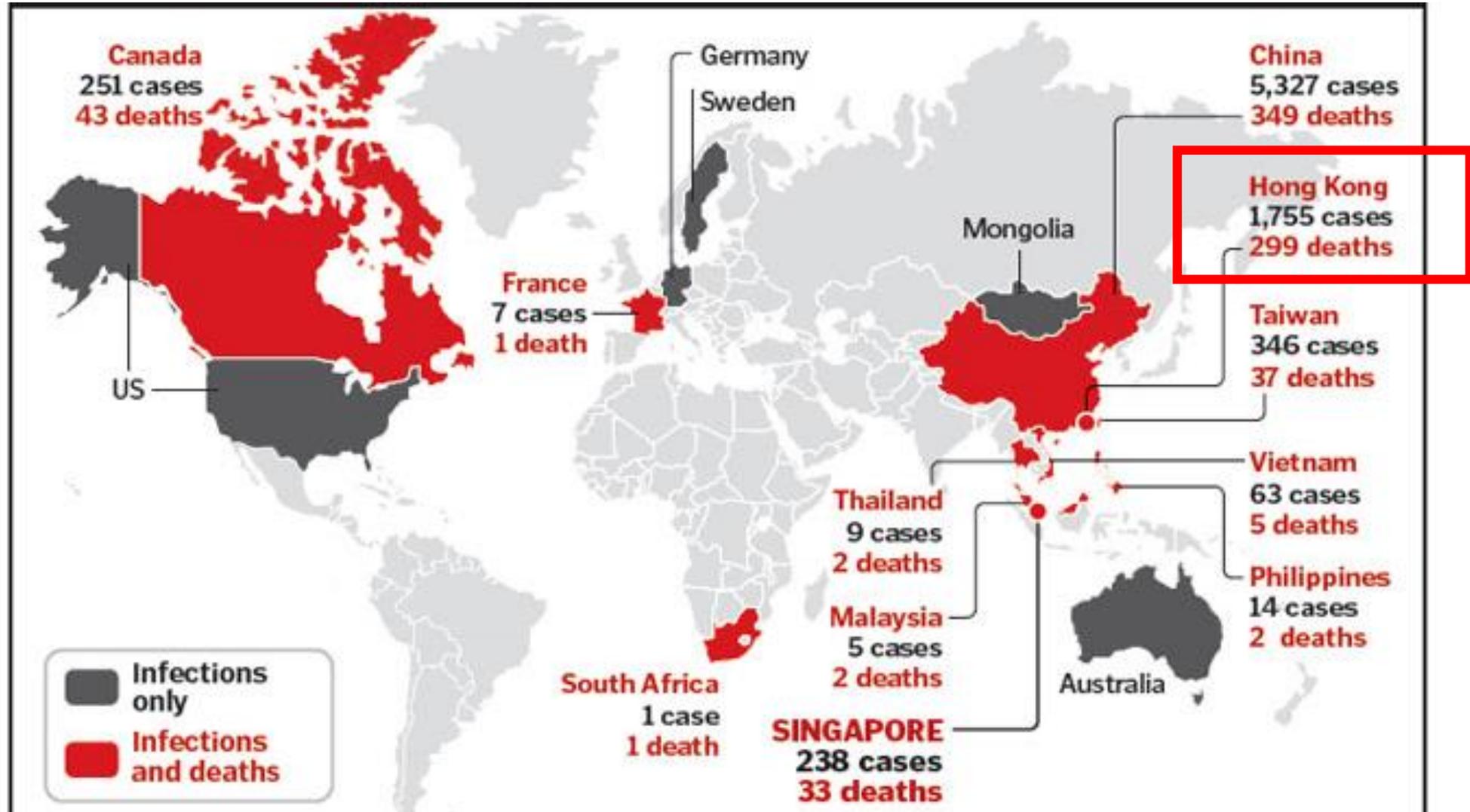
B





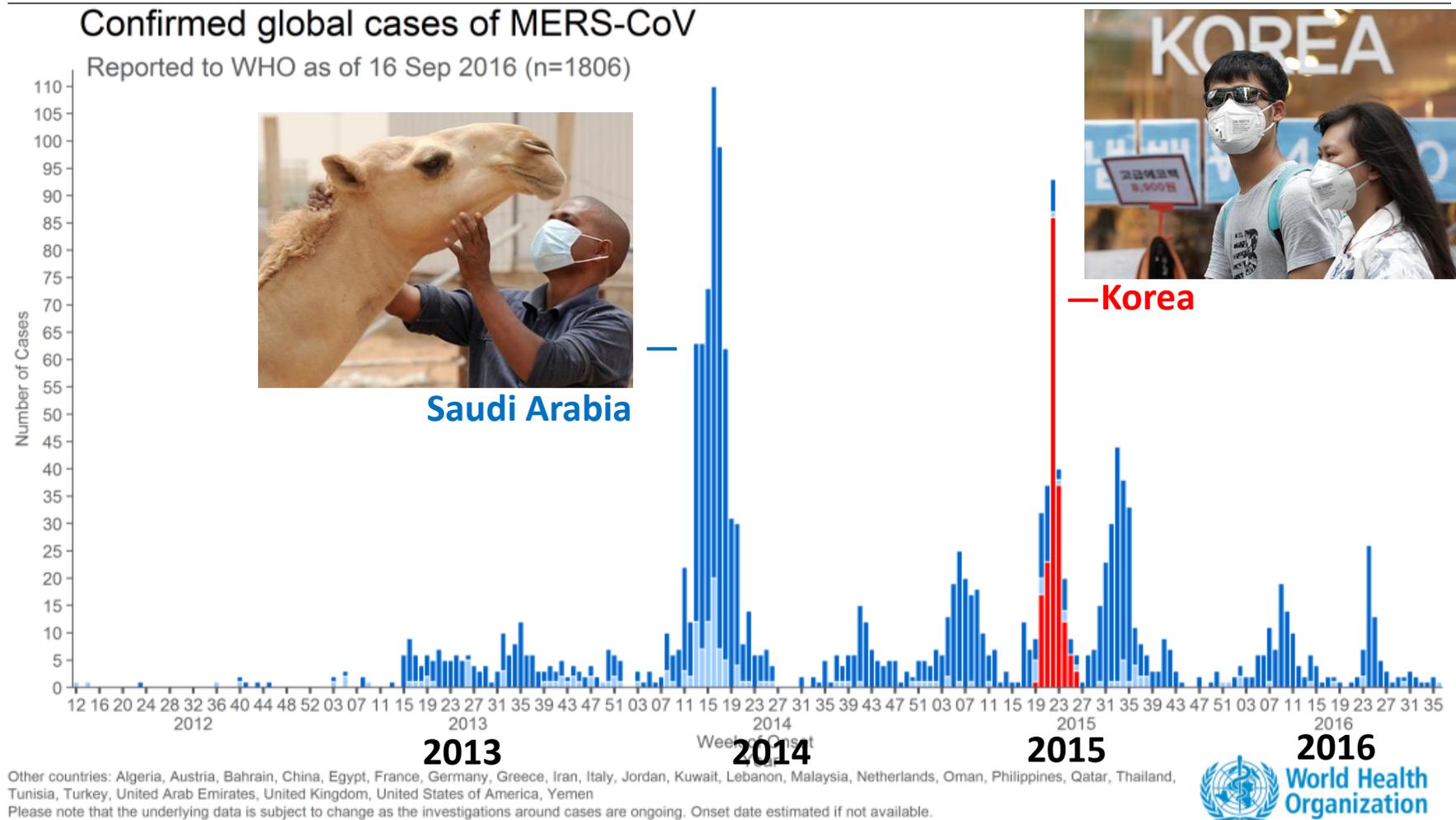
# SARS: 774 deaths and 8096 infections

(11/2002-7/2003)



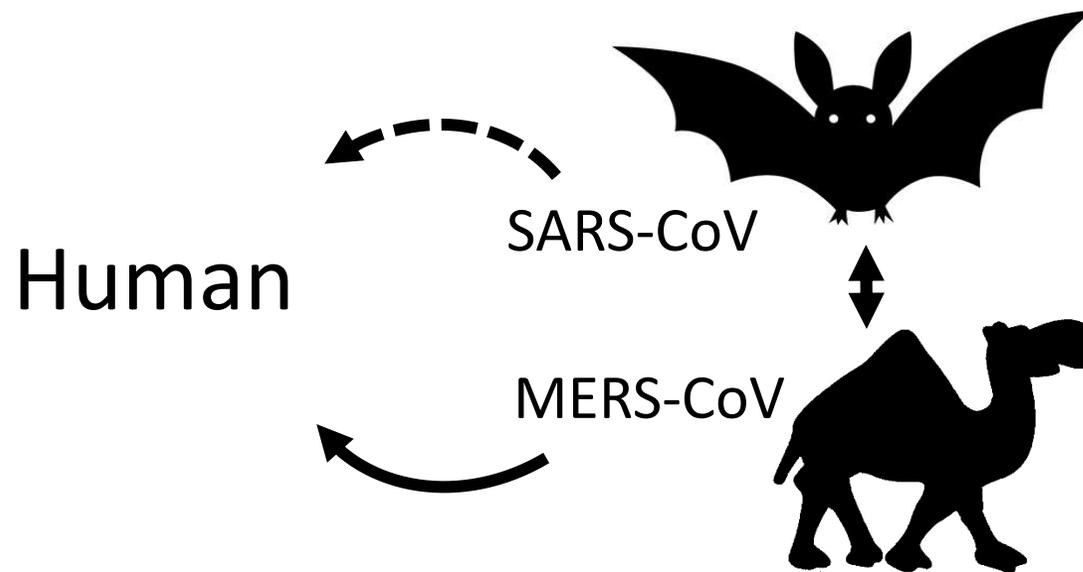
# MERS: 643 deaths and 1806 infections

(9/2012-9/2016)



# Past SARS outbreak (2003) and current MERS outbreak (2012-now)

They are caused by human infection of  
novel coronaviruses!!



# Key research area on emerging infectious diseases:

- Discovery of new viruses
- Interspecies transmission
- Pathogenesis

# Key research area on emerging infectious diseases:

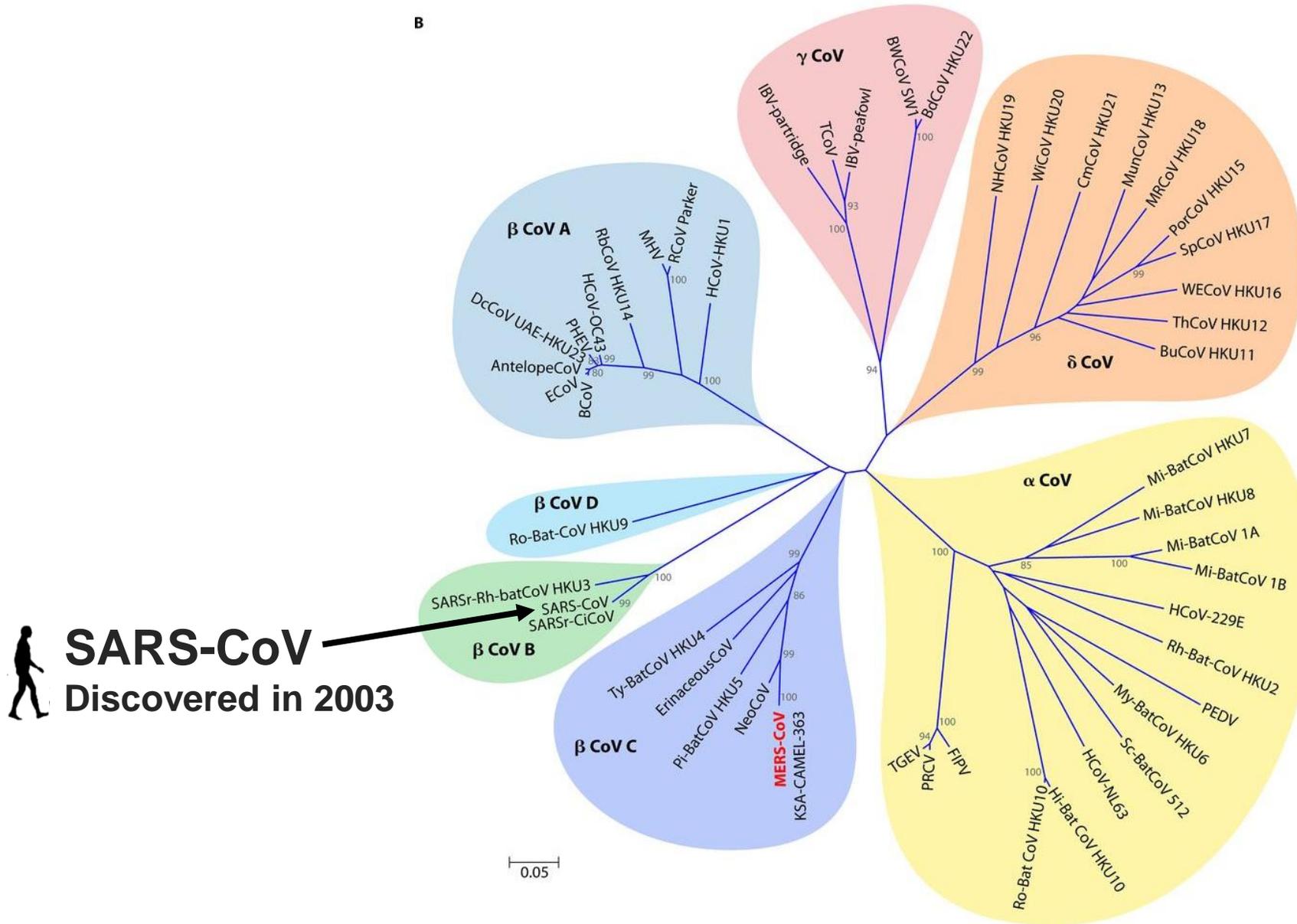
- **Discovery of new viruses**
- Interspecies transmission
- Pathogenesis

# Key research area on emerging infectious diseases

- Discovery of new coronaviruses in Hong Kong
- (2003-2015)

# 1) Discovery of SARS-CoV

B



# 1) Discovery of SARS-CoV





# 1) Discovery of SARS-CoV

50 patients - symptoms of SARS  
(Hong Kong 26/2/2003-26/3/2003)

Collected blood samples

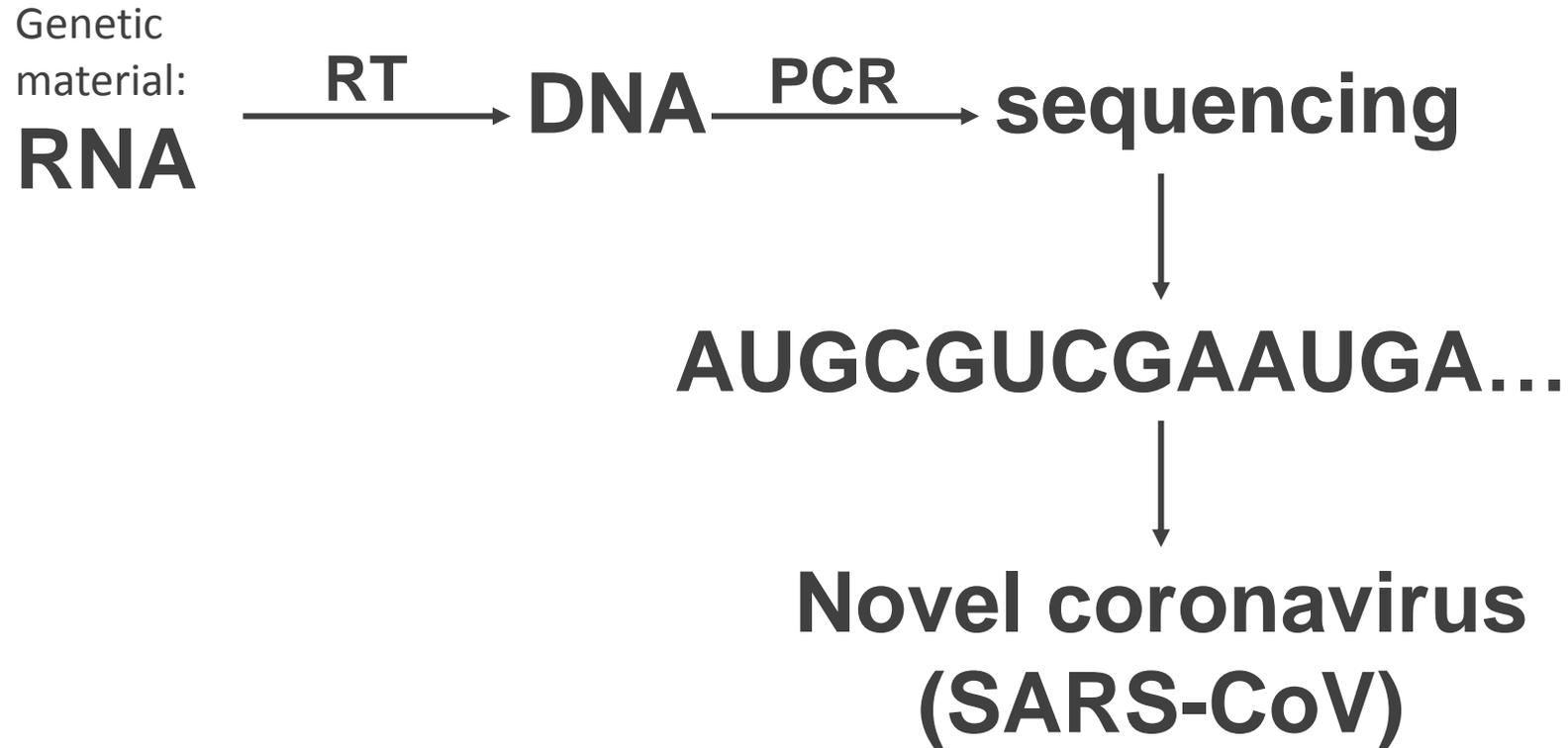
Influenza, respiratory syncytial virus etc.: -ve

Virus culture in different cultured cells

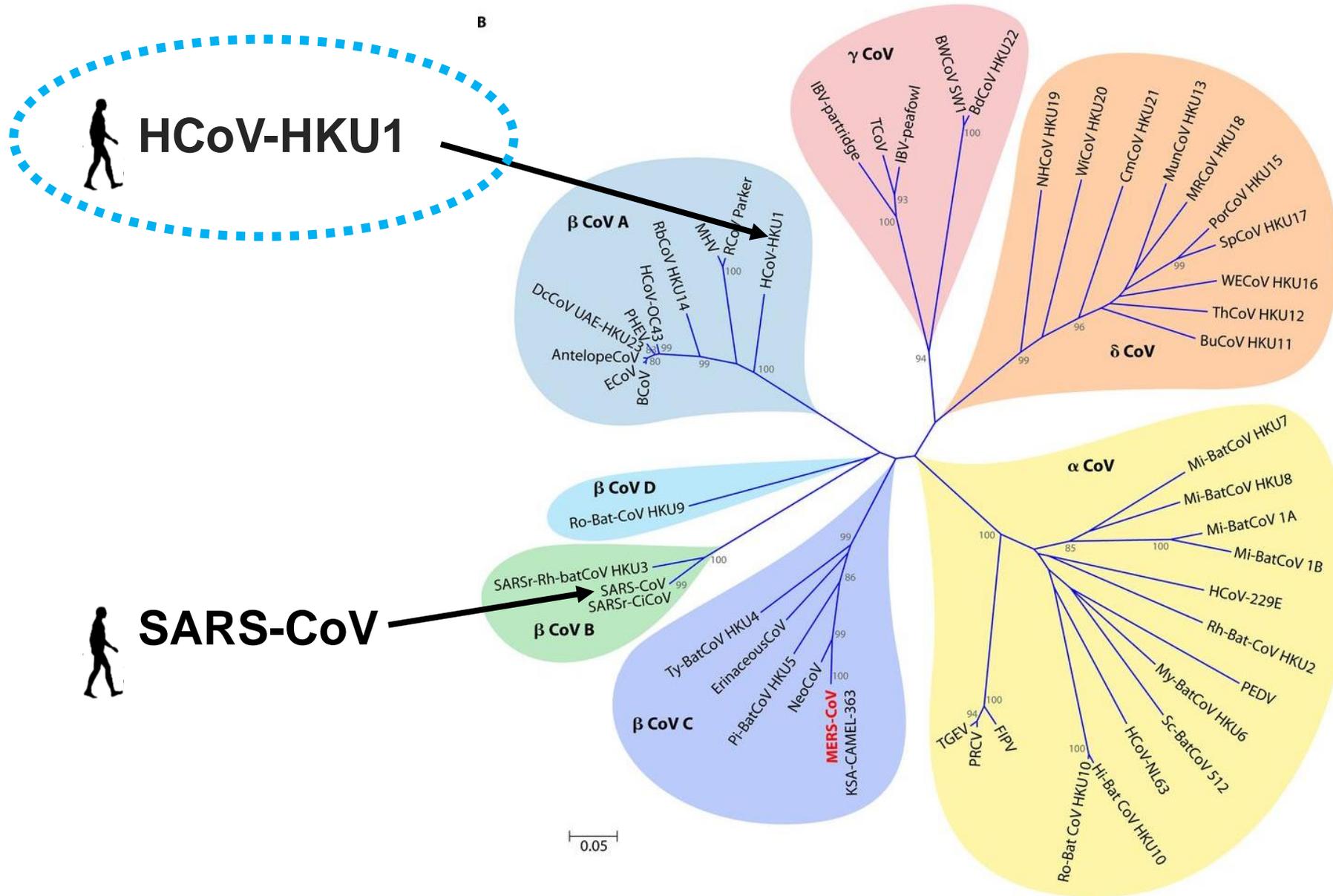
**Random RT-PCR assay**

**Novel coronavirus RNA** was detected

# Random RT-PCR assay



# 2) Discovery of HCoV-HKU1



# 2) Discovery of HCoV-HKU1

## Index patient

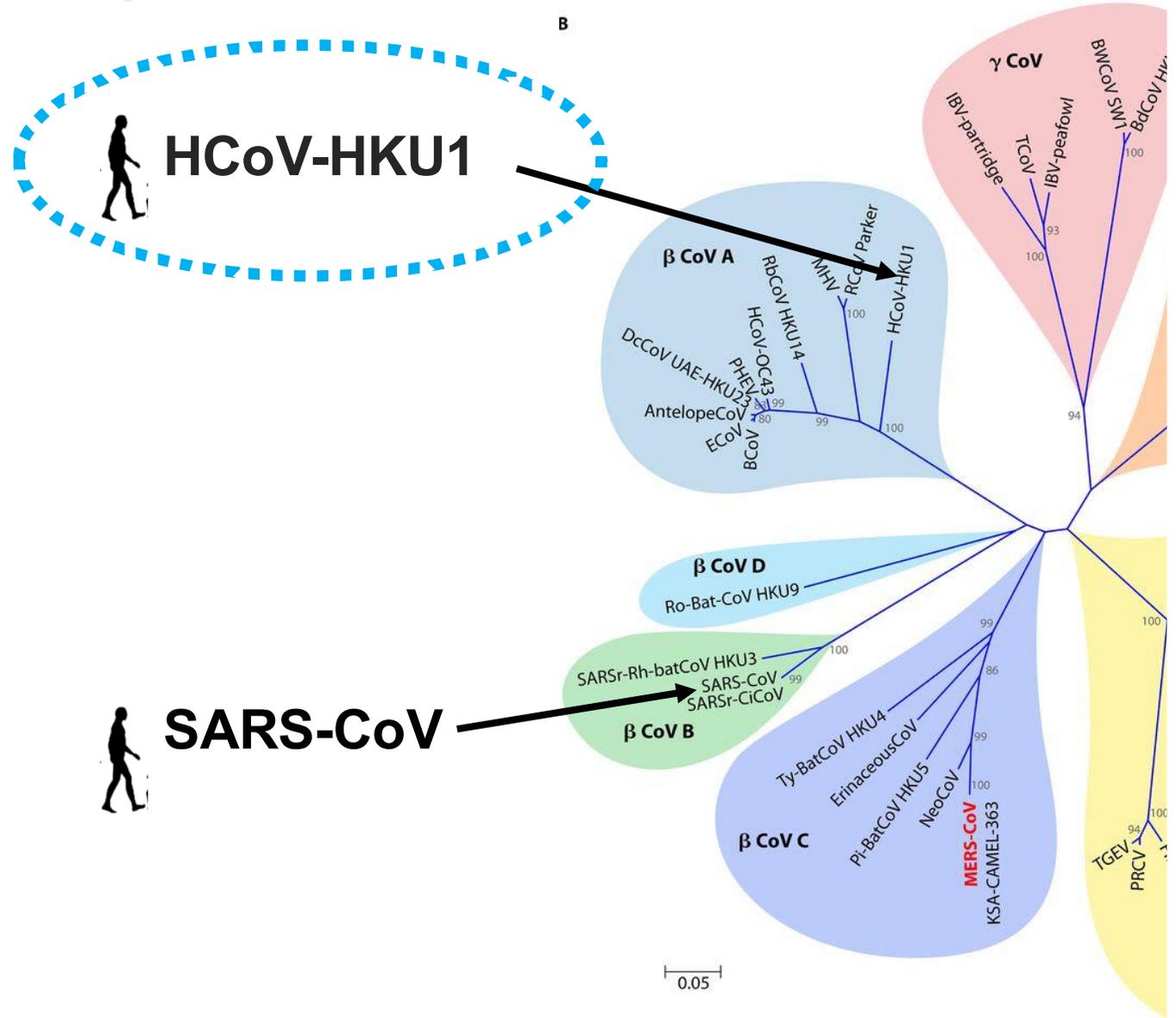
- January 2004
- M/71
- Fever, cough, sputum
- CXR: infiltration
- Naso-pharyngeal Aspirate:
  - Resp. virus: **-ve**
  - Viral culture **-ve**
- Sputum:
  - Bacterial culture: **-ve**
- Paired sera:
  - SARS-CoV Ab: **-ve**
- Discharged on day 5

Novel virus??

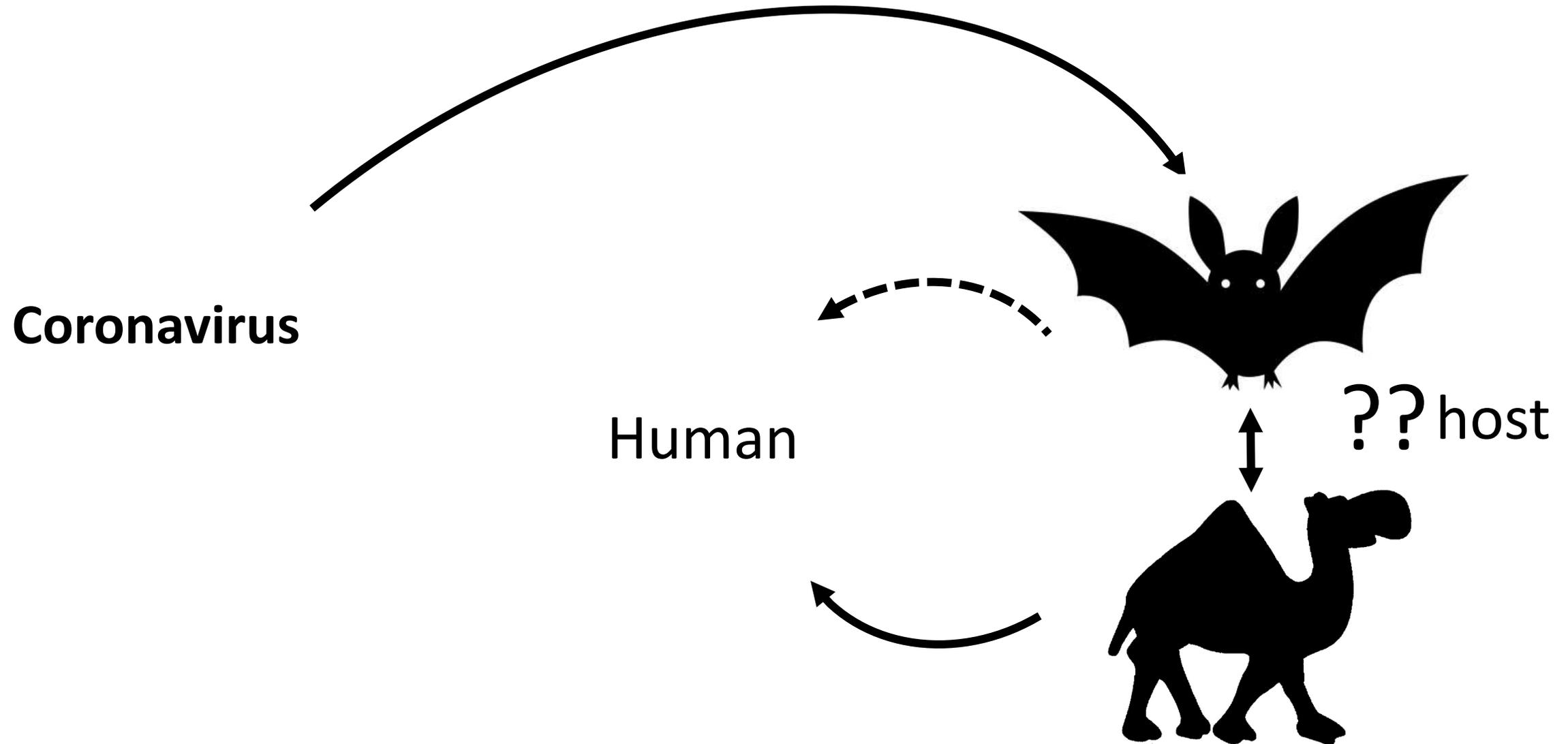
# 2) Discovery of HCoV-HKU1

- RT-PCR

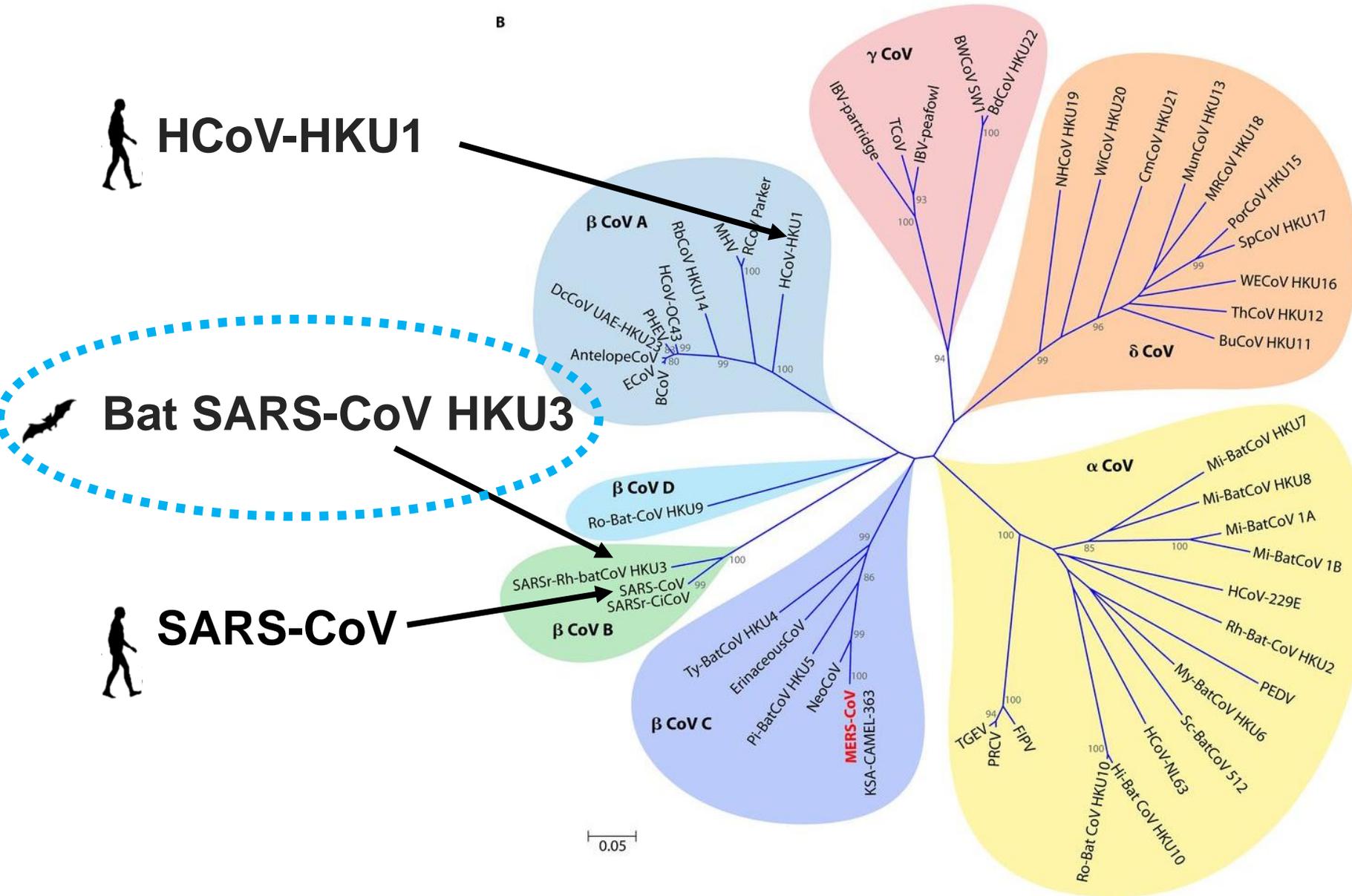
- Patient sample
- RNA extraction
- RT-PCR
- **Novel coronavirus**



# Discovery of other animal CoVs



# 3) Discovery of Bat SARS CoV



# 3) Discovery of Bat SARS CoV

- Sampling

414 nasopharyngeal/anal swabs

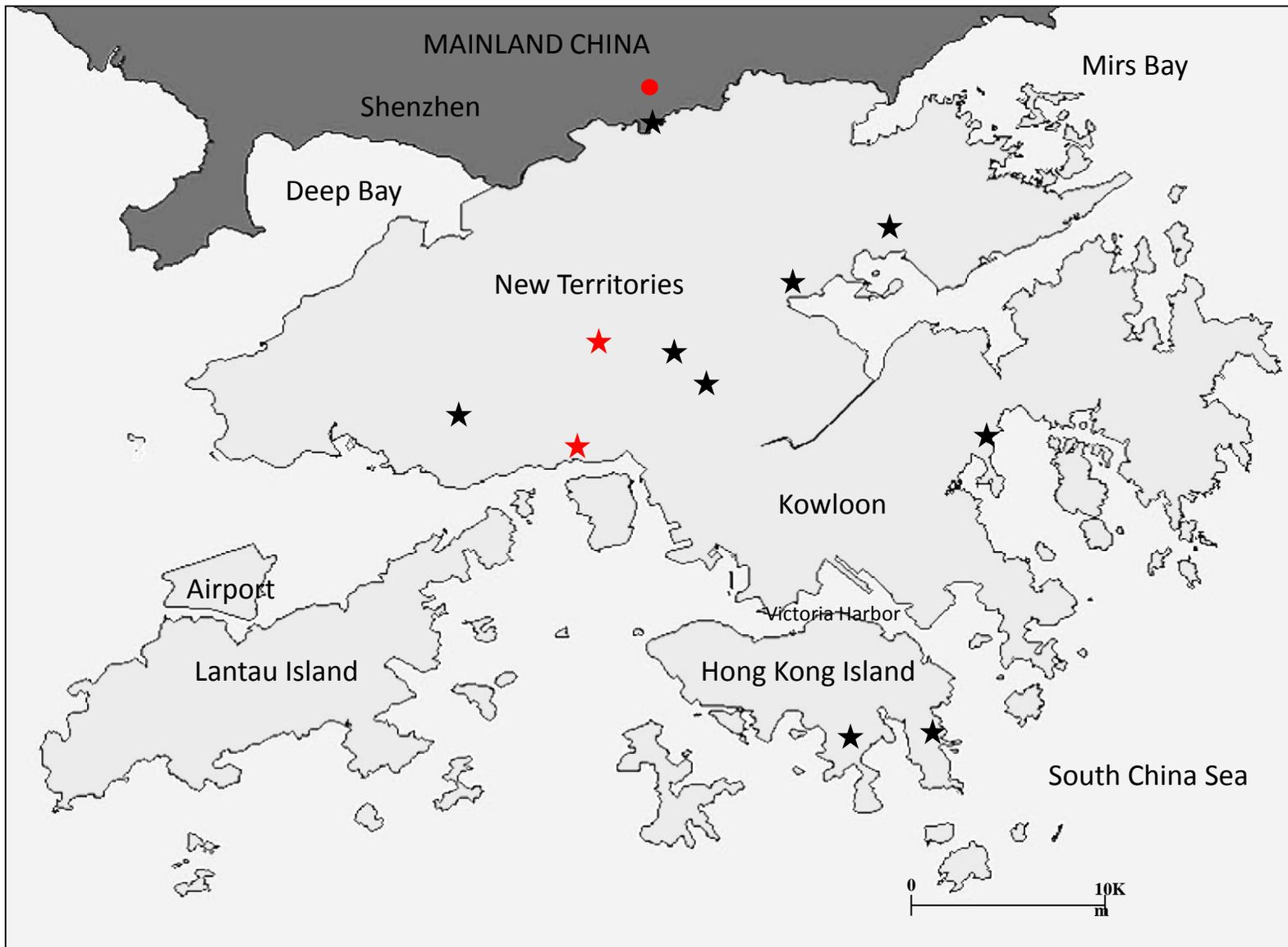
127 bats,

60 rodents,

20 monkeys

11 locations

2004 summer - 2005 spring







**This is one of our sampling trips**



**Many bat species in Hong Kong are cave dwellers**



Sleeping bats →

zzzz





Once they drop into the net, they are trapped

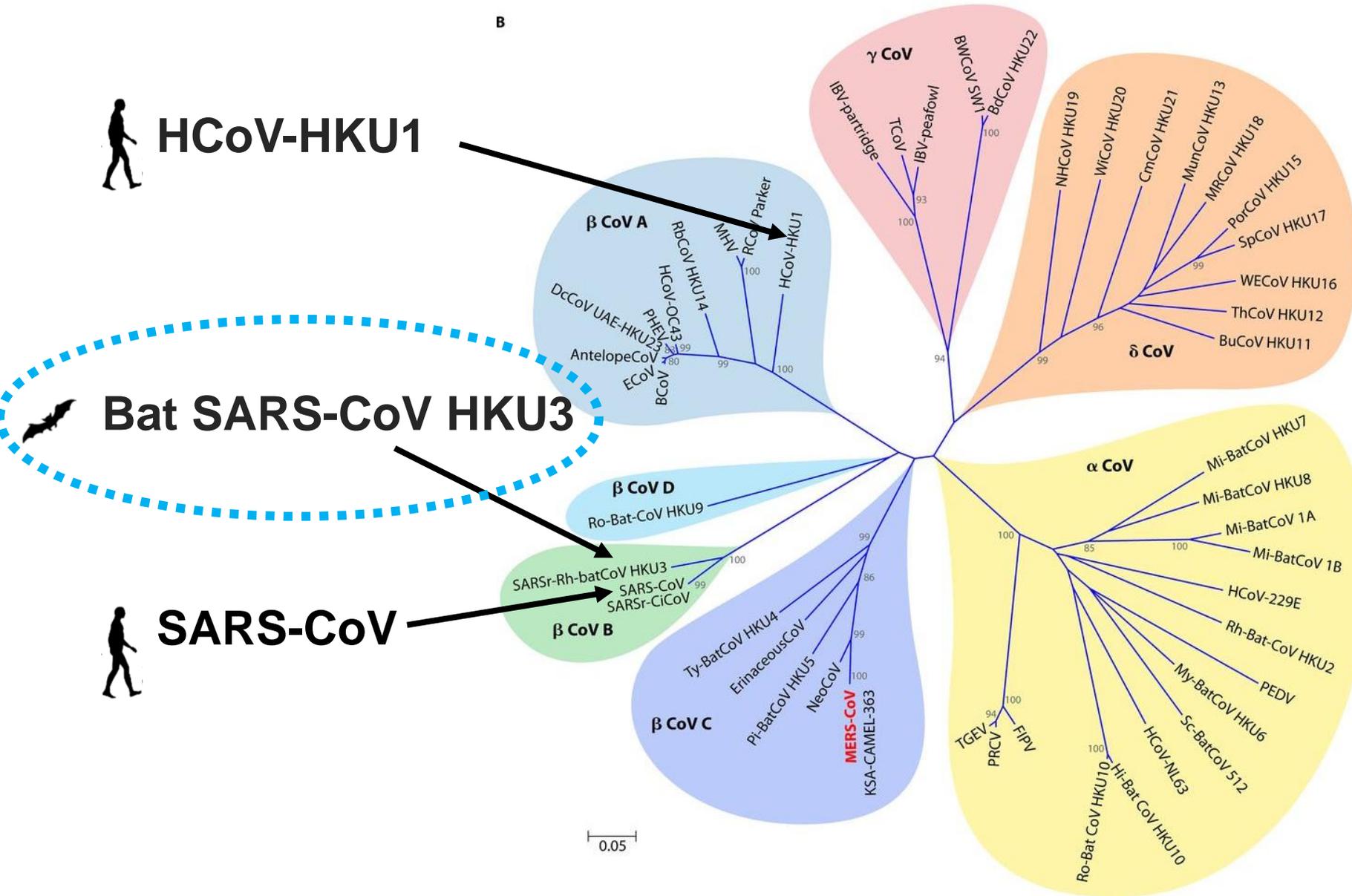


measuring their weight and length of wing span



After collecting specimens, the bats will be released back to their natural habitats.

# 4) Discovery of Bat SARS CoV





618 samples, 309 bats of 13 species, 20 locations

Bat-CoV HKU2

Bat-CoV HKU4

Bat-CoV HKU5

Bat-CoV HKU6

Bat-CoV HKU7

Bat-CoV HKU8



**Other Bat CoVs**

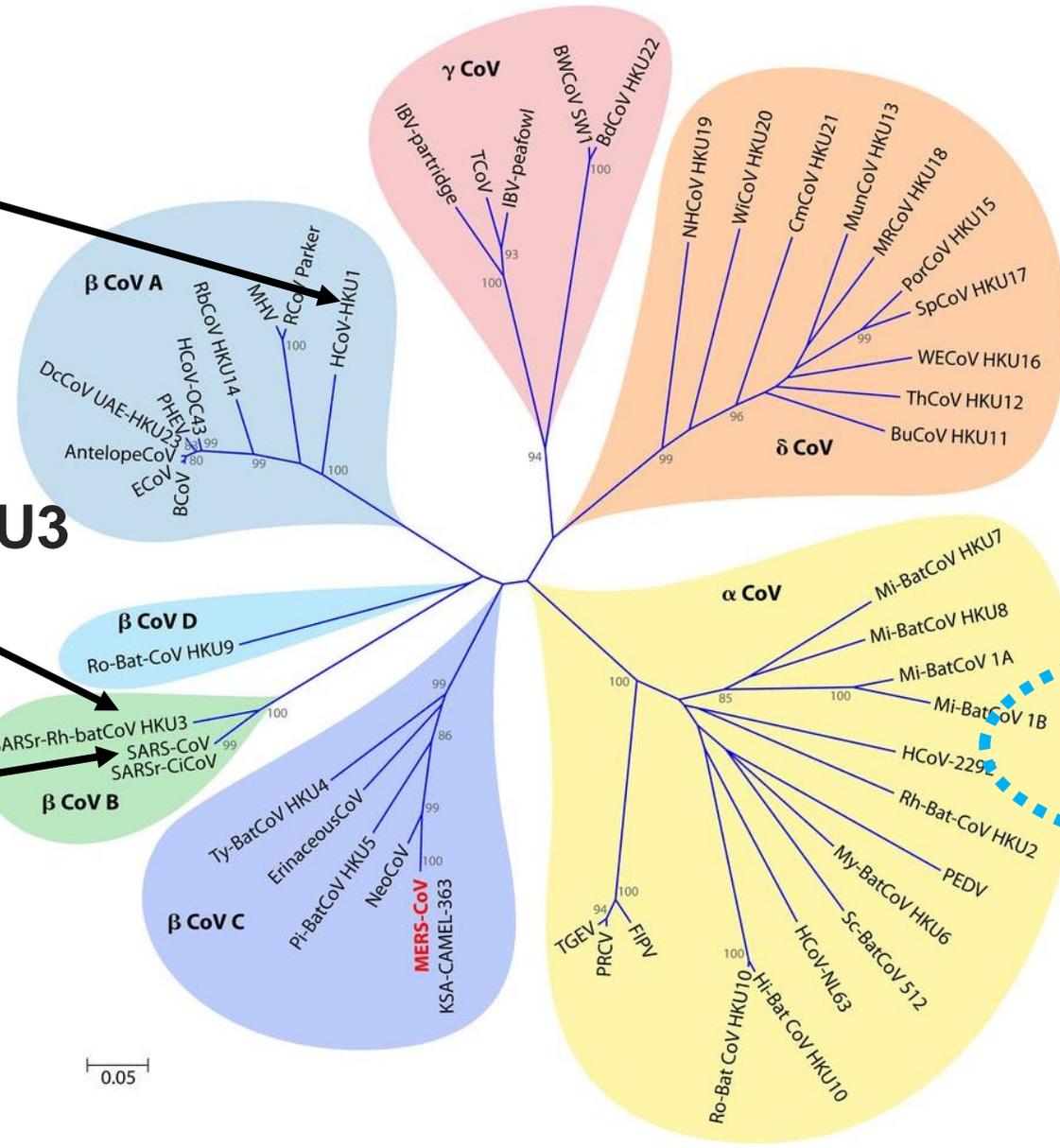
# 4) Discovery of new bat CoVs

B

 HCoV-HKU1

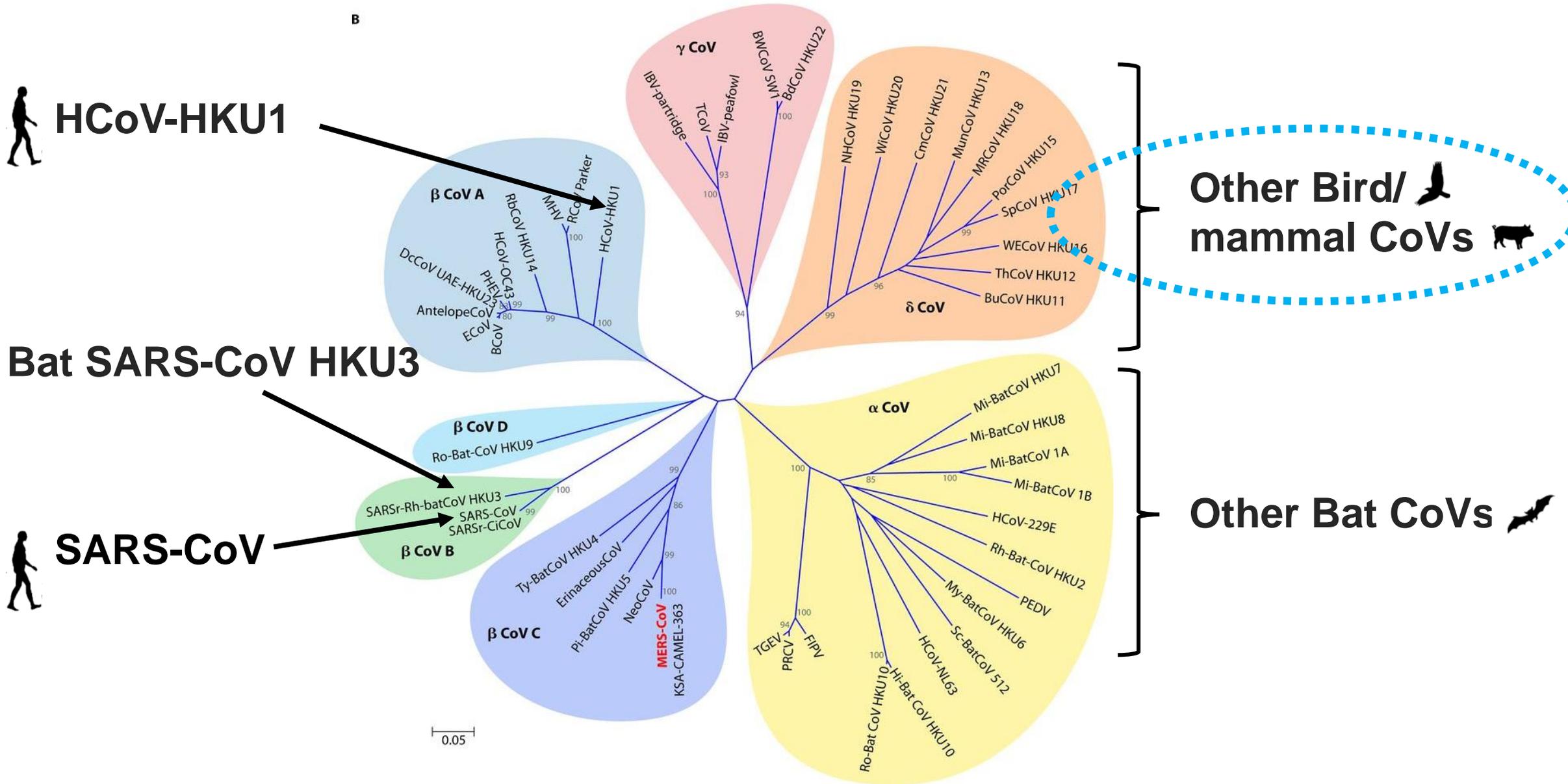
 Bat SARS-CoV HKU3

 SARS-CoV



 Other Bat CoVs

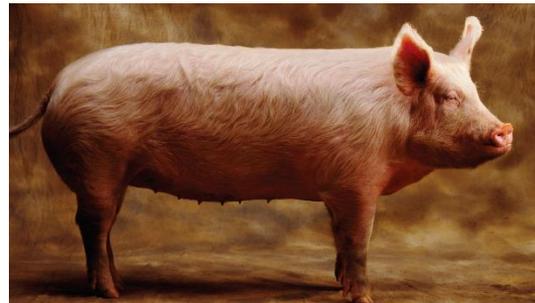
# 5) Discovery of new bird/mammal CoVs



# 3137 mammals and 3298 birds

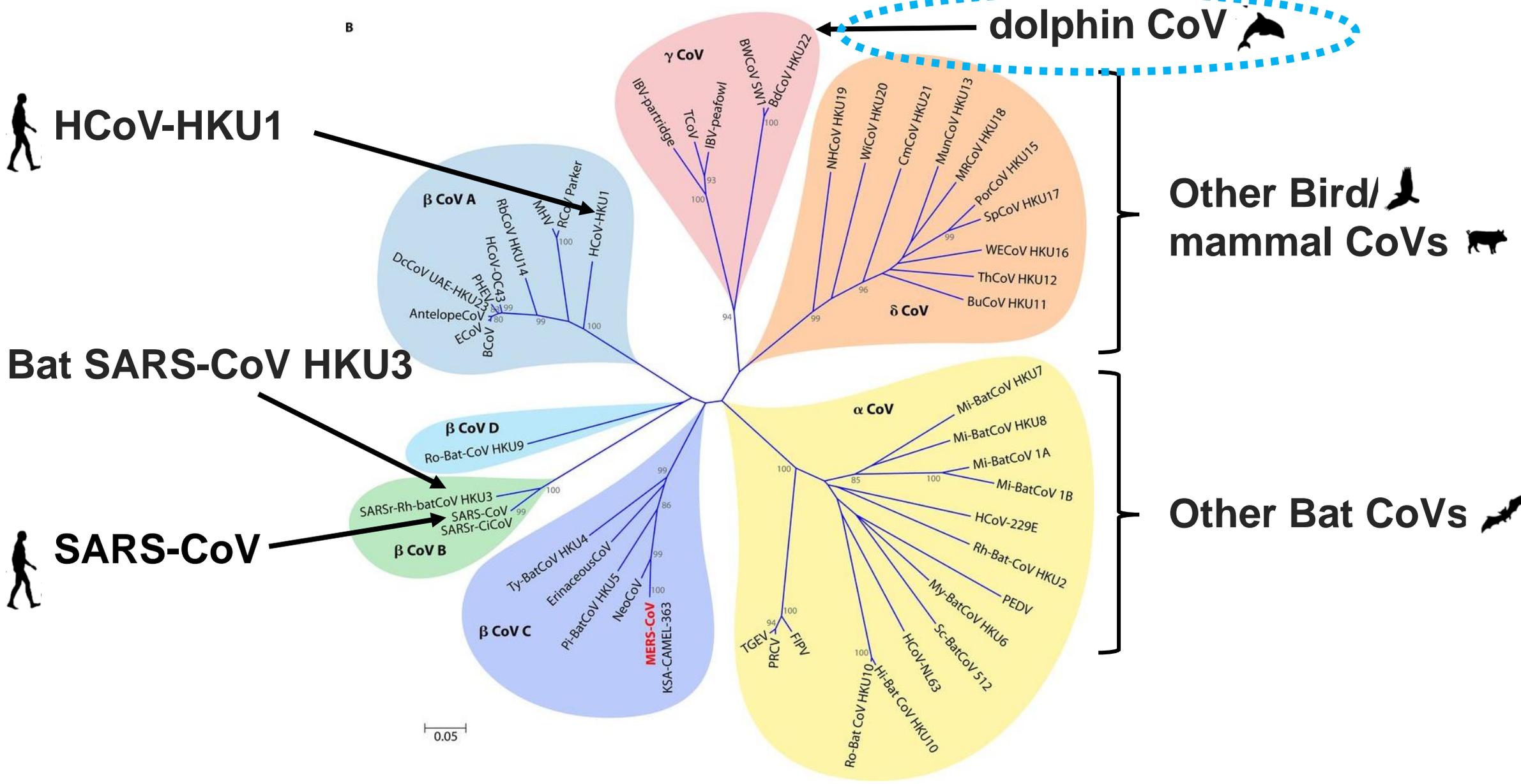


- White-eye CoV-HKU16
- Sparrow CoV-HKU17
- Magpie robin CoV-HKU18
- Night heron CoV-HKU19
- Wigeon CoV-HKU20
- Common moorhen CoV-HKU21



Pig CoV-HKU15

# 6) Discovery of new marine mammal CoVs



44 Sea lions, 12 Seals and 48 dolphins

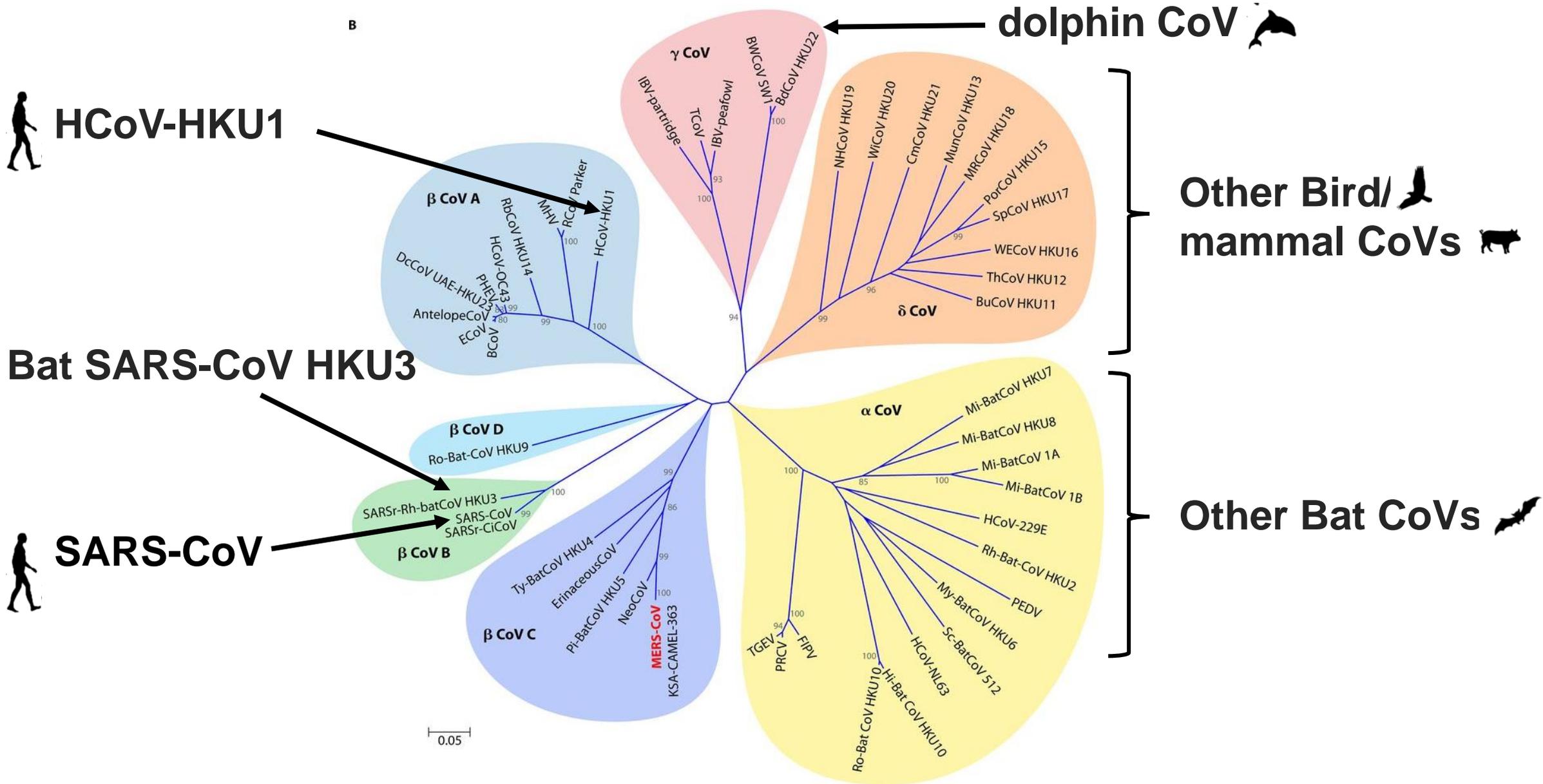


# Indo-pacific dolphins CoV-HKU22



# Summary

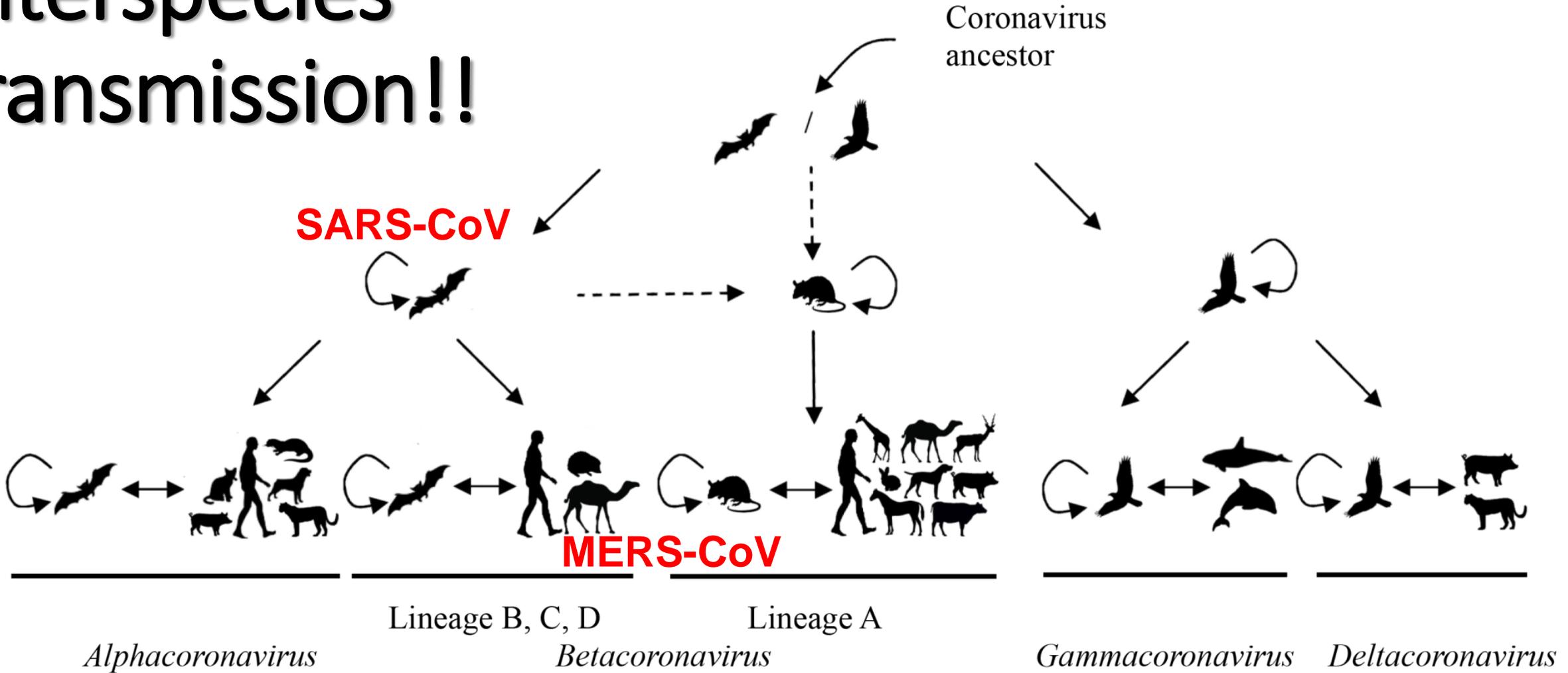
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# Summary

## Interspecies transmission!!



# Other research area on emerging infectious diseases:

- Discovery of new viruses
- Interspecies transmission
- Pathogenesis