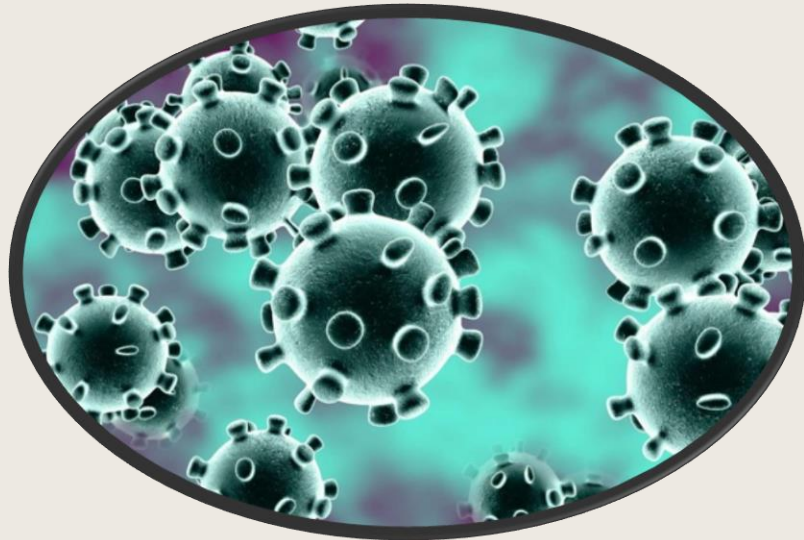


Towards a pan-sarbecovirus vaccine: progress and anticipated challenges



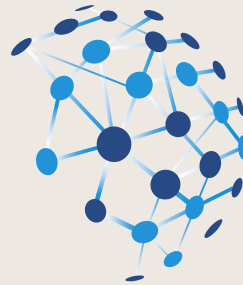
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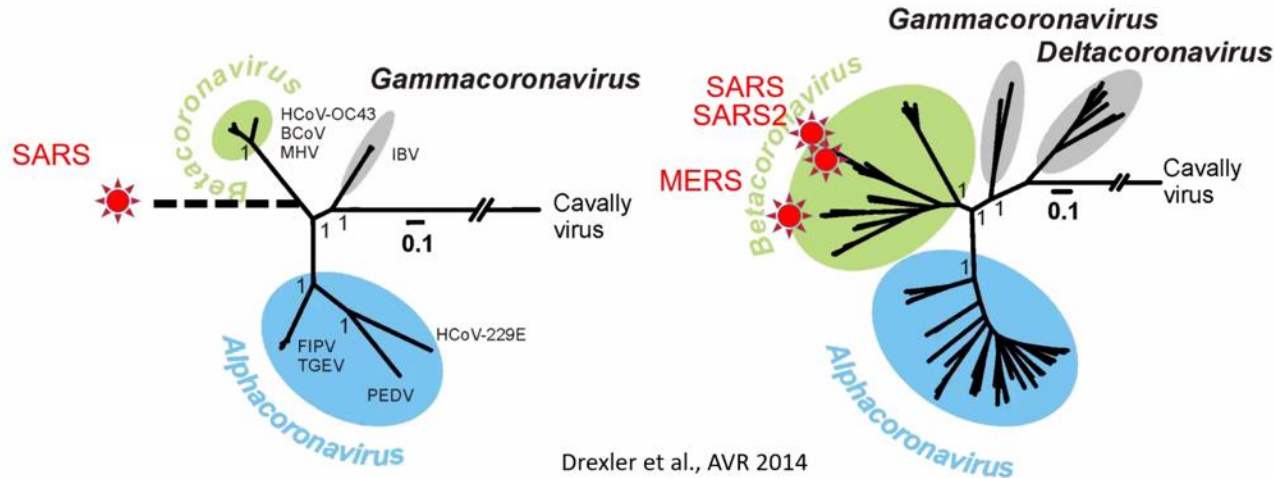
R&D Blueprint

Powering research
to prevent epidemics

Biodiversity research enables virus recognition

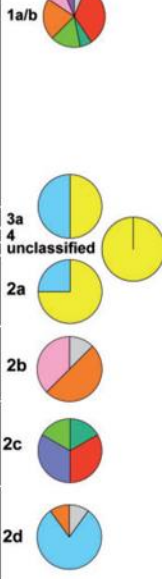
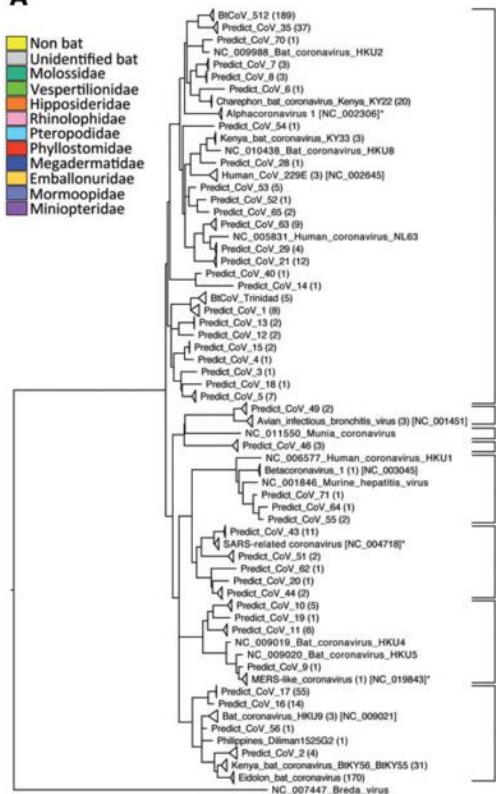
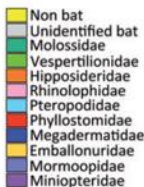
Before SARS

10 years after SARS



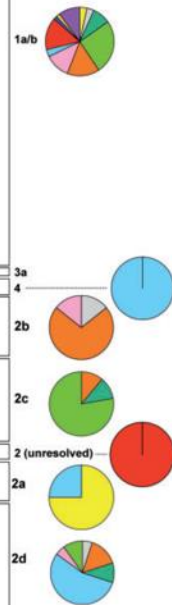
Courtesy, C. Drosten

A



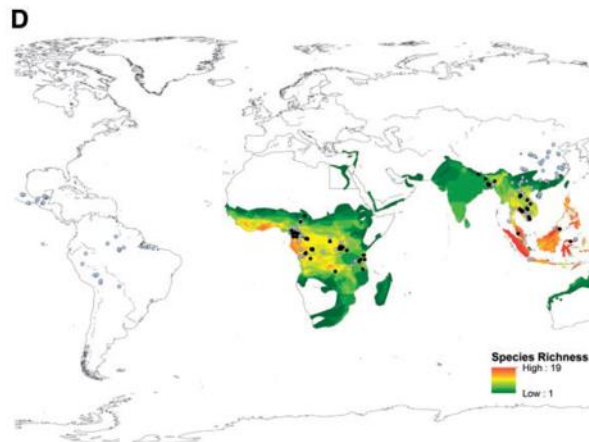
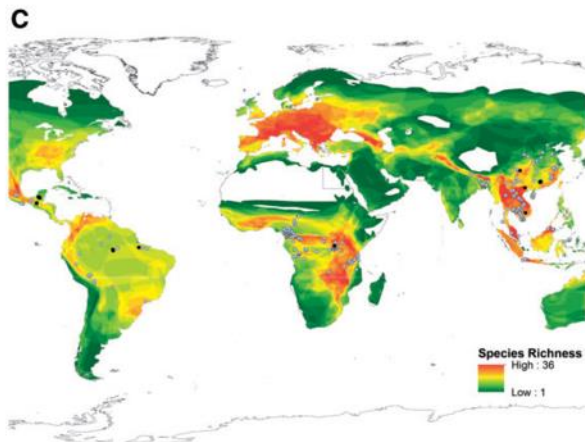
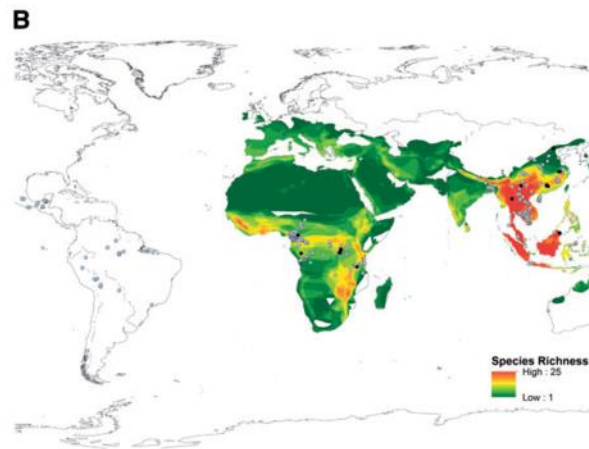
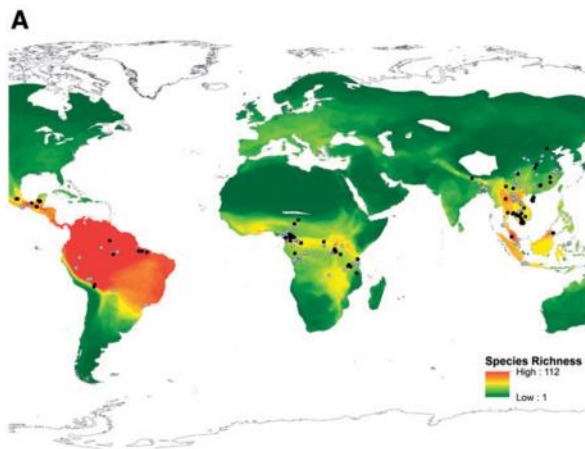
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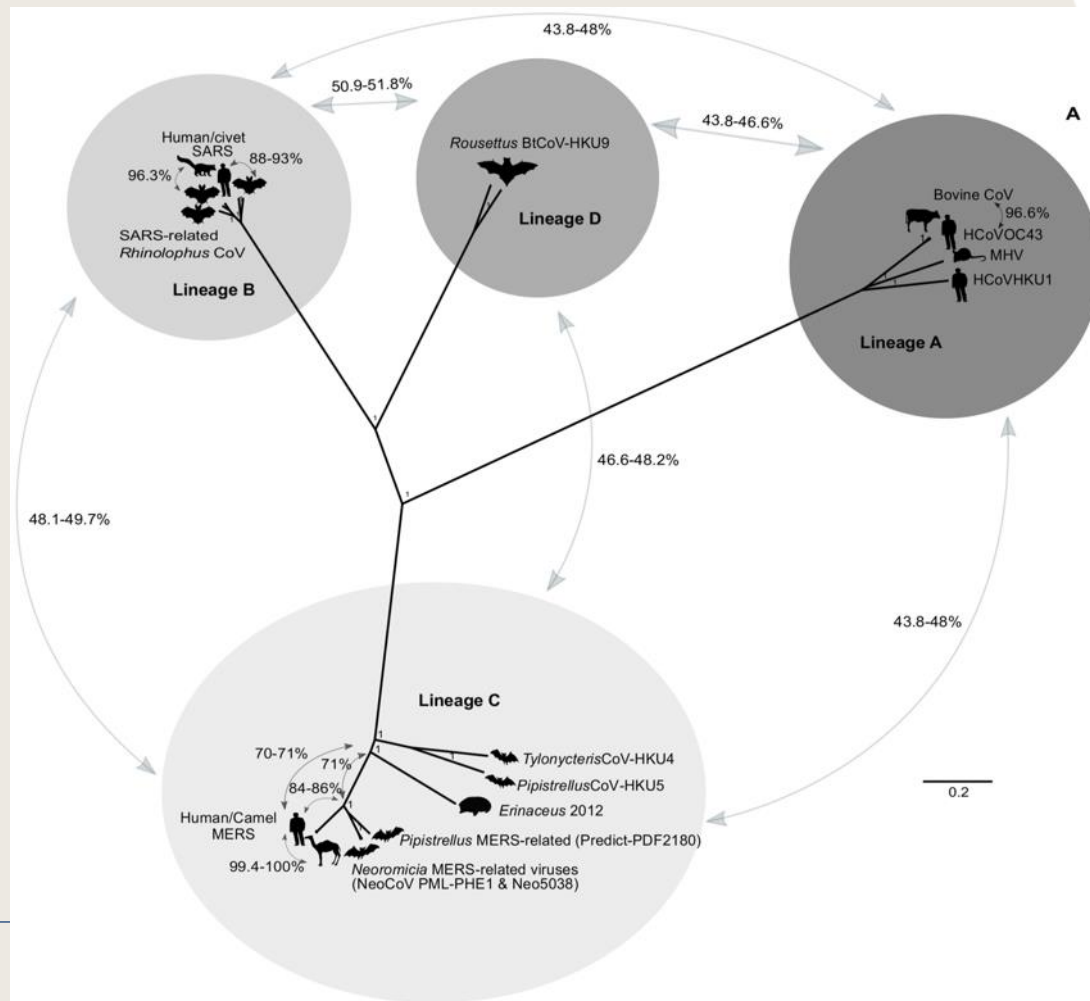


0.3

Anthony, et al. Virus Evolution



Anthony, et
al. Virus
Evolution



Geldenhuys,
et al. PLOS
One

β-CoV SUBGENERA	BAT SPECIES	BAT FAMILY	REGION
Hibecovirus	Hipposideros armiger	Hipposideridae	Asia
	Hipposideros caffer	Hipposideridae	Africa
	Rhinolophus clivosus	Rhinolophidae	Africa
	Macronycteris commersoni	Hipposideridae	Africa
	Rhinolophus creaghi	Rhinolophidae	Asia
	Hipposideros galeritus	Hipposideridae	Asia
	Hipposideros larvatus	Hipposideridae	Asia
	Hipposideros lekaguli	Hipposideridae	Asia
	Hipposideros pratti	Hipposideridae	Asia
	Hipposideros ruber	Hipposideridae	Africa
	Rhinonycteris aurantia	Rhinonycteridae	Australia

Courtesy, C. Sanchez, EcoHealth Alliance

β -CoV SUBGENERA	BAT SPECIES	BAT FAMILY	REGION
Nobecovirus	Cynopterus brachyotis	Pteropodidae	Asia
	Cynopterus horsfieldii	Pteropodidae	Asia
	Cynopterus sphinx	Pteropodidae	Asia
	Dobsonia moluccensis	Pteropodidae	Asia
	Dyacopterus spadiceus	Pteropodidae	Asia
	Megaerops kusnotoi	Pteropodidae	Asia
	Megaerops niphanae	Pteropodidae	Asia
	Eidolon dupreanum	Pteropodidae	Africa
	Eidolon helvum	Pteropodidae	Africa
	Ptenochirus jagori	Pteropodidae	Asia
	Pteropus alecto	Pteropodidae	Asia
	Pteropus lylei	Pteropodidae	Asia
	Pteropus medius	Pteropodidae	Asia
	Pteropus rufus	Pteropodidae	Africa
	Pteropus vampyrus	Pteropodidae	Asia
	Epomophorus gambianus	Pteropodidae	Africa
	Epomophorus labiatus	Pteropodidae	Africa
	Epomops franqueti	Pteropodidae	Africa
	Epomoporus pusillus	Pteropodidae	Africa
	Eonycteris spelaea	Pteropodidae	Asia
	Macroglossus sp.	Pteropodidae	Asia
	Myonycteris angolensis	Pteropodidae	Africa
	Megaloglossus woermanni	Pteropodidae	Africa
	Rousettus aegyptiacus	Pteropodidae	Africa
	Rousettus amplexicaudatus	Pteropodidae	Asia
	Rousettus leschenaultii	Pteropodidae	Asia
	Hipposideros lekaguli	Hipposideridae	Asia
	Triaenops persicus	Hipposideridae	Africa
	Scotophilus dinganii	Vespertilionidae	Africa
	Scotophilus heathii	Vespertilionidae	Asia
	Scotophilus kuhlii	Vespertilionidae	Asia
	Scotophilus leucogaster	Vespertilionidae	Africa
	Mops condylurus	Molossidae	Africa

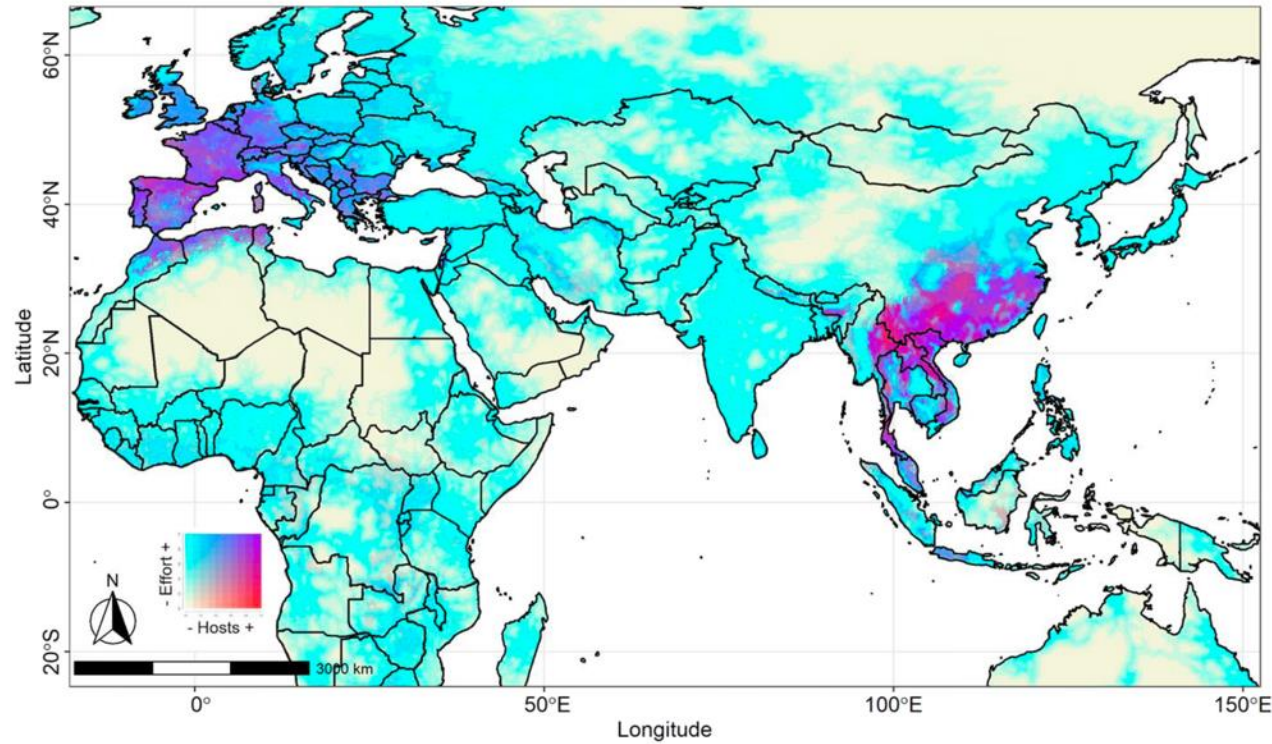
Courtesy, C. Sanchez,
EcoHealth Alliance

β-CoV SUBGENERA	BAT SPECIES	BAT FAMILY	REGION
Merbecovirus	Hipposideros armiger	Hipposideridae	Asia
	Rhinopoma hardwickii	Rhinopomatidae	Africa/Asia
	Myotis daubentonii	Vespertilionidae	Eurasia
	Myotis pilosus	Vespertilionidae	Asia
	Eptesicus isabellinus	Vespertilionidae	Europe
	Eptesicus serotinus	Vespertilionidae	Eurasia
	Hypsugo savii	Vespertilionidae	Europe
	Laephotis capensis	Vespertilionidae	Africa
	Laephotis zuluensis	Vespertilionidae	Africa
	Pipistrellus abramus	Vespertilionidae	Asia
	Pipistrellus coromandra	Vespertilionidae	Asia
	Pipistrellus hesperidus	Vespertilionidae	Africa
	Pipistrellus kuhlii	Vespertilionidae	Eurasia
	Pipistrellus nathusii	Vespertilionidae	Europe
	Pipistrellus pipistrellus	Vespertilionidae	Asia
	Pipistrellus pygmaeus	Vespertilionidae	Europe
	Plecotus auritus	Vespertilionidae	Europe
	Tylonycteris pachypus	Vespertilionidae	Asia
	Ia io	Vespertilionidae	Asia
	Vespertilio sinensis	Vespertilionidae	Asia
	Eumops glaucinus	Molossidae	Latin America
	Nyctinomops laticaudatus	Molossidae	Latin America
	Taphozous perforatus	Emballonuridae	Africa/Asia
	Nycteris gambiensis	Nycteridae	Africa
	Pteronotus davyi	Mormoopidae	Latin America
	Pteronotus parnellii	Mormoopidae	Latin America
	Pteronotus personatus	Mormoopidae	Latin America
	Artibeus lituratus	Phyllostomidae	Latin America
	Artibeus obscurus	Phyllostomidae	Latin America
	Artibeus phaeotis	Phyllostomidae	Latin America
	Carollia perspicillata	Phyllostomidae	Latin America

Courtesy, C. Sanchez,
EcoHealth
Alliance

β-CoV SUBGENERA	BAT SPECIES	BAT FAMILY	REGION
Sarbecovirus	Rhinolophus affinis	Rhinolophidae	Asia
Clade 3	Rhinolophus ferrumequinum	Rhinolophidae	Eurasia
	Rhinolophus hipposideros	Rhinolophidae	Eurasia
	Rhinolophus macrotis	Rhinolophidae	Asia
	Rhinolophus monoceros	Rhinolophidae	Asia
	Rhinolophus pearsonii	Rhinolophidae	Asia
	Rhinolophus sinicus	Rhinolophidae	Asia
	Aselliscus stoliczkanus	Hipposideridae	Asia
	Mops plicatus	Molossidae	Asia
Clade 2	Rhinolophus pusillus	Rhinolophidae	Asia
	Rhinolophus rex	Rhinolophidae	Asia
Clade 1	Rhinolophus blasii	Rhinolophidae	Africa
	Rhinolophus euryale	Rhinolophidae	Eurasia
	Rhinolophus mehelyi	Rhinolophidae	Eurasia
	Rhinolophus sp. Kenya	Rhinolophidae	Africa
	Nyctalus leisleri	Vespertilionidae	Europe
	Plecotus auritus	Vespertilionidae	Europe
	Tadarida teniotis	Molossidae	Eurasia

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Figure 2. A choropleth bivariate map showing the near current distribution of reported *Sarbecovirus* bat host species and estimated sampling rate calculated for the filtered dataset, according to potential drivers of residual accessibility bias. Areas in red signal high numbers of *Sarbecovirus* hosts, but estimated lower sampling rates driven by accessibility.

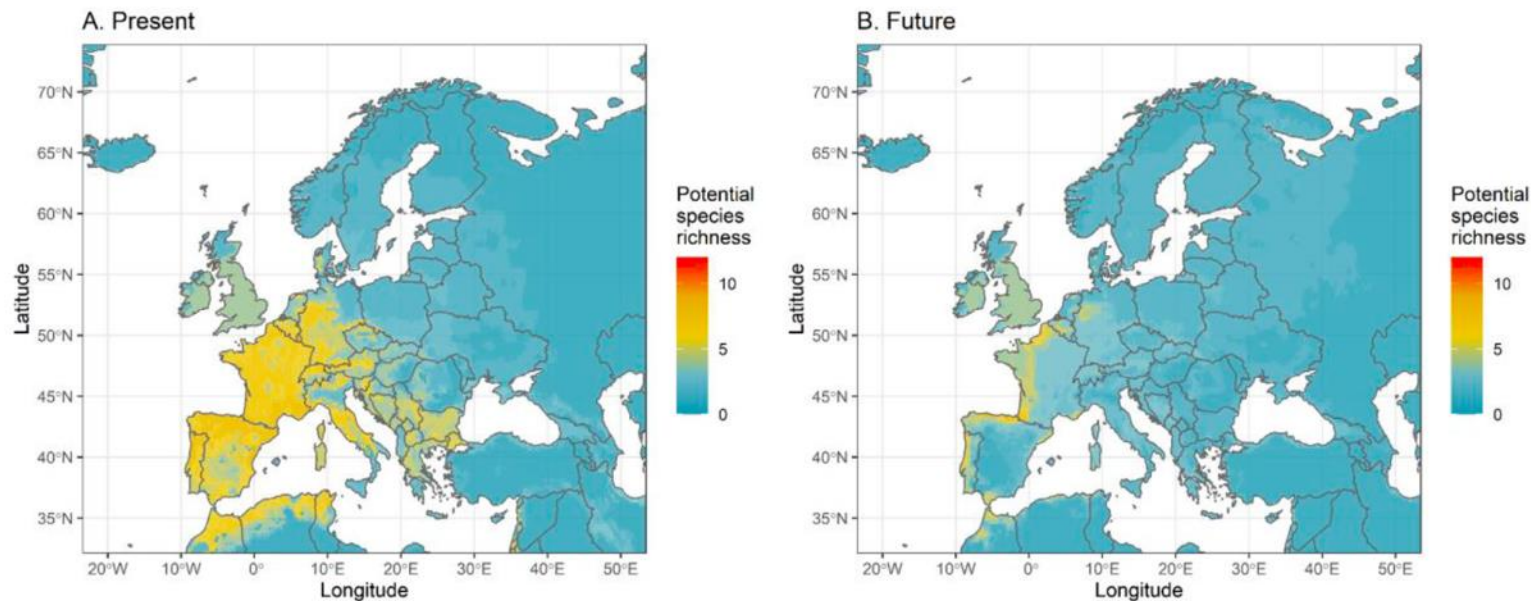
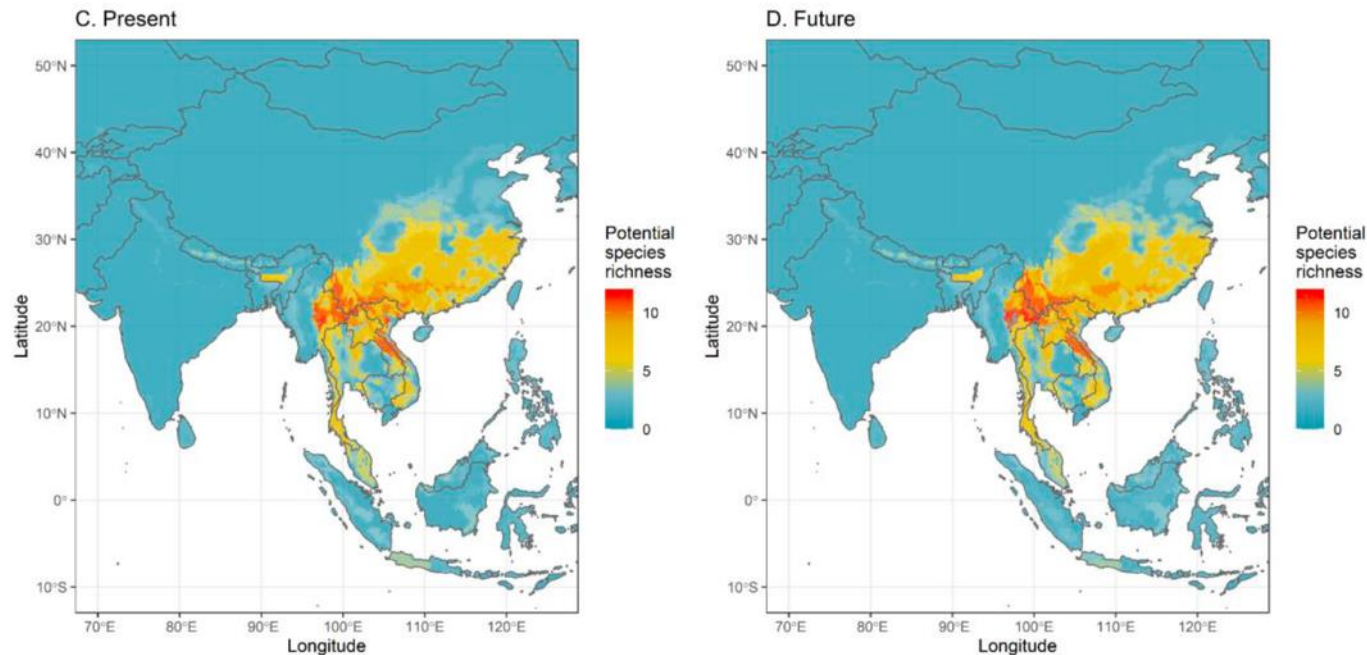


Figure 1. Present (A, C) and future (B, D) distribution of *Sarbecovirus* bat host species richness, mostly peaking in Europe and Southeast Asia. Projections for *Sarbecovirus* bat host species richness consider the period 2080-2100 (SSP585 scenario, BCC-CSM2-MR global circulation model).

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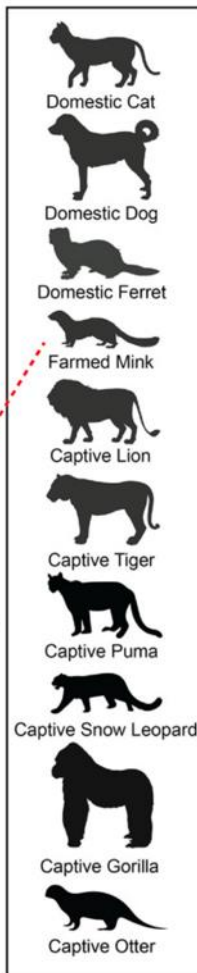


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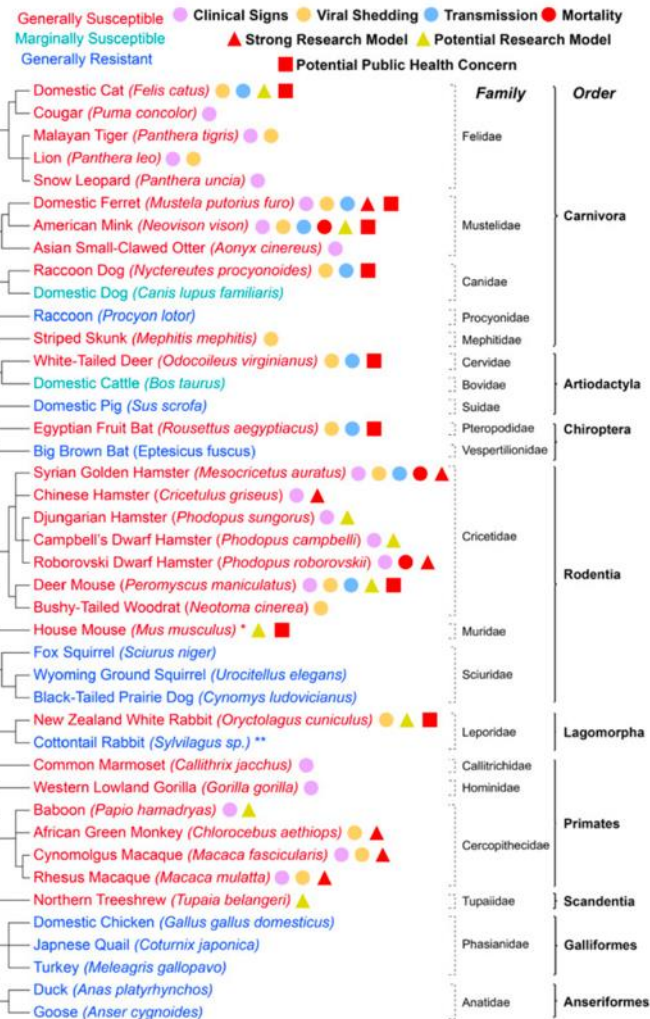
Figure 1. Present (A, C) and future (B, D) distribution of *Sarbecovirus* bat host species richness, mostly peaking in Europe and Southeast Asia. Projections for *Sarbecovirus* bat host species richness consider the period 2080-2100 (SSP585 scenario, BCC-CSM2-MR global circulation model).

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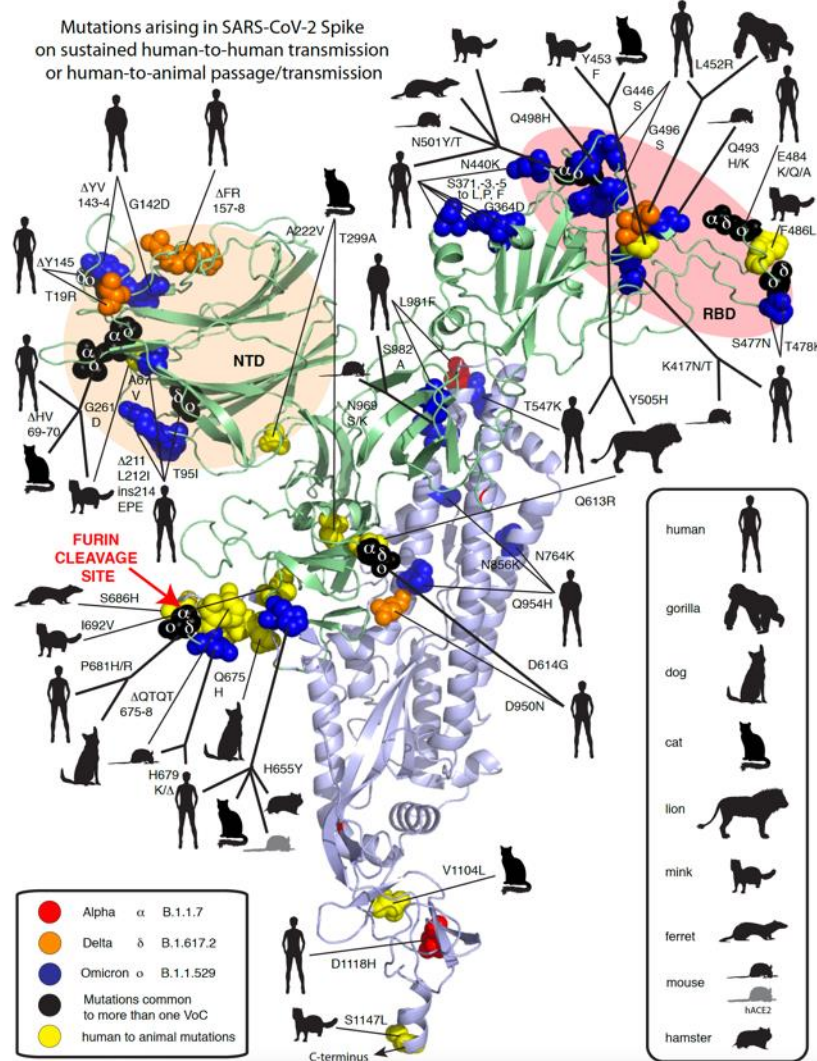
Natural Infections B



B



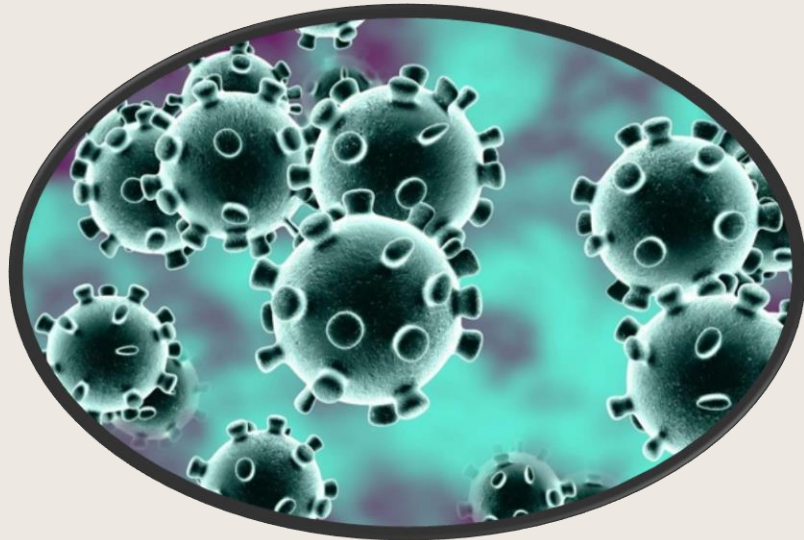
Mutations arising in SARS-CoV-2 Spike
on sustained human-to-human transmission
or human-to-animal passage/transmission



Official Reports 2020-2022



Towards a pan-sarbecovirus vaccine: progress and anticipated challenges



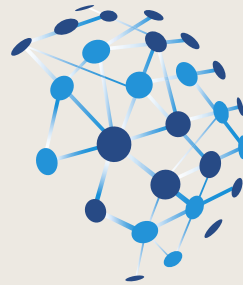
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