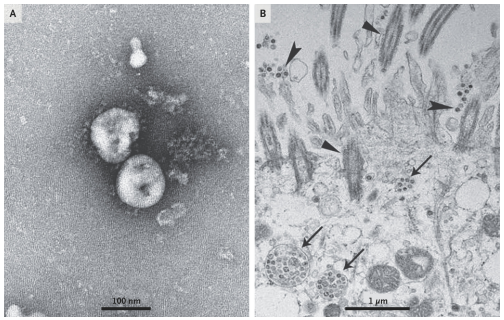

Novel Coronavirus: nCoV-2019 COVID-19 SARS-CoV-2

Zhu et al. N Engl J Med 2020;382:727-33.

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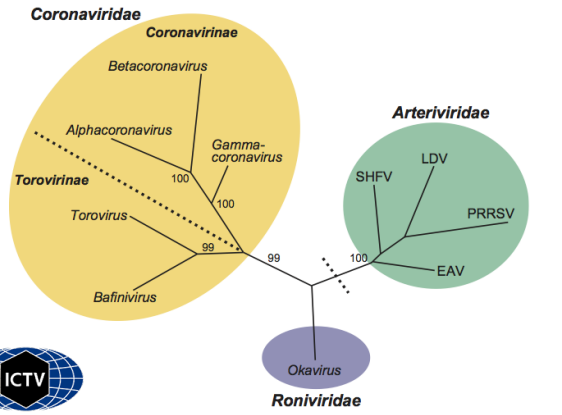
Order: Nidovirales



https://talk.ictvonline.org/ictv-reports/ictv_9th_report/positive-sense-rna-viruses-2011/w/posrna_viruses/223/coronaviridae-figures
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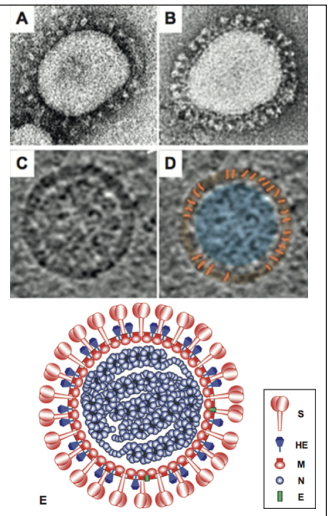
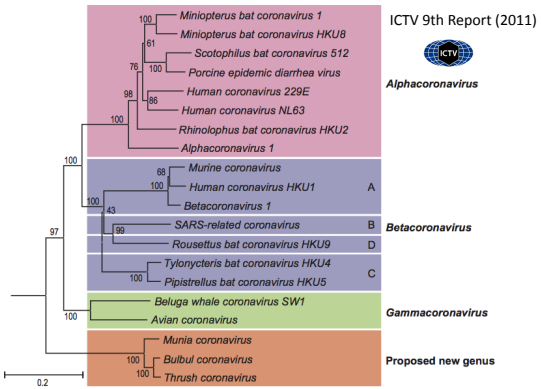


Coronavirus

Coronaviruses

- Order: Nidoviralis
- Family: Coronaviridea
  - Subfamily: Orthocoronavirinae
- Positive Strand RNA virus
- Genome size up to ~26-32 kb
- Host ranges mammals and avians
  - Important veterinary pathogens
    - IBV, TGEV, PEDV
  - Humans
    - Common cold hCoV 229E, NL63, OC43
    - Middle Eastern Respiratory Syndrome (MERS) CoV
    - Severe Acute Respiratory Syndrome (SARS) CoV
    - SARS-CoV-2 (COVID-19)



ICTV 9th Report (2011)

Alphacoronavirus
Betacoronavirus
Gammacoronavirus
Proposed new genus

https://talk.ictvonline.org/ictv-reports/ictv_9th_report/positive-sense-rna-viruses-2011/w/posrna_viruses/223/coronaviridae-figures

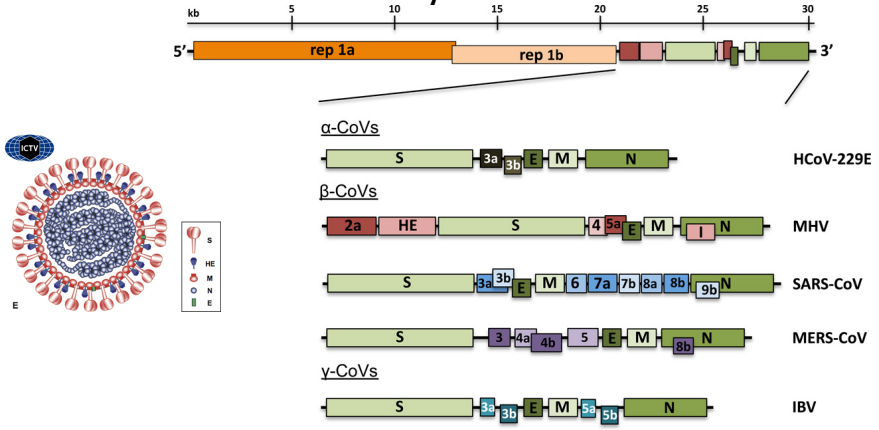
Emergence of Coronaviruses

Virus	Species	Emergence
HCoV-NL63	Human	500-800 years
HCoV-229E	Human	200-300 years
HCoV-OC43	Human	~120 years
PEDV	Porcine	~25 years
rBCoV	Bovine	~25 years
SARS-CoV	Human	~16 years
MERS-CoV	Human	~7 years
SADS-CoV (HKU2)	Porcine	~2 years
SARS-CoV-2	Human	Present

Fu et al. 2018 Infect Gen Evol; Peiris et al. Lancet 2003; Huynh et al. J Virol 2012; Zaki et al N Engl J Med 2013; Mole Nature 2013; Zhou et al Nature 2018

CROI 2020
https://special.croi.capitalreach.com/

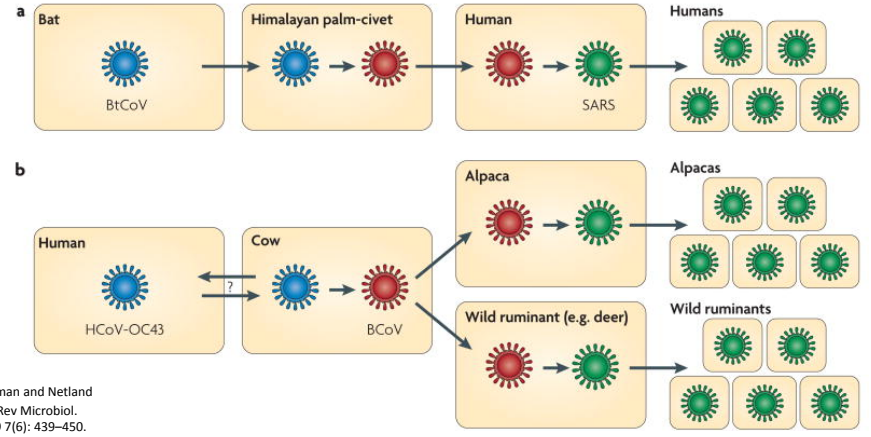
Structural and Accessory Proteins



Fehr & Perlman Methods Mol Biol. 2015 ; 1282: 1–23.

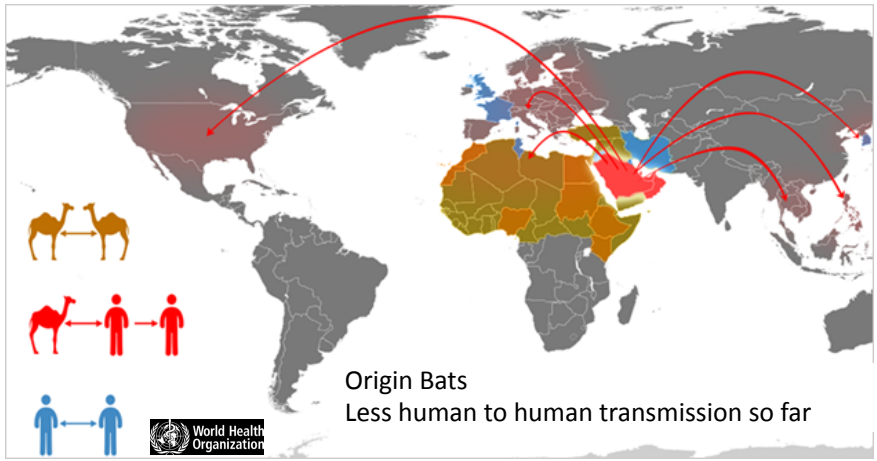
Host "Jumping" Coronaviruses

Role of Intermediate hosts



Perlman and Netland
Nat Rev Microbiol.
2009 7(6): 439–450.

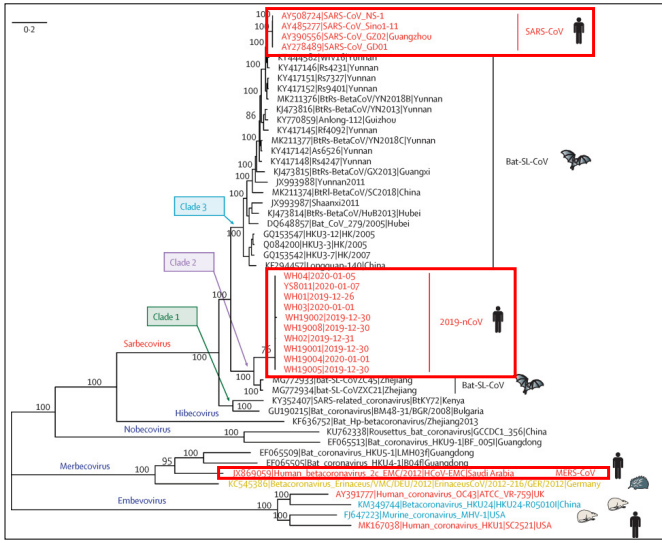
Host "Jumping" MERS CoV



Origin Bats
Less human to human transmission so far

https://www.who.int/emergencies/mers-cov/accelerating-response/en/

Animal Origin SARS-CoV-2 (COVID 19)?

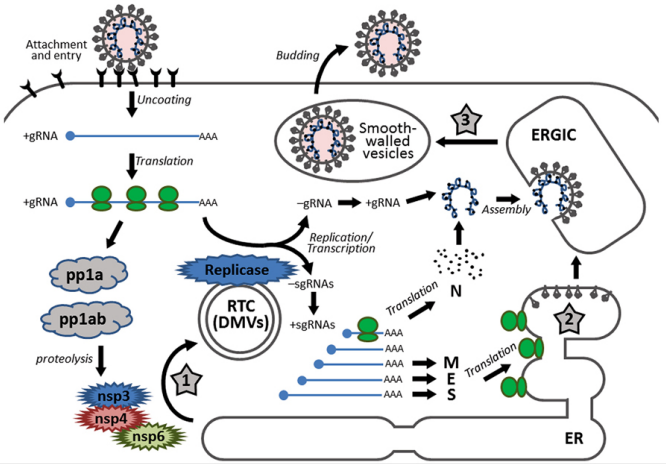


Did pangolins spread coronavirus to people?

Lu et al. Lancet 2020; 395: 565–74

Therapeutic Approaches & Vaccines?

Coronavirus Life cycle



Receptors for Cell Entry

HCoV-229E	APN
HCoV-NL63	ACE2
TGEV	APN
PEDV	APN
FIPV	APN
CCoV	APN
MHV	mCEACAM
SARS-CoV	ACE2
MERS-CoV	DPP4

Fehr & Perlman
Methods Mol Biol.
(2015) 1282: 1–23.

Fung et al.
Front Microbiol
(2014) 5:296

Potential Vaccines:

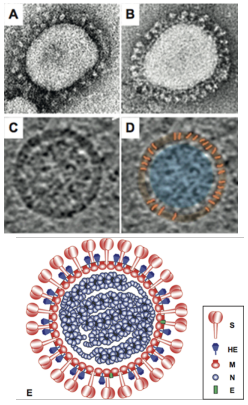
- Targets structural proteins (S, M, N)
- Humoral and Cellular Immune are protective

But:

- Antibody Dependent Enhancement of infection (ADE)?
- Other Immune Pathologies?
- Longevity of Response?
- Immune escape?

Potential Antivirals:

- Block virus binding or entering cells
- Protease inhibitors against viral proteases
  - Papain like proteases
  - Chymotrypsin like proteases
- Target other Non Structural Proteins (nsp).
  - Replicase (Remdesivir)
- Target Viral Accessory Proteins
- Target Interferon Responses
- Other cellular processes & antiviral responses



Coronavirus