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Sayed-Hamidreza Mozhgani

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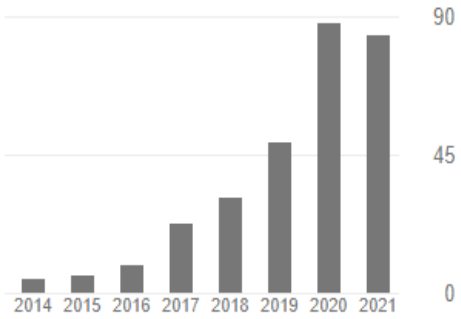

Co-authors EDIT


S.A.R Rezaee
Associate Professor of Immunovi...


Manoochehr Makvandi
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Short Communication

Effect of Ammonium Chloride in addition to standard of care in outpatients and hospitalized COVID-19 patients: A randomized clinical trial

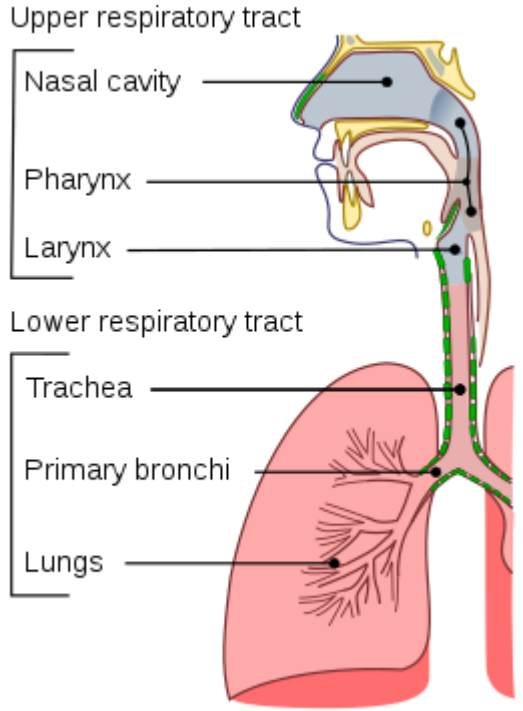
Zeinab Siami[a], Sepehr Aghajanian[b], Somayeh Mansouri[b], Zakiye Mokhames[c], Reza Pakzad[d,e], Kourosh Kabir[f], Mehdi Norouzi[g,h], Alireza Soleimani[a], Mojtaba Hedayat Yaghoobi[a], Shahrzad Shadabi[b], Ramin Tajbakhsh[i], Ali Kargar Kheirabad[g,**], Sayed-Hamidreza Mozhgani[j,k,*]

[a] Department of Infectious Diseases, School of Medicine, Alborz University of Medical Sciences, Karaj, Iran
[b] Student Research Committee, Alborz University of Medical Sciences, Karaj, Iran
[c] Department of Molecular Diagnostics, Emam Ali Educational and Therapeutic Center, Alborz University of Medical Sciences, Karaj, Iran
[d] Department of Epidemiology, Faculty of Health, Ilam University of Medical Sciences, Ilam, Iran
[e] Student Research Committee, Ilam University of Medical Sciences, Ilam, Iran
[f] Department of Community Medicine, School of Medicine, Alborz University of Medical Sciences, Karaj, Iran
[g] Department of Virology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
[h] Research Center for Clinical Virology, Tehran University of Medical Sciences, Tehran, Iran
[i] Department of Internal Medicine, School of Medicine, Imam Ali Hospital, Alborz University of Medical Sciences, Karaj, Iran
[j] Non-communicable Diseases Research Center, Alborz University of Medical Sciences, Karaj, Iran
[k] Department of Microbiology, School of Medicine, Alborz University of Medical Sciences, Karaj, Iran

Introduction

Respiratory tract infections (RTIs) are infectious diseases involving the respiratory tract. An infection of this type usually is further classified as an upper respiratory tract infection (URI or URTI) or a lower respiratory tract infection (LRI or LRTI).

Lower respiratory tract infections are generally more severe than upper respiratory infections. LRIs are the leading cause of death among all infectious diseases.



Introduction

Of the viruses that cause respiratory infections in humans, most have seasonal variation in prevalence.

- Influenza, Human orthopneumovirus (RSV) and human coronaviruses are more prevalent in the winter.
- Adenovirus, Human bocavirus and Human metapneumovirus occur year-round.
- Rhinoviruses (which cause the common cold) occur mostly in the spring and fall.
- Human parainfluenza viruses have variable peaks depending on the specific strain.
- Enteroviruses, with the exception of rhinoviruses, tend to peak in the summer.

Coronaviridae

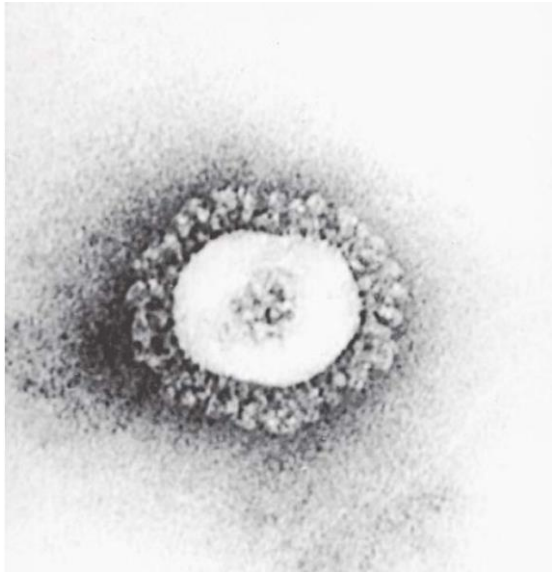
Coronaviruses

Coronaviruses are large, enveloped RNA viruses.

The human coronaviruses cause common colds, may cause lower respiratory tract infections.

Novel coronaviruses have been identified as the cause of:

- Severe acute respiratory syndrome (SARS 1 & 2)
- Middle East respiratory syndrome (MERS)



Coronaviridae

Classification

There are two subfamilies:

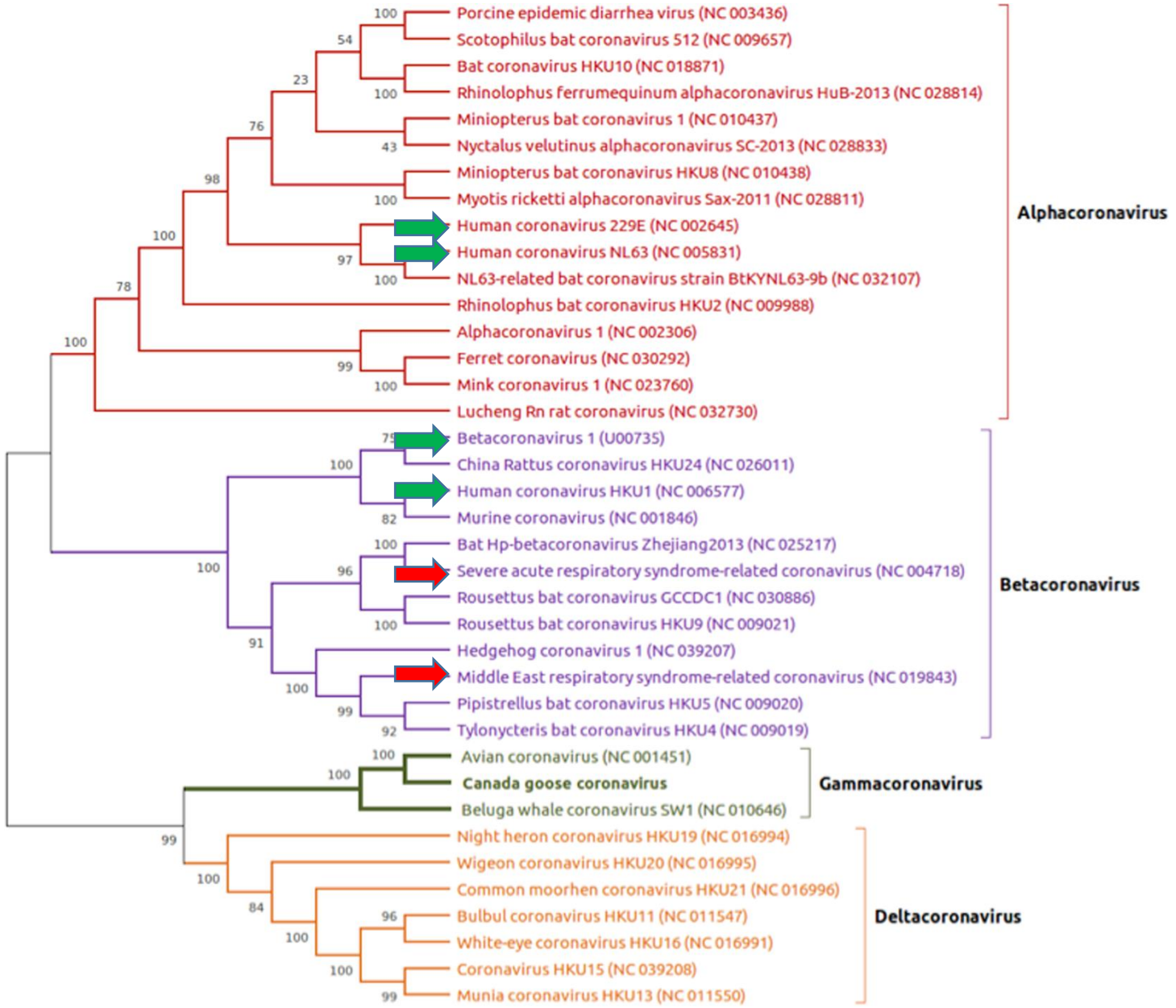
- Coronavirinae
- Torovirinae

six genera:

- Alphacoronavirus
- Betacoronavirus
- Gammacoronavirus
- Deltacoronavirus
- Bafinivirus
- Torovirus

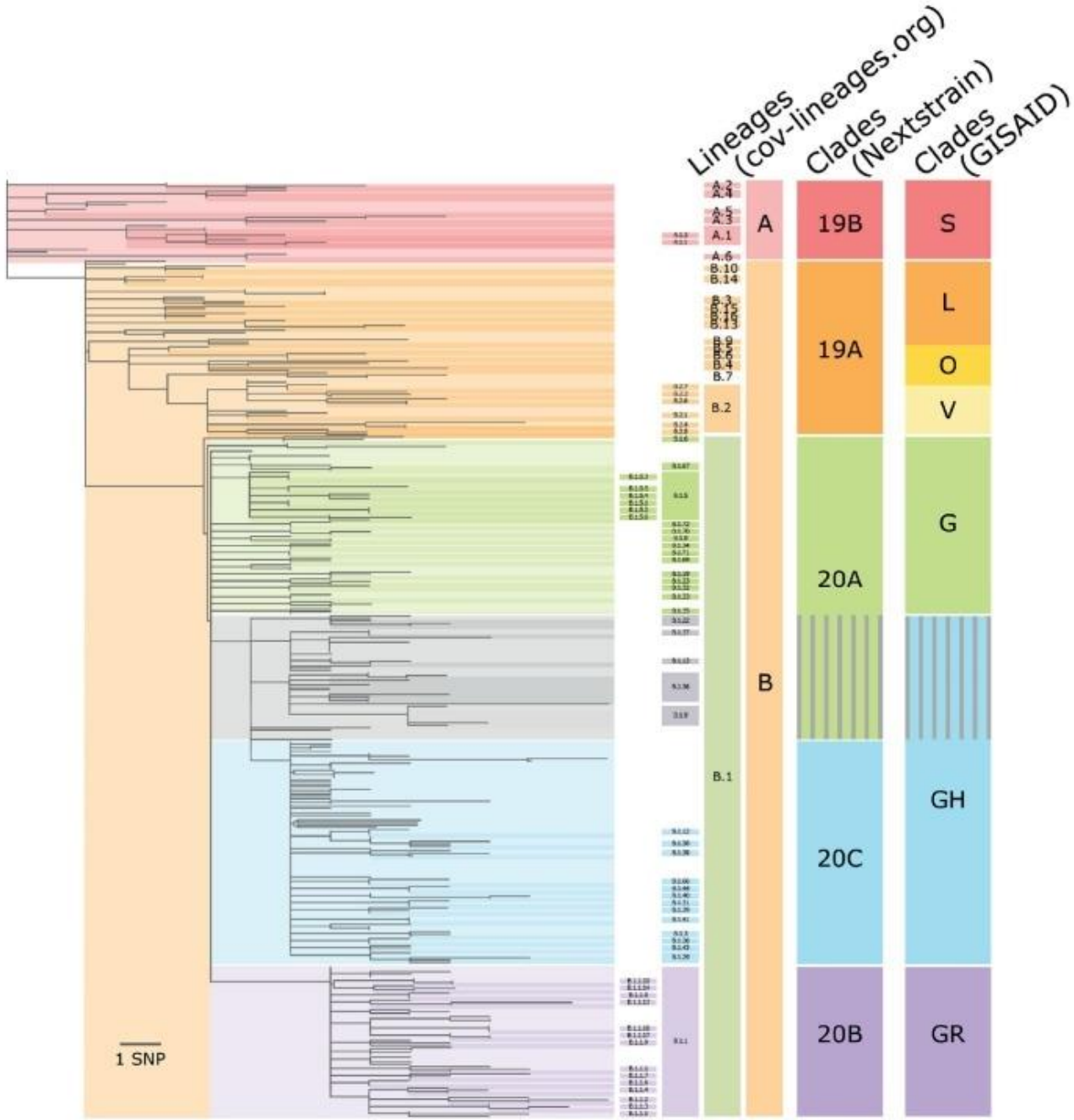
The first two and the last genera contain viruses able to infect humans.

The Toroviruses are associated with diarrheal disease.



Classification

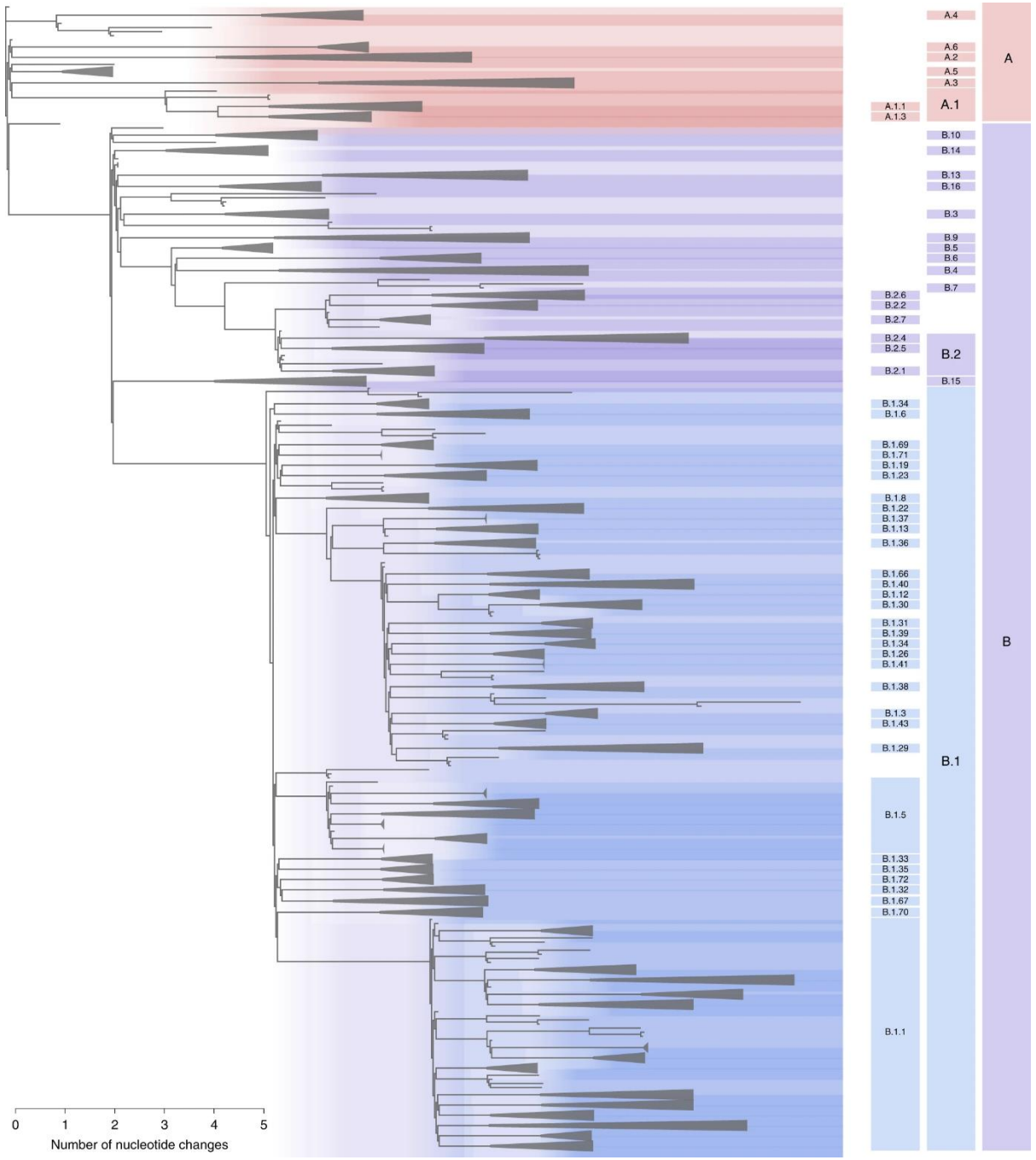
Schematic comparison of the GISAID, Nextstrain and cov-lineages.org nomenclatures for SARS-CoV-2 sequences of world-wide origin.



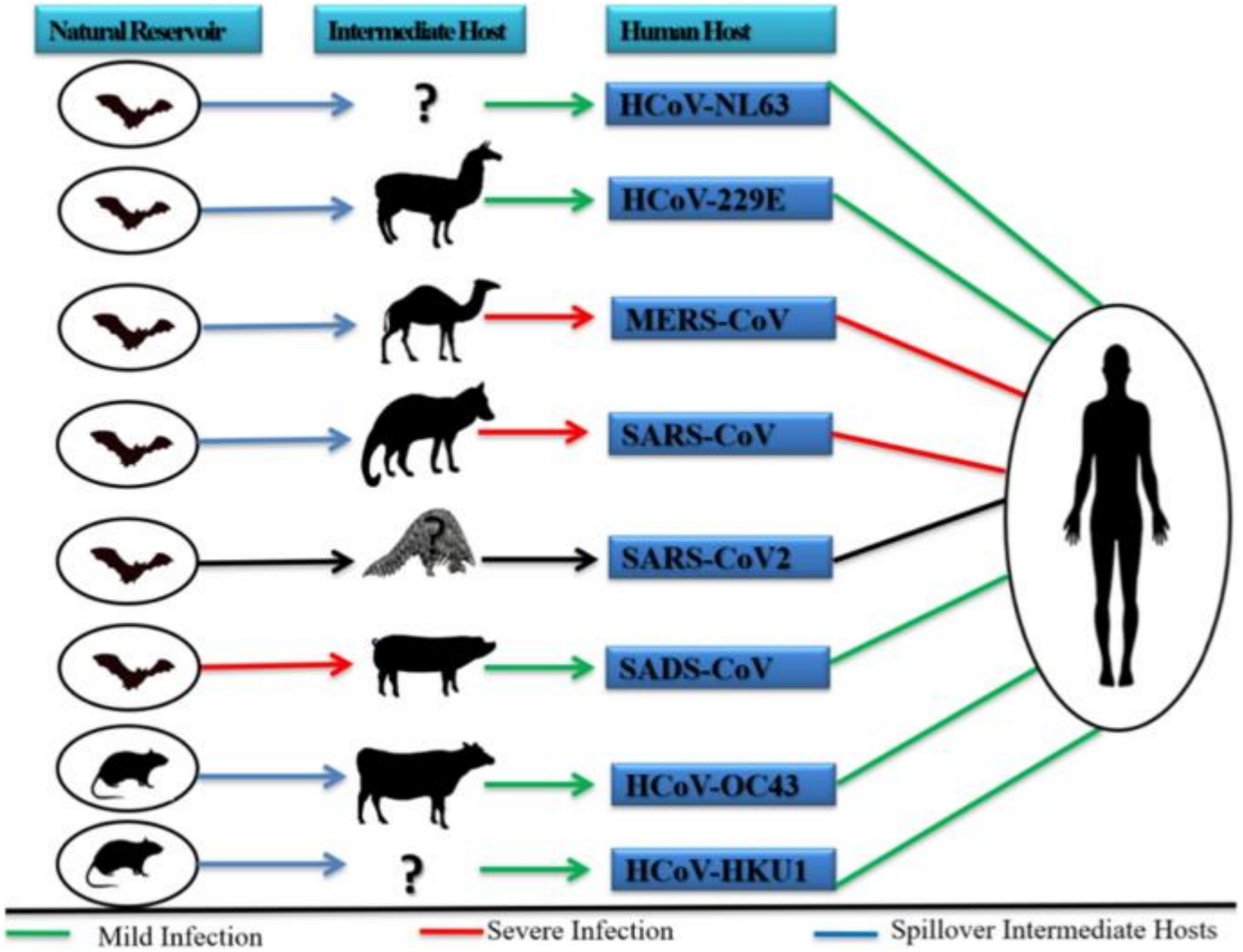
Coronaviridae

Classification

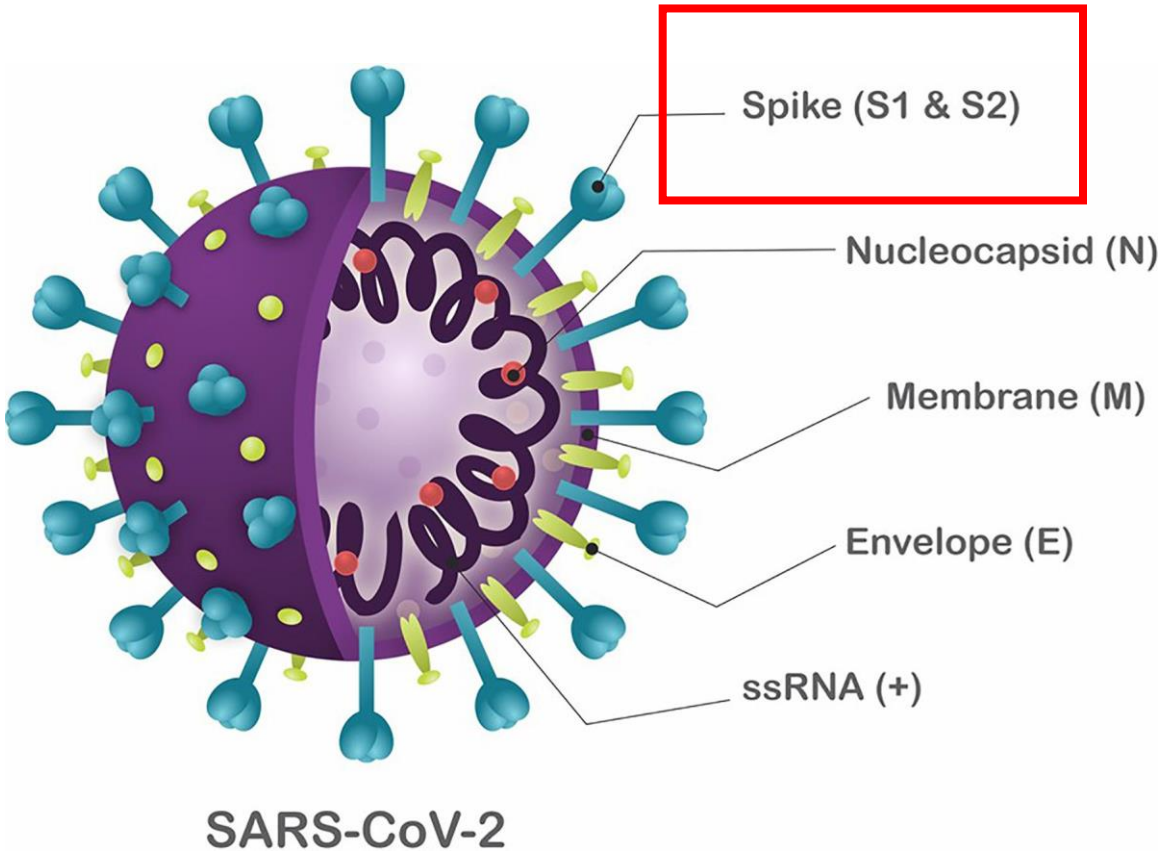
Maximum likelihood phylogeny of globally sampled sequences of SARS-CoV-2 downloaded from the GISAID database.

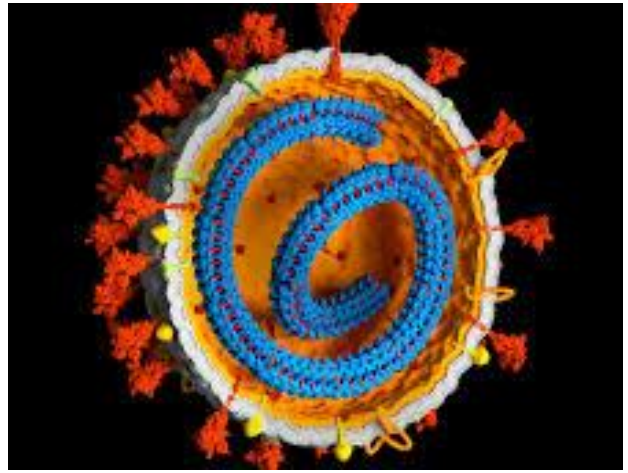


Origin of SARS-CoV-2

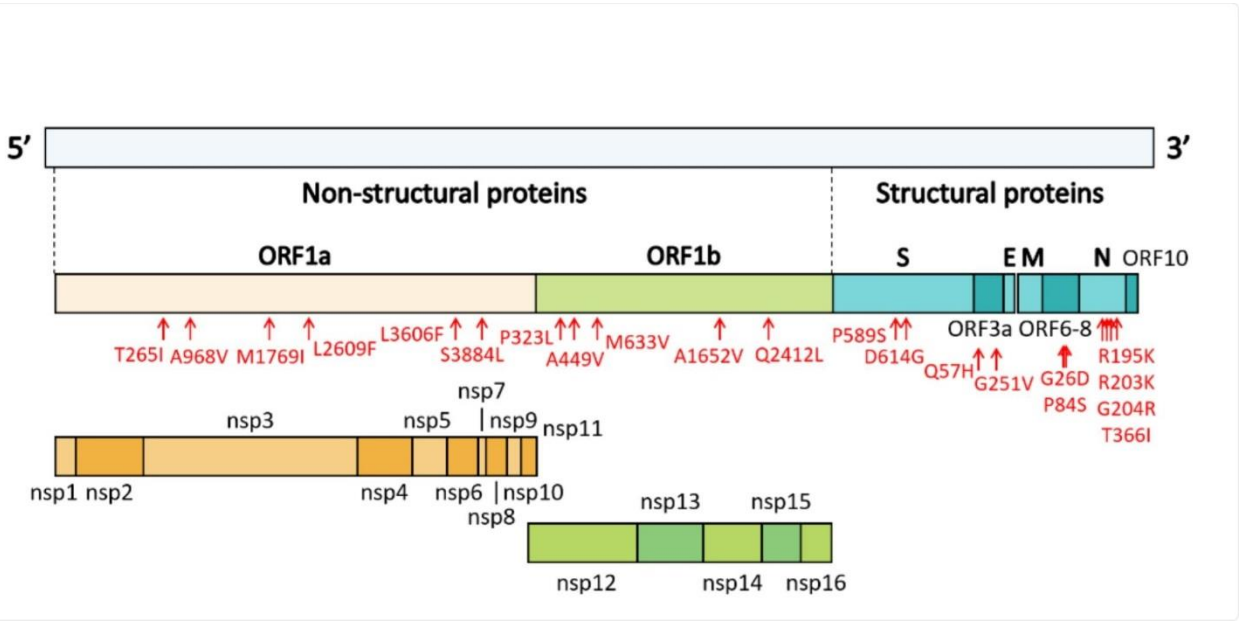


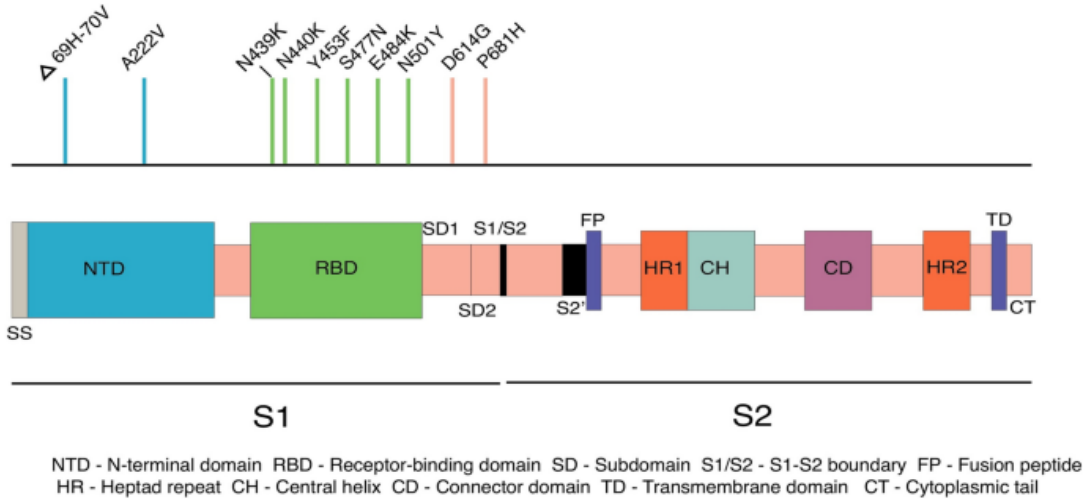
Viral Structure



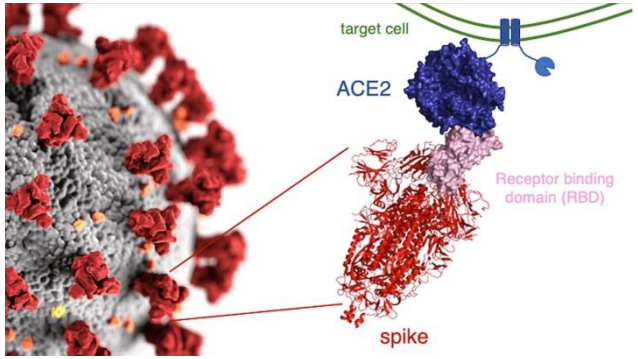


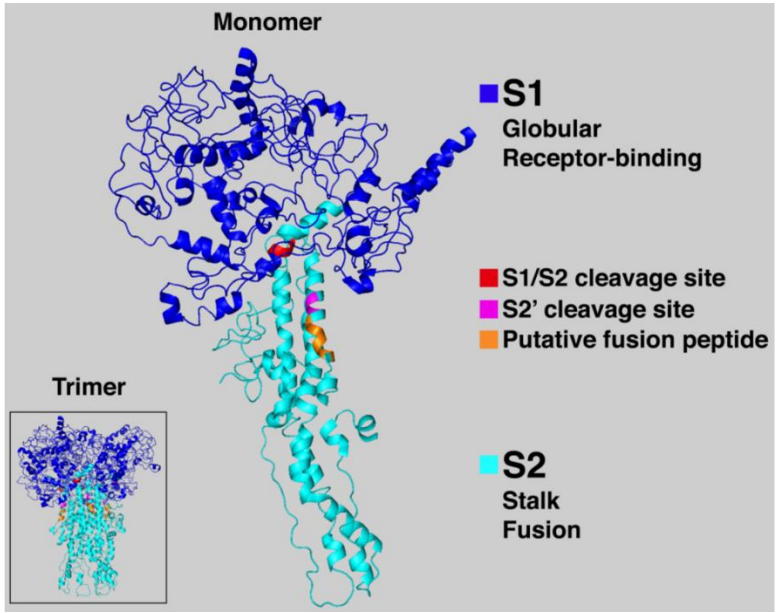
Genomic Structure

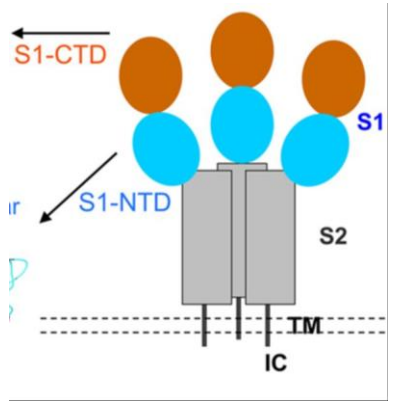




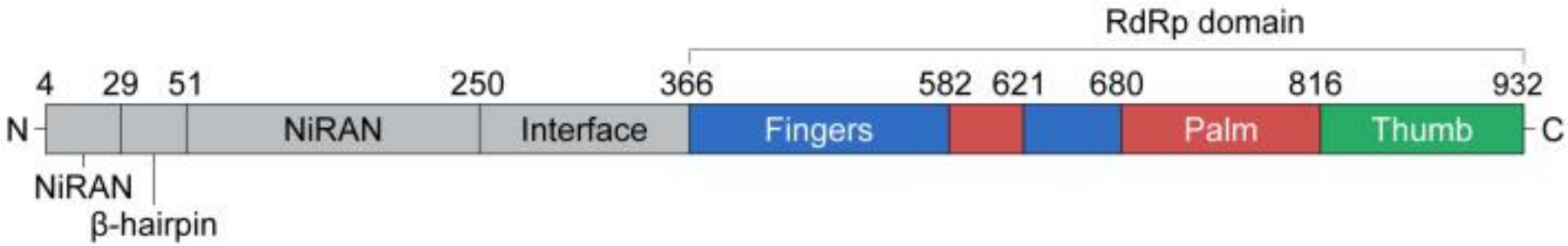
NTD - N-terminal domain RBD - Receptor-binding domain SD - Subdomain S1/S2 - S1-S2 boundary FP - Fusion peptide
HR - Heptad repeat CH - Central helix CD - Connector domain TD - Transmembrane domain CT - Cytoplasmic tail

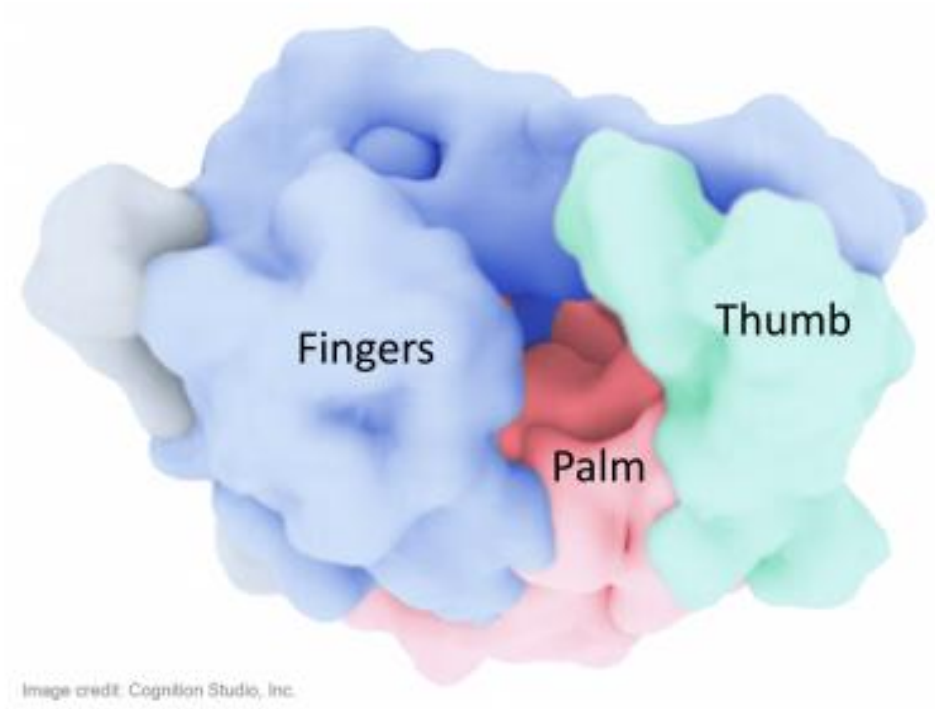




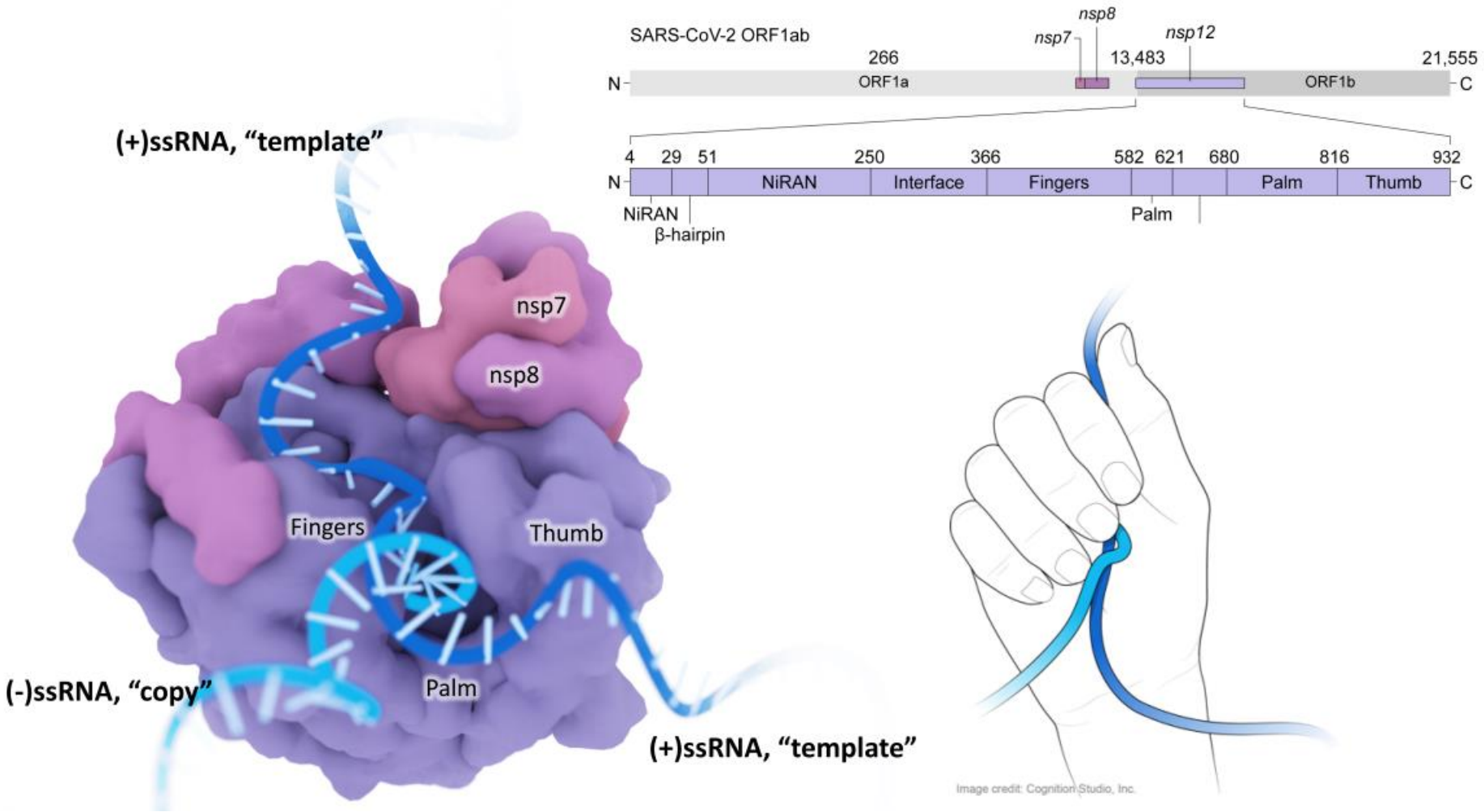


Genomic Structure

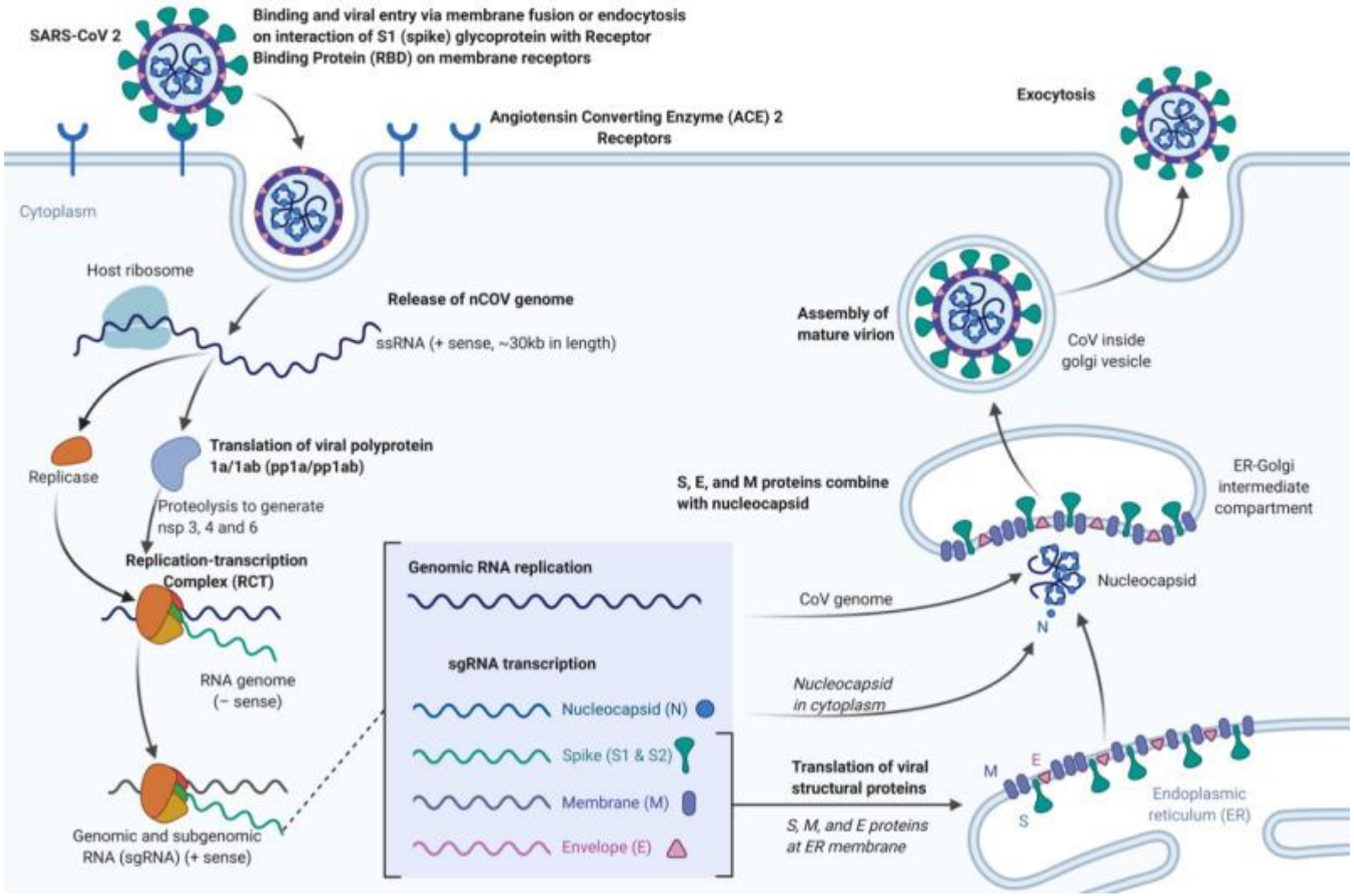




Genomic Structure



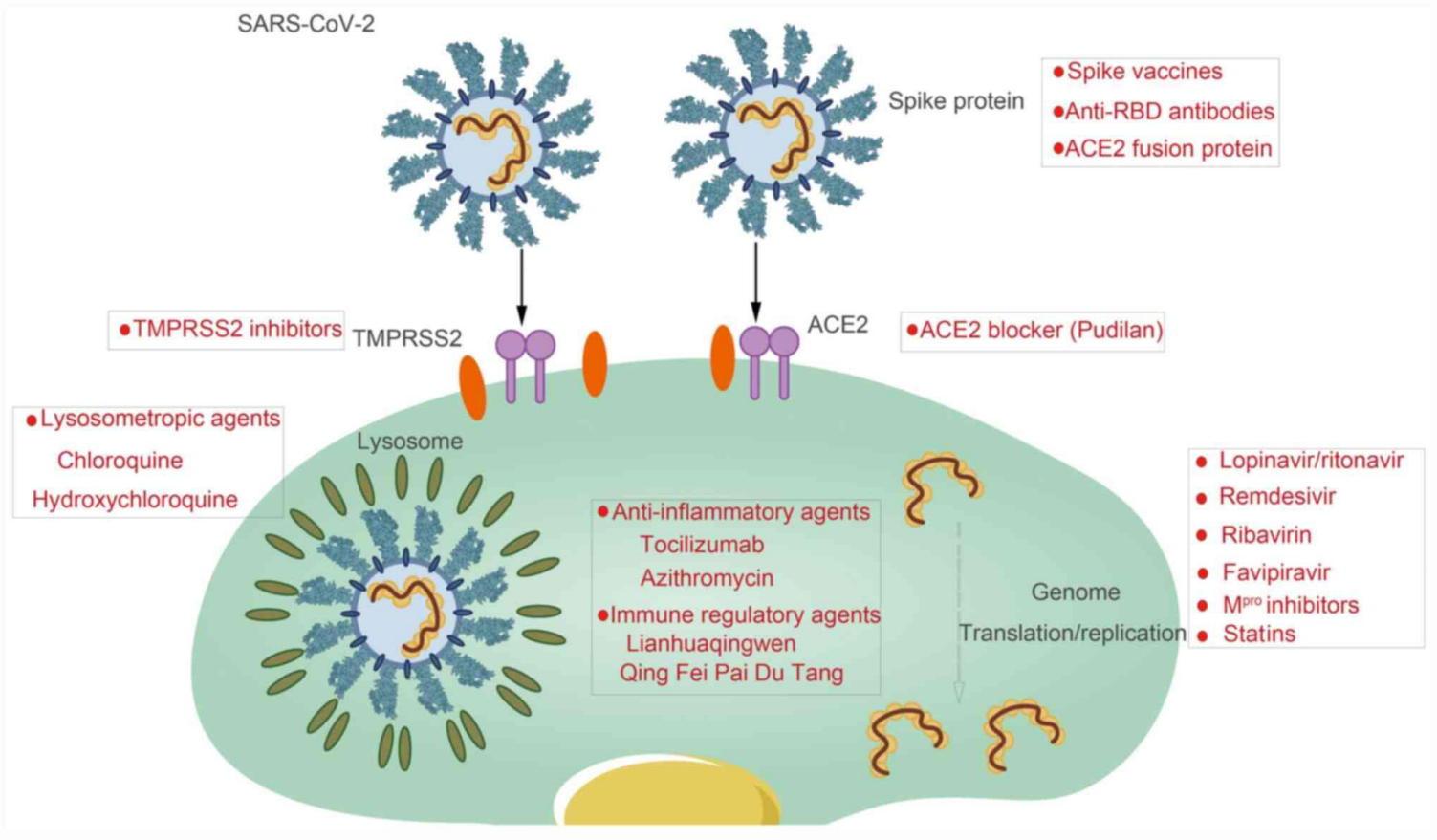
Replication Cycle



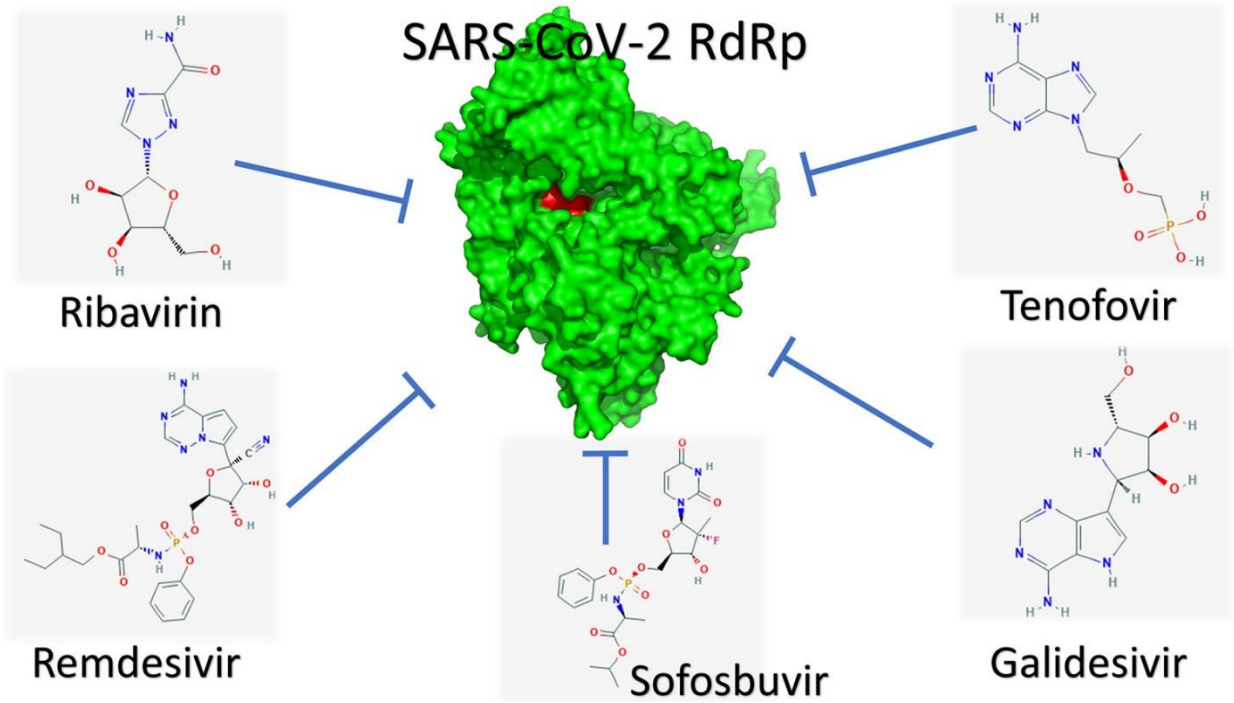
Antiviral Agents

SARS-CoV-2 employs the serine protease TMPRSS2 for S protein priming.

TMPRSS2; transmembrane protease serine



Antiviral Agents



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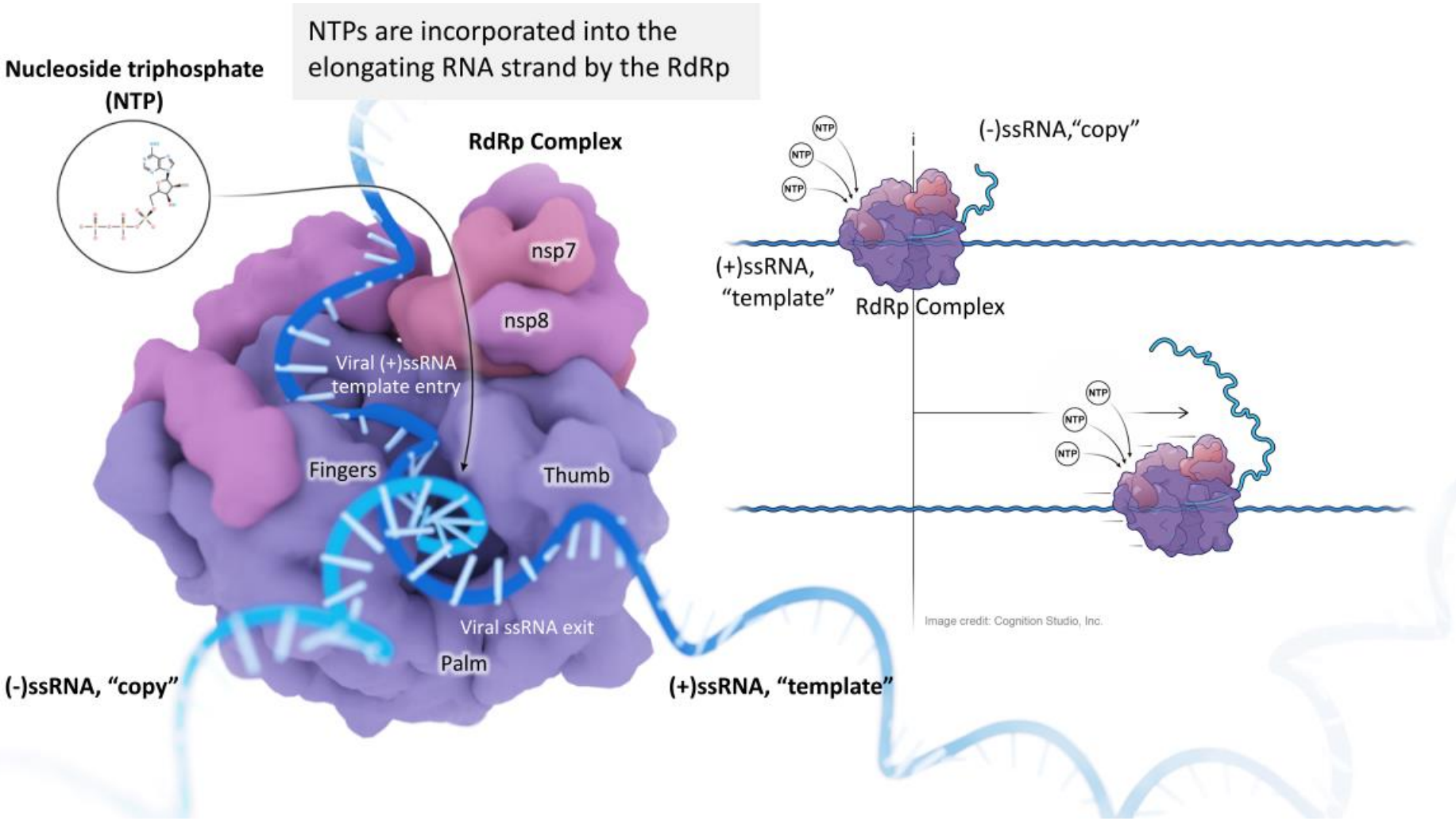

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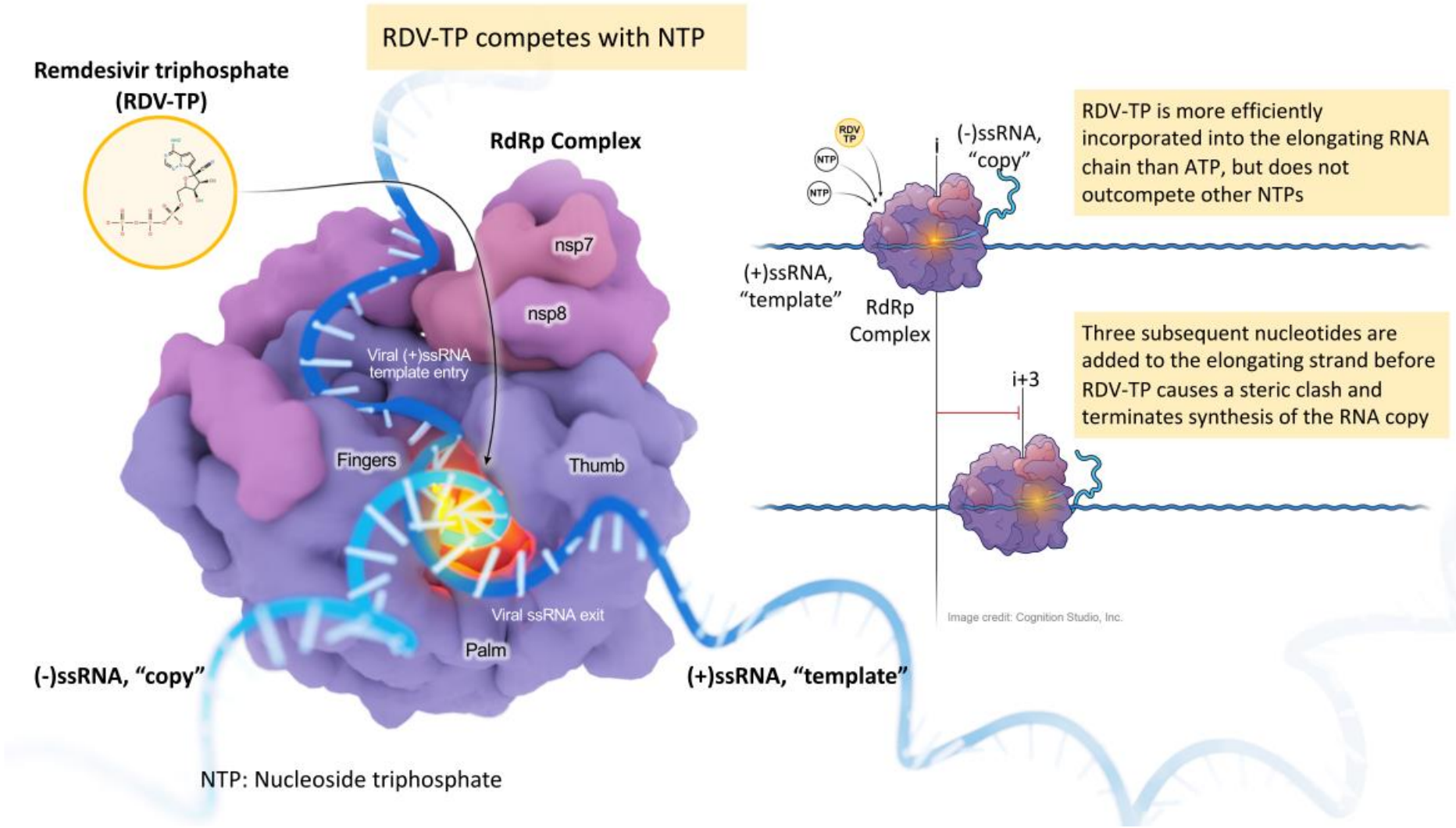

Antiviral Agents

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[f] Department of Community Medicine, School of Medicine, Alborz University of Medical Sciences, Karaj, Iran
[g] Department of Virology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
[h] Research Center for Clinical Virology, Tehran University of Medical Sciences, Tehran, Iran
[i] Department of Internal Medicine, School of Medicine, Imam Ali Hospital, Alborz University of Medical Sciences, Karaj, Iran
[j] Non-communicable Diseases Research Center, Alborz University of Medical Sciences, Karaj, Iran
[k] Department of Microbiology, School of Medicine, Alborz University of Medical Sciences, Karaj, Iran

SARS-CoV-2 variants

Amino Acid	3 letter	1 letter
Alanine	Ala	A
Arginine	Arg	R
Asparagine	Asn	N
Aspartic acid	Asp	D
Cysteine	Cys	C
Glutamic acid	Glu	E
Glutamine	Gln	Q
Glycine	Gly	G
Histidine	His	H
Isoleucine	Ile	I
Leucine	Leu	L
Lysine	Lys	K
Methionine	Met	M
Phenylalanine	Phe	F
Proline	Pro	P
Serine	Ser	S
Threonine	Thr	T
Tryptophan	Trp	W
Tyrosine	Tyr	Y
Valine	Val	V

SARS-CoV-2 variants

Variants of Concern (VOC)

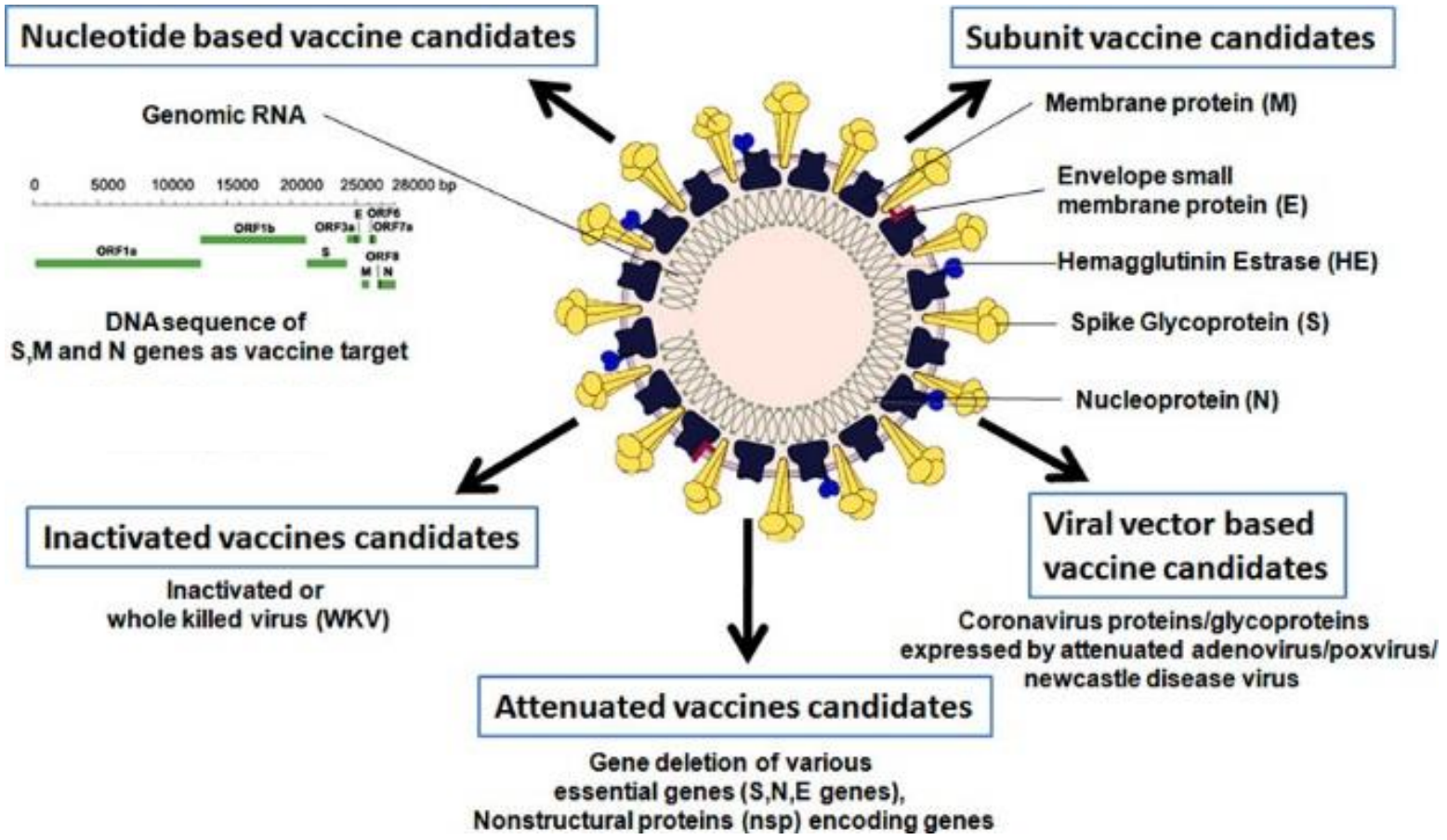
WHO label	Lineage + additional mutations	Country first detected (community)	Spike mutations of interest	Year and month first detected	Impact on transmissibility	Impact on immunity	Impact on severity	Transmission in EU/EEA
Beta	B.1.351	South Africa	K417N, E484K, N501Y, D614G, A701V	September 2020	Increased (v) (1)	Increased (v) (2, 3)	Increased (v) (4, 5)	Community
Gamma	P.1	Brazil	K417T, E484K, N501Y, D614G, H655Y	December 2020	Increased (v) (6)	Increased (v) (7)	Increased (v) (5)	Community
Delta	B.1.617.2	India	L452R, T478K, D614G, P681R	December 2020	Increased (v) (8)	Increased (v) (9-11)	Increased (v) (10, 12)	Community
Omicron	B.1.1.529	South Africa and Botswana	(x)	November 2021	Unclear (v) (13-15) a	Increased (v) (16)	Reduced (v) (17-23) b	Dominant

SARS-CoV-2 variants

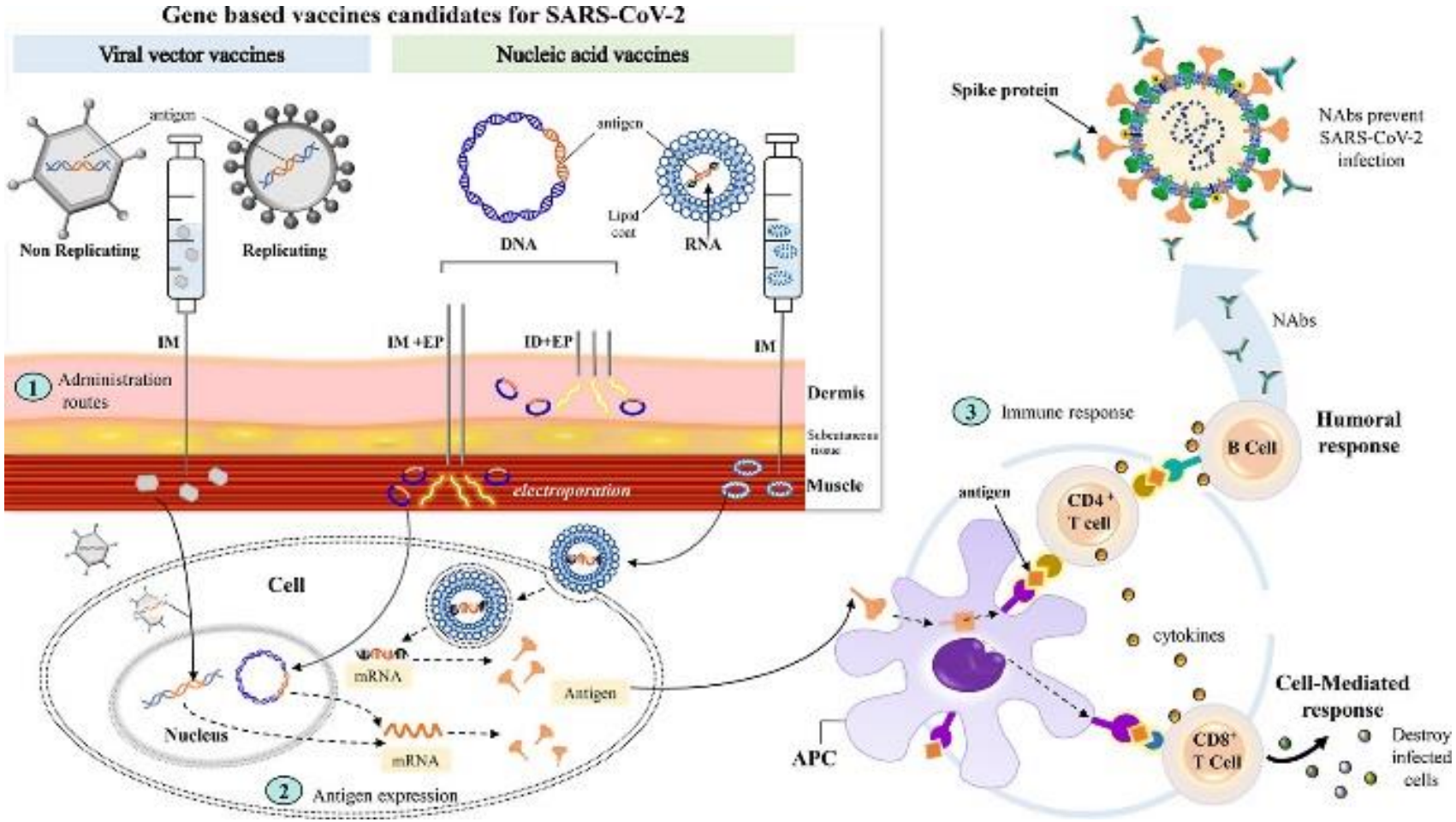
Variants of Interest (VOI)

WHO label	Lineage + additional mutations	Country first detected (community)	Spike mutations of interest	Year and month first detected	Impact on transmissibility	Impact on immunity	Impact on severity	Transmission in EU/EEA
Mu	B.1.621	Colombia	R346K, E484K, N501Y, D614G, P681H	January 2021	Increased (m) (24)	Increased (m) (25)	No evidence	Sporadic/Travel
Lambda	C.37	Peru	L452Q, F490S, D614G	December 2020	No evidence	Increased (v) (26, 27)	No evidence	Sporadic/Travel
n/a	AY.4.2	United Kingdom	L452R, T478K, D614G, P681R, A222V, Y145H	June 2021	Increased (v) (28)	Similar (v) (28, 29)	Similar (v) (28)	Community

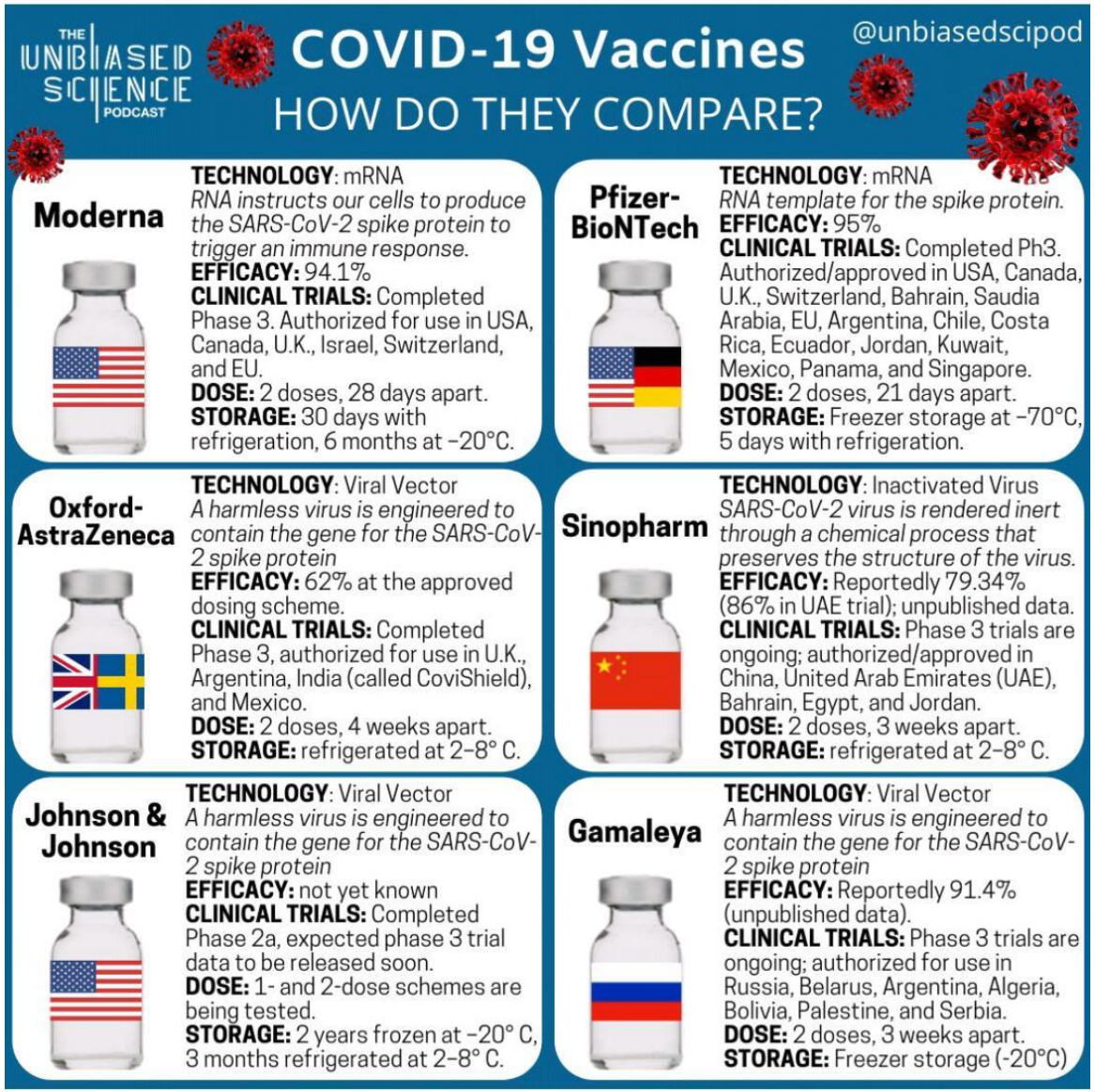
Vaccination strategies



Vaccination strategies



Vaccination strategies



Immunity

As with other respiratory viruses, immunity develops but is not absolute.

Laboratory Diagnosis

Prevention, and Control

Control measures that were effective in stopping the spread of SARS-2 included isolation of patients, quarantine of those who had been exposed, and travel restrictions, as well as the use of gloves, gowns, goggles, and respirators by health care workers.


Thank you