Adult Immunisation Forum 2021

Update on COVID-19

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NSW GOVERNMENT | Health Pathology

for all of trust

ProMED
INTERNATIONAL SOCIETY
FOR INFECTIOUS DISEASES

Published Date: 2019-12-30 23:59:00
Subject: PRO/AH/EDR> Undiagnosed pneumonia - China (HU): RFI
Archive Number: 20191230.6864153

UNDIAGNOSED PNEUMONIA - CHINA (HUBEI): REQUEST FOR INFORMATION
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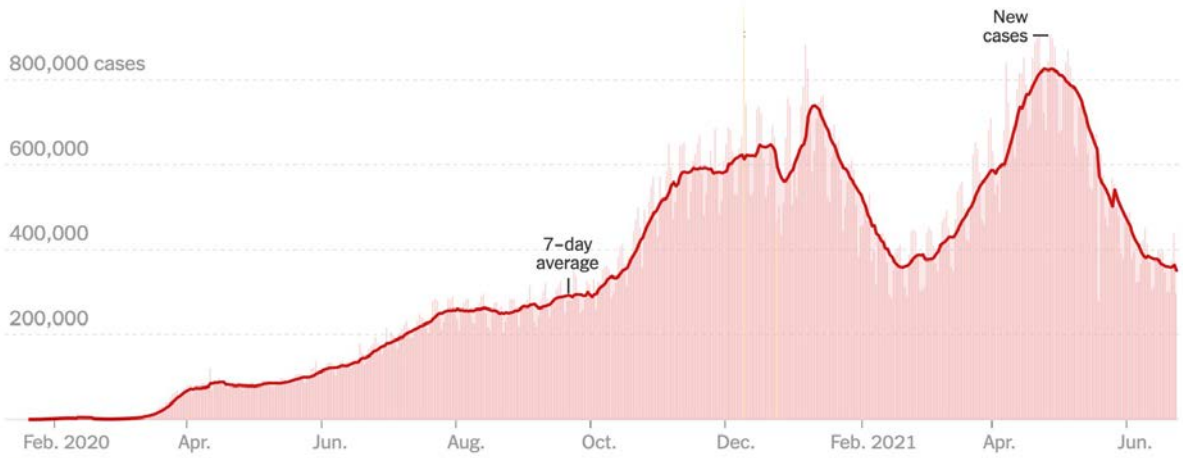
A ProMED-mail post
http://www.promedmail.org
ProMED-mail is a program of the
International Society for Infectious Diseases
http://www.isid.org

Updated June 24, 2021

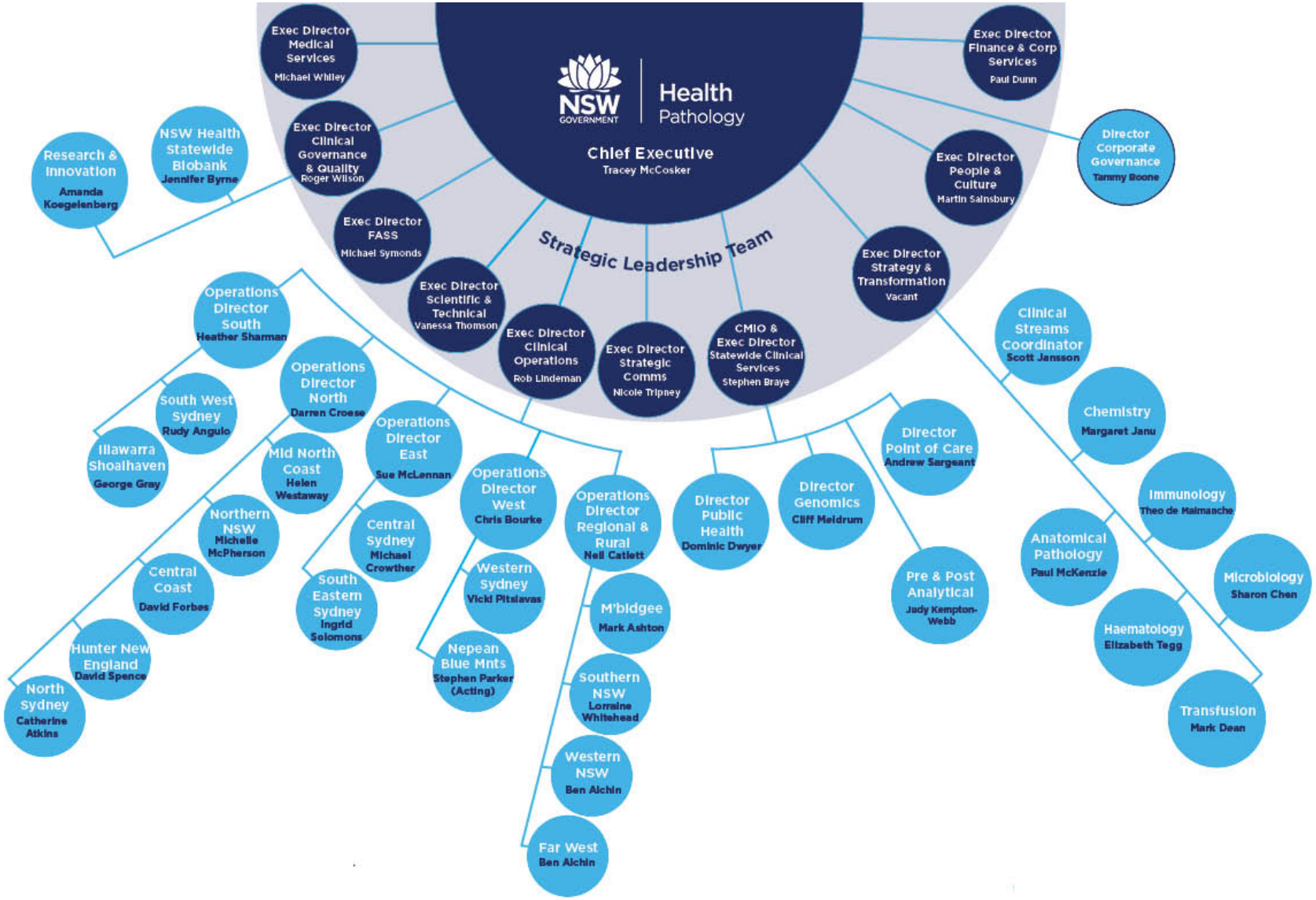
New reported cases



These are days with a reporting anomaly. Read more here.

	AVG. ON JUN. 24	14-DAY CHANGE	TOTAL REPORTED
Cases	350,768	–8%	179,880,197
Deaths	7,918	–23%	3,897,507

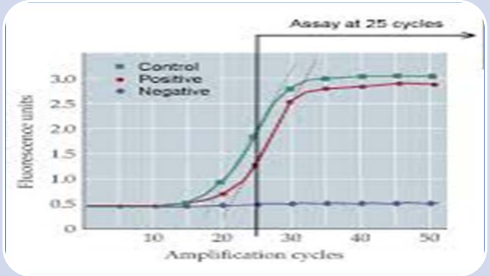
NSW Health Pathology Structure

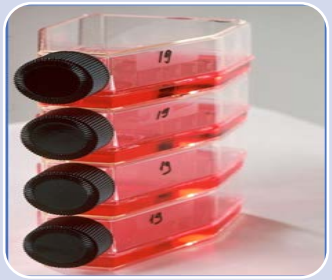


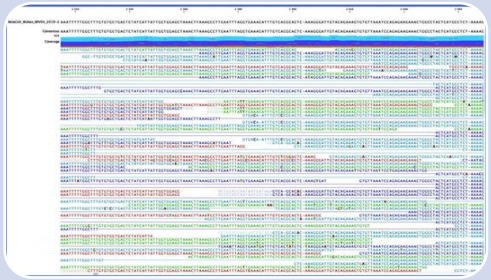
NSW Health Pathology COVID-19 testing

- NSWHP Public Health Pathology State-wide Service
- Centralised approach to testing strategies and roll-out 2020-21
- Current testing program
- New issues
  - Saliva testing for occupational assessment
  - Rapid antigen/antibody testing

SARS-CoV-2 testing in NSWHP







SARS-CoV-2 NAT (PCR) Testing

SARS-CoV-2 Serology Testing

SARS-CoV-2 Culture

SARS-CoV-2 Whole Genome Sequencing

NSWHP-SARS-CoV-2 NAT Roll-out Phases

Phase 1 ICPMR-Westmead (22/01/20) then Randwick

Phase 2 Liverpool, RPAH, RNSH

Phase 3 JHH, Nepean

Phase 4 EMAI, Lismore, Concord

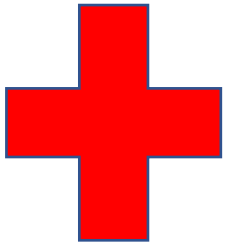
Phase 5 Various Metropolitan and Rural-Regional Laboratories (37) – Rapid testing with GeneXpert

Phase 6 Regional Labs - Dubbo, Wagga, Bega, Wollongong, Gosford etc

Elizabeth MacArthur Agricultural Institute (EMAI)

- NSW Public Health Veterinary Laboratory at Menangle
- Managed the equine influenza outbreak in 2007-8, performing up to 30,000 PCRs weekly
- Assisting NSWHP with COVID-19 testing
- Accreditation and microbiologist supervision (Catherine Pitman, Dominic Dwyer)
- Surge capacity for Westmead, Nepean, Liverpool (and Vic)
- Production and validation of viral transport medium (30,000+/week)
- Saliva testing for occupational screening

COVID-19 PCR Testing



COVID-19 Pandemic: EMAI vs NSWHP

- First meeting 24th March 2020
- Testing at EMAI 30th March 2020
- COVID-19 Diagnostic PCR: 52 000 tests
- COVID-19 Saliva PCR 150 000 tests

NSWHP SARS-CoV-2 Rapid NAT

- GeneXpert rapid NAT (1-4 hours) for high risk patients where urgent result is required
- Indications for use issued through Clinician factsheet ('bracket creep')
- Major evaluations performed by ICPMR and JHH
- Rolled out to 37 NSWHP laboratories in April-May 2020
- Centralised QC and cartridge distribution to testing laboratories
- Variable supply (especially in early-mid 2020)
- Influenza/RSV/SARS-CoV-2 cartridges available
- Alternative systems available

Rapid antigen testing

Cons

- Less sensitive
- Not high throughput
- Role in screening?
- Lack of integration into LIS/EMR
- Cost/billing/supply chain
- False positives
- Only 7 now FDA approved

Pros

- Reasonably sensitive in first 5-7 days of illness
- Rapid (10-20 minutes)
- Single use
- ‘Out of lab’ testing
  - Remote location use
  - Home testing

Saliva testing for SARS-CoV-2

- Frequent NP sampling unpopular
- NSWHP - not sample of choice for disease diagnosis, but occasionally acceptable
- Quarantine workers: screening versus symptomatic scenarios
- Sample collection methods
- (reduced) sensitivity and lower viral loads
- NAT only (not rapid antigen, antibody testing, immune markers)
- Separate from clinical testing

SARS-CoV-2 Serology Roll-out Phases

Phase 1 ICPMR Westmead – IFA (IgG/A/M) and neutralisation assays (from 20 February 2020)

Phase 2 Randwick/Kirby – IgG EIA and neutralisation assays (from 15 May 2020)

Phase 3 Concord, JHH, Liverpool, RPAH, RNSH

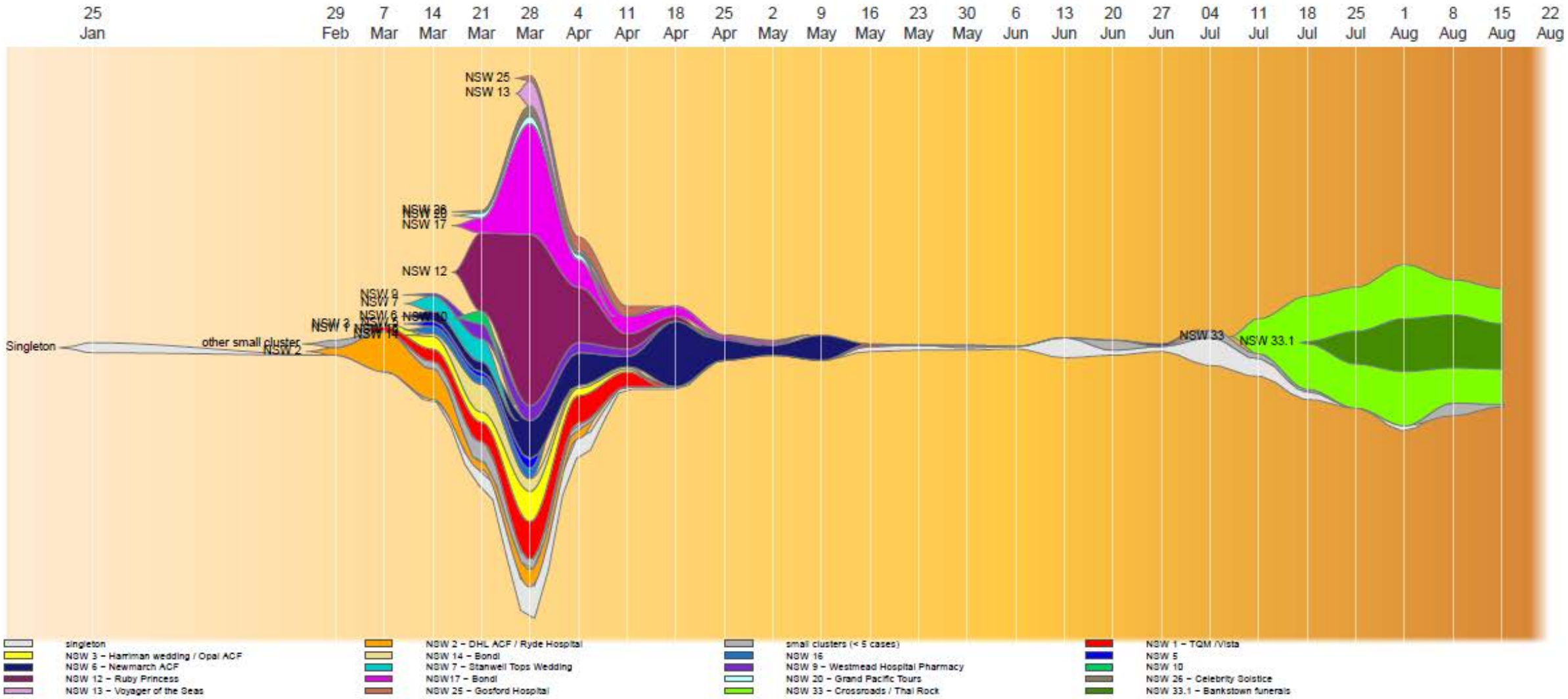
IgG EIA high-throughput assays (from 7 October 2020)

Rapid antibody testing

- Mostly rapid lateral flow point-of-care tests, some with readers
- Many evaluated by NSWHP*
- Sensitivity 27-58% and specificity 88-100%
- Lags 2-9 days behind immunofluorescence
- Performance dependent on disease prevalence
- Not supported by NSWHP
- Quality issues identified by FDA and other regulatory agencies (also in rapid antigen assays, viral transport media, swabs)
- 175 previously notified assays removed by FDA

*Robosa RS et al. Pathology 2020 doi: 10.1016/j.pathol.2020.09.002.

Evolution of clusters in New South Wales



Rockett R et al. Nature Medicine 2020

Variants of Concern (VOC)

WHO label	Pango lineage	GISAID clade/lineage	Nextstrain clade	Earliest documented samples	Date of designation
Alpha	B.1.1.7	GRY (formerly GR/501Y.V1)	20I (V1)	United Kingdom, Sep-2020	18-Dec-2020
Beta	B.1.351	GH/501Y.V2	20H (V2)	South Africa, May-2020	18-Dec-2020
Gamma	P.1	GR/501Y.V3	20J (V3)	Brazil, Nov-2020	11-Jan-2021
Delta	B.1.617.2	G/478K.V1	21A	India, Oct-2020	VOI: 4-Apr-2021 VOC: 11-May-2021

https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/

VOC in Australia

State/Territory	B.1.1.7	B.1.351	P.1	B.1.617.1	B.1.617.2
ACT	0	5	0	0	1
NSW	140	22	6	9	62
NT	13	2	0	11	28
QLD	85	20	0	5	9
SA	61	7	0	4	12
TAS	0	0	0	0	0
VIC	97	8	0	77	29
WA	51	14	1	4	25

cdgn.org.au 14/06/21

Variants of Interest (VOI)

WHO label	Pango lineage	GISAID clade/lineage	Nextstrain clade	Earliest documented samples	Date of designation
Epsilon	B.1.427/B.1.429	GH/452R.V1	21C	United States of America, Mar-2020	5-Mar-2021
Zeta	P.2	GR/484K.V2	20B/S.484K	Brazil, Apr-2020	17-Mar-2021
Eta	B.1.525	G/484K.V3	21D	Multiple countries, Dec-2020	17-Mar-2021
Theta	P.3	GR/1092K.V1	21E	Philippines, Jan-2021	24-Mar-2021
Iota	B.1.526	GH/253G.V1	21F	United States of America, Nov-2020	24-Mar-2021
Kappa	B.1.617.1	G/452R.V3	21B	India, Oct-2020	4-Apr-2021
Lambda	C.37	GR/452Q.V1	20D	Peru, Aug-2020	14-Jun-2021

https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/

Treatments for COVID-19

- Supportive

- Outpatients
- Mild-moderate COVID-19 (not hospitalised)
  - SARS-CoV-2 MAbs (bamlanivimab+etesevimab; cairivimab+imdevimab)
  - (Not chloroquine/hydroxychloroquine, dexamethasone, antibiotics)
- Hospitalised COVID-19 : no O_2/ O_2/ventilated
  - Remdesivir
  - Dexamethasone
  - Tocilizumab (anti-LI-6)

https://files.covid19treatmentguidelines.nih.gov/guidelines/covid19treatmentguidelines.pdf
https://www.asid.net.au/documents/item/1873

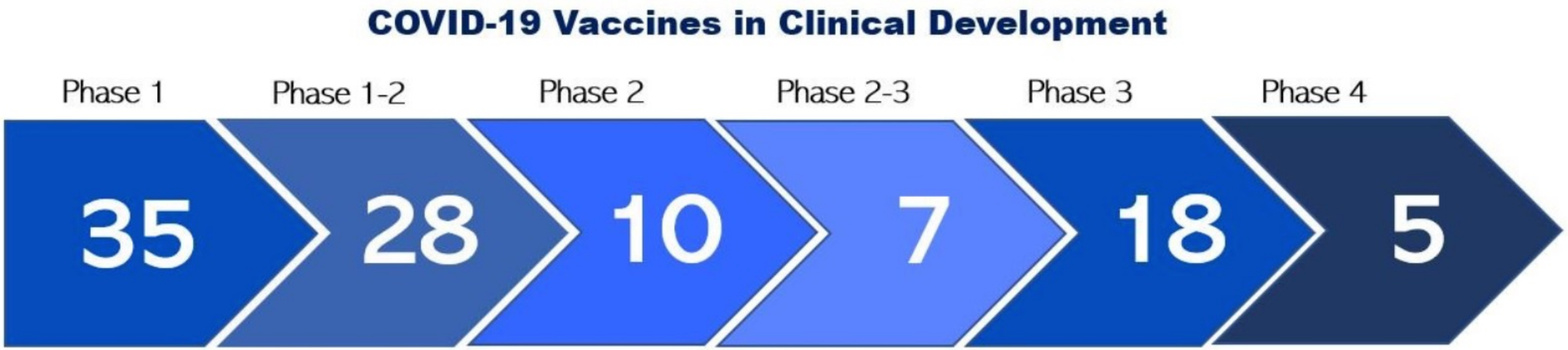
Antiviral targets

	Target	HIV	SARS-CoV-2
1.	Virus adsorption (attachment) to the host cells	Yes	Yes
2.	Virus penetration into the host cells (for enveloped viruses by fusion)	Yes	Yes
3.	Uncoating (decapsidation) so as to release viral (+)RNA (= mRNA)	Yes	Yes
4.1.	Reverse transcription (+)RNA –> (±)DNA by RNA-dependent DNA polymerase (reverse transcriptase)	Yes	No
4.2.	RNA-dependent RNA polymerase (RdRp) (+)RNA –> (–)RNA –> (+)RNA	No	Yes
5.	Integration of (±) proviral DNA into host cell chromosome	Yes	No
6.	Transcription of proviral (–)DNA to mRNA by cellular DDRp (DNA-dependent RNA polymerase)	Yes	No
7.	Viral mRNA translation to viral proteins	Yes	Yes
8.	Posttranslational modification (proteolytic cleavage by HIV protease, glycosylation, . . .)	Yes	Yes
	Formation of structural (S) and non-structural (NS) proteins		
9.	Assembly	Yes	Yes
10.	Budding (release of virus particles)	Yes	?

DeClerc E. Microbiology Australia 2021;42(1) 47-53 https://doi.org/10.1071/MA21013

SARS-CoV-2 vaccines

287	103	184
Total candidate vaccines	Clinical phase	Pre-clinical phase



https://www.who.int/publications/m/item/draft-landscape-of-covid-19-candidate-vaccines

The WHO-China Joint Report: https://www.who.int/publications/i/item/report-of-the-who-china-joint-mission-on-coronavirus-disease-2019-(covid-19)
(personal viewpoint: https://theconversation.com/i-was-the-australian-doctor-on-the-whos-covid-19-mission-to-china-heres-what-we-found-about-the-origins-of-the-coronavirus-155554)