COVID-19 and vaccines

Positive Action Foundation Philippines Incorporated (PAFPI)

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Introduction

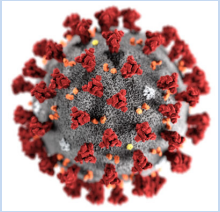
I am HIV positive (since the late 1980s)

I am on ART since 1996

I have worked at i-Base for 20 years:

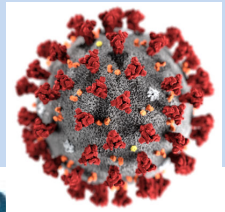
- writing about HIV treatment and running a Q&A service.
- Being a community rep on research studies
- For the last year I have covered COVID-19

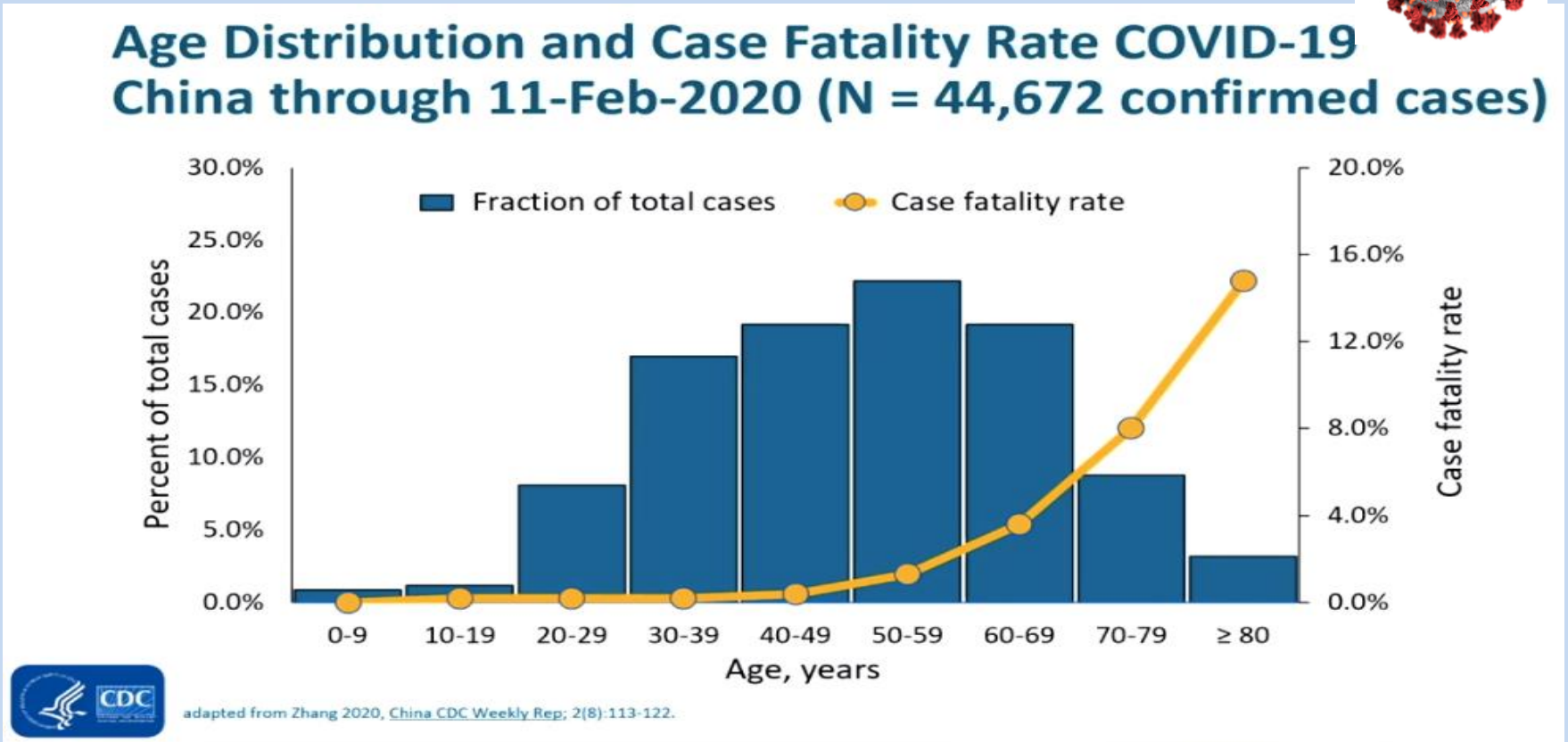
COVID-19 Intro



1. COVID-19 is the illness cased by SARS-CoV-2.
2. 4 out of 5 (80%) are mild/moderate.
3. 1 in 5 (20%) need hospitalisation.
4. Symptoms: fever, tiredness, loss or taste/smell, headache, aches, dry cough etc.
5. Risk factors for serious outcomes: older age (>70 years), male, lung (asthma, COPD), heart, kidney disease, obesity and some jobs.
6. HIV: slightly higher risk of serious outcomes.

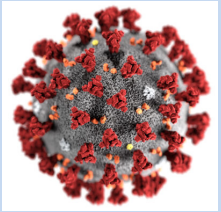
COVID-19: US MMWR





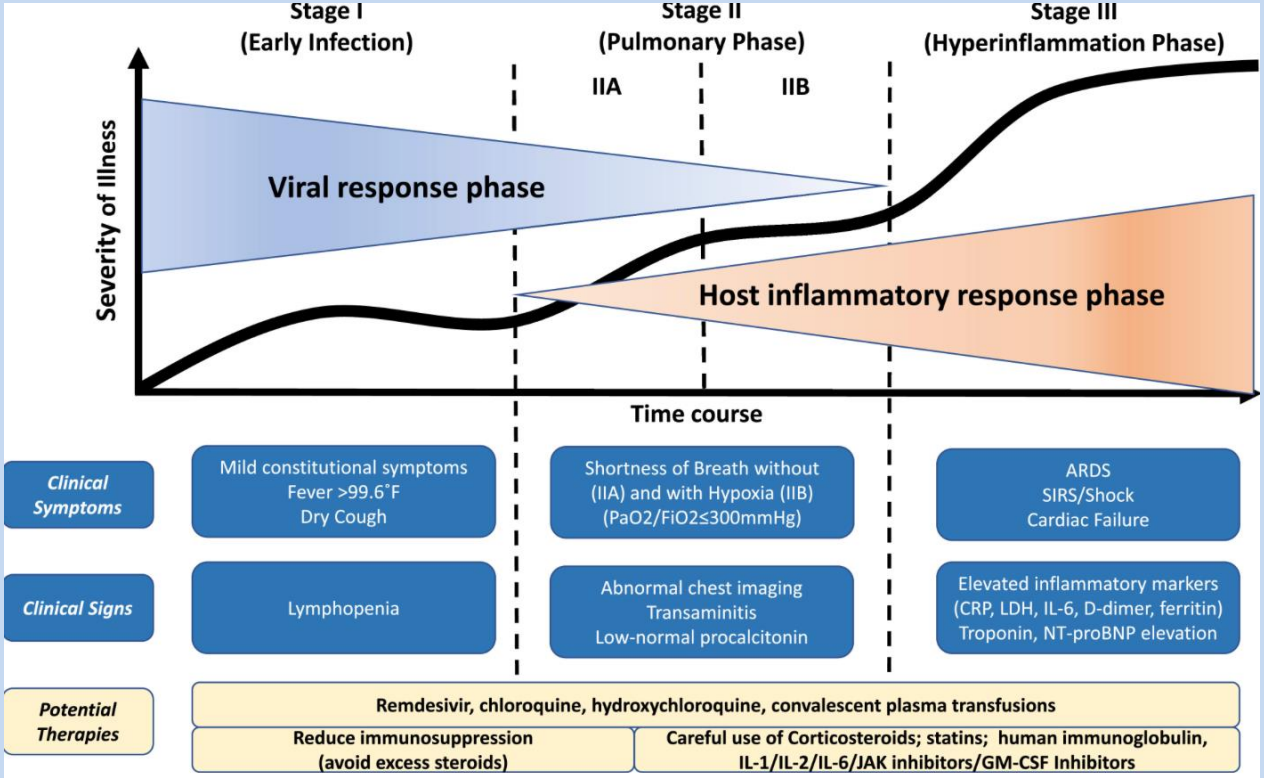
https://www.cdc.gov/mmwr/Novel_Coronavirus_Reports.html

Disease path



1. Viral infection in throat/nose (virus detected from day 2 to day 10)
2. Moves to upper lung - first immune reactions start to block lungs, reduce oxygen in blood.
3. Inflammation throughout the body - causes problems with major organs: lungs, kidneys, heart, blood clots, etc - Often needs intensive care: 20-40% mortality - higher in some groups. Cytokine storm.
4. Recovery - can take many months. Some damage not reversible. Long COVID even from mild disease.

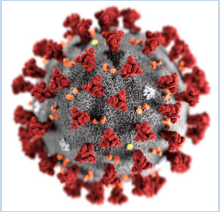
Pathogenesis: how disease progresses



Later expanded:
(i) other organ involvement.
(ii) coagulation and blood clots in lungs and other organs.
(iii) Much longer time to recover and return to normal ('long-COVID').

Ref: COVID-19 illness in native and immunosuppressed states: A clinical–therapeutic staging proposal. Siddiqi HK et al. DOI:10.1016/j.healun.2020.03.012. (20 March 2020).

Treatments?



Severe (ICU) - steroids (dexamethasone)
- anti-IL-6 (tocilizumab)

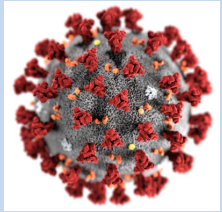
Mild/Moderate - remdesivir,
- monoclonal antibodies
- convalescent plasma ???

Outpatient - colchicine ???
- inhaled interferon :???

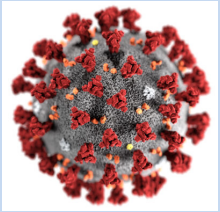
Many ongoing studies - ivermectin, aspirin, baracitimab etc

BUT NO EFFECT: Hydroxychloroquine, azithromycin, lopinavir/r etc

Prevention: airborne



Prevention: airborne

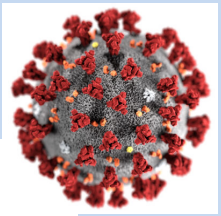


1. Masks
2. Social distancing - keeping 1-2 m apart.
3. Hygiene - hand-washing and not touching your face.
4. Indoors - highest risk if family member is positive.
5. Ventilation - Outdoors - minimum risk.

Infectious 2 days BEFORE symptoms (= pandemic)

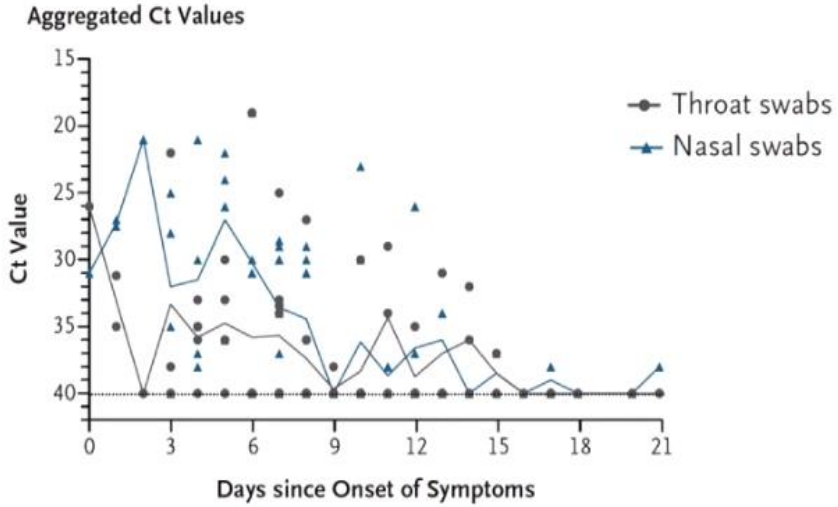
1 in 5 (20%) have no symptoms but are still infectious.

Transmission linked to viral load



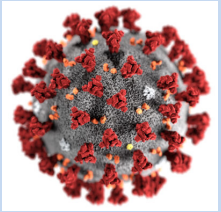
Viral Shedding Greatest At Time Symptoms Start

- SARS-CoV-2 viral loads in 17 symptomatic patients
- No data regarding duration of replication-competent virus shedding (e.g., culture)



Zou 2020, N Engl J Med; DOI: 10.1056/NEJMc2001737

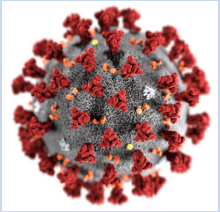
HIV and COVID-19



- Small, early studies - no clear impact of HIV.
- But 4 large recent studies report HIV positive people have higher risk of worse outcomes.
- Main difference: risk at lower age (50 vs 70)
- At any CD4 count, even on ART
- But… lower CD4 might increase risk

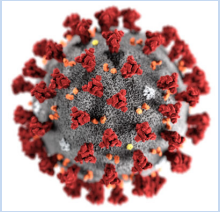
Therefore HIV+ people in the UK are priority 6 (out of 9) to get earlier COVID vaccine.

Vaccine Intro



1. Vaccines trick your body to produce strong immune responses to a virus or bacteria.
2. The body stores these so they can be quickly made if needed in the future.
3. COVID vaccine do NOT use whole or live virus - just fragment or copies of an outside protein.
4. Very high efficacy - >90% reductions, no deaths.
5. Very high safety - >160 million people globally.
6. Risk from COVID is serious and unpredictable.

Statistics



	Philippines	UK	Global
Population	109 m	67 m	7,800 m
Cases (diagnosed)	0.54 m	4 m	180 m
Cases yst	1955	13,000	–
Total deaths	11,507	117,128	2.3 million
Vaccinated	?	15 m	160 m

Sources (14 Feb2021: https://covid19.who.int/ and https://ourworldindata.org

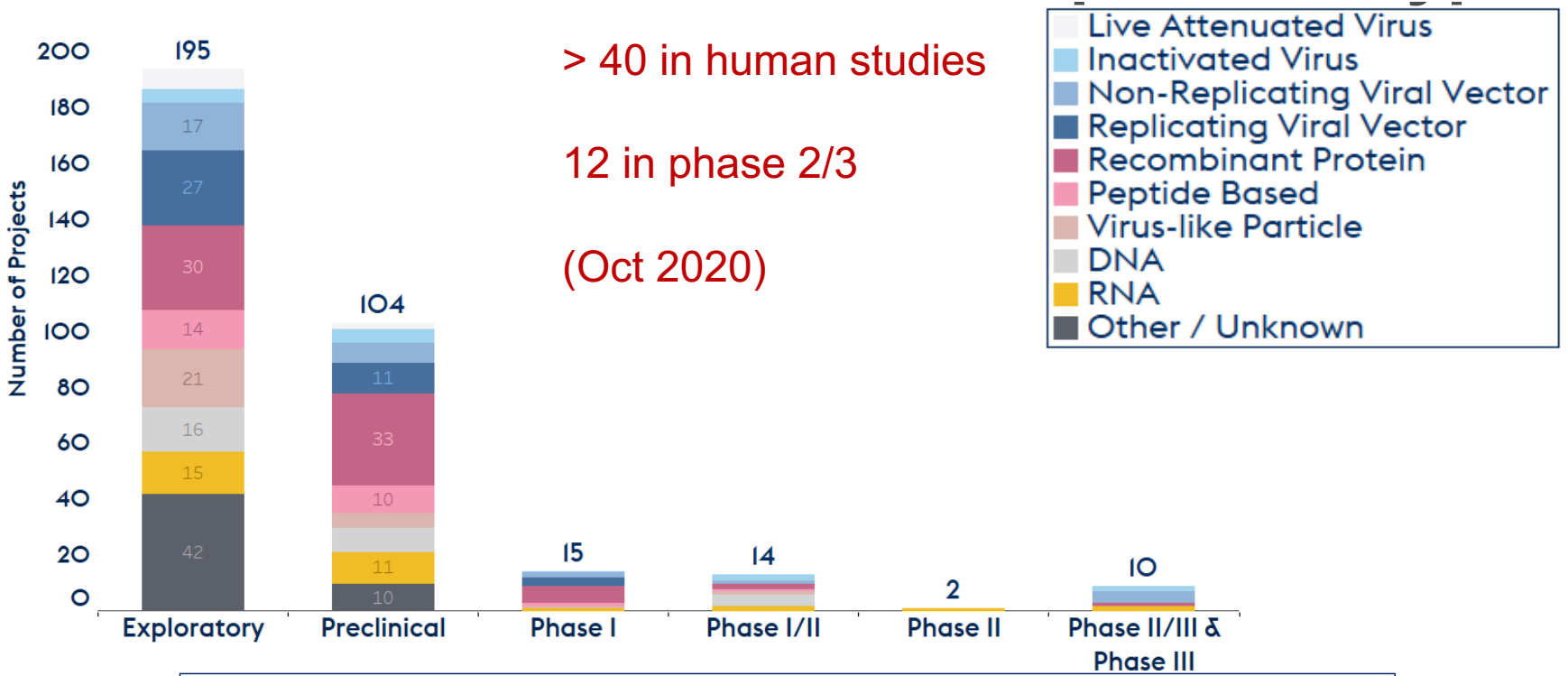
Current vaccines in use

Pfizer/BioNTech	mRNA	95%	$36-60
Moderna/NIH	mRNA	95%	$50-70
Oxford/AstraZeneca	virus vector	90%	$4-8
Sputnik (Russia)	virus vector	90%	?
CanSino (China)	virus vector	50%?	?

Janssen	virus vector	85% (1 dose)
Novavax	protein-based	90% UK, 63% SA

Slide: COVAX Oct 2020

>330 candidate compounds



> 40 in human studies

12 in phase 2/3

(Oct 2020)

- **Exploratory:** project has not started with in-vivo testing
- **Preclinical:** project started to test in-vivo / manufacture CTM but not yet started with testing on human
- Start of **clinical phases** is defined as first subject dosed

COVID variants

Unlike HIV, SARS changes much more slowly - but variants can be serious.

- B.1.1.7 - UK/Kent - transmission+ outcome+
- P.1 - Brazil - transmission+
- B.1.351 - S.Africa - **overcomes vaccines**

Not helpful to name after countries - quickly carried globally.

Second-generation vaccines already in trials.

Vaccine access

- Need universal global access.
- “Vaccine nationalism” - high income countries buying first stock plus next options.
- Many countries already have more stock and options (from different vaccines) to treat their population several times.
- Global access to low/middle income countries (LMIC) much lower (3-20% COVAX options are too low for herd immunity).

Questions

- Effective?
- Safe?
- Side effects?
- Safe for HIV+ and ART?

65 Q&As on vaccines from HIV+ people (UK-CAB)

i-base.info/qa/16330

Q&As

Why should I get a vaccine?

Can I wait for a COVID-19 vaccine if I am young with a low risk?

Is my risk high enough to need the vaccine?

How long will protection last?

Will it prevent infection or just becoming ill?

Were HIV positive people included in COVID-19 vaccine studies?

https://i-base.info/qa/16330

Q&As

Do I have to get the COVID-19 vaccine?

Are vaccines against COVID-19 safe?

What is the best/ideal interval between vaccine doses?

Am I protected after the first dose of a COVID-19 vaccine?

Are animal products in the vaccines? Are they Halal and Kosher?

What if I have a history of allergy reactions?

https://i-base.info/qa/16330

Q&As

I worry after Denvaxia in Philippines…

What if I have haemophilia/cancer/immune disease etc

Are there interactions with HIV meds? other meds?

Were black/brown/Asian people in the studies?

Will my viral load blip?

Can I have vaccine in pregnancy?

Are they safe for children?

Do I need to social distance after the vaccine?

https://i-base.info/qa/16330

Key access links

- Coalition for Epidemic Preparedness Innovations (CEPI) - 2017
- WHO - Access to COVID-19 Tools (ACT) Accelerator - initiative to coordinate international response.
- COVAX - Vaccine arm of ACT
- GAVI - (co-sponsor COVAX)
- People's Vaccine Alliance (coalition of organisations: Oxfam, UNAIDS)

Conclusion

- Unparalleled crisis and scientific response.
- High-income countries might soon return to low risk of COVID-19 (after terrible cost to life).
- Global access plan at least another year to reach 2 billion in low income countries.
- Huge volume of research and data - on vaccines, treatment, access etc.
- Long-term data still needed.
- Roll of community for education and support.

Additional slides

Results: Pfizer/BioNTech

- mid-Nov: top-line interim phase 3 results using BNT 162b2 vs placebo in ~43,500 adults (>16 years, 44% > 55 years) in 152 sites globally (130 in the US). Data from 36,000 pts.
- Dec10: Full results in NEJM & FDA documents.
- 95% efficacy: 162 vs 8 cases
- Severe COVID: 9 vs 1 case.
- Conditional approval: UK (2 Dec), US (12 Dec).
- No US funding. Requires ultra cold chain (UCC, minus 80° to transport etc). 96% to high income countries.

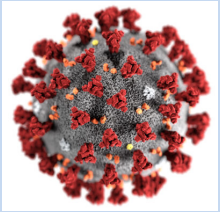
Results: Moderna/NIH

- mid-Nov: top-line interim phase 3 results using mRNA-1273 vs placebo in ~30,000 adults in 100 US sites.
- 94% efficacy: 90 vs 5 cases (FDA report: now 185 vs 11 cases): but 86% in >65 yo.
- Severe COVID: 30 vs 0 cases.
- FDA hearing: 17 Dec 2020 - documents online.
- Did have US funding. Requires cold chain (minus 20˚ to transport etc). 100% pledged to high-income countries.

Results: Oxford/Astra-Zeneca

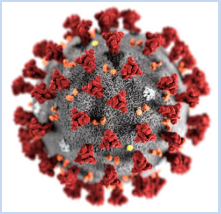
- 18 Nov: top-line interim phase 3 results using ChAdOx1 vs placebo in ~11,500 adults in UK and Brazil (+ some data from South Africa).
- 70% overall efficacy: but 90% in 2741 UK participants who used half-dose/full dose (error) vs 62% in those using two full doses. Includes transmission as an endpoint.
- >50% doses also separated by 12 weeks.
- Some US funding. No cold chain (+ 2-8˚ to transport etc). Lowest price ~ $4 a shot : 64% pledged to low income countries (mainly India).

mRNA approach



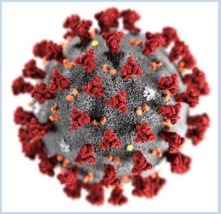
- In research for years - first aapproved for COVID.
- Pfizer/BioNTech and Moderna/NIH use mRNA.
- mRNA contains instructions for muscle cells to produce spike proteins on the surface of SARS-CoV-2.
- Delivered directly to cells.
- Produces an immune response against these proteins.
- The mRNA is then broken down (transient - like SnapChat).
- Produced in a lab and easy to scale up.
- $36 – 60 for two doses (in US)

viral vectors



- Viral vectors use an **inactivated harmless virus** (as a Trojan horse) to deliver proteins. When immune cells respond to the transporting virus they also respond to SARS-CoV-2.
- Oxford/AstraZeneca, CanSino and Janssen use different adenovirus (Chimp Ad, Ad5, Ad26 etc - common cold).
- Can produce both cellular responses (T cells) and antibody responses (B cells).
- Caution: prior exposure to carrier virus can reduce immune response - so a second booster dose might use different vaccine?
- Non-replicating - only produce antigen.
- Replicating - also produces new carrier virus.
- Oxford/AZ is $6-8 for two vaccines.

protein based



- Protein- based vaccines also get the body to respond to recombinant versions of a viral protein - for example the ‘spike’ for SARS-CoV-2.
- Novavax uses protein-based approach (also Sanofi/GSK).
- They also rely on a second component - an adjuvant - to prime the immune system to respond to the protein.
- Slower to develop but they can generate strong immune responses and have good safety record.
- Novavax studies in SA had HIV+ but lower response. Active against variants - not yet approved or priced.