Weekly COVID-19 Vaccine Updates

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Introduction

This document summarises the vaccine efficacy and effectiveness, the vaccine specifications, the vaccine development pipeline and the timeline for WHO review of the various COVID-19 vaccines in late phase development. The document is updated weekly.

- Vaccine efficacy refers to the performance of a vaccine in a controlled clinical trial (study) situation
- Vaccine effectiveness refers to the performance of a vaccine in a population under real-world conditions

Key messages:

- It is difficult to directly compare the results from the studies as:
    - there are multiple variations in the way the clinical trials and effectiveness studies were undertaken;
    - each used different outcomes;
    - and the definitions for outcomes (eg. for severity) also varied
- All COVID-19 vaccines in late phase development report high vaccine efficacy against severe COVID-19
- Pfizer/BioNTech and AstraZeneca both show high vaccine effectiveness in the UK and Israel where the B.1.1.7 (UK) variant is circulating

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Vaccine Specifications

	ASTRAZENECA	GAMALEYA	JOHNSON & JOHNSON	MODERNA	NOVAVAX	PFIZER/BIONTECH	SINOVAC
VACCINE TYPE	Viral vector (chimpanzee adenovirus ChAdOx1)	Viral vector (recombinant adenovirus types 5 and 26)	Viral vector (recombinant adenovirus type 26)	mRNA	Protein subunit	mRNA	Inactivated virus
Available Through Covax	✓	-	✓	-	✓	✓	-
Doses Required	2 doses: 8-12 weeks apart*	2 doses: 3 weeks apart	1 dose	2 doses: 28 days apart*	2 doses: 3 weeks apart	2 doses: 3 weeks apart*	2 doses: 2 weeks apart (Brazil data suggest higher efficacy with 3 weeks between doses)
Shipping, Storage & Presentation	Normal cold chain requirements (2-8°C); 10-dose vials	-18.5°C (liquid form); 2-8°C (dry form)	2-8°C; 5-dose vials	-25°C to -15°C; 10-dose vials	2-8°C; 10-dose vials	-80°C to -60°C; -25°C to -15°C for up to 2 weeks; 6-dose vials	2-8°C; Single-dose vials
Approval by a Stringent Regulatory Authority (SRA)	WHO EUL, EMA, TGA, MHRA	Under review by WHO SAGE	WHO EUL, EMA, FDA	EMA, FDA	Under review by WHO SAGE	WHO EUL, EMA, FDA, TGA, MHRA	Under review by WHO SAGE

*Based on WHO Strategic Advisory Group of Experts on Immunization (SAGE) recommendations

WHO EUL: WHO Emergency Use Listing
EMA: European Medicines Agency
FDA: Food and Drug Administration (USA)
TGA: Therapeutic Goods Administration (Australia)
MHRA: Medicines and Healthcare Products Regulatory

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COVID-19 Vaccine Efficacy

VACCINE	VACCINE EFFICACY				
	ASYMPTOMATIC	MILD - MODERATE-SEVERE	SEVERE	HOSPITALISATION/DEATH	OTHER OUTCOMES
AstraZeneca	2.0% (-50.7-36.2) Symptomatic and asymptomatic combined: 54.1% (44.7-61.9)[1]	-	100% (15 cases in the placebo group)[1]	Hospitalisation: 100% (9 cases in placebo group) [1]	Symptomatic infection: 66.7% (57.4-74.0) [1] Symptomatic infection using a SINGLE DOSE (22-90 days post-vaccination): 76.0% (59·3 to 85·9) [1] Efficacy higher with longer time interval between doses: 82.4% (2.7-91.7) at 12+ weeks, compared with 54.9% (32.7-69.7) at <6 weeks[1] Efficacy in elderly is similar to other age groups and modelling suggests that vaccinating those >65 years of age is a priority[2]
Gamaleya	-	Moderate-severe: 100% (20 cases in the placebo group)[3]	-	-	Symptomatic infection: 91.6% (85·6–95·2)[3]
Johnson & Johnson	-	All sites: 66.1% (55.0-74.8) US: 72.0% (58.2-81.7) Latin America: 61.0% (46.9-71.8) South Africa: 64.0% (41.2-78.7)[4]	85.4% (54.2-96.9)[4]	100% (7 deaths in placebo group)[4]	Preserved for all ages and virus variants including B1.351[4]
Moderna	-	-	100% (30 cases in placebo group)[5]	100% (1 death in placebo group)[5]	Symptomatic infection: 94.1% (89.3-96.8)[5]
Novavax	-	-	-	-	Symptomatic infection: 89.3% (75.2-95.4)[6] (not peer reviewed)
Pfizer/BioNTech	-	-	88.9% (20.1–99.7)[7]	-	Symptomatic infection: 94.6% (89.9–97.3)[7]
Sinovac	-	-	-	-	Symptomatic infection: Brazil: 50.4%; Indonesia: 65.3%: Turkey 91.3% (not peer reviewed)

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COVID-19 Vaccine Effectiveness

VACCINE	SEVERE	HOSPITALISATION / DEATH	OTHER OUTCOMES
AstraZeneca	-	SINGLE DOSE in Scotland: 94% (73-99)[8]	-
Pfizer/BioNTech	Israel: 92% (75-100)[9]	SINGLE DOSE in Scotland: 85% (76-91)[8] England: 86% (76-97) 7 days after 2 doses 72% (58-86) 21 days after 1 dose[10]	Symptomatic infection in Israel: 94% (87-98)[9] Documented infection in Israel: 92% (88-95)[9]

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Vaccine efficacy against variants

Refer to previous table for vaccine effectiveness results for the Pfizer/BioNTech vaccine in Scotland, England and Israel, where all locations had predominant B.1.1.7 circulation.

VACCINE	VACCINE EFFICACY			
	B.1.1.7 (UK) VARIANT	B1.351 501Y.V2 (SOUTH AFRICA) VARIANT		B.1.1.28.P1 AND B.1.1.28.P2 (BRAZIL) VARIANTS
	MILD/MODERATE	MILD/MODERATE	SEVERE	SEVERE
AstraZeneca	74.6% (41.6-88.9) (84% (70.7-91.4) against wild variant in UK)[11]	10.4% (−76.8 to 54.8)[12]	Study underway [4]	-
Johnson & Johnson	-	-	Moderate to severe/critical: 64.0% (41.2-78.7) Severe/critical: 81.7% (46.2-95.4)[4]	Moderate to severe/critical: 68.1% (48.8-80.7) Severe/critical: 87.6% (7.8-99.7)[4]
Novavax	85.6%[6] (not peer reviewed)	60.0% (19.9-80.1) against mild, moderate and severe COVID-19 in HIV-negative[6] 49.4% (6.1-72.8) overall against mild, moderate and severe COVID-19[6] (not peer reviewed)	-	-

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Who can be vaccinated based on WHO SAGE recommendations?

So far, WHO SAGE have reviewed AstraZeneca, Moderna and Pfizer/BioNTech and have made recommendations for use.

	ASTRAZENECA	MODERNA	PFIZER/BIONTECH	JOHNSON & JOHNSON
Minumum Age	18 years	18 years	16 years	16 years
Maximum Age (SAGE WHO)	None	None	None	None
Pregnancy	Yes if high priority group & approved by health provider	Yes if high priority group & approved by health provider	Yes if high priority group & approved by health provider	Yes if high priority group & approved by health provider
Breastfeeding	Yes if high priority group	Yes if high priority group	Yes if high priority group	Yes if high priority group
Immunocompromised Including HIV	✔	✔	✔	✔
People Previously Infected by SARS-CoV-2 (PCR Confirmed)	Yes, although that person may choose to delay vaccination by 6 months	Yes, although that person may choose to delay vaccination by 6 months	Yes, although that person may choose to delay vaccination by 6 months	Yes, although that person may choose to delay vaccination by 6 months
History of Anaphylaxis (Severe Allergy)	Yes (unless the allergy is to the vaccine or its components)	Yes (unless the allergy is to the vaccine or its components)	Yes (unless the allergy is to the vaccine or its components)	Yes (unless the allergy is to the vaccine or its components)

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Vaccine development pipeline

WHO has recommended that vaccines adopted by countries have WHO SAGE EUL and/or Stringent Regulatory Approval.

VACCINE TYPE	NUMBER OF VACCINE CANDIDATES AT EACH PHASE OF DEVELOPMENT				
	PRE-CLINICAL	PHASE I/II	PHASE III	PHASE IV	IN USE*
RNA	29	5	1	2	2 Pfizer/BioNTech, Moderna
DNA	16	8	2	0	0
Vector (non-replicating)	26	7	3	1	4 CanSino, Gamaleya, Johnson & Johnson, AstraZeneca
Vector (replicating)	18	4	0	0	0
Inactivated	9	5	5	1	5 Sinopharm/BIBP, Bharat, Chumakov, Sinovac, Sinopharm/WIBP
Live-attenuated	3	1	0	0	0
Protein subunit	73	20	4	0	1 Vector institute
Virus-like particle	19	2	1	0	0
Other/unknown	34	5	0	0	0

*Not all vaccines in use have SRA (as recognised by WHO) approval (see Vaccine specifications table and WHO SAGE Emergency Use Listing and prequalification timeline for approval status of vaccines).

Source: London School of Hygiene and Tropical Medicine COVID-19 vaccine tracker.

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WHO SAGE Emergency Use Listing and prequalification timeline

MANUFACTURER	NAME OF VACCINE	PLATFORM	STATUS OF ASSESSMENT	ANTICIPATED DECISION DATE
Pfizer/BioNTech	BNT162b2/COMIRNATY Tozinameran (INN)	mRNA	Final decision made	Authorised 31/12/20
AstraZeneca	AZD1222	Adenoviral vector	Final decision made	Authorised 15/02/21
Serum Institute of India	Covishield (ChAdOx1_nCoV19)	Adenoviral vector	Final decision made	Authorised 15/02/21
Sinopharm/Beijing Institute of Biological Products (BIBP)	SARS-CoV-2 Vaccine (Vero Cell), Inactivated (InCoV)	Inactivated	In progress	Earliest March
Sinovac	SARS-CoV-2 Vaccine (Vero Cell), Inactivated	Inactivated	Additional submission required	Earliest March
Moderna	mRNA-1273	mRNA	In progress	Earliest March
Johnson & Johnson	Ad26.COV2.S	Adenoviral vector	Final decision made	Authorised 13/03/21
The Gamaleya National Center	Sputnik V	Adenoviral vector	Clinical review ongoing	Will be determined when chemistry, manufacturing and control (CMC) data are submitted
CanSinoBIO	Ad5-nCoV	Adenoviral vector	Rolling data assessment to start in April 2021	-
Novavax	NVX-CoV2373	Protein subunit	Expression of interest submitted 23/02/21. Pre-submission meetings required prior to commencing assessment	-

Source: WHO Guidance Document: Status of COVID-19 Vaccines within WHO EUL/PQ evaluation process (1st March 2021)

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References

1. Voysey M, Costa Clemens SA, Madhi SA, et al. Single-dose administration and the influence of the timing of the booster dose on immunogenicity and efficacy of ChAdOx1 nCoV-19 (AZD1222) vaccine: a pooled analysis of four randomised trials. Lancet. 2021;397(10277):881-891. doi:10.1016/S0140-6736(21)00432-3
2. Bubar KM, Reinholt K, Kissler SM, et al. Model-informed COVID-19 vaccine prioritization strategies by age and serostatus. Science (80-). 2021. doi:10.1126/science.abe6959
3. Logunov DY, Dolzhikova I V, Shcheblyakov D V, et al. Safety and efficacy of an rAd26 and rAd5 vector-based heterologous prime-boost COVID-19 vaccine. Lancet. 2021.
4. FDA Briefing Document Janssen Ad26.COV2.S Vaccine for the Prevention of COVID-19. Vaccines and Related Biological Products Advisory Committee Meeting February 26, 2021.
5. Baden LR, El Sahly HM, Essink B, et al. Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine. N Engl J Med. 2021. doi:10.1056/nejmoa2035389
6. Novavax COVID-19 Vaccine Demonstrates 89.3% Efficacy in UK Phase 3 Trial. Novavax press release 28 January 2021.
7. World Health Organisation (WHO). Background Document on the MRNA Vaccine BNT162b2 (Pfizer-BioNTech) against COVID-19.; 2021. https://www.who.int/publications/i/item/background-document-on-mrna-vaccine-bnt162b2-(pfizer-biontech)-against-covid-19.
8. Vasileiou E, Simpson CR, Robertson C, et al. Effectiveness of First Dose of COVID-19 Vaccines Against Hospital Admissions in Scotland: National Prospective Cohort Study of 5.4 Million People. SSRN Electron J. 2021. doi:10.2139/ssrn.3789264
9. Dagan N, Barda N, Kepten E, et al. BNT162b2 mRNA Covid-19 Vaccine in a Nationwide Mass Vaccination Setting. N Engl J Med. February 2021:NEJMoa2101765. doi:10.1056/NEJMoa2101765
10. Hall VJ, Foulkes S, Saei A, et al. Effectiveness of BNT162b2 mRNA Vaccine Against Infection and COVID-19 Vaccine Coverage in Healthcare Workers in England, Multicentre Prospective Cohort Study (the SIREN Study). SSRN Electron J. 2021. doi:10.2139/ssrn.3790399
11. Emary KRW, Golubchik T, Aley PK, et al. Efficacy of ChAdOx1 nCoV-19 (AZD1222) Vaccine Against SARS-CoV-2 VOC 202012/01 (B.1.1.7). SSRN Electron J. 2021. doi:10.2139/ssrn.3779160
12. Madhi SA, Baillie V, Cutland CL, et al. Safety and efficacy of the ChAdOx1 nCoV-19 (AZD1222) Covid-19 vaccine against the B.1.351 variant in South Africa. Alex Sigal. 2021.

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