Int J Adv Life Sci Res. Volume 4(4) 01-06
https://doi.org/10.31632/ijalsr.2021.v04i04.001

International Journal of Advancement in Life Sciences Research

Online ISSN: 2581-4877

journal homepage http://ijalsr.org

Review Article

Juxtaposition on Discrete Covid-19 Vaccines: For Rudimentary and Pivotal Cognizance

Pankaj Kisan Chatki*[1], Sana Tabassum[2]

[1]*Analytical Research and Development Department, Slayback Pharma India LLP, Hyderabad, Telangana, India.*
[2]*Pharmaceutical Analysis and Quality Assurance, Jawaharlal Nehru Technological University, Hyderabad, Telangana, India.*

**Correspondence E-mail : pankajchatki22@gmail.com*

Abstract

This paper accomplishes an introduction to diverse types of vaccines against coronavirus. Many countries, researchers and pharmaceutical companies worked abundantly so that they could discover a safe and efficacious vaccine against corona virus. Thereby, vaccines were discovered on a fast track mode and companies registered for an emergency use authorization, so that it would be helpful to society during pandemic. Manufacturers and various regulatory units are working tirelessly to develop, manufacture and deploy safe and effective vaccines. Scanty information is added on divergent COVID vaccines encompassing information related to the developer, vaccine class, description, efficacy rate, dosing, storage, permitted age groups and authorizations issued.

Keywords: *Coronavirus, Vaccine, Vaccine Class, Efficacy, Dosing and Authorizations.*

Introduction

The novel corona virus-SARS-CoV-2 has led to the infectious disease COVID-19. It is a disease which mostly affects the respiratory system. Based on the severity of disease the symptoms vary from mild to severe illness. Symptoms appear within 2-14 days after the exposure of corona virus. Symptoms comprises of fever, cold, cough, chills, dyspnea, body ache, dysgeusia, anosmia, throat infections, diarrhoea etc. In this long run of the pandemic, vaccine is essential. (Baden *et al*., 2021; Pedro Folegatti *et al.,* 2020).

Review

Distinct types of vaccines against coronavirus are listed below. The disparate vaccine class includes encapsulated mRNA, viral vector, inactivated virus, virus like particle and Plasmid DNA. Vaccines general names and trade names, developer name, and vaccine class related particulars are provided. Based on the published clinical trials data the number of doses to be administered with respective frequencies is given. Below provided information on the number of doses to be taken or administered and frequency is universal. Developers and manufacturers, based on the vaccines stock availability accordingly framed the dosing frequency, covering the safety and efficacy facets. A description is given appertaining to active and inactive ingredients involved in the respective vaccine. The storage conditions to be followed for a vaccine are given. Based on the data announced by the developer, efficacy of each listed vaccine is specified. Small information is added on the effectiveness of vaccines against other strains as per the declarations of the

developer. Information on the major regulatory agencies, which approved Emergency Use Authorizations for the respective vaccine, is incorporated (Pfizer-BioNTech 2021; Sinopharm WHO 2021).

Results

Table : Juxtaposition on COVID-19 Vaccines

Vaccine Name (Trade Names & Other Names) & Developed by	Vaccine Class	Brief Description of Active Ingredient	Inactive Ingredients/ Excipients Composition	Dosing and Administration Related Information	Efficacy Rate after complete doses	Storage	Major Authorizations and (References)
BNT162b2/ Comirnaty/ Tozinameran Pfizer-BioNTech	Encapsulated mRNA	➢ 0.3 mL dose comprise of 30 mcg of a nucleoside mRNA encoded with glycoprotein-viral spike of SARS-CoV-2. ➢ Prior to use to form the vaccine, the vial must be diluted with sterile 0.9 % Sodium chloride- 1.8 mL .	➢ Lipids contains= 0.43 mg of (4- hydroxybutyl) azanediyl) bis (hexane-6, 1 diyl)bis(2-hexyl decanoate), 0.09 mg of 1,2-distearoyl-sn-glycero-3 phosphocholine, 0.2 mg of cholesterol 0.05 mg of 2 [(polyethylene glycol)-2000]-N,N-di tetradecyl acetamide.; ➢ Monobasic Potassium phosphate-0.01 mg; ➢ Sodium Chloride-0.36 mg; ➢ Dibasic sodium phosphate dihydrate-0.07 mg; ➢ Potassium chloride-0.01 mg; ➢ 6 mg of sucrose. ➢ 0.09 % of Sterile Sodium chloride used as diluent. ➢ It contains no preservatives.	➢ V = 0.3 mL ➢ N = 2 doses ➢ F = 21 days apart (i.e., 3 weeks apart) ➢ DF = Frozen Suspension ➢ ROA = I.M.	➢ Overall efficacy 95 % against Original Strain ➢ 79 % effective against delta variant.	➢ Frozen Vials: Before use frozen vials to be stored at temperature of -90 ºC to – 60 ºC till the expiry date. Can be stored at - 25 ºC to - 25 ºC for upto 2 weeks. ➢ Thawed Vials can be stored at 2ºC to 8ºC for up to 5 days. It can be stored at Room Temperature, for 30 minutes. ➢ Undiluted vials can be stored at room temperature upto 2hrs. ➢ Diluted Vials to be placed at 2°C to 25°C and should be used within 6 hrs. from dilution time.	➢ FDA and WHO issued EUA. ➢ PAG = 12 years and older ➢ Aiming to implement booster dose for emerging variant. (Fernando Polack *et al*., 2021 ; Edward W *et al*., 2020; Pfizer-BioNTech 2021)
mRNA-1273/ Elasomeran/ Spikevax Moderna	Encapsulated mRNA	➢ The vaccine is designed such that each 0.5 mL comprises of nucleoside modified mRNA(100 mcg) encoded with spike glycoprotein of SARS-CoV-2(pre fusion stabilized form)	➢ It contains lipid content of 1.93 mg which includes PEG-2000, dimyristoyl glycerol, SM-102, 1,2-distearoyl-sn glycero-3-phospho choline and cholesterol; ➢ Tromethamine HCl (1.18 mg); ➢ 0.043 mg of Acetic acid; ➢ Tromethamine (0.31 mg); ➢ 0.20 mg Sodium acetate 3H2O; ➢ 43.5 mg of Sucrose. ➢ Contains no preservatives.	➢ V = 0.5 mL ➢ N = 2 doses ➢ F = 1 month apart. ➢ DF= Frozen suspension ➢ ROA = I.M.	➢ Overall efficacy proved to be 94.1 % (OS)	➢ Multiple-dose vials - stored frozen between -50ºC to -15ºC. ➢ It must be not stored at or below -50 ºC and on dry ice. ➢ Can be stored at 2° to 8°C upto 30 days. ➢ Can be stored at 8° to 25°C till 24 hrs only. ➢ After dose withdrawal to be placed within 2° to 25°C. ➢ After the puncture to be discarded after 12 hrs. ➢ Once thawed, not to be refreeze. ➢ Thawed vials can be placed at room light conditions.	➢ US FDA and WHO issued EUA. ➢ PAG = Authorized for 12 years and older (Baden *et al*., 2021; Lisa Jackson *et al*., 2020; Moderna Vaccine- Fact Sheet 2021).
Covishield/ ChAdOx1-S/ AZD1222/ Vaxzevria Oxford University and AstraZeneca.	Viral Vector	➢ Vaccine is designed such that it constitutes of recombinant replication of adenovirus virus(from Chimpanzee) encoded with the spike glycoprotein. ➢ It is produced by rDNA technology by genetically modifying the human embryonic cells.	➢ Inactive ingredients includes MgCl hexahydrate, Disodium EDTA, Histidine, Histidine HCl monohydrate, Ethanol; Polysorbate 80; NaCl, Sucrose; and Sterile water. ➢ It is preservative free.	➢ V = 0.5 mL ➢ N = 2 doses ➢ F = Between 4 to 12 weeks apart, as per WHO 8 to 12 weeks apart. ➢ DF = Solution ➢ ROA = I.M.	➢ Overall efficacy 82% (OS) ➢ 61% effective against delta variant.	➢ Multidose unopened vials to be stored at refrigerator conditions i.e., at +2 to +8ºC for upto 6 months. ➢ Not to be freezed. ➢ Opened vials can be stored at room temperature(for 6hrs.); or between +2 to +8ºC (for 48 hrs.).No reconstitution is required.	➢ EMA, WHO issued EUA. ➢ PAG = Authorized for 18 years and older (Merryn a, b *et al*., 2021; Pedro Folegatti *et al*., 2020; Astrazeneca Canada Inc. 2021; EMA Vaxzevria 2021; EMA AstraZeneca 2021).
JNJ-78436735 Also known as, Ad26.COV2. S. Janssen Vaccines-Johnson and Johnson	Viral Vector	➢ This vaccine carries replicated incompetent recombinant Adenovirus 26, expressing spike protein with stabilized conformation. ➢ Each dose is formulated such that it contains 5×1010 virus particles.	➢ Inactive ingredients comprises of 2 mg of Trisodium .2 H2O; 2 mg of Ethanol; 0.14 mg of Citric acid H2O; 2 mg of NaCl; 0.16 mg of Polysorbate-80 and 25.5 mg of 2-hydroxypropyl-β-cyclodextrin. It is preservative free.	➢ V = 0.5 mL ➢ N = 1 dose ➢ DF= Suspension ➢ ROA= I.M.	➢ 66 % effective against preventing symptomatic COVID-19. ➢ 85 % effective for severe conditions. ➢ 100 % prevents	➢ If stored at -20°C (Stable for 2yrs.) , and if stored at refrigeration temperatures of 2° to 8°C-stable for 4 and half months. ➢ No need of dilution.	➢ US FDA and EMA issued EUA. ➢ PAG = Authorized for 18 years and older. ➢ Based on clinical trials it is evident that a single shot of this vaccine generated strong effectiveness even with the Delta

					hospitalizatio n or death.		variant and viral variants of corona virus. (Jerald a, b *et al.*, 2021; Janssen COVID-19 Vaccine 2021).
Sputnik V Also known as Gam-Covid Vac. Gamaleya-Research Institute of Epidemiology & Microbiology	It is a Combined Viral Vector based heterologous vaccine (Adenovirus viral vector are rAd26 and rAd5)	➢ Manufactured by biotechnology, without utilizing SARS-CoV-2 virus. ➢ Component I incorporates recombinant adenoviral vector of a serotype 26 human adenovirus with a protein S gene of SARS-CoV-2. ➢ Component II incorporates serotype 5 human adenoviral vector with a protein S gene of SARS-CoV-2. ➢ Per dose=each component includes (1.0±0.5) x 1011 particles.	Component I & II: ➢ 1.21 mg of Tris-(hydroxy methyl) amino methane; ➢ 19 µg of Disodium salt of 2H2O; ➢ 2.19 mg of Sodium chloride; ➢ 25 mg of Sucrose; ➢ 102 µg of MgCl hexahydrate; ➢ 250 µg of Polysorbate 80; ➢ 2.5 µL of Ethanol; ➢ Sterile Water	➢ V = 0.5 mL ➢ N = 2 doses ➢ F = 3 weeks apart. Dose 1 (i.e., Day 0)-0.5 mL of component-I. and ➢ Dose 2 (i.e., on Day 21)- 0.5mL of component-II ➢ DF = Solution ➢ ROA = I.M.	➢ 91.6 % effective against Coronavirus (OS) ➢ 83% effective against delta variant	➢ Store at a temperature NMT -18°C in a dark place. ➢ Thawed vial to be used within 2 hrs. ➢ No need of dilution. ➢ Not to be re-freezed, once the vial is thawed.	➢ US FDA and EMA issued EUA. ➢ PAG = Authorized for 18 years and older. (Denis Logunov *et al.*,2020; Denis Logunov *et al.*,2020; Ministry of Health - Russian Federation 2020; Dr. Reddy's SPUTNIK V Gam-COVID-Vac 2021).
Covaxin; BBV152 Bharat Biotech and ICMR-Indian Council of Medical Research	Whole Virus-Inactivated	➢ Single solitary dose comprise of 6 µg of inactivated SARS-CoV-2 antigen-whole virion (Strain: NIV-2020-770) and it is incorporated with a 7/8 agonist molecule adsorbed on to alum-toll like receptor	➢ Inactive ingredients include 15 µg of TLR 7/8 imidazo quinolinone agonist ; 250 µg of gel-Aluminum hydroxide ➢ 2.5 mg of 2- phenoxy ethanol and 0.5 mL saline Phosphate buffer.	➢ V = 0.5 mL ➢ N = 2 doses ➢ F = 28 days apart ➢ DF = Solution ➢ ROA = I.M.	➢ 93.4 % (OS) effective for severe cases. ➢ Overall vaccine efficacy is = 77.8% against symptomatic infections. ➢ 65.2 % protection against infection with delta variant.	➢ To be stored at +2° to +8 °C. ➢ Not to be freezed, if done so to be discarded. ➢ Opened vials must be used within 6 hrs, if kept at 2 to 8 °C.	➢ CDSCO issued EUA. ➢ PAG = Authorized for 18 years and older. ➢ Clinical trials: Ongoing for age group 2-12 years. ➢ Efficacy data demonstrates protection against delta variant. ➢ Proven to neutralize alpha, beta, gamma, zeta delta, kappa variant. (Raches a, b *et al.*, 2021; Bharat Biotech International Ltd 2021).
CoronaVac SinoVac Biotech Ltd.	Inactivated Virus	➢ Each dose (0.5mL) contains 600 SU of inactivated corona virus as antigen. ➢ The virus strain used is CZ02, this is inoculated into Vero cell of African green monkey kidney cell, which is then inactivated and finally adsorbed by aluminum hydroxide.	➢ Inactive ingredients contains NaCl, Disodium hydrogen 12 H20, Na dihydrogen phosphate H20, Al hydroxide (as adjuvant); and sterile Water. ➢ It is free of preservatives.	➢ V = 0.5 mL ➢ N = 2 doses ➢ F = 14-28 days apart ➢ DF = Suspension ➢ ROA = I.M.	➢ Overall efficacy 83.5 %. ➢ 65.9% effective for the prevention. ➢ 87.5 % effective for the prevention of hospitalizatio n. ➢ 90.3% effective against ICU circumstance s. ➢ 86.3% for the prevention of death.	➢ It must be stored at a temperature of +2-8 °C and must be protected from light.	➢ WHO issued EUA. ➢ PAG = Authorized for 18 years and older. (Alejandro *et al.*, 2021; Mine Durusu *et al.*, 2021; Sinovac Life Sciences 2021).
BBIBP-CorV Sinopharm's-Beijing Institute of Biological Pdts Co.	Inactivated Virus	➢ It is formulated as vero cell based-adjuvanted with aluminium hydroxide-adjuvanted and β-propiolactone. ➢ It is an inactivated vaccine based on the strain-19nCOV-CDC-TAN-HB02 (HB02 strain). ➢ Each dose is contributes to 6.5 U or 4 µg of inactivated virus antigen.	➢ Inactive composition includes Al. hydroxide adjuvant in phosphate buffered saline (PBS). ➢ PBS contains disodium hydrogen phosphate 12 H20, NaCl and Na dihydrogen phosphate.	➢ V = 0.5 mL ➢ N = 2 doses ➢ DF = Suspension ➢ F = 21 days apart ➢ ROA = I.M.	➢ 74% against asymptomati c and symptomatic cases. ➢ Nearly 100% against severe conditions.	➢ To be stored at 2–8 °C, protected from light. ➢ Not to be frozen.	➢ WHO issued EUA. ➢ General PAG = Authorized for 18 to 60 years. UAE and China approved the EUA for 3-17 aged adolescents and for children (Sinopharm WHO 2021; Shengli *et al.*, 2020).
Covovax, also known as NVX-CoV2373 Novavax, Coali	Virus like particle	➢ Per dose formulated such that it incorporates a recombinant nanoparticle spike	➢ Inactive substances are NaCl, Dibasic 7 H2O, Sodium phosphate, monobasic H2O, Monobasic Potassium Phosphate,	➢ V = 0.5 mL ➢ N = 2 doses ➢ F = 21 days apart ➢ DF =	➢ Overall efficacy of 89.7% after the final dose.	➢ Can be stored for 6 months if stored between 2–8 °C and for 2 yrs. If stored at–20 °C.	➢ EMA issued EUA. ➢ General PAG = Authorized for 18 to 60 years. (Paul Heath *et*

tion for Epidemic Preparedness Innovations		protein of 5 µg and Matrix-M adjuvant of 50 µg	Polysorbate 80, KCl, Water; NaOH, matrix adjuvant and HCl. ➢ It does not contain any preservatives.	Suspension ➢ ROA =I.M.	➢ 86.3% against the variant of B.1.1.7. ➢ 96.4% w.r.t non-B.1.1.7 variants.		al.,2021; Novavax 2021).
ZyCoV-D Zydus Cadila(Cadila Healthcare Limited)	World's first Plasmid DNA Vaccine	➢ Vaccine formulated such that, the Plasmid DNA incorporates of the spike S gene corona virus(SARS Co-V) accompanying gene coding for generation of a signal peptide. ➢ The spike S comprised of receptor which binds to the human ACE-angiotensin converting Enzyme 2 receptor. ➢ During clinical study it was confirmed that this vaccine mediates the entry of virus inside the cell. ➢ Study doses includes intradermal route at 1mg , 2 mg dose.	Developer has not published or revealed any information related to the inactive ingredients still.	➢ Dose = Every dose is 2 mg split into two parts, administered at two separate sites. ➢ N = 3 doses ➢ F = Day 0, 28th , 56th day ➢ DF = Suspension ➢ ROA = It is administered using a needle free applicator- The PharmaJet. This type of administration is confirmed to as painless intradermal route.	➢ 66.6% efficacious against symptomatic cases. ➢ 100% effective for moderate to severe disease ➢ Efficacy results data is reported for interim analysis of its phase 3 study trial.	➢ During study it was stored at 2-8 ° C. ➢ But even when stored at 25 °C it was found to be stable for at least 3 months.	➢ DCGI issued EUA. ➢ Phase-I and II trials showed its safety in all age groups. ➢ To be approved PAG = Authorized for adults age group and adolescents 12-18 years age group. (Taufik *et al.*, 2021; Ayan *et al.*, 2021; Zydus Cadila 2021).

List of Abbreviations

V = Dosing Volume;
N = Number of doses;
F = Dose frequency or dosing interval between two subsequent doses;
DF = Dosage Form;
ROA = Route of Administration;
mg = Milligram;
DNA = Deoxyribonucleic acid;
I.M. = Intramuscular Injection;
U= Unit;
SU = Sub-units;
R = Brief Method of Reconstitution;
CDSCO = Central Drugs Standard Control Organisation
mL = Milliliter;
SARS-CoV-2 = Severe Acute Respiratory Syndrome Coronavirus ;
OS= Original Strain;
EUA = Emergency Use Authorization;
US FDA = United States Food and Drug Administration;
PAG = Permitted Age group for usage;
mRNA = Messenger Ribonucleic Acid;
COVID = Coronavirus Disease.

Discussion

Many divergent laboratories and Pharma companies have developed effective vaccines against COVID-19. The strive done by researchers and regulatory agencies is boundless. Though, throughout the world pandemic was there, they didn't lose their hope and made eminent efforts in developing and manufacturing vaccines. Continuous attempts are being made by developers to develop vaccine that could be effective against all strains of corona virus. After the defined doses series, now even booster shots of vaccines are also being given for certain age groups. Majority of vaccines are administered via intramuscular injection. Many of the vaccine candidates have surpassed Phase-III clinical trials. Apart from efficacy rate of vaccines, safety of vaccines is also equally given significant and scrutinized. Even though, vaccines have stabilized the mortality rates, we as humans also must adhere to Covid protocols to the extent possible, so that we can avoid another pandemic situation. Still studies are going on regarding administration of vaccines to infants, adolescents and pregnant womens. Ultimately the global endeavour to generate safe and effective vaccines is bearing fruit**.**

Conclusion

Various mentioned vaccines against coronavirus were developed on fast track modes after the outbreak of coronavirus. Every respective vaccine was subjected for estimating the safety and efficacy. Upon the approvals of emergency use authorizations, developed vaccines. Many of the vaccines are now being administered to humans in various countries. Existing data and facts suggests that the vaccines discovered may be contributory in saving individuals and even for diminishing the disease expansion during pandemic and post-pandemic. This article assists various researchers, manufacturers, and scientists to crisply study on various types of COVID vaccines. Provided juxtaposition, aids the reader to perceive about the developer, class of vaccine, active and inactive ingredients involved, efficacy, storage conditions, permitted age groups and authorizations approved on various types of vaccines against coronavirus.

Acknowledgments

The authors are thankful to the authorities of Slayback Pharma India LLP and Jawaharlal Nehru Technological University, Hyderabad, Telangana, India for giving necessary permission to carry over the review work.

Conflicts of Interest

The authors declare no conflict of interest.

References

Alejandro, J., Eduardo Undurraga, A,, Cecilia, González., Fabio, P., Tomás, F., et al. (2021). Effectiveness of an Inactivated SARS-CoV-2 Vaccine in Chile. The New England Journal of Medicine, 385, 875-884. https://doi.org/10.1056/NEJMoa2107715

Astrazeneca Canada Inc. (2021, September 15). Product Monograph Including Patient Medication Information Astrazeneca Covid-19 Vaccine (Chadox1-S [Recombinant]). Retrieved September 20, 2021, from https://covid-vaccine.canada.ca/info/pdf/astrazeneca-covid-19-vaccine-pm-en.pdf

Ayan, D., Chozhavel Rajanathan, T. M., Harish, C., Hari Pericherla, P. R., Sanjeev, K., et al. (2021). Immunogenic potential of DNA vaccine candidate, ZyCoV-D against SARS-CoV-2 in animal models. Vaccine, 39 (30), 4108-4116. https://doi.org/10.1016/j.vaccine.2021.05.098

Baden, L. R., El Sahly, H. M., Essink, B,, Kotloff, K., Frey, S., Novak, R., et al. (2021). Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine. The New England Journal of Medicine, 384(5), 403-416. https://doi.org/10.1056/NEJMoa2035389

Bharat Biotech International Ltd.(2021, January 15). Covaxin- Summary of Product Characteristics. Retrieved August 29, 2021, from https://cdsco.gov.in/opencms/export/sites/CDSCO_WEB/en/COVAXIN-SMPC_-BBIL.pdf

Denis Logunov, Y., Inna Dolzhikova, V., Olga Zubkova, V., Amir, Tukhvatullin I., Dmitry Shcheblyakov, V., et al. (2020). Safety and immunogenicity of an rAd26 and rAd5 vector-based heterologous prime-boost COVID-19 vaccine in two formulations: two open, non-randomised phase ½ studies from Russia. The Lancet, 396(10255), 887-897.https://doi.org/10.1016/S0140-6736(20)31866-3

Denis Logunov, Y., Inna Dolzhikova, V., Dmitry Shcheblyakov, V., Amir Tukhvatulin, I., Olga VZubkova, V., et al. (2021). Safety and efficacy of a rAd26 and rAd5 vector-based heterologous prime-boost COVID-19 vaccine: an interim analysis of a randomised controlled phase 3 trial in Russia. The Lancet, 397, 671-681.https://doi.org/10.1016/S0140-6736(21)00234-8

Dr. Reddy's SPUTNIK V Gam-COVID-Vac. (2021, April 1). Summary of Product Characteristics. Retrieved August 28, 2021, from https://cdsco.gov.in/opencms/resources/UploadCDSCOWeb/2018/UploadSmPC/SMPCsputinikdr.Reddys.pdf

Edward Walsh, E., Robert, F., Ann Falsey, R., Nicholas, K., Judith, A., et al. (2020). RNA-Based COVID-19 Vaccine BNT162b2 Selected for a Pivotal Efficacy Study. The New England Journal of Medicine, 383, 2439-2450. https://doi.org/10.1056/NEJMoa2027906

EMA AstraZeneca. (2021, January 29). Report on-AstraZeneca, COVID 19 Vaccine (ChAdOx1 S [recombinant]). Retrieved August 29, 2021, from https://www.ema.europa.eu/en/documents/product-information/covid-19-vaccine-astrazeneca-product-information-approved-chmp-29-january-2021-pending-endorsement_en.pdf

EMA Vaxzevria. (2021, August). Report on Vaxzevria COVID-19 Vaccine (ChAdOx1-S [recombinant]). Retrieved August 29, 2021, from https://www.ema.europa.eu/en/documents/product-information/vaxzevria-previously-covid-19-vaccine-astrazeneca-epar-product-information_en.pdf

Fernando Polack, P., Stephen Thomas, J., Nicholas, K., Judith, A., Alejandra, G., et al. (2020). Safety and Efficacy of the BNT162b2 mRNA Covid-19 Vaccine. The New England Journal of Medicine, 383(27), 2603-2615. https://doi.org/10.1056/NEJMoa2034577

Janssen COVID-19 Vaccine (2021, August 27). Fact Sheet for Health Care Providers. Emergency Use Authorization (EUA) of the Janssen COVID-19 vaccine to prevent Coronavirus Disease 2019 (COVID-19). Retrieved September 1, 2021, from https://www.fda.gov/media/146304/download

Jerald, S., Glenda, G., Vandebosch, A., Vicky, C., Georgi, S., et al. (2021). Safety and Efficacy of Single-Dose Ad26.COV2.S Vaccine against Covid-19. The New England Journal of Medicine, 384, 2187-2201.https://doi.org/10.1056/NEJMoa2101544

Jerald, S., Mathieu, L. G., Georgi, S., Dirk, H., Carla, T., et al. (2021). Interim Results of a Phase 1–2a Trial of Ad26.COV2.S Covid-19 Vaccine. The New England Journal of Medicine, 384, 1824-1835. https://doi.org/10.1056/NEJMoa2034201

Lisa Jackson, A., Evan Anderson, J., Nadine Rouphael, G., Paul Roberts, C., Mamodikoe, M., et al. (2020). An mRNA Vaccine against SARS-CoV-2 — Preliminary Report. The New England Journal of Medicine, 383, 1920-1931. https://doi.org/10.1056/NEJMoa2022483

Merryn, V., Sue Ann, C. C., Shabir Madhi, A., Lily Weckx, Y., Pedro Folegatti, M., et al. (2021). Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomised controlled trials in Brazil, South Africa, and the UK. The Lancet, 397, 99–111.https://doi.org/https://doi.org/10.1016/ S0140-6736(20)32661-1

Merryn, V., Sue Ann, C. C., Shabir Madhi, A., Lily Weckx, Y., Pedro Folegatti, M., et al. (2021). 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. The Lancet, 397, 881–891. https://doi.org/10.1016/ S0140-6736(21)00432-3

Mine Durusu, T., Hamdi Levent, D., Murat, A., Hatice Rahmet, G., Alpay, A., et al. (2021). Efficacy and safety of an inactivated whole-virion SARS-CoV-2 vaccine (CoronaVac): interim results of a double-blind, randomised, placebo-controlled, phase 3 trial in Turkey. The Lancet, 398, 213–22. https://doi.org/10.1016/ S0140-6736(21)01429-X

Ministry of Health of the Russian Federation. (2020, December 28). Gam-COVID-Vac. Retrieved August 28, 2021, from https://www.fda.gov.ph/wp-content/uploads/2021/03/12.-Proposed-Philippine-package-insert-Instruction-Eng.pdf

Moderna COVID-19 Vaccine -Fact Sheet for Healthcare Providers Administering Vaccine (Vaccination Providers). (2021, August 27). Emergency Use Authorization (EUA) of the Moderna COVID-19 Vaccine to prevent Coronavirus Disease 2019 (COVID-19). Retrieved September 1, 2021, from https://www.fda.gov/media/144637/download

Novavax. (2021). Covid-19 Vaccine. Retrieved August 25, 2021, from https://www.drugs.com/pro/covid-19-vaccine-novavax.html

Paul Heath, T., Eva Galiza, P., David Baxter, N., Marta, B., Duncan, B., et al. (2021). Safety and Efficacy of NVX-CoV2373 Covid-19 Vaccine. The New England Journal of Medicine. Advance online publication.https://doi.org/10.1056/NEJMoa2107659

Pedro Folegatti, M., Katie Ewer, J., Parvinder Aley, K., Brian, A., Stephan, B., et al. (2020). Safety and immunogenicity of the ChAdOx1 nCoV-19 vaccine against SARS-CoV-2: a preliminary report of a phase 1/2, single-blind, randomised controlled trial. The Lancet, 396, 467–478. https://doi.org/10.1016/ S0140-6736(20)31604-4

Pfizer-BioNTech COVID-19-Fact Sheet for Healthcare Providers Administering Vaccine (Vaccination Providers). (2021, September 22). Emergency Use Authorization (EUA) of the Pfizer-BioNTech COVID-19 Vaccine to Prevent Coronavirus Disease 2019 (COVID-19). Retrieved September 4, 2021, from https://www.fda.gov/media/144413/download

Raches, E., Krishna Mohan, V., Harsh, J., Sai, P., Siddharth, R., et al. (2021). Safety and immunogenicity of an inactivated SARS-CoV-2 vaccine, BBV152: a double-blind, randomised, phase 1 trial. The Lancet Infectious Diseases, 21(5), 637-646. https://doi.org/10.1016/S1473-3099(20)30942-7

Raches, E., Siddarth, R., William, B., Varsha, P., Pragya, Y., et al. (2021). Efficacy, safety, and lot to lot immunogenicity of an inactivated SARS-CoV-2 vaccine (BBV152): a, double-blind, randomised, controlled phase 3 trial. medRxiv. Advance online publication.https://doi.org/10.1101/2021.06.30.21259439

Shengli, X., Yuntao, Z., Yanxia, W., Hui, W., Yunkai, Y., et al. (2020). Safety and immunogenicity of an inactivated SARS-CoV-2 vaccine, BBIBP-CorV: a randomised, double-blind, placebo-controlled, phase 1/2 trial. The Lancet Infectious Disease, 21(1), 39–51. https://doi.org/10.1016/ S1473-3099(20)30831-8

Sinopharm WHO. (2021, May 7). Interim recommendations for use of the inactivated COVID-19 vaccine BIBP developed by China National Biotec Group (CNBG), Interim guidance by WHO. Retrieved August 25, 2021, from https://apps.who.int/iris/bitstream/handle/10665/341251/WHO-2019-nCoV-vaccines-SAGE-recommendation-BIBP-2021.1-eng.pdf?sequence=1&isAllowed=y

Sinovac Life Sciences Co., Ltd. (2021, February 22). Report on Evaluation of Safety, Efficacy and Quality of CoronaVac COVID-19 Vaccine (Vero Cell) Inactivated. Retrieved August 25, 2021, from https://www.fhb.gov.hk/download/our_work/health/201200/e_evaluation_report_CoronaVac.pdf

Taufik, M., Kevinkumar, K., Hardik, P., Sunil, S., Bhumika, S., et al. (2021). Safety and Immunogenicity of a DNA SARS-CoV-2 vaccine (ZyCoV-D): Results of an open-label, non-randomized phase I part of phase I/II clinical study by intradermal route in healthy subjects in India. E Clinical Medicine, 38(101020), 1-13. https://doi.org/10.1016/j.eclinm.2021.101020

Zydus Cadila. (2021, August 20). Zydus receives EUA from DCGI for ZyCoV-D, the only needle-free COVID vaccine in the world. Press Release. Retrieved August 31, 2021, from https://www.zyduscadila.com/public/pdf/pressrelease/Press%20Release-Zydus-receives-EUA-from-DCGI-for-ZyCoV-D.pdf