COVID-19: Pfizer/BioNTech, Oxford/AstraZeneca and Moderna vaccines characteristics comparison chart

IMPORTANT: This document provides a quick reference of the vaccine characteristics and excipients information for the three COVID-19 vaccines currently available through the UK COVID-19 vaccination programme. The information in this document is correct as of the date of writing on 12/1/2021.

Table 1: characteristics of the Pfizer/BioNTech, Oxford University/AstraZeneca and Moderna vaccines

Characteristics	Pfizer/BioNTech	Oxford University/AstraZeneca	Moderna
Therapeutic indication	For active immunisation to prevent COVID-19 caused by SARS-CoV-2 virus, in individuals 16 years of age and over.	For active immunisation to prevent COVID-19 in individuals 18 years of age and over.	For active immunisation to prevent COVID-19 caused by the SARS-CoV-2 virus, in individuals 18 years of age and older.
Type of vaccine	Messenger RNA (mRNA) vaccine BNT162b2 concentrate for solution for injection.	Adenovirus vector.	Messenger RNA (mRNA) vaccine (nucleoside modified).
Composition	Multidose vial which must be diluted before use. One vial (0.45ml) contains 5 doses of 30 micrograms of BNT162b2 RNA.	One dose (0.5 ml) contains COVID-19 vaccine (ChAdOx1-Srecombinant) 5×10^{10} viral particles.	Multidose vial with one vial containing 10 doses. One dose (0.5 mL) contains 0.10 mg of mRNA (embedded in lipid nanoparticles).
Pharmaceutical form	Concentrate for solution for injection.	Solution for injection.	Dispersion for injection.
Colour	White to off-white frozen solution.	Colourless to slightly brown, clear to slightly opaque and particle free.	White to off-white frozen dispersion (pH: 7.0 – 8.0).
Dosage schedule	Two doses (0.3mL each) with an interval of between 3 to 12 weeks.	Two doses (0.5mL each) with an interval of between 4 and 12 weeks	Two doses (0.5 mL each). It is recommended to administer the second dose 28 days after the first dose.
Method of administration	Intramuscularly into the deltoid muscle after dilution.	Intramuscular injection only, preferably in the deltoid muscle.	Intramuscular injection only, preferably in the deltoid muscle.
Contraindication	Hypersensitivity to the active substance or to any of the excipients listed.	Hypersensitivity to the active substance or to any of the excipients listed.	Hypersensitivity to the active substance or to any of the excipients listed.
Special warnings and precautions	• **Hypersensitivity and anaphylaxis:** events of anaphylaxis have been reported. Appropriate medical treatment and supervision should always be readily available in case of an anaphylactic reaction following the administration of the vaccine. Close observation for at least 15 minutes is recommended following vaccination. A second dose should not be given to those	• **Hypersensitivity:** appropriate medical treatment and supervision should always be readily available in case of an anaphylactic event following the administration of the vaccine. • **Concurrent illness:** administration should be postponed in individuals suffering from an acute severe febrile illness. However, the presence of a minor infection, such as	• **Anaphylaxis**: Events of anaphylaxis have been reported. Appropriate medical treatment and supervision to manage immediate allergic reactions must always be readily available in case of an acute anaphylactic reaction following administration of the vaccine. Close observation for at least 15 minutes is recommended following vaccination.

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	who have experienced anaphylaxis to the first dose. On 9 December 2020, the MHRA advised any person with a history of immediate-onset anaphylaxis to a vaccine, medicine or food should not receive the vaccine. On 30 December 2020, the CHM recommended that, following a review of further data, any person with a previous history of allergic reactions to the excipients of the vaccine should not receive it; however, those with any other allergies, such as a food allergy, can now have the vaccine. Please see the PHE guidance: "*Information for healthcare practitioner*" for more detail. • **Traceability**: in order to improve the traceability of biological medicinal products, the name and the batch number of the administered product should be clearly recorded. • **Acute severe febrile illness:** the vaccine should be postponed in individuals suffering from acute severe febrile illness. • **Anticoagulant therapy and bleeding disorders**: individuals receiving anticoagulant therapy or those with a bleeding disorder that would contraindicate intramuscular injection, should not be given the vaccine unless the potential benefit clearly outweighs the risk of administration. Please refer to the PHE *"COVID-19 vaccination programme guidance for healthcare practitioners"* for more details.	cold, and/or low-grade fever should not delay vaccination. • **Traceability:** in order to improve the traceability of biological medicinal products, the name and the batch number of the administered product should be clearly recorded. • **Thrombocytopenia and coagulation disorders:** should be given with caution to individuals with thrombocytopenia, any coagulation disorder or to persons on anticoagulation therapy, because bleeding or bruising may occur following an intramuscular administration in these individuals. • **Immunocompromised individuals**: it is not known whether individuals with impaired immune responsiveness, including individuals receiving immunosuppressant therapy, will elicit the same response as immunocompetent individuals to the vaccine regimen.	• **Traceability**: in order to improve the traceability of biological medicinal products, the name and the batch number of the administered product should be clearly recorded. • **Anxiety-related reactions**: including vasovagal reactions (syncope), hyperventilation or stress-related reactions may occur in association with vaccination as a psychogenic response to the needle injection. It is important that precautions are in place to avoid injury from fainting. • **Immunocompromised individuals**: the efficacy, safety and immunogenicity have not been assessed in immunocompromised individuals, including those receiving immunosuppressant therapy. The efficacy of vaccine may be less in these individuals. • **Coagulation disorders**: should be given with caution in individuals with bleeding disorders, such as haemophilia, or individuals currently on anticoagulant therapy, to avoid the risk of haematoma following the injection. • **Acute illness**: immunisation should be postponed in individuals with severe febrile illness or severe acute infection. Individuals with moderate or severe acute illness should be vaccinated as soon as the acute illness has improved.

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	• **Immunocompromised individuals**: including individuals receiving immunosuppressant therapy, may have a diminished immune response to the vaccine. No data are available about concomitant use of immunosuppressants.		
Interactions with other medicinal products	• No interaction studies have been performed including concomitant administration with other vaccines. • Do not mix with other vaccines/products in the same syringe.	• No interaction studies have been performed including concomitant administration with other vaccines.	• No interaction studies have been performed including concomitant administration with other vaccines.
Shelf life and special precautions for storage	• Store in a freezer at -80°C to -60°C shelf life 6 months. Store in the thermal container at -90°C to -60°C. • Store in the original package in order to protect from light. • Once removed from the freezer, the undiluted vaccine can be stored for up to 5 days at 2°C to 8°C, and up to 2 hours at temperatures up to 25°C, prior to use. • During storage, minimise exposure to room light, and avoid exposure to direct sunlight and ultraviolet light. • Thawed vials can be handled in room light conditions. • After dilution, store the vaccine at 2°C to 25°C and use as soon as practically possible and within 6 hours. • Once diluted, the vials should be marked with the dilution time and discarded within 6 hours of dilution. • Once thawed, the vaccine cannot be re-frozen.	• **Unopened multidose vial:** 6 months in a refrigerator (2°C to 8°C). Do not freeze. Keep vials in outer carton to protect from light. • **After first use:** use as soon as practically possible and within 6 hours. The vaccine may be stored between 2°C and 25°C during the in-use period.	• Store at -25°C to -15°C shelf life of 7 months. Do not store or transport on dry ice or below -40°C. Protect from light. • After thawing, the vaccine should not be re-frozen and may be stored refrigerated at 2°C to 8°C protected from light for up to 30 days if not used (needle-punctured). • Chemical and physical stability of an unopened vial after removal from refrigerated conditions has been demonstrated for 12 hours at 8° to 25°C. Do not refreeze. • **Punctured vial:** Chemical and physical in-use stability has been demonstrated for 6 hours at 2°C to 25°C after first puncture. From a microbiological point of view, the product should be used immediately. If not used immediately, in-use storage times and conditions are the responsibility of the user.

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Nature and contents of container	Concentrate for solution for injection for 5 doses in a 2 mL clear vial. Pack size of 195 vials.	5 ml of solution in a 10-dose vial or 4 ml of solution in an 8-dose vial vials. Pack size of 10 vials. Not all pack sizes may be marketed.	Each vial contains a maximum of 10 doses of 0.5 mL each. Pack size of 10 vials.
Suitability in paediatrics	Safety and efficacy not established yet in children under 16 years of age.	Safety and efficacy not established in children under 18 years of age.	Safety and efficacy not yet established in children and adolescents less than 18 years of age.
Suitability in pregnancy	• There is limited data of the vaccine in pregnant women. • Administration should only be considered when the potential benefits outweigh any potential risks. • The Joint Committee on Vaccination and Immunisation (JCVI) has recognised that the potential benefits of vaccination are particularly important for some pregnant women. This includes those who are at very high risk of catching the infection or those with clinical conditions that put them at high risk of suffering serious complications from COVID-19.	• There is a limited experience in pregnant women. • Administration in pregnancy should only be considered when the potential benefits outweigh any potential risks for the mother and fetus.	• There is limited experience in pregnant women. • Animal studies do not indicate direct or indirect harmful effects with respect to pregnancy, embryo/foetal development, parturition or post-natal development. • Administration in pregnancy should only be considered when the potential benefits outweigh any potential risks for the mother and foetus.
Suitable in breastfeeding	It is unknown whether it is excreted in human milk.	It is unknown whether it is excreted in human milk.	It is unknown whether it is excreted in human milk.
Effects on fertility	Animal studies do not indicate direct or indirect harmful effects with respect to fertility	Preliminary animal studies do not indicate direct or indirect harmful effects with respect to fertility.	Animal studies do not indicate direct or indirect harmful effects with respect to reproductive toxicity.
Alcohol content	Ethanol is used in the manufacturing process and is then removed down to trace levels. Therefore, it is not listed in the final product composition	A very small amount of alcohol (0.002 mg of alcohol (ethanol) per dose of 0.5 ml). This is not enough to cause any noticeable effects.	*Awaiting confirmation*
Interchangeability	Individuals who have received one dose of COVID-19 mRNA Vaccine BNT162b2 should receive a second dose of COVID-19 mRNA Vaccine BNT162b2 to complete the vaccination series	Individuals who receive a first dose of COVID-19 Vaccine AstraZeneca should receive a second dose of COVID-19 Vaccine AstraZeneca to complete the vaccination series	Individuals who have received one dose of COVID-19 Vaccine Moderna should receive a second dose of COVID-19 Vaccine Moderna to complete the vaccination series.

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Table 2: Excipient information of the Pfizer/BioNTech and Oxford University/AstraZeneca vaccines

Vaccine	Antibiotic free	Preservative free	Sodium free	Gluten free	Nut free	Soy free	Egg free	Vegetarian and vegan suitability	Halal certification
Pfizer/ BioNTech	✗[1]	✓	✓[2]	✓[3]	✓[4]	✓[5]	✓[6]	✓[7]	✗[8]
Oxford University/ AstraZeneca	*Awaiting confirmation*	✓	✓[9]	✓[10]	✓[11]	✓[12]	✓[13]	✓[14]	*Awaiting confirmation*
Moderna	*Awaiting confirmation*	✓	✓[15]	*Awaiting confirmation*	*Awaiting confirmation*	*Awaiting confirmation*	*Awaiting confirmation*	*Awaiting confirmation*	*Awaiting confirmation*

Key

[1] ***Pfizer*** *confirms Kanamycin is used during the manufacturing process; however, it is not expected to be in detectable quantities in the final product presentation. No other antibiotics (such as penicillins, sulphonamides and neomycin) are used during the manufacturing process. Pfizer cannot guarantee that minute amounts of substances are not contained in raw materials obtained from our suppliers. To ensure Pfizer has a consistent and reliable supply of medications, Pfizer must use a network of suppliers and manufacturing sites globally for both active and inactive ingredients*

[2] ***Pfizer*** *confirms less than 1 mmol sodium (23 mg) per dose, that is to say essentially 'sodium-free'.*

[3] ***Pfizer*** *confirms gluten is not used during the manufacturing of the vaccine and the final product does not contain gluten; however, Pfizer cannot guarantee that minute amounts of substances, such as gluten, are not contained in raw materials from their suppliers.*

[4] ***Pfizer*** *confirms nuts are not used during the manufacturing of the vaccine and the final product does not contain nuts; however, Pfizer cannot guarantee that minute amounts of substances, such as nuts, are not contained in raw materials from their suppliers.*

[5] ***Pfizer*** *confirms soy is not used during the manufacturing of the vaccine and the final product does not contain soy; however, Pfizer cannot guarantee that minute amounts of substances, such as soy, are not contained in raw materials from their suppliers.*

[6] ***Pfizer*** *confirms eggs are not used during the manufacturing of the vaccine and the final product does not contain eggs; however, Pfizer cannot guarantee that minute amounts of substances, such as eggs, are not contained in raw materials from their suppliers.*

[7] ***Pfizer*** *confirms a material used in the early stage of the manufacturing process of COVID-19 mRNA Vaccine BNT162b2 contains a component that is derived from bovine milk. The bovine milk is fit for human consumption and complies with bovine spongiform encephalopathy (BSE)/transmissible spongiform encephalopathies (TSE) regulations. Other raw materials used in the manufacture of the vaccine are of non-animal origin. All lipid excipients used in the vaccine are either from plant-derived sources or are synthetic and have no animal components. Pfizer cannot guarantee that minute amounts of substances are not contained in raw materials obtained from their suppliers.*

[8] ***Pfizer*** *states that the vaccine was not submitted for halal certification prior to authorisation approval and they are currently investigating the submission/application process.*

[9] ***AstraZeneca*** *confirms the vaccine contains less than 1 mmol sodium (23 mg) per dose, which means it is essentially 'sodium-free'.*

[10] ***AstraZeneca*** *confirms the vaccine does not contain gluten; however, AstraZeneca does not manufacture the raw materials used in its products, and the suppliers may periodically change. Lack of contact with other ingredients during the manufacturing process cannot be guaranteed.*

[11] ***AstraZeneca*** *confirms the vaccine does not contain peanut or tree nut derivatives; however, AstraZeneca does not manufacture the raw materials used in its products, and the suppliers may periodically change. Lack of contact with other ingredients during the manufacturing process cannot be guaranteed.*

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[12] ***AstraZeneca*** *confirms the vaccine does not contain soy; however, AstraZeneca does not manufacture the raw materials used in its products, and the suppliers may periodically change. Lack of contact with other ingredients during the manufacturing process cannot be guaranteed.*

[13] ***AstraZeneca*** *confirms the vaccine does not contain egg; however, AstraZeneca does not manufacture the raw materials used in its products, and the suppliers may periodically change. Lack of contact with other ingredients during the manufacturing process cannot be guaranteed.*

[14] ***AstraZeneca*** *confirms the vaccine does not contain any animal-derived products and excipients are of vegetable origin.*

[15] ***Moderna*** *confirms less than 1 mmol sodium (23 mg) per 0.5ml dose, and is essentially 'sodium-free'.*

References and further reading

- MHRA *'Pfizer/BioNTech COVID-19 vaccine'*: https://www.gov.uk/government/publications/regulatory-approval-of-pfizer-biontech-vaccine-for-covid-19
- MHRA '*AstraZeneca COVID-19 vaccine':* https://www.gov.uk/government/publications/regulatory-approval-of-covid-19-vaccine-astrazeneca
- MHRA '*Moderna COVID-19 vaccine'*: https://www.gov.uk/government/publications/regulatory-approval-of-covid-19-vaccine-moderna
- PHE *'COVID-19 vaccination guidance for healthcare practitioners'*: https://www.gov.uk/government/publications/covid-19-vaccination-programme-guidance-for-healthcare-practitioners
- MHRA *'Managing allergic reactions with Pfizer/BioNTech vaccine'*: https://www.gov.uk/government/news/confirmation-of-guidance-to-vaccination-centres-on-managing-allergic-reactions-following-covid-19-vaccination-with-the-pfizer-biontech-vaccine
- PHE *'A guide for women of childbearing age, pregnant or breastfeeding'* : https://www.gov.uk/governhhment/publications/covid-19-vaccination-women-of-childbearing-age-currently-pregnant-planning-a-pregnancy-or-breastfeeding/covid-19-vaccination-a-guide-for-women-of-childbearing-age-pregnant-planning-a-pregnancy-or-breastfeeding
- SPS *'COVID-19 vaccines'*: https://www.sps.nhs.uk/home/covid-19-vaccines/

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