Australian Nursing & Midwifery Federation

ANMF COVID-19 RESOURCE

Safety and reactogenicity of COVID-19 vaccines (Pfizer and AstraZeneca)

***ALERT* Evidence regarding COVID-19 is continually evolving. This resource will be updated regularly to reflect new emerging evidence but may not always include the very latest evidence in real-time.**

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Key points

- *Any vaccine used in Australia must be approved by the Therapeutic Goods Administration (TGA) as being safe and effective.*
- *The Pfizer/Comirnaty mRNA vaccine and the Oxford/AstraZeneca viral vector vaccines have provisional TGA approval in Australia.*
- *The Jannsen (Johnson & Johnson) and Moderna vaccines are provisionally approved by the TGA but not yet available in Australia.*
- *Most reactions to the vaccines are local or systemic reactions to injection and foreign particles (reactogenicity) not a 'mild' form of COVID-19.*
- *Mild-moderate local reactions include injection site pain and redness.*
- *Mild-moderate systemic reactions include headache, tiredness, fever/chills, muscle aches.*
- *Other less common mild-moderate reactions can include joint pain and nausea.*
- *Most reactions disappear within a day or two.*
- *Reports of serious reactions are rare, and most may not be to be related to the vaccine.*
- *Allergic reactions and anaphylaxis are very uncommon and appear to be most common among people with a history of allergy or anaphylaxis related to either polyethylene glycol – PEG (an ingredient in the Pfizer/Comirnaty vaccine), or polysorbate (an ingredient in the AstraZeneca vaccine).*
- *Very rare instances of blood clots with low platelet counts (thrombosis with thrombocytopenia/TTS) have been reported among people (mainly women under 60 years of age) who have received the Oxford/AstraZeneca vaccine.*
- *In Australia, it has been recommended that the Pfizer/Comirnaty vaccine be preferable for all adults under 60 years of age.*
- *Where benefits outweigh the risks of thrombosis with thrombocytopenia among adults under 60 years of age, the Oxford/AstraZeneca vaccine may still be administered following appropriate assessment of suitability by a qualified health professional and provision of verbal or written consent.*
- *Overall, the benefits associated with COVID-19 vaccine administration (both Pfizer/Comirnaty and Oxford/AstraZeneca) outweigh a potentially increased risk of TTS following Oxford/AstraZeneca vaccination among those aged under 60.*
- *People who have received the first dose of the Oxford/AstraZeneca vaccine with no serious adverse effects (including people under 60) should still receive the second dose.*
- *The vaccines cannot cause COVID-19 infection.*
- *The vaccines cannot change human DNA.*

Introduction

The Australian Government has detailed a national rollout strategy for the delivery of COVID-19 vaccines. In the Phase 1a, vaccines will be available to quarantine and border workers, priority sub-groups of frontline health workers, and aged care and disability care staff and residents.[1]

COVID-19 vaccines have been developed to protect people against the 'severe acute respiratory syndrome coronavirus 2' virus (or 'SARS-CoV-2'). Any COVID-19 vaccine approved for use in Australia may be effective in reducing the severity of illness but may not completely protect against infection or prevent a person from transmitting the virus to others. All current official recommendations regarding infection prevention and control should continue to be observed regardless of vaccine status.

The first two vaccines that have received provisional approval by the Australian Therapeutic Goods Administration (TGA) for administration in Australia; the *Pfizer/Comirnaty* mRNA-based vaccine,[2] and the *Oxford/AstraZeneca* viral vector vaccine.[3] More recently, the *Moderna* and *Janssen (Johnson & Johnson)* vaccines have also received provisional TGA approval. This evidence summary does not cover these two vaccines as they are currently unavailable in Australia.

Only vaccines found to be safe and effective by the TGA are granted provisional registration. Safety and effectiveness is determined through analysis of ongoing clinical trials, international collaboration, and advice from the Advisory Committee on Vaccines (ACV). The TGA continually monitors the safety, quality, and efficacy of all vaccines before and following provisional approval.[4,5] There are other COVID-19 vaccines under development at varying stages.[6] Australia currently has agreements in place with four COVID-19 vaccine developers including the developers of the *Novavax* protein vaccine,[7] and the *COVAX Facility* that currently have nine different vaccines in varying stages of development under consideration, including the *Moderna* vaccine, an mRNA-based vaccine currently in use internationally.[8,9,10] As the various vaccines are rolled out and administered around the world, many organisations and research studies are continuously monitoring their efficacy, safety, and impact upon COVID-19 outcomes and transmission.

This resource addresses the safety and reactogenicity (inflammatory reactions in response to vaccines) of *Pfizer* and *AstraZeneca* COVID-19 vaccines. For more evidence-based information about COVID-19 vaccines please see the ANMF's other resources:

- ANMF COVID-19 RESOURCES[11]

Reactions to approved COVID-19 vaccines

For both the *Pfizer/Comirnaty* and *AstraZeneca* vaccines approved in Australia, most reactions are mild (i.e. do not interfere with daily activities) and only last a day or two. Moderate to severe reactions (such as headache, fever/chills, fatigue) are very uncommon and usually also resolve in two to three days.[12,13] Severe reactions are very rare, but may be experienced by people with known allergies to certain ingredients of the vaccines.[12,14]

Mild-moderate reactions

The most common reactions to COVID-19 vaccines are the same as those people commonly experience for vaccines in general.[12,15] These reactions are most often mild to moderate and can occur after both the first and second dose of a vaccine. Reactions can include:[16]

- injection site pain and redness (within the first 24 hours)
- headache
- tiredness
- fever/chills
- muscle aches

Other less common reactions include joint pain and nausea.

Most reactions arise and then subside within a day or two of receiving the vaccine or occasionally up to a week. They generally do not interfere with the daily activities of most people. Commonly available pain relief medication, rest, and ensuring adequate hydration and comfortable body temperature is usually effective for reducing discomfort due to mild reactions to vaccination.[12]

If injection site pain or redness increases after 24 hours following vaccination, or other side effects do not dissipate after a few days, healthcare professional advice should be sought.[12]

Allergic reactions

Some people have experienced non-severe, immediate allergic reactions following COVID-19 vaccination.[14] These reactions have presented within a few hours and include hives, swelling, and wheezing (respiratory distress). Severe allergic reactions (anaphylaxis) within minutes to hours are uncommon among people who have received COVID-19 vaccines.[17,18]

Allergic reactions to vaccines or their ingredients (e.g. polyethylene glycol – PEG) are rare. People who are known to be allergic to PEG (an ingredient in the *Pfizer/Comirnaty* vaccine)[19] or polysorbate (an ingredient in the *AstraZeneca* vaccine)[20] should not receive a vaccine if it contains a known allergen.

It appears that unless a person has experienced an allergic reaction to the first dose of a COVID-19 vaccination or an ingredient known to be contained within the COVID-19 in question, it is likely that people who have a history of allergic reactions to other, non-COVID-19 vaccines or other sources can still be safely vaccinated.[18] There is precedent for safely administering vaccines (for Yellow Fever) to people who are known to be allergic to vaccine ingredients (egg),[21] and the suggestion that by identifying and effectively triaging people into groups who may require observation or skin-testing for allergic reactions to PEG and polysorbate, COVID-19 vaccines could be administered to people who are allergic.[18]

Reactions to specific vaccines

The Pfizer/Comirnaty vaccine

Adverse reactions to the *Pfizer/Comirnaty* vaccine are rare. By December 23, 2020 1,893,360 initial doses of the vaccine had been administered in the United States. Of these there were 4,393 (0.2%) adverse events submitted to the Vaccine Adverse Event Reporting System (VAERS). This included 175 case reports marked for further review as possible cases of severe allergic reaction. Of this group, anaphylaxis was identified as the cause of 21 cases of which 17 people had a history of allergies including 7 with a history of anaphylaxis.[17]

The *Pfizer/Comirnaty* vaccine may cause mild-to-moderate, short-term pain at the injection site, headache, and fatigue.[22] These reactions usually resolved within one to two days. Systemic reactions such as fever and chills may also be observed within the first one to two days following vaccination and usually resolve soon after.[22]

The incidence of other adverse events appears to be low; of 43,252 participants 64 vaccine recipients (0.3%) and six placebo recipients (<0.1%) reported lymph nodes swelling.[22] Four vaccine related serious adverse events were reported from the 21,720 vaccine recipients; shoulder injury, right axillary lymphadenopathy, paroxysmal ventricular arrhythmia, and right leg paresthesia.[22]

The Oxford/AstraZeneca vaccine

As for the *Pfizer/Comirnaty* vaccine, mild-to-moderate, short-term reactions to the *Oxford/AstraZeneca* vaccine can occur. These are similarly unlikely to be related to the vaccine itself but are commonly occurring reactions to injections and foreign particles entering the body.

Studies that have investigated the efficacy and safety of the *Oxford/AstraZeneca* vaccine report few adverse events with similar profiles between experimental and control groups and few or none considered to be related to the vaccine.[3,13]

In one primary analysis of data from 11,636 participants in four large, ongoing randomised controlled trials in the United Kingdom, Brazil, and South Africa serious adverse events occurred in 168 participants including 79 (0.7%) who received the vaccine and 89 (0.8%) who received the meningococcal vaccine (MenACWY) or saline control.[3] Adverse events of special interest (i.e. recorded but not classified as serious adverse events) occurred in 95 (0.8%) vaccine group participants and 126 (1.1%) control group participants. One case of fever >40◦C occurred two days following the first dose but resolved and did not occur again following the second dose. One case of idiopathic transverse myelitis (cause unknown) was reported in the vaccine group that may have been related to vaccination. All trial participants have recovered or are in a stable or improving condition.[3]

In another study, of 12,282 participants in the vaccine group 108 (0.9%) participants experienced a serious adverse event compared to 127 participants (1.1%) in the control group.[23] Infections and infestations accounted for the largest number of serious adverse events in both experimental (23 participants) and control groups (41 participants). Reporting of serious adverse events included any serious adverse event including those that would be unrelated to vaccine administration (e.g. animal bite, road traffic accident).[23]

Other COVID-19 vaccine safety considerations

Approved COVID-19 vaccines don't cause infection

While some vaccines for other illnesses use viruses that are weakened/attenuated (complete but genetically weakened) or inactivated and harmless (whole viruses, but 'dead' versions of the virus),[24] the COVID-19 vaccines approved for use in Australia use only isolated parts of the SARS-CoV-2 virus (spike proteins) to generate an immune response and the production of antibodies.[25] Because of this, the approved COVID-19 vaccines cannot infect a person with COVID-19.

The effectiveness of a person's immune response to SARS-CoV-2 depends on the ability of their body to quickly recognise and respond to infection. When the immune system learns to recognise virus spike proteins, antibodies are developed to provide protection against infection.[26]

Approved COVID-19 vaccines don't alter human DNA

COVID-19 vaccines that use deoxyribonucleic acid (DNA) such as the *Oxford/AstraZeneca* viral vector vaccine,[3,13] or mRNA (messenger ribonucleic acid) including the *Pfizer/Comirnaty* vaccine,[27] and *Moderna* vaccine,[28] have been found to be safe and effective.[29,30]

Other viral vector vaccines include those for Ebola, Hepatitis B, Human Papilloma Virus, and Whooping Cough.[13] The genetic material in viral vector vaccines cannot integrate into human DNA in the cell nuclei, and only codes for the SARS-CoV-2 spike protein. Messenger RNA is different to the DNA that exits within chromosomes. Messenger RNA cannot combine with the DNA in cell nuclei to change the human genetic code and instead is broken down within the body's cells within around 72 hours.[31]

Vaccines using mRNA technology have been in development for other viruses (e.g. Zika), but before now have not been used in practice.[24,32] Vaccines contain the mRNA of a harmless SARS-CoV-2 spike protein responsible for binding the virus to human cells.[22]

Blood clots with low platelet counts and the AstraZeneca vaccine

Very rare instances of blood clots with low platelet counts (thrombosis with thrombocytopenia/TTS) have been reported among people who have received the *Oxford/AstraZeneca* vaccine.[33,34] An in-depth review of 62 cases of cerebral venous sinus thrombosis and 24 cases of splanchnic vein thrombosis has been carried out from a total population (to date) of approximately 25 million people who have received the vaccine in Europe.[33]

It is important for healthcare professionals and people who receive the vaccine to be aware of the very rare possibility of TTS following vaccination.[33] People who have been vaccinated should seek medical assistance immediately if they develop the following symptoms:[33]

- shortness of breath
- chest pain
- swelling of the leg
- persistent abdominal pain
- neurological symptoms, including severe and persistent headaches or blurred vision
- tiny blood spots under the skin away from the site of injection

As of 25 August 2021, 60 confirmed and probable cases of TTS have been reported in Australia and assessed by the Vaccine Safety Investigation Group (VSIG).[35] The European Medicines Agency (EMA) has found links between the *AstraZeneca* COVID-19 vaccine and TTS.[33] The TGA is carefully reviewing all Australian reports of TTS following the *AstraZeneca* vaccine and will update any advice accordingly.[36]

In Australia, it has been recommended that the *Pfizer/Comirnaty* vaccine be preferable for all adults under 60 years of age (i.e. all adults regardless of sex assigned at birth).[37] Where benefits outweigh the risks of thrombosis with thrombocytopenia among adults under 60 years of age, the *Oxford/AstraZeneca* vaccine may still be administered following an appropriate assessment of suitability by a qualified health professional and provision of verbal or written consent.[37]

Overall, the benefits associated with *Oxford/AstraZeneca* outweigh a potentially increased risk of thrombosis with thrombocytopenia following *Oxford/AstraZeneca* vaccination among those aged over 60.[33,37] People who have received the first dose of the *Oxford/AstraZeneca* vaccine with no serious adverse effects (including people under 60) should still receive the second dose.[37]

Globally, many groups are continuously monitoring even very rare and minor adverse events. Even an extremely small number of cases of blood clots among vaccine recipients is being taken seriously and investigated. It is important to consider that among non-vaccinated people, blood clots (non TTS) are relatively common (millions of cases every year worldwide).[38] There are many and varied risk factors that increase a person's risk of blood clots including some common medications (e.g. oral contraceptives), hospitalisation and medical treatments (major surgery), pregnancy and postpartum, increasing age, male biological sex, and personal and familial history).[33,38]

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