Third Dose COVID-19 mRNA Vaccines
Disclaimer

• Please note that the information provided is the opinion of the presenter and is not a substitute for obtaining medical advice as required from one’s own physician.
Review of mRNA Vaccines
Quick facts on mRNA vaccines

- Developed over 30 years
- Recent advances in RNA technology and chemistry, and delivery methods has led to more successful vaccinations
- Clinical trials for viruses including Influenza, Zika, CMV, Rabies
- Extensively studied and tested for treatment of cancers etc.
- Not a live (attenuated) or killed vaccine like many traditional vaccinations
How do mRNA vaccines work?

• COVID-19 mRNA vaccines are given in the upper arm muscle.

• Once the instructions (mRNA) are inside the immune cells it give instructions for our cells to make a harmless piece of “spike protein” normally found on the surface of the virus that causes COVID-19.

• After the protein piece is made, the cell breaks down the instructions and gets rid of them. It does not enter the Nucleus (where DNA is stored) and does not modify our DNA.

• The cell displays the protein piece on its surface. Our immune systems recognize that the protein doesn’t belong there and begins building an immune response and making antibodies (which protect us), like what happens in natural infection against COVID-19.
Types of Immunity after Infection or Vaccination

• After first exposure or immunization, we produce:
  • Antibodies that can neutralize the virus
  • T cells that can tell infected cells to die and stop producing virus

• Between infections the immune system “remembers” this information in Memory B cells and Memory T cells
Immune Response Changes Over Time

• High levels of initial antibodies can kill virus and prevent infection or lead to very short illness

• After prolonged periods without exposure the immune system starts focusing on other threats and the levels of antibodies diminishes

• When we are re-exposed (from the virus or immunization) then the body remembers how to make antibodies, and quickly increases the amount of antibody in the system to again prevent/minimize infection

• If there are not enough antibodies to neutralize the virus, T cells still protect against serious illness by eliminating cell that are producing the virus.
  • This is a highly effective but slower response than that from antibodies.
Experience with COVID-19 Vaccines to Date

• Vaccination has been highly protective against serious illness, hospitalization, and death from COVID-19 in most populations

• Vaccine effectiveness decreases with time

• Not all the antibodies produced by vaccinations will neutralize Omicron variant

• With Omicron variant, COVID-19 boosters provide increased protection across the population by boosting antibody levels

• More specific vaccinations against variants are been developed
Vaccine Effectiveness and the Omicron Variant
Boosting with Moderna and Pfizer Results in Similar Antibody Levels

Original Vaccination: Moderna Johnson & Johnson Pfizer-BioNTech

Binding Antibody

Neutralizing Ab

DMID 21-0012 – Heterologous Platform Boost Study Mix and Match Advisory Committee on Immunization Practices, October 21, 2021
Robert L. Atmar, MD representing Mix and Match Study Team
Baylor College of Medicine,
Side Effects are Similar Regardless of Booster

Moderna

Pfizer-BioNTech

Safety of Mixing Vaccines

• Public health has made it clear that it is safe to mix and match Pfizer and Moderna COVID vaccines for booster shots:
  • Both the Pfizer-BioNTech and Moderna mRNA vaccines work the same way
  • During clinical trials, both mRNA vaccines (Pfizer-BioNTech, Moderna) demonstrated similar safety profiles and side effects (NACI).
  • Both mRNA vaccines showed similar vaccine efficacy in clinical trials against symptomatic COVID-19 disease following the second dose, 95% and 94% respectively for Pfizer-BioNTech and Moderna vaccines (NACI).

• Research from the **Centers for Disease Control (CDC)** found that using the mix-and-match strategy elicited either a similar or a higher response as compared to using the same vaccine.

Booster Effectiveness against Omicron

Original Vaccination: Pfizer-BioNTech
Two doses of BNT162b2 with a BNT162b2 or mRNA-1273 booster dose

UK Health Security Agency. SARS-CoV-2 variants of concern and variants under investigation in England Technical briefing 34
Booster Effectiveness against Omicron

UK Health Security Agency.  SARS-CoV-2 variants of concern and variants under investigation in England Technical briefing 34
Table 2. Hazard ratios and vaccine effectiveness against hospitalisation (all vaccine brands combined). OR = odds ratio, HR = hazards ratio, VE = vaccine effectiveness

<table>
<thead>
<tr>
<th>Dose</th>
<th>Interval after dose (weeks)</th>
<th>OR v symptomatic disease</th>
<th>HR vs hospitalisation</th>
<th>VE vs hospitalisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4+</td>
<td>0.74 (0.72-0.76)</td>
<td>0.57 (0.38-0.85)</td>
<td>58% (37-72)</td>
</tr>
<tr>
<td>2</td>
<td>2 to 24</td>
<td>0.81 (0.8-0.82)</td>
<td>0.45 (0.36-0.56)</td>
<td>64% (54-71)</td>
</tr>
<tr>
<td>2</td>
<td>25+</td>
<td>0.94 (0.92-0.95)</td>
<td>0.6 (0.49-0.74)</td>
<td>44% (30-54)</td>
</tr>
<tr>
<td>3</td>
<td>2 to 4</td>
<td>0.32 (0.31-0.33)</td>
<td>0.26 (0.19-0.35)</td>
<td>92% (89-94)</td>
</tr>
<tr>
<td>3</td>
<td>5 to 9</td>
<td>0.42 (0.41-0.43)</td>
<td>0.29 (0.23-0.37)</td>
<td>88% (84-91)</td>
</tr>
<tr>
<td>3</td>
<td>10+</td>
<td>0.5 (0.49-0.51)</td>
<td>0.34 (0.26-0.44)</td>
<td>83% (78-87)</td>
</tr>
</tbody>
</table>
Recommended Dose

• If an individual is moderate or severely immunocompromised the recommendation is to give a third primary dose of the same vaccine as the initial series.

• Older adults >=70 or living in LTC home or other senior congregate setting should receive Pfizer or a full dose Moderna as a booster.

• 18-29 years old Pfizer is preferred due to slightly lower incidence of pericarditis.

• All others should receive booster dose Moderna (1/2 the regular dose based on scientific data showing effectiveness) or Pfizer based on availability.
Who Should be Vaccinated with a Third Dose?
Who should get Booster Dose?

• NACI:
  • Booster doses should be prioritized with particular emphasis on frontline health care workers and those at highest risk of severe illness from COVID-19, including those in older age groups and those with high-risk medical condition

• All individuals in Ontario aged ≥18 are eligible to receive a boosters dose of an mRNA vaccine ≥3 months (84 days) after completion of a primary COVID-19 vaccine series.
Who are Health Care Workers?

Health Care Workers include:

• Any regulated health professionals and any staff member, contract worker, student/trainee, registered volunteer, or other designated essential caregiver currently working in-person in a health care organization, including workers that are not providing direct patient care and are frequently in the patient environment (i.e., cleaning staff, research staff, other administrative staff).

• Workers providing healthcare service or direct patient service in a congregate, residential or community setting outside of a health care organization.
Why are Boosters Recommended for Health Care Workers (HCW)?

• HCW are at an **increased risk of COVID-19 infection**
• Pose an **increased risk of transmission** to vulnerable populations they care for if infected
• HCW are **essential** for maintaining health system capacity
• HCW were prioritized early in Ontario’s COVID-19 immunization program, leaving **more time for waning**
• Optimizing the protection of HCW can help to balance any disproportionate burden of those taking on additional risks to protect the public, thereby upholding the ethical principle of reciprocity (NACI, 2021).
What if I have had COVID-19?

• Recommended to get booster according to normal schedule
• Must wait until resolution of symptoms to minimize the risk of transmission of COVID-19 at an immunization venue and to enable monitoring for COVID-19 vaccine adverse events
Some final thoughts

Q. If I am offered the Moderna vaccine, should I wait until I can get the Pfizer vaccine?

A. No, you should not wait. The Pfizer and Moderna vaccines are very similar in how they work and how effective they are against COVID-19. Both are mRNA vaccines, and in clinical trials, they showed almost the exact same efficacy after one dose (92.6% for Pfizer and 92.1% for Moderna) and two doses (95.0% for Pfizer and 94.1% for Moderna).

Q. If the Moderna and Pfizer vaccines are so similar, why have I been hearing about people preferring Pfizer?

A. The Pfizer and Moderna vaccines are indeed very similar. Hesitancy around the Moderna vaccine is likely due to people being more familiar with Pfizer as a company. It also may be because Canada has received many more Pfizer vaccines compared to Moderna. But the differences in quantities of vaccines are due to logistics, and have nothing to do with the effectiveness or safety of either vaccine.

– Centre for Effective Practice (https://cep.health/)
The benefits of the COVID-19 vaccine and booster doses far outweigh the risks, and for the benefit of the vulnerable patients we serve we should all very seriously consider being fully vaccinated and boosted.