

## Current Status of COVID-19 Vaccines in Canada

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**To:** Chair and Members of the Board of Health

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## Recommendations

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It is recommended that the Board of Health:

1. Receive this report for information.

## Key Points

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- Multiple COVID-19 vaccines began their development early on in the pandemic. As of March 31, 2021, four different vaccines have been approved for use in Canada.
- Clinical trials for each of the approved vaccines have found them to be safe and effective at preventing COVID-19 illness. Real-world studies are continuing to add to our understanding of these vaccines, and there is a system in place to investigate any safety concerns that arise.
- Most people will receive their second dose of a COVID-19 vaccine up to four months after their first dose. In the context of limited vaccine supply, this allows more people to receive the protection offered by a single dose.

- While over 50,000 immunizations have taken place in Wellington-Dufferin-Guelph (WDG), to date, we are still in the early days of the COVID-19 immunization campaign. Until a greater fraction of the population is vaccinated, it is important for all individuals (including vaccinated individuals) to continue to practice recommended public health measures.

## Discussion

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Since the early days of the COVID-19 pandemic in March, 2020, COVID-19 has posed a clear and present danger to everyone in our community. Though Ontario has reported hundreds of thousands of cases, to date, most of the population likely remains susceptible to infection. In autumn 2020, data from Public Health Ontario showed that only about 1% of the population had any evidence that they had developed antibodies to COVID-19.<sup>1</sup>

COVID-19 vaccines provide a means for the population to develop immunity to COVID-19 without becoming infected, and without the subsequent risk of illness and death. Vaccine development began early during the pandemic, with manufacturers starting clinical trials as early as March, 2020.<sup>2</sup> In addition to the personal protection against illness that vaccines offer, high levels of population immunity also interrupt chains of transmission and reduce the overall risk of COVID-19 in the community.

### COVID-19 Vaccines Approved in Canada

In December 2020, Health Canada approved two vaccines for use within Canada: the Pfizer-BioNTech vaccine (Dec. 9, 2020) and the Moderna vaccine (Dec. 23, 2020). Both of these vaccines fall into the category of **nucleic acid vaccines**. These vaccines include a piece of genetic code (messenger RNA or mRNA) for the spike protein of the virus that causes COVID-19 (SARS-CoV-2). After injection, the body uses this code to build the spike protein so that the body's immune system is able to recognize it. These vaccines cannot infect someone with COVID-19 and the included mRNA is not incorporated into a person's DNA. Both of these vaccines require two doses. These vaccines must also be stored in freezers and have specialized instructions for transport and handling.

So far in 2021, Health Canada has approved two additional vaccines: the AstraZeneca/Oxford vaccine (Feb. 26, 2021) and the Janssen vaccine (Mar. 5, 2021). Both of these vaccines fall into the category of **viral vector vaccines**. Like the nucleic acid vaccines, these vaccines deliver a piece of genetic code for the for the spike

protein of the virus that causes COVID-19 (SARS-CoV-2) – however, it uses a specialized virus to deliver this code into cells. This virus cannot reproduce itself and cannot cause infection. Importantly, these vaccines are fridge-stable and can be handled in similar ways to routinely-used vaccines. Additionally, the Janssen vaccine requires only one dose.

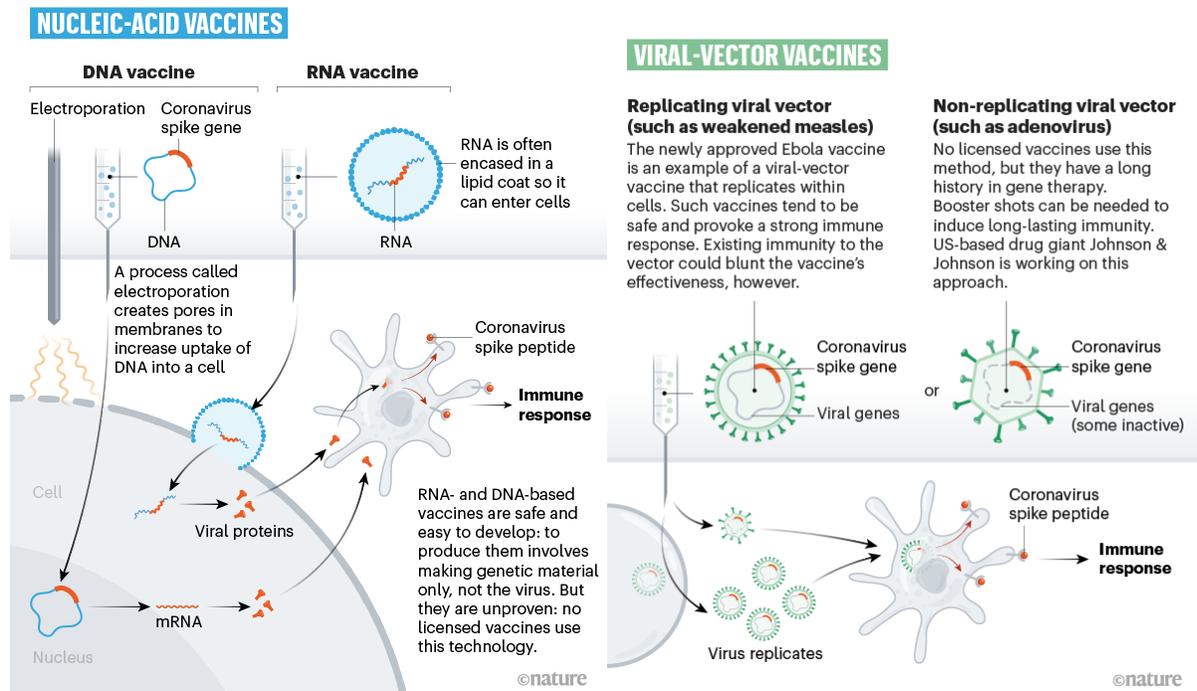
**Table 1: Characteristics of COVID-19 Vaccines approved by Health Canada.**

Vaccine Product	Pfizer-BioNTech Vaccine	Moderna Vaccine	AstraZeneca-Oxford Vaccine†	Janssen Vaccine
Authorized ages for use	16 years of age and older	18 years of age and older		
Antigenic Target	SARS-CoV-2 spike (S) glycoprotein			
Vaccine Platform	Nucleic acid (mRNA)		Viral vector	
Schedule	2 doses, 21-28 days apart*	2 doses, 28 days apart*	2 doses, 4-12 weeks apart*	1 dose
Route	Intramuscular (IM), generally administered to deltoid muscle (shoulder)			

\* Schedule per product monograph. Note the recommendation regarding extended dose interval below.

† Vaccine manufactured by the Serum Institute of India goes by the brand name COVISHIELD.

**Figure 1: Mechanism of Action for nucleic acid and viral vector vaccines.<sup>3</sup>**



Credit: Nature

\* Note that the Pfizer-BioNTech and Moderna vaccines are RNA vaccines, and the AstraZeneca-Oxford and Janssen vaccines use a non-replicating viral vector.

## Efficacy and Effectiveness

All of the approved COVID-19 vaccines reduce a person's risk of becoming ill with COVID-19. The effectiveness of the vaccines based on their clinical trials (their *efficacy*) ranged from approx. 95% for the Pfizer-BioNTech vaccine to approx. 67% for the Janssen vaccine (Table 2).<sup>4,5</sup> These efficacy figures are challenging to compare head-to-head; trials for each vaccine took place in different parts of the world, at different points during the pandemic, with different variants of circulating COVID-19. However, each vaccine offers strong protection against COVID-19.

**Table 2: Summary of reported and estimated vaccine efficacy for COVID-19 vaccines currently approved in Canada<sup>5,6</sup>**

Vaccine	Efficacy: 14 days after dose 1 and before dose 2	Efficacy: > 7-14 days after dose 2
Pfizer-BioNTech	93% (69% to 98%)	95% (90% to 98%)
Moderna	92% (69% to 99%)	94% (89% to 97%)
Oxford-AstraZeneca	76% (59% to 86%)*	81.6% (47.0% to 93.6%)^
Janssen-J&J	66.9% (59.0% to 73.4%)	N/A (1-dose vaccine)

\* From day 22 up to day 90 after dose 1.

^ Estimate of vaccine efficacy for dose interval of >12 weeks

Sometimes, the effectiveness of a vaccine in the 'real world' is different from its efficacy in a clinical trial. However, accumulating real-world evidence indicates that these vaccines are effective. For example, a study from England found that a single dose of the Pfizer-BioNTech vaccine or the AstraZeneca vaccine substantially reduced the risk of illness, hospitalization, and death from COVID-19.<sup>7</sup> The impact of COVID-19 vaccines on asymptomatic transmission is still being investigated.

Emerging evidence suggests that the vaccines are effective against the B.1.1.7 ('UK') variant of concern, though they may be less effective against the less-common B.1.351 ('S. Africa') or P.1 ('Brazil') variants. The B.1.351 and P.1 variants contain additional mutations, and some lab studies indicate that the antibodies produced by vaccines are less effective at neutralizing these variants.<sup>8,9</sup> Pfizer recently announced that its vaccine had 100% efficacy against the B.1.351 variant, though the data has not been published.<sup>10</sup>

## Safety

All of the approved COVID-19 vaccines have been found to be safe in the populations for whom they are recommended. Common adverse reactions (side-effects) are similar to those for other routinely-used vaccines, and include pain at the injection site, fatigue, headache, and muscle/joint pain. In clinical trials, these reactions were usually mild-moderate in intensity and resolved after a few days.<sup>11</sup> Serious reactions, such as anaphylaxis (severe allergic reaction), were rare.

After vaccines are approved in Canada, multiple parties are involved in the post-market surveillance of vaccines in order to identify new or rare adverse events following immunization (AEFIs). Locally, Wellington-Dufferin-Guelph Public Health (WDGPH) receives AEFI reports from health care providers and investigates events as required. AEFIs are reported to Public Health Ontario and Health Canada/Public Health Agency of Canada, who identify potential safety signals requiring investigation. These investigations ensure that the vaccines being used are safe.<sup>12</sup>

Recently, concerns have been raised about a very rare thrombotic (blood clotting) event linked to the AstraZeneca vaccine.<sup>13</sup> These events were first reported in Europe and, to date, no such events have been reported in Canada.<sup>14</sup> Cases have been found primarily in women under the age of 55.<sup>15</sup> Health Canada has required the manufacturers of the AstraZeneca vaccine to conduct a detailed risk/benefit assessment of the vaccine by age and sex to inform regulatory decisions.<sup>14</sup> In the interim, the National Advisory Committee on Immunization (NACI) has recommended that adults under the age of 55 not receive this vaccine.<sup>15</sup> The vaccine is still considered safe for adults 55 years of age and older, and the benefits of immunization continue to outweigh the possible risks.

## Extended Dose Interval

Though multiple COVID-19 vaccines have been approved for use in Canada, the available vaccine supply has been limited. Given the ongoing transmission of COVID-19, provinces and territories across Canada have had to make decisions regarding how to maximize the impact of the available vaccine supply.

On March 3, 2021, Canada's National Advisory Committee on Immunization (NACI) issued a strong recommendation stating that, in the context of limited supply, jurisdictions should maximize the number of people receiving a first vaccine dose by delaying the second dose for up to four months.<sup>16</sup> This 'first doses fast' approach is similar to that used in the United Kingdom, where second doses have been delayed up to 12 weeks.<sup>17</sup> NACI's recommendation is based on data and modelling that suggest

that a single dose offers reasonably good protection and that more people will benefit by prioritizing first doses. NACI has committed to adjusting this recommendation if needed as new evidence emerges.<sup>16</sup>

On March 5, 2021, Ontario announced that it would adopt an extended dose interval based on NACI's recommendation.<sup>18</sup> With limited exceptions, all Ontarians eligible to receive the vaccine will receive their second dose up to four months after their first dose. Ontario's Vaccine Clinical Advisory Group and NACI are expected to make further recommendations as new evidence emerges and as vaccine supply forecasts are updated.

## Maintaining Public Health Measures

While the available COVID-19 vaccines provide an important layer of protection, our community is not yet at a point where we have widespread herd immunity. Public Health Ontario estimates that 40-90% of the population must be immunized in order for herd immunity to be achieved.<sup>19</sup> Until that time, COVID-19 transmission will still occur.

Public health authorities across Canada recommend that individuals who are immunized continue to follow recommended public health measures such as physical distancing, masking, and hand hygiene.<sup>20</sup> Currently, there is not sufficient evidence to suggest that it is safe for partially - or fully-vaccinated individuals to discontinue these measures, since they may still become infected and be parts of chains of transmission. Scientists are continuing to study how effective these vaccines are at preventing asymptomatic COVID-19 infections or reducing transmission, and these learnings will inform future recommendations about public health measures for vaccinated individuals.

## Conclusion

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As of March 31, 2021, Canada has approved four different vaccines against COVID-19. All of the approved vaccines are effective, and their rollout is supported by a robust regulatory process that ensures that they are safe.

WDGPH has administered over 50,000 vaccine doses since January, 2021. However, much work lies ahead in order to ensure that every eligible person who wants a vaccine is able to receive one. Until a significantly greater fraction of the population is immunized, COVID-19 will continue to pose a clear and present danger. It is critical that everyone in our community continue to follow recommended public health measures.

Our community's ability to 'bend the curve' will minimize the impact of COVID-19 and allow more time for more people to be immunized.

## Ontario Public Health Standard

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### Immunization

- The board of health shall provide consultation to community partners on immunization and immunization practices, based on local needs and as requested.
- The board of health shall promote and provide provincially funded immunization programs and services to eligible persons in the health unit, including underserved and priority populations.

### Infectious and Communicable Disease Prevention and Control

- The board of health shall communicate, in a timely and comprehensive manner, with all relevant health care providers and other partners about urgent and emerging infectious diseases issues.

## 2020 WDGPH Strategic Direction(s)

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**Service Delivery:** We will provide our programs and services in a flexible, modern and accessible manner, and will ensure they reflect the immediate needs of our Clients and our role in the broader sector.

**System Transformation:** We will equip the Agency for change in all aspects of our work so that we are ready for transformational system change when the time comes.

**Knowledge Transfer:** We will ensure that our decision-making and policy development efforts are informed by meaningful health data at all times.

## Health Equity

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COVID-19 poses a threat across the WDG community, but disproportionately impacts more marginalized groups. Emerging evidence finds that racialized and low-income groups face greatest burden of infections, hospitalizations, and death.<sup>21</sup> The pandemic has exacerbated existing health and social inequities. WDGPH is working to ensure

that the local vaccine rollout meets the community's needs and aligns with Ontario's ethical framework for COVID-19 vaccine distribution.<sup>22</sup>

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## Appendices

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