


# Episode 56 – Novavax Nuvaxovid & Medicago Covifenz COVID-19 Vaccines

**March 11, 2022**

## COVID-19 vaccines[1]

Vaccines are the most cost-effective and efficacious means of reducing the disease burden of infectious diseases. Health Canada recently approved Novavax Nuvaxovid COVID-19 vaccine and Medicago Covifenz COVID-19 vaccine. [1]

**COVID-19 vaccines authorized in Canada** [1] [2] [3] [4] [5] [6] [7] [8]

| Product name | Type of vaccine | Approved for ages | Efficacy | Doses | Authorization date |
|---|---|---|---|---|---|
| **Pfizer-BioNTech Comirnaty COVID-19 vaccine** | mRNA | ≥5 years | 95% for ages ≥16<br>100% for ages 12–15<br>91% for ages 5–11 | 2 doses | Dec 9, 2020 |
| **Moderna Spikevax COVID-19 vaccine** | mRNA | ≥12 years | 94% for ages ≥18<br>100% for ages 12–17 | 2 doses | Dec 23, 2020 |
| **AstraZeneca Vaxzevria COVID-19 vaccine** | Viral vector-based | ≥18 years | 74% | 2 doses | Feb 26, 2021 |
| **Janssen (Johnson & Johnson) COVID-19 vaccine** | Viral vector-based | ≥18 years | 66% | 1 dose | Mar 5, 2021 |
| **Novavax Nuvaxovid COVID-19 vaccine** | Protein-based vaccine | ≥18 years | 90% | 2 doses | Feb 17, 2022 |
| **Medicago Covifenz COVID-19 vaccine** | Plant-based virus-like particle vaccine | 18–64 years | 71% | 2 doses | Feb 24, 2022 |

## Novavax Nuvaxovid COVID-19 vaccine

On February 17, 2022, Health Canada authorized the Novavax Nuvaxovid COVID-19 vaccine for use as a primary series in individuals aged ≥18 years. Novavax Nuvaxovid (also referred to as NVX-CoV2373) is the first recombinant protein subunit COVID-19 vaccine authorized for use in Canada. Novavax Nuvaxovid is composed of purified full-length SARS-CoV-2 recombinant spike (rS) protein nanoparticle combined with the

[1] Refer to Episode 15, 28, 34, 39, 40, 48, & 52 for additional information on COVID-19 vaccines.

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

saponin-based Matrix-M adjuvant. To date, the vaccine has been approved for use in a total of 36 countries, including Australia, Denmark, France, Norway, and the United Kingdom (UK). [9] [10]

**Protein subunit vaccines**

Protein subunit vaccines (also called acellular vaccines) contain harmless and purified pieces of proteins of the virus, which have been specifically selected for their ability to trigger immunity.[2] Protein subunit vaccines are used for other diseases (e.g., hepatitis B, acellular pertussis) and in the SHINGRIX shingles vaccine. [11] [12] [13] [14]

Advantages of protein subunit vaccines include:

- Well-established technology
- Suitable for individuals with compromised immune systems
- No live components, so no risk of the vaccine triggering disease
- Relatively stable (e.g., stored at refrigeration temperatures) [14]

Disadvantages of protein subunit vaccines include:

- Relatively complex to manufacture
- Adjuvants[3] and booster doses may be required
- Takes time to determine best antigen combination (i.e., mix of protein pieces) [14]

**Matrix-M adjuvant**

Protein subunit vaccines do not elicit as strong an immune response as whole-pathogen vaccines,[4] so they often include an adjuvant. Novavax Nuvaxovid uses the proprietary adjuvant Matrix-M, which is based on saponin, a type of compound found naturally in over 100 plant families (e.g., legumes [beans, peas, soyabeans]). Novavax Nuvaxovid utilizes the saponin extracted from *Quillaja saponaria* Molina bark, also know as the soap bark tree (an evergreen native to Chile). The adjuvant facilitates activation of the innate immune system, which enhances the magnitude of the spike protein-specific immune response. The adjuvant also makes achieving immunity possible with a smaller dose of the spike protein. [15] [16] [17] [18]

The SARS-CoV-2 recombinant spike protein is produced in moth cells (*Spodoptera frugiperda* also known as the fall armyworm moth) infected with a baculovirus[5] that contains a modified coronavirus spike protein gene. The moth cells replicate the spike protein and display it on their cell membranes. The spike proteins are harvested, purified, and assembled onto a synthetic lipid nanoparticle about 50 nm across, each displaying up to 14 spike proteins. Note: the vaccine contains no genetic material, only proteins. Moth cells have also been used in manufacturing influenza vaccines. [7] [15] [16] [17] [19] [20]

---

[2] Refer to Episodes 44 & 45 for additional information on the immune system.

[3] Adjuvant is an ingredient added to a vaccine to enhance immune response and extend the duration of B & T cell activation. [56] Refer to Episode 15 for additional information on vaccine ingredients.

[4] Whole-pathogen vaccines use the entire pathogen (virus or bacteria) that has been inactivated or weakened (attenuated). [57] Refer to Episode 15 for information on types of vaccines.

[5] Baculovirus infects insects in nature and is non-pathogenic to humans. [58]

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

**Mechanism of action**
Together, the SARS-CoV-2 recombinant spike protein and the adjuvant elicit B and T cell immune responses to the spike protein, including neutralizing antibodies, which contributes to the protection against COVID-19. [7] [15] [16] [19]

**Dosage**
Novavax Nuvaxovid is provided in a multidose vial containing 10 doses per vial. The vaccine is administered as a 2-dose regimen delivered intramuscularly, 21 days apart. One dose (0.5 mL) contains 5 mcg of SARS-CoV-2 recombinant spike protein with 50 mcg of Matrix-M adjuvant. The vaccine does not contain preservative. Punctured vials are stored between 2°C – 25°C for up to 6 hours. The vaccine is discarded if not used within 6 hours after the vial is first punctured. [15]
.

**Vaccine efficacy**[6]
Novavax Nuvaxovid clinical trials demonstrated approximately 90% efficacy (7 days after second dose) at preventing symptomatic COVID-19 and 100% efficacy at preventing severe disease. Preliminary and exploratory data shows Novavax Nuvaxovid produces neutralizing antibodies against the Omicron variant; however, further confirmatory data is needed. [14] [21]

**Vaccine ingredients** [14]

| Ingredients | Component category | Function |
|---|---|---|
| SARS-CoV-2 recombinant spike (rS) protein (original [Wuhan] strain) | Protein subunit | Active ingredient, stimulates the immune response<br>Spike protein is grown in moth cells |
| Matrix-M adjuvant (*Quillaja saponaria* saponins fraction-A and fraction-C) | Adjuvant | Helps stimulate immune response to the vaccine<br>Composed of 40-nm-sized particles formulated from purified saponin extracted from *Quillaja saponaria* Molina bark (i.e., soap bark tree) |
| Cholesterol | Lipid | Forms a protective shell around the active ingredients<br>Allows it to "slide" into cells so it can work |
| Disodium hydrogen phosphate dihydrate | Mild base | Used to balance pH & salt levels of the vaccine to be close to that of the human body |
| Disodium hydrogen phosphate heptahydrate | Acid stabilizer | |
| Hydrochloric acid | Acid | |
| Potassium chloride | Salt | |

[6] Refer to Episode 40 for information on vaccine efficacy and effectiveness.
Vaccine efficacy is the degree to which a vaccine prevents disease, and possibly also transmission, under ideal controlled circumstances (e.g., in a clinical trial comparing a vaccinated group with a placebo group). The World Health Organization (WHO) requires COVID-19 vaccines to have a high efficacy rate of 50% or above to be approved after going through RCTs to test their quality, safety, and efficacy. Health Canada considers a target threshold of at least 50% efficacy for COVID-19 vaccines. [59] [60]

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

| Ingredients | Component category | Function |
|---|---|---|
| Potassium dihydrogen phosphate | Salt | |
| Sodium chloride | Salt | |
| Sodium dihydrogen phosphate monohydrate | Salt | |
| Phosphatidylcholine | Emulsifier | Helps prevent oil-based & water-based ingredients from separating<br>Commonly found in foods & cosmetics |
| Polysorbate 80 | | |
| Water for injection | Water | Mixed with vaccine ingredients to form a liquid for injection purposes |

## Vaccine side effects

Serious side effects

Overall, serious side effects seen in clinical trials were uncommon and were essentially similar between the placebo group and those who received the vaccine. A slightly higher incidence rate occurred among participants aged ≥65 years compared to those 18-64. No deaths related to the vaccine were reported in clinical trials. [14] [15]

Non-serious side effects

Side effects observed during clinical trials were typically mild, commonly reported side effects of vaccines, and do not pose a risk to health. Overall, mild side effects were more frequent in vaccine recipients compared to placebo, more frequent after the second dose compared to the first, and more frequent in adults aged 18-64 than in those aged ≥65. The median duration of side effects was ≤2 days for local events and ≤1 day for systemic events after vaccination. [14] [15]

Most frequently reported side effects were:

- Tenderness at injection site: 68%
- Pain at injection site: 56%
- Fatigue: 45%
- Muscle pain: 44%
- Headache: 41%
- Malaise: 35%
- Joint pain: 20%
- Nausea or vomiting: 11%

Uncommon side effects were:

- Fever
- Chills
- Injection site swelling or erythema [14] [15]

## Contraindications

- Novavax Nuvaxovid COVID-19 vaccine is contraindicated for individuals with an allergy to a component of the vaccine or its container. [14] [15] [22]

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

- Severe immediate allergic reactions (e.g., anaphylaxis) were not reported in the clinical trials. However, given the size of the clinical trials, rare and very rare side effects of Novavax Nuvaxovid are not likely to have been identified at this time. [19]

**Precautions**

Individuals should consult with a healthcare professional prior to receiving Novavax Nuvaxovid if they:

- Have ever fainted following any needle injection
- Have a bleeding condition, bruise easily, or use blood thinning medications
- Have a high fever or severe infection
- Have any serious illness
- Are immunodeficient or are taking immune suppressing medications (e.g., high-dose corticosteroids, immunosuppressants, cancer medications)
- Are pregnant, may be pregnant, or plan to become pregnant
- Are breastfeeding or plan to breastfeed
- Have any allergies or previous problems following administration of Nuvaxovid, such as an allergic reaction or breathing problems
- Are currently experiencing symptoms that could be due to COVID-19. Vaccination should be postponed and consultation with a medical provider is necessary to determine when eligible to receive the vaccine. [14] [22]

Note: It may take at least 7 days after the second dose to develop optimal protection. As with any vaccine, Novavax Nuvaxovid may not fully protect all those who receive it. Continuing to follow local public health recommendations remains important to help prevent spread of the virus. [22]

**National Advisory Committee on Immunization (NACI) recommendations**

- NACI continues to preferentially recommend a complete primary series of an mRNA COVID-19 vaccine (i.e., Pfizer-BioNTech Comirnaty or Moderna Spikevax) should be offered to individuals (in the authorized age group) without vaccine contraindications.
- Novavax Nuvaxovid vaccine is an option for individuals (in the authorized age group) who have been unable, due to contraindications, or not willing to receive an mRNA COVID-19 vaccine.
- The vaccine may be used in a heterologous (mixed) primary series for individuals for whom mRNA COVID-19 vaccine is contraindicated, inaccessible, or has been refused. Informed consent should include the benefits and risks given the limited data available on mixed schedules with Novavax Nuvaxovid.
- The vaccine may be offered as a booster dose to individuals who are not able to receive an mRNA vaccine, regardless of which COVID-19 vaccines they received in the primary series. Informed consent should be obtained as this recommendation is off-label since Novavax Nuvaxovid is not currently authorized for use as a booster dose in Canada.
- For individuals with serious polyethylene glycol (PEG) allergy or previous serious allergic reaction to an mRNA vaccine preventing further vaccination with mRNA

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

vaccines, Novavax Nuvaxovid may be the preferred product for vaccination, based on consultation with an allergist or other appropriate physician. [9] [19]

**Medicago Covifenz COVID-19 vaccine**

On February 24, 2022, Health Canada authorized the Medicago Covifenz COVID-19 vaccine for use as a primary series in adults aged 18-64 years. Medicago Covifenz COVID-19 vaccine is a SARS-CoV-2 spike (S) recombinant (adjuvanted), protein virus-like particle (VLP). It is the first plant-based COVID-19 vaccine authorized for use in Canada.[7] The vaccine was developed by Medicago, a Canadian biopharmaceutical company and utilizes an adjuvant developed by GlaxoSmithKline (GSK)[8] to help boost the immune response.

Currently, Medicago Covifenz is only authorized for use in adults aged 18-64 based on data reviewed by Health Canada. There was limited enrolment of participants older than 65 years in the clinical trials because a large proportion of older individuals were already vaccinated. Medicago is currently gathering data in older individuals to support regulatory authorization for this age group. [23]

**Plant-based vaccines**[9]

In a plant-based vaccine, living plants are used as bioreactors (factories) to produce a particle that mimics the target virus. Medicago uses its Proficia® technology to synthesize the virus's genetic sequence so its genetic instructions can be read by plants. Medicago uses *Nicotiana benthamiana*, a plant indigenous to Australia, and a close relative of tobacco. *N. benthamiana* plants have a fast growth rate, are a non-food crop, and are easy to work with. *N. benthamiana* is the most widely used experimental host in plant virology, mainly due to the large number of viruses that can successfully infect the plant. The plant's natural cell processes are utilized to produce VLPs, the active ingredient of the vaccine.

To produce the VLPs, part of the virus's genetic sequence is inserted into *Agrobacterium tumefaciens*, a bacterial vector that can transfer genetic material to plants only (i.e., carry the information into the plant's cells). The plants are then immersed in a liquid containing the *A. tumefaciens*. Using a vacuum, the air between the plant cells is removed. The plants then act like sponges, absorbing the liquid and the *A. tumefaciens*. Once inside the plant, the bacteria will transfer the genetic material into the leaf tissue.

After the bacterial bath, the plants are placed for at least 4 days in a controlled greenhouse so they can continue to grow. During this period, the plants quickly produce large quantities of the VLPs.

---

[7] Currently, Medicago Covifenz COVID-19 vaccine is only approved in Canada. [61]

[8] GSK's adjuvant is used in other COVID-19 vaccines. GSK partnered with Sanofi (France) and SK Bioscience of South Korea to use its adjuvant to develop their adjuvanted COVID-19 vaccines. [62]

[9] The world's first plant-based vaccine was approved for the Newcastle disease virus by the United States Department of Agriculture for poultry. It was shown to confer more than 90% protection in chicken. Another licensed plant-based product is used in Cuba to produce a recombinant Hepatitis B virus vaccine. [63]

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

The leaves of mature plants are harvested and the VLPs are extracted and purified to produce the final material used in the vaccine. VLPs mimic the structure of the virus and trigger an immune reaction after vaccination. VLPs do not contain genetic material, making them non-infectious. [24] [25] [26] [27] [28]

Advantages of plant-based vaccines include:

- Can be produced inexpensively in very high amounts
- No live components, so no risk of the vaccine triggering disease
- Antigens derived from plants are stable and can be stored for long time periods
- Can be produced relatively quickly and are easy to scale up for large production [25] [29]

Disadvantages of plant-based vaccines include:

- Adjuvants and booster shots may be required
- Takes time to determine the correct antigen and plant expression host because not all antigens are compatible with the selected host plants (commonly used host plants include tobacco, potato, tomato, corn, rice)
- Inconsistency of dosage as dosage produced may vary between plants of the same species [30]

**AS03 adjuvant**

AS03 adjuvant enhances the immune response and contains naturally occurring molecules (squalene and vitamin E) plus an emulsifier (polysorbate 80) and phosphate buffered saline. The vaccine does not contain any live viruses, egg proteins, or human-derived materials. [31]

**Mechanism of action**

Medicago Covifenz is an adjuvanted vaccine composed of plant-based VLPs that closely mimics the original SARS-CoV-2 virus and activates local innate immune responses. The vaccine then elicits both neutralizing antibody and cell-mediated immune responses to the spike antigen, which contributes to the protection against COVID-19. [32]

**Dosage**

Medicago Covifenz is authorized as a 2-dose regimen, administered intramuscularly, 21 days apart. Each dose is 0.5 mL and contains 3.75 mcg of the SARS-CoV-2 spike protein and 0.25 mL of AS03 adjuvant. [31] [32]

The vaccine is supplied in 2 separate refrigerated vials: a multidose vial containing the antigen and a second multidose vial containing the adjuvant. The antigen component of the vaccine is mixed 1:1 with the AS03 adjuvant component prior to administration. The vaccine does not contain preservatives and must be used within 6 hours after mixing and stored at room temperature (20°C – 30°C) until administered. [32]

**Vaccine efficacy**

In clinical trials, the vaccine demonstrated 71% efficacy against symptomatic infection and 100% efficacy against severe disease caused by SARS-CoV-2 (7 days after the

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

second dose). The clinical trials were conducted while multiple variants were in circulation. Data from clinical trials showed efficacy against the Delta and Gamma variants, and also suggested efficacy against Alpha, Lambda, and Mu variants.[10] While additional confirmatory data are needed, preliminary and exploratory data shows Medicago Covifenz produces neutralizing antibodies against the Omicron variant.[11] [23]

**Vaccine ingredients** [14]

| Ingredients | Component category | Function |
|---|---|---|
| Plant-based virus-like particles of SARS-CoV-2 spike protein (original strain) | Virus-like particles | Active ingredient, stimulates the immune response<br>Spike protein is made from plants |
| AS03 Adjuvant<br>(Manufactured by GSK) | Adjuvant | Helps stimulate immune response to the vaccine<br>Contains naturally occurring molecules (squalene & vitamin E) & polysorbate 80 (emulsifier) & phosphate buffered saline (salt) |
| Polyethylene glycol (trace amounts) | Lipid | Forms a protective shell around the active ingredients<br>Allows it to "slide" into cells so it can work |
| Carbenicillin (trace amounts) | Antibiotics | Helps minimize bacterial contamination during the initial manufacturing process<br>Removed in subsequent vaccine manufacturing steps, but trace amounts may remain |
| Kanamycin (trace amounts) | | |
| Potassium phosphate monobasic anhydrous | Salts | Used to balance pH & salt levels of the vaccine to be close to that of the human body |
| Sodium chloride | | |
| Sodium phosphate dibasic anhydrous | | |
| Polysorbate 80 | Emulsifier | Helps keep the oil-based & water-based ingredients from separating<br>Commonly found in foods & cosmetics |
| Water for injecting | Water | Mixed with vaccine ingredients to form a liquid for injection purposes |

## Vaccine side effects

Serious side effects

In clinical trials, serious adverse events were reported in 0.4% of vaccine recipients and 0.3% of placebo recipients. There were no notable patterns or significant numerical imbalances between treatment groups that would implicate the vaccine as the cause of these rare serious side effects. No deaths or other serious side effects related to the vaccine were reported. Although no cases of anaphylaxis occurred during clinical trials,

[10] Refer to Episode 39 for more information on SARS-CoV-2 variants.
[11] Refer to Episode 52 for more information on the Omicron variant of concern.

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

the vaccine should be administered with caution to individuals with confirmed anaphylaxis to plant materials. [14] [32]

Non-serious side effects

Side effects observed during the clinical trials were typically mild, commonly reported side effects of vaccines, and do not pose a risk to health. Overall, side effects were more frequent in vaccine recipients compared to placebo and more frequent after the second dose compared to the first.

Most frequently reported side effects were:

- Pain at injection site: 92%
- Headache: 68%
- Muscle aches: 68%
- Fatigue: 65%
- Feeling of general discomfort: 64%
- Chills: 47%
- Joint aches: 40%
- Swelling at injection site: 38%
- Swelling in the neck: 22%
- Erythema at injection site: 20%
- Swelling in the axilla (armpit): 15%
- Fever: 10%

Uncommon side effects:

- Nasal congestion
- Oropharyngeal pain
- Cough
- Catarrh
- Diarrhea
- Nausea [14] [32]

**Contraindications**

Medicago Covifenz COVID-19 vaccine is contraindicated in:

- Individuals who have an allergy to the active substance or to any ingredient in the formulation or its container. [14] [32]

**Precautions**

Individuals should consult with a healthcare professional prior to receiving Medicago Covifenz if they:

- Have history of confirmed anaphylaxis to plant materials
- Have ever fainted following any needle injection
- Have a bleeding problem, bruise easily, or use blood thinning medications
- Have a high fever or severe infection
- Have any serious illness
- Are immunodeficient or are taking immune suppressing medications (e.g., high-dose corticosteroids, immunosuppressants, or cancer medications)

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

- Are pregnant, think they may be pregnant, or plan to become pregnant
- Are breastfeeding or plan to breastfeed
- Have any allergies or previous problems following administration of Covifenz, such as an allergic reaction or breathing problems
- Are currently experiencing symptoms that could be due to COVID-19. Vaccination should be postponed and consultation with a medical provider is necessary to determine when eligible to receive the vaccine. [14] [31]

Note: It may take at least 7 days after the second dose to develop optimal protection. As with any vaccine, Medicago Covifenz may not fully protect all those who receive it. Continuing to follow local public health recommendations remains important to help prevent the spread of the virus. [31]

**Novavax Nuvaxovid & Medicago Covifenz COVID-19 vaccines** [7] [8] [14] [15] [32]

| | **Novavax Nuvaxovid COVID-19 vaccine** | **Medicago Covifenz COVID-19 vaccine** |
|---|---|---|
| **Type of vaccine** | Protein-based | Plant-based |
| **Manufacturer** | Novavax Inc. | Medicago Inc. |
| **Approved ages** | ≥18 years | 18 – 64 years |
| **Dosage** | 2 doses, 21 days apart<br>Each dose contains 5 mcg of the SARS-CoV-2 spike protein & 50 mcg of Matrix-M adjuvant | 2 doses, 21 days apart<br>Each dose contains 3.75 mcg of the SARS-CoV-2 spike protein & 0.25 mL of AS03 adjuvant |
| **Administration route** | Intramuscular | Intramuscular |
| **Reconstitution** | Must not be reconstituted, mixed with other medicinal products, or diluted | Antigen is mixed with the adjuvant prior to administration |
| **Active ingredients** | SARS-CoV-2 recombinant spike (rS) protein | Plant-based virus-like particles (VLP) of SARS-CoV-2 spike protein |
| **Adjuvant** | Matrix-M adjuvant:<br>*Quillaja saponaria* saponins<br>Cholesterol<br>Phosphatidylcholine<br>Potassium chloride<br>Potassium dihydrogen phosphate<br>Disodium hydrogen phosphate dihydrate<br>Sodium chloride | AS03 Adjuvant (by GSK):<br>DL-alpha-tocopherol<br>Squalene<br>Polysorbate 80<br>Phosphate buffered saline |
| **Non-medicinal ingredients** | Disodium hydrogen phosphate heptahydrate<br>Hydrochloric acid<br>Polysorbate 80<br>Sodium chloride<br>Sodium dihydrogen phosphate monohydrate<br>Sodium hydroxide<br>Water for injection | Potassium phosphate monobasic anhydrous<br>Polysorbate 80<br>Sodium chloride<br>Sodium phosphate dibasic anhydrous<br>Water for injection<br>May contain trace amounts of polyethylene glycol, kanamycin & carbenicillin |

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

| | Novavax Nuvaxovid COVID-19 vaccine | Medicago Covifenz COVID-19 vaccine |
|---|---|---|
| **Storage** | Store unopened vials refrigerated (2°C – 8°C)<br>Do not freeze<br>Keep the vials in the outer carton to protect from light<br>Once punctured store vial between 2°C – 25°C for up to 6 hours | Store Unopened vials refrigerated (2°C – 8°C)<br>Do not freeze<br>Handle and store mixed vaccine at room temperature (20°C – 30°C)<br>Protect from light<br>Do not refrigerate after mixing & use within 6 hours |
| **Possible temporary common side effects at injection site*** | Redness<br>Soreness<br>Swelling | Redness<br>Soreness<br>Swelling |
| **Possible temporary common general side effects*** | Chills<br>Fatigue<br>Joint pain<br>Headache<br>Mild fever<br>Muscle aches<br>Nausea & vomiting | Chills<br>Fatigue<br>Joint aches<br>Headache<br>Mild fever<br>Muscle aches<br>Nausea<br>Nasal congestion<br>Sore throat<br>Cough<br>Diarrhea |
| **Contraindications** | Contraindicated in individuals who are hypersensitive to the active ingredient or to any ingredients in the formulation, including any non-medicinal ingredient, or component of the container | Contraindicated in individuals who are hypersensitive to the active ingredient or to any ingredient in the formulation, including any non-medicinal ingredient, or component of the container |

*It is common to have temporary side effects after vaccination lasting a few hours to a few days.

## Importance of COVID-19 vaccines

As of March 6, 2022, COVID-19 has caused almost 6 million deaths globally, with over 36,800 deaths reported in Canada and over 12,500 in Ontario. [33] [34]

It is estimated almost 7 million children globally have lost either a primary or secondary caregiver (i.e., one or both parents, death of custodial grandparents, and/or death of other co-residing grandparents) due to COVID-19 as of March 5, 2022. [35]

Deaths and illness caused by COVID-19 have been lessened by COVID-19 immunization. COVID-19 vaccines have helped to prevent hospitalization, severe disease, and mortality. For instance, it was estimated COVID-19 vaccination efforts in the US prevented nearly 1.1 million deaths and over 10.3 million hospitalizations from mid-December 2020 to November 2021. In addition to reducing hospitalization and death, vaccination prevented nearly 36 million additional COVID-19 infections. [36] [37]

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

A study by the WHO Regional Office for Europe and European Centre for Disease Prevention and Control estimated 470,000 lives have been saved among those aged ≥60 years since the start of COVID-19 vaccination roll-out in December 2020 to November 2021 in 33 countries across the WHO European Region. [38] [39]

Research has further highlighted the importance of vaccination. For example:

- Individuals who were unvaccinated had a greater risk of testing positive for COVID-19 and a greater risk of dying from COVID-19 than those who were fully vaccinated.
- Unvaccinated individuals in all age groups had higher case and death rates than those fully vaccinated in the same age groups.
- Case and death rates for individuals fully vaccinated with Moderna, Pfizer-BioNTech, or Janssen COVID-19 vaccines were much lower than for unvaccinated individuals.
- Fully vaccinated individuals with an additional or booster dose had lower case rates compared with those without a booster dose. Both of these groups had much lower risk of testing positive for COVID-19 and a lower risk of dying from COVID-19 compared with unvaccinated individuals. Those aged ≥65 had a larger overall benefit from receiving an additional or booster dose, compared with younger age groups. [40]

By preventing COVID-19 infections, vaccinations have also reduced the prospect that millions of individuals could develop long COVID (or post COVID-19 condition)[12] and its debilitating symptoms. Depending on the severity of symptoms, most individuals with COVID-19 fully recover within 3-4 weeks, but some experience long-term effects such as fatigue, shortness of breath, and cognitive dysfunction, commonly referred to as brain fog (e.g., confusion, forgetfulness, lack of mental focus or recall). Over 200 long COVID-19 symptoms have been reported and there does not appear to be a relationship between the initial severity of COVID-19 infection and the likelihood of developing long COVID. [41] [42]

Vaccines appear to offer protection against long COVID. A rapid evidence review by the UK Health Security Agency found evidence:

- Vaccinated individuals who are subsequently infected with COVID-19 were less likely to report symptoms of long COVID than unvaccinated individuals.
- Unvaccinated individuals with long COVID who were subsequently vaccinated had, on average, reduced long COVID symptoms (though some reported worsened symptoms after vaccination).
- Unvaccinated individuals with long COVID who were subsequently vaccinated reported fewer long COVID symptoms than those who remained unvaccinated. [43]

Vaccination coverage in Canada as of March 4, 2022:

- 81% of the total population were fully vaccinated.
- 85% of those aged ≥5 years were fully vaccinated
- 34% of 5- to 11-year-olds were fully vaccinated
- 46% of the total population were fully vaccinated with an additional dose
- 56% of those aged ≥18 years were fully vaccinated with an additional dose [44]

[12] Refer to Episodes 28, 38, & 48 for additional information on long COVID.

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

There are additional Canadians who would benefit from full vaccination and a booster dose considering SARS-CoV-2 continues to circulate. Protection from the primary series of COVID-19 vaccination can wane overtime. By triggering more antibodies, a booster dose can increase the immune response and help improve protection against COVID-19. In addition, many scientists expect it is very unlikely the coronavirus to be eradicated and will eventually become endemic, meaning it will continue to circulate in pockets of the global population for years to come. [45] [46]

**Take home messages**

- Research has demonstrated all COVID-19 vaccines authorized in Canada are safe, effective, and of high quality.
- COVID-19 vaccines have had a significant impact on preventing deaths and illness.
- Novavax Nuvaxovid and Medicago Covifenz COVID-19 vaccines provide an option for individuals who have been unable (e.g., due to allergies) or unwilling to receive an mRNA or a viral vector COVID-19 vaccine.
- It is essential for oral health professionals to stay current on COVID-19 vaccines to be able to inform and educate clients, and answer their questions and concerns.

**Rapid antigen test kits**

Health Canada announced a public advisory on February 24, 2022 reminding individuals how to safely use COVID-19 rapid antigen tests because of an increase in reports to poison control centres. At least 50 calls had been made to poison control centres in Canada over accidental exposure to certain ingredients in the liquid solutions, such as the preservatives sodium azide and Proclin. These ingredients may be poisonous if swallowed or absorbed through the skin, particularly in children and pets. For example, small doses of sodium azide can lower blood pressure. Proclin contains chemicals that can cause skin and eye irritation, as well as allergic reactions.

Health Canada is advising Canadians on a precautionary basis to help mitigate the risks associated with misuse, accidental ingestion, or skin exposure.

Health Canada is advising individuals to:

- Keep rapid antigen test kits and solutions out of the reach of children and pets.
- Do not swallow the solutions, and avoid eye and skin contact.
- Wash hands thoroughly after use.
- If spillage occurs, rinse well with water.
- Follow all instructions for proper disposal.
- Report any health product-related side effects[13] or complaints[14] to Health Canada.
- Contact local Poison Information and Control Centre in cases of accidental ingestion or direct skin exposure to test kit solutions. [47]

[13] Reporting health product-related side effects: https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada/adverse-reaction-reporting.html

[14] Reporting health product-related complaints: https://healthycanadians.gc.ca/apps/radar/MD-IM-0005.08.html

List of authorized COVID-19 testing devices: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/medical-devices/authorized/list.html

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

Rapid tests are safe, effective, easy to administer, and produce results in approximately 15 minutes. Together with other public health measures, they are an important tool to rapidly detect and isolate cases. They help individuals reduce the risk of spreading the virus to their families, co-workers, and communities. It is important to remind clients, friends, and family to use them safely. [48]

Disposal of used kits

If members of the public are using the test kits, they can contact their local municipality on safe disposal of used kits. [49]

Businesses utilizing the test kits must make arrangements with a private company to dispose of the test kits. The Government of Ontario has listed a few companies on their website (see below).[15] [50]

**Use of rapid antigen tests during the Omicron Wave**

In mid-February 2022, the Ontario COVID-19 Science Advisory Table made recommendations on Rapid Antigen Test Sample Collection during the Omicron wave.[16] Omicron is the dominant variant in Canada and following the identification of the Omicron variant in Ontario in November 2021, it quickly became the dominant strain in the province. [34] [51] [52]

As per the Science Advisory Table, the emergence of the Omicron variant demands a reassessment of the diagnostic performance of rapid antigen tests:

- Rapid antigen tests using nasal samples are less sensitive for the Omicron variant compared to the Delta variant.
- Rapid antigen tests can more reliably detect infectious cases of the Omicron variant in combined oral-nasal samples.
- Individuals can collect these samples by initially swabbing both cheeks, followed by the back of the tongue or throat, and then both nostrils.[17] [51] [53]

[15] Guidance for business owners about the safe handling and disposal of rapid COVID-19 test kits: https://www.ontario.ca/page/safe-handling-and-management-rapid-antigen-covid-19-testing-waste
List of authorized COVID-19 testing devices
https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/medical-devices/authorized/list.html

[16] Ontario COVID-19 Science Advisory Table Use of Rapid Antigen Tests during the Omicron Wave: https://covid19-sciencetable.ca/sciencebrief/use-of-rapid-antigen-tests-during-the-omicron-wave/

[17] Ontario Health COVID-19 Rapid Antigen Tests: How to Collect a Sample: https://www.ontariohealth.ca/sites/ontariohealth/files/2022-02/COVID-19RapidAntigenTests-HowtoCollectaSample.pdf
Ontario COVID-19 Science Advisory Table rapid antigen test video instructions for adults: https://www.youtube.com/watch?v=LJhdIWWdXT4
Ontario COVID-19 Science Advisory Table rapid antigen test video instructions for children: https://www.youtube.com/watch?v=nZOLJJlBs7M

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

## Hand sanitizer recall

Health Canada continues to update its list of recalled hand sanitizers.[18] It is important to consult the recall list regularly for updates and stop using any products identified by Health Canada because of the posed health risks. It is important to remind clients, friends, and family to do the same. [54] [55]

## References


[1] Government of Canada, "List of authorized vaccines and treatments for COVID-19," March 2022. [Online]. Available: https://covid-vaccine.canada.ca/. [Accessed 1 March 2022].

[2] Government of Canada, "Approved COVID-19 Vaccines," 24 February 2022. [Online]. Available: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines.html. [Accessed 1 March 2022].

[3] Government of Canada, "Pfizer-BioNTech Comirnaty COVID-19 vaccine," 23 December 2021. [Online]. Available: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/pfizer-biontech.html. [Accessed 1 March 2022].

[4] Government of Canada, "Moderna Spikevax COVID-19 vaccine," 24 December 2021. [Online]. Available: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/moderna.html. [Accessed 1 March 2022].

[5] Government of Canada, "AstraZeneca Vaxzevria COVID-19 vaccine," 23 November 2021. [Online]. Available: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/astrazeneca.html. [Accessed 1 March 2022].

[6] Government of Canada, "Janssen (Johnson & Johnson) COVID-19 vaccine," 24 November 2021. [Online]. Available: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/janssen.html. [Accessed 1 March 2022].

[7] Government of Canada, "Novavax Nuvaxovid COVID-19 vaccine," 17 February 2022. [Online]. Available: https://www.canada.ca/en/health-


[18] Health Canada warns about certain hand sanitizers that may pose health risks (Part 2 – March 31, 2021 to present):
https://recalls-rappels.canada.ca/en/alert-recall/health-canada-warns-about-certain-hand-sanitizers-may-pose-health-risks-part-2-march
Recall of certain hand sanitizers that may pose health risks (Part 1 - June 17, 2020 to March 24, 2021):
https://recalls-rappels.canada.ca/en/alert-recall/recall-certain-hand-sanitizers-may-pose-health-risks-part-1-june-17-2020-march-24-2021
List of hand sanitizers authorized by Health Canada:
https://www.canada.ca/en/health-canada/services/drugs-health-products/disinfectants/covid-19/hand-sanitizer.html
Disinfectants and hand sanitizers accepted under COVID-19 interim measure:
https://www.canada.ca/en/health-canada/services/drugs-health-products/disinfectants/covid-19/products-accepted-under-interim-measure.html


Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/novavax.html. [Accessed 1 March 2022].

[8] Government of Canada, "Medicago Covifenz COVID-19 vaccine," 24 February 2022. [Online]. Available: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/medicago.html. [Accessed 1 March 2022].

[9] Natonal Advisory Committee on Immunization, "Summary of Natonal Advisory Committee on Immunization (NACI) Statement of February 17, 2022 Recommendations on the use of Novavax Nuvaxovid COVID-19 vaccine," Public Health Agency of Canada, Ottawa, 2022.

[10] VIPER Group COVID19 Vaccine Tracker Team, "Novavax: Nuvaxovid," 2022. [Online]. Available: https://covid19.trackvaccines.org/vaccines/25/. [Accessed 1 March 2022].

[11] Government of Canada, "COVID-19 protein subunit vaccines," 17 February 2022. [Online]. Available: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/protein-subunit.html. [Accessed 1 March 2022].

[12] Gavi , "What are protein subunit vaccines and how could they be used against COVID-19?," 2022. [Online]. Available: https://www.gavi.org/vaccineswork/what-are-protein-subunit-vaccines-and-how-could-they-be-used-against-covid-19. [Accessed 1 March 2022].

[13] World Health Organization, "Subunit Vaccines," 2022. [Online]. Available: https://vaccine-safety-training.org/subunit-vaccines.html. [Accessed 1 March 2022].

[14] Centre for Effective Practice, "COVID-19: Vaccines," 4 March 2022. [Online]. Available: https://tools.cep.health/tool/covid-19-vaccines/. [Accessed 1 March 2022].

[15] Novavax, Inc., "Nuvaxovid COVID-19 Product Monograph," Novavax, Inc., Gaithersburg, MD, 2022.

[16] Precision Vax LLC, "Novavax Nuvaxovid CovoVax COVID-19 Vaccine," 26 February 2022. [Online]. Available: https://www.precisionvaccinations.com/vaccines/novavax-nuvaxovid-covovax-covid-19-vaccine. [Accessed 2 March 2022].

[17] Nebraska Medicine, "Moths and tree bark: How the Novavax vaccine works," 25 June 2021. [Online]. Available: https://www.nebraskamed.com/COVID/moths-and-tree-bark-how-the-novavax-vaccine-works. [Accessed 2 March 2022].

[18] D. Kregiel, W. I. Berlowska, et al., "Saponin-based, biological-active surfactants from plants," in *Saponin-Based, Biological-Active Surfactants from Plants*, IntechOpen, 2017.

[19] National Advisory Committee on Immunization, "An Advisory Committee Statement (ACS) National Advisory Committee on Immunization (NACI) Recommendations on the use of Novavax Nuvaxovid COVID-19 vaccine," Public Health Agency of Canada, Ottawa, 2022.

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

[20] M. Fabre, P. Arrias, T. Masson, M. Pidre and V. Romanowski, "Baculovirus-Derived Vectors for Immunization and Therapeutic Applications," *Emerging and Reemerging Viral Pathogens,* pp. 197-244, 2020.

[21] Government of Canada, "Health Canada authorizes Novavax's Nuvaxovid COVID-19 vaccine," 17 February 2022. [Online]. Available: https://www.canada.ca/en/health-canada/news/2022/02/health-canada-authorizes-novavaxs-nuvaxovid-covid-19-vaccine.html. [Accessed 2 March 2022].

[22] Government of Canada, "Details for: NUVAXOVID - COVID-19," 17 February 2022. [Online]. Available: https://covid-vaccine.canada.ca/info/nuvaxovid-en.html. [Accessed 3 March 2022].

[23] Government of Canada, "Health Canada authorizes Medicago COVID-19 vaccine for adults 18 to 64 years of age," 24 February 2022. [Online]. Available: https://www.canada.ca/en/health-canada/news/2022/02/health-canada-authorizes-medicago-covid-19-vaccine-for-adults-18-to-64-years-of-age.html. [Accessed 3 March 2022].

[24] Medicago Inc, "Plant-based technology," 2021. [Online]. Available: https://medicago.com/en/our-technologies/plant-based-technology/. [Accessed 4 March 2022].

[25] Medicago Inc., "Plant-derived vaccines," *biopharmadealmakers,* p. 834, June 2018.

[26] Government of Canada, "COVID-19 plant-based vaccines," 24 February 2022. [Online]. Available: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/plant-based.html. [Accessed 4 March 2022].

[27] A. Kumar, K. Kadiresen, W. Gan and A. Ling, "Current updates and research on plant-based vaccines for coronavirus disease 2019," *Clinical and Experimental Vaccine Research,* vol. 10, no. 1, pp. 13-23, 31 January 2021.

[28] M. Goodin, D. Zaitlin, R. Naidu and S. Lommel, "Nicotiana benthamiana: Its History and Future as a Model for Plant–Pathogen Interactions," *Mol Plant Microbe Interact,* vol. 21, no. 8, pp. 1015-1026, August 2008.

[29] World Health Organization, "Plant-derived vaccines," 2022. [Online]. Available: https://www.who.int/teams/health-product-policy-and-standards/standards-and-specifications/vaccine-standardization/plant-derived-vaccines. [Accessed 4 March 2022].

[30] E. Laere, A. Ling, Y. Wong, R. Koh, M. Lila and S. Hussein, "Plant-based vaccines: Production and challenges," *Journal of Botany,* article 4928637, pp. 1-11, 2016.

[31] Government of Canada, "Details for: COVIFENZ - COVID-19," 17 February 2022. [Online]. Available: https://covid-vaccine.canada.ca/info/covifenz-en.html. [Accessed 4 March 2022].

[32] Medicago Inc., "COVIFENZ® COVID-19 Vaccine Product Monograph," Medicago Inc., Québec, QC , 2022.

[33] Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU), "COVID-19 Dashboard," 6 March 2022. [Online]. Available:

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

https://gisanddata.maps.arcgis.com/apps/dashboards/bda7594740fd40299423467b48e9ecf6. [Accessed 6 March 2022].

[34] Government of Canada, "COVID-19 daily epidemiology update," 4 March 2022. [Online]. Available: https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html. [Accessed 6 March 2022].

[35] Imperial College of London, "COVID-19 Orphanhood," 5 March 2022. [Online]. Available: https://imperialcollegelondon.github.io/orphanhood_calculator/#/country/Global. [Accessed 6 March 2022].

[36] J. Stephenson, "US COVID-19 Vaccination Efforts May Have Prevented More than 1 Million Deaths, 10 Million Hospitalizations," *JAMA Health Forum,* vol. 2, no. 12, pp. 1-2, 21 December 2021.

[37] E. Schneider, A. Shah, P. Sah, S. Moghadas, T. Vilches and A. Galvani, "The U.S. COVID-19 Vaccination Program at One Year: How Many Deaths and Hospitalizations Were Averted?," *Commonwealth Fund,* 14 December 2021.

[38] M. Meslé, J. Brown and P. Mook, "Estimated number of deaths directly averted in people 60 years and older as a result of COVID-19 vaccination in the WHO European Region, December 2020 to November 2021," *Eurosurveillance,* vol. 26, no. 47, 2021.

[39] European Centre for Disease Prevention and Control, "WHO/ECDC: Nearly half a million lives saved by COVID-19 vaccination in less than a year," 25 November 2021. [Online]. Available: https://www.ecdc.europa.eu/en/news-events/who-ecdc-nearly-half-million-lives-saved-covid-19-vaccination. [Accessed 5 March 2022].

[40] Centers for Disease Control and Prevention, "COVID Data Tracker," 2022. [Online]. Available: https://covid.cdc.gov/covid-data-tracker/#rates-by-vaccine-status. [Accessed 5 March 2022].

[41] World Health Organization, "Coronavirus disease (COVID-19): Post COVID-19 condition," 16 December 2021. [Online]. Available: https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-(covid-19)-post-covid-19-condition. [Accessed 5 March 2022].

[42] F. Razak, G. Katz, A. Cheung, et al., "Understanding the Post COVID-19 Condition (Long COVID) and the Expected Burden for Ontario," Ontario COVID-19 Science Advisory Table, 14 September 2021. [Online]. Available: https://covid19-sciencetable.ca/sciencebrief/understanding-the-post-covid-19-condition-long-covid-and-the-expected-burden-for-ontario/. [Accessed 5 March 2022].

[43] UK Health Security Agency, "The effectiveness of vaccination against long COVID A rapid evidence briefing," UK Health Security Agency, London, 2022.

[44] Government of Canada, "COVID-19 vaccination in Canada," 4 March 2022. [Online]. Available: https://health-infobase.canada.ca/covid-19/vaccination-coverage/. [Accessed 5 March 2022].

[45] Government of Canada, "Vaccines for COVID-19: How to get vaccinated," 4 March 2022. [Online]. Available: https://www.canada.ca/en/public-

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

health/services/diseases/coronavirus-disease-covid-19/vaccines/how-vaccinated.html. [Accessed 5 March 2022].

[46] N. Phillips, "The coronavirus is here to stay — here's what that means," *Nature,* vol. 590, pp. 382-384, 16 February 2021.

[47] Government of Canada, "Public advisory - Rapid antigen test kits and potential exposure to hazardous substances," 24 February 2022. [Online]. Available: https://recalls-rappels.canada.ca/en/alert-recall/rapid-antigen-test-kits-and-potential-exposure-hazardous-substances. [Accessed 1 March 2022].

[48] Government of Ontario, "Rapid testing for at-home use," 25 February 2022. [Online]. Available: https://www.ontario.ca/page/rapid-testing-home-use. [Accessed 1 March 2022].

[49] J. Ferreira, "Should you throw your used COVID-19 rapid test in the trash?," CTV News, 18 January 2022. [Online]. Available: https://www.ctvnews.ca/health/coronavirus/should-you-throw-your-used-covid-19-rapid-test-in-the-trash-1.5742103. [Accessed 1 March 2022].

[50] "Safe handling and management of rapid antigen COVID-19 testing waste, Guidance for business owners about the safe handling and disposal of rapid COVID-19 test kits," 2 March 2022. [Online]. Available: https://www.ontario.ca/page/safe-handling-and-management-rapid-antigen-covid-19-testing-waste. [Accessed 4 March 2022].

[51] Ontario COVID-19 Science Advisory Table, "Use of Rapid Antigen Tests during the Omicron Wave," 10 February 2022. [Online]. Available: https://covid19-sciencetable.ca/sciencebrief/use-of-rapid-antigen-tests-during-the-omicron-wave/. [Accessed 1 March 2022].

[52] Public Health Ontario, "Underreporting of COVID-19 Case Counts in the Context of the Omicron Variant," 25 December 2021. [Online]. Available: https://www.publichealthontario.ca/en/about/blog/2021/underreporting-of-covid-19-case-counts-in-the-context-of-the-omicron-variant. [Accessed 1 March 2021].

[53] Ontario Health, "COVID-19 Rapid Antigen Tests: How to Collect a Sample," 9 February 2022. [Online]. Available: https://www.ontariohealth.ca/sites/ontariohealth/files/2022-02/COVID-19RapidAntigenTests-HowtoCollectaSample.pdf. [Accessed 1 March 2022].

[54] Government of Canada, "Health Canada warns about certain hand sanitizers that may pose health risks (Part 2 – March 31, 2021 to present)," 21 February 2022. [Online]. Available: https://recalls-rappels.canada.ca/en/alert-recall/health-canada-warns-about-certain-hand-sanitizers-may-pose-health-risks-part-2-march. [Accessed 1 March 2022].

[55] Government of Canada, "Recall of certain hand sanitizers that may pose health risks (Part 1 - June 17, 2020 to March 24, 2021)," 24 March 2021. [Online]. Available: https://recalls-rappels.canada.ca/en/alert-recall/recall-certain-hand-sanitizers-may-pose-health-risks-part-1-june-17-2020-march-24-2021. [Accessed 1 March 2022].

[56] Government of Canada, "Contents of immunizing agents available for use in Canada: Canadian Immunization Guide," 23 12 2021. [Online]. Available:

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-1-key-immunization-information/page-15-contents-immunizing-agents-available-use-canada.html. [Accessed 2 March 2022].

[57] Gavi, "What are whole virus vaccines and how could they be used against COVID-19?," 2022. [Online]. Available: https://www.gavi.org/vaccineswork/what-are-whole-virus-vaccines-and-how-could-they-be-used-against-covid-19. [Accessed 2 March 2022].

[58] H. Lu, Y. Chen and H. Liu, "Baculovirus as a vaccine vector," *Bioengineered,* vol. 3, no. 5, pp. 271-274, 1 September 2012.

[59] World Health Organization, "Vaccine efficacy, effectiveness and protection," 14 July 2021. [Online]. Available: https://www.who.int/news-room/feature-stories/detail/vaccine-efficacy-effectiveness-and-protection. [Accessed 3 March 2022].

[60] Government of Canada, "Guidance for market authorization requirements for COVID-19 vaccines: Rolling submissions, non-clinical and clinical requirements," 30 March 2021. [Online]. Available: https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/guidance-market-authorization-vaccines/rolling-submissions-non-clinical-requirements.html. [Accessed 3 March 2022].

[61] Medicago Inc., "Medicago and GSK announce the approval by Health Canada of COVIFENZ®, an Adjuvanted Plant-Based COVID-19 Vaccine," 24 February 2022. [Online]. Available: https://medicago.com/en/press-release/covifenz/. [Accessed 3 March 2022].

[62] GlaxoSmithKline plc. , "Our response to COVID-19," 2022. [Online]. Available: https://www.gsk.com/en-gb/media/resource-centre/our-contribution-to-the-fight-against-2019-ncov/. [Accessed 4 March 2022].

[63] K. Dhama, S. Natesan, M. Yatoo, S. Patel, R. Tiwari, S. Saxena and H. Harapan, "Plant-based vaccines and antibodies to combat COVID-19: Current status and prospects," *Human Vaccines & Immunotherapeutics,* vol. 16, no. 12, pp. 2913-2920, 2020.

**Client Resources**

Details for: NUVAXOVID - COVID-19, Consumer information, Government of Canada
https://covid-vaccine.canada.ca/info/nuvaxovid-en.html

Details for: COVIFENZ - COVID-19, Consumer information, Government of Canada
https://covid-vaccine.canada.ca/info/covifenz-en.html

**Additional Resources**

Nuvaxovid™ Product Monograph, Novavax Inc. February 17, 2022, p 1-23
https://covid-vaccine.canada.ca/info/pdf/nuvaxovid-pm-en.pdf

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

Regulatory Decision Summary - Nuvaxovid - Health Canada, February 17, 2022
https://covid-vaccine.canada.ca/info/regulatory-decision-summary-detail.html?linkID=RDS00916

An Advisory Committee Statement (ACS) National Advisory Committee on Immunization (NACI) Recommendations on the use of Novavax Nuvaxovid COVID-19 vaccine, February 17, 2022, p 1-23
https://www.canada.ca/content/dam/phac-aspc/documents/services/immunization/national-advisory-committee-on-immunization-naci/recommendations-use-novavax-nuvaxovid-covid-19-vaccine.pdf

Summary Of National Advisory Committee on Immunization (NACI) Statement of February 17, 2022, Recommendations on the use of Novavax Nuvaxovid COVID-19 vaccine, p 1-5
https://www.canada.ca/content/dam/phac-aspc/documents/services/immunization/national-advisory-committee-on-immunization-naci/summary-february-17-2022-recommendations-use-novavax-nuvaxovid-covid-19-vaccine.pdf

An Advisory Committee Statement (ACS) National Advisory Committee on Immunization (NACI) Recommendations on the use of Medicago COVID-19 vaccine (Covifenz), March 11, 2022, p 1-21
https://www.canada.ca/content/dam/phac-aspc/documents/services/immunization/national-advisory-committee-on-immunization-naci/recommendations-use-medicago-covid-19-vaccine/recommendations-use-medicago-covid-19-vaccine.pdf

Summary of National Advisory Committee on Immunization (NACI) Statement Of March 11, 2022, Recommendations on the use of Medicago COVID-19 vaccine (Covifenz), p 1-4
https://www.canada.ca/content/dam/phac-aspc/documents/services/immunization/national-advisory-committee-on-immunization-naci/recommendations-use-medicago-covid-19-vaccine/recommendations-use-medicago-covid-19-vaccinesummary-march-11-2022.pdf

Efficacy and safety of NVX-CoV2373 in adults in the United States and Mexico, Dunkle, L; Kotloff, K; Gay, C; et al. New England Journal of Medicine, Volume 386, February 10, 2022, p 531-543
https://www.nejm.org/doi/full/10.1056/NEJMoa2116185

Safety and efficacy of NVX-CoV2373 COVID-19 vaccine, Heath, P; Galiza, E; Baxter, D; et al. *New England Journal of Medicine*, Volume 385, September 23, 2021, p 1172-1183
https://www.nejm.org/doi/full/10.1056/NEJMoa2107659

Covifenz® Product Monograph, Medicago Inc. February 24, 2022
https://medicago.com/app/uploads/2022/02/Covifenz-PM-en.pdf

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA

Regulatory Decision Summary - Covifenz - Health Canada, February 24, 2022
https://covid-vaccine.canada.ca/info/regulatory-decision-summary-detail.html?linkID=RDS00921

Safety, immunogenicity, and protection provided by unadjuvanted and adjuvanted formulations of a recombinant plant-derived virus-like particle vaccine candidate for COVID-19 in nonhuman primates, *Cellular & Molecular Immunology*, Volume 19, January 5, 2022, p 222-233
https://www.nature.com/articles/s41423-021-00809-2

Lack of effects on female fertility or pre- and postnatal development of offspring in rats after exposure to AS03-adjuvanted recombinant plant-derived virus-like particle vaccine candidate for COVID-19, Dubé, C; Paris-Robidas, S; Primakova, I; et al. *Reproductive Toxicology*, Volume 107, January 2022, p 69-80
https://www.sciencedirect.com/science/article/pii/S0890623821001738
Phase 1 randomized trial of a plant-derived virus-like particle vaccine for COVID-19, *Nature Medicine*, Volume 27, May 18, 2021, p 1071-1078
https://www.nature.com/articles/s41591-021-01370-1

Plant-Based Vaccines: The Way Ahead? LeBlanc, Z; Waterhouse, P; Bally, J. *Viruses*, Volume 13, Issue 1, December 22, 2022, p 1-13
https://www.mdpi.com/1999-4915/13/1/5/htm

Plant-based vaccines and antibodies to combat COVID-19: Current status and prospects, Dhama, K; Natesan, S; Yatoo, M; et al. *Human Vaccines & Immunotherapeutics*, Volume 16, Issue 12, December 3, 2020, p 2913-2920
https://www.tandfonline.com/doi/full/10.1080/21645515.2020.1842034

Disclaimer: This document is educational and not intended to provide clinical advice nor should it be used as a replacement for professional dental or medical advice. Dental hygienists are encouraged to consult with CDHO practice advisors and refer to CDHO guidelines. Dental hygienists are responsible for the decisions they make and for the consequences associated with those decisions. © ODHA