The federal government's call to dental hygienists for vaccine promotion

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In mid-December 2020, I was honoured to participate in a Zoom event hosted by the Honourable Patty Hajdu, federal minister of health, and Dr. Theresa Tam, Canada's chief public health officer. Dental hygienists throughout Canada were invited to attend this appreciation event for health care and allied health care workers. I believe this was one of the first steps in the recognition of dental hygienists as primary health care providers by the federal government and thus was pleased to see several dental hygienists in attendance alongside physicians, nurses, dentists, paramedics, etc. The discussion revolved around the safety of the messenger RNA (mRNA) vaccines now available as well as the challenges not only with distribution but also with convincing the public to take the vaccine. Minister Hajdu suggested that dental hygienists were in a prime position to provide health promotion information to Canadians, including countering misinformation regarding the safety of the vaccines, since they see their clients more routinely than other health care providers. Additionally, Dr. Tam requested that we provide testimonials to our clients regarding the safety of the vaccine once we have personally received it.

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This call for action by dental hygienists requires us to keep abreast of information on the properties and guidelines, as well as the safety, of each vaccine as it becomes available. Currently, the only 2 vaccines approved by Health Canada for distribution are the Pfizer-BioNTech and Moderna mRNA vaccines. Once other vaccines developed using different technology become available, we will need to learn about their specific properties and guidelines as well. It will be important to stay on top of the literature and information provided about the vaccines by the Government of Canada through its COVID-19 website.[1]

COVID-19 VACCINES APPROVED FOR USE IN CANADA

It is truly an amazing accomplishment, as well as a major medical advancement, that both the Pfizer-BioNTech and Moderna vaccines have become available in such a short period of time. Typically, vaccine development has taken 4 years at the very least, and in most cases, a lot longer. Numerous people have questioned the speed of this process and thus may be skeptical about receiving the vaccine. There is, however, a very good explanation for this rapid pace of development, which we should be sharing with our clients to alleviate their concerns.

Shortly after the onset of the pandemic, scientists identified, analysed, and published the genetic structure of SARS-CoV-2 and shared their findings around the globe, giving scientists worldwide the tools to begin vaccine development. The speed at which these first 2 vaccines were developed is due to use of an entirely different type of technology than what has commonly been used in the past for human vaccine development. Rather than using DNA fragments of living viruses that have been attenuated or rendered non-infectious, scientists began working with mRNA technology, which is a far more efficient, cell-free lab process. Because all they need is the genetic sequence of the virus, they do not need to manufacture any protein, which significantly shortens the time frame to produce a vaccine. This technology is not exactly new: mRNA vaccines have been used successfully in animals, although this is the first time they have been used in humans.[1,2]

In addition, because these mRNA vaccines have not been made from actual virus particles (containing viral DNA) or any living organism for that matter, they are much safer. With no viral DNA present, the mRNA vaccine enters only the cytoplasm of the cell, not the cell nucleus, making it virtually impossible for the recipient to become infected with the virus![2] The potential for infection is often a major concern for those nervous about receiving the vaccine.

Both the Pfizer-BioNTech and Moderna vaccines are created by building strands of mRNA that carry the "code" for the SARS-CoV-2 "spike protein" found on the surface of the coronavirus shell. This spike protein is how the virus gains entry into our cells by binding to ACE-2 receptors on our cell surface membranes.[2] Interestingly, the corona group of viruses were named after these surface spikes—"corona" means crown. The concentrated replicated strands of mRNA are then embedded in a lipid nanoparticle and

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placed in a microcapsule to serve as a carrier, facilitating the entry of the code into cells through injection into the patient's arm (deltoid) muscle.[2] Although the technology is the same for the 2 vaccines, there are slight differences between the 2 based on the dosage and contents of the nanoparticle carrier. The Pfizer-BioNTech vaccine comes in a 0.3 mL dose that requires the addition of a sodium chloride diluent to the syringe prior to injection, while the Moderna vaccine comes in a 0.5 mL dose and does not require the addition of a diluent prior to injection.[2] This difference accounts for the recommended storage temperatures for the 2 vaccines. Although both vaccines must be stored at very cold temperatures until the time of injection, the Pfizer-BioNTech vaccine requires a temperature of –70 degrees Celsius. The need for specialized freezers complicates the storage and distribution of this vaccine. In contrast, the Moderna vaccine can be stored in regular freezers at –20 degrees Celsius. Both vaccines require an initial dose and then a booster dose (21 days after for Pfizer-BioNTech and 28 days after for Moderna).[2]

HOW DO THESE VACCINES WORK?

Once the mRNA vaccine enters the body, the strands of mRNA are absorbed by the immune system cells and give them instructions to make a "harmless" piece of the spike protein that is found on the surface of the SARS-CoV-2 virus.[3] Once the protein piece is made, the cell actually breaks down and gets rid of the instructions.[3] This new protein piece is then displayed on the cell surface, enabling the immune system to recognize it as an "antigen" or "invader" and to launch both a cellular (T-cell) and humoral (B-cell) response.[3] This response creates antibodies against the spike protein, which are then stored in the immune system for protection against future infection by the actual virus, thus creating immunity.

Efficacy for the Pfizer-BioNTech vaccine is 95% after the 2nd dose; for the Moderna vaccine, it is 94% after the 2nd dose.[2] It is important to note, however, that there are still a lot of unknowns, such as how long the immunity will last and if we will need to have occasional booster shots in the future.[2] We also don't know yet if a vaccinated individual can still contract and carry the SARS-CoV-2 virus asymptomatically, transmitting it and infecting others who are not vaccinated. Thus, it will be important for us all to continue wearing a mask and remaining socially distanced from others until a state of herd immunity is reached within the country. Although the exact percentage is unknown at this time, the National Advisory Committee on Immunization (NACI), a part of the Public Health Agency of Canada, estimates that herd immunity will be achieved when at least 70% of the population is immunized.[2] More information will become available to answer these questions as the Phase 3 trials continue for both vaccines.

In terms of side effects, some people may be allergic to some of the ingredients in the carrier nanoparticle, in particular, polyethylene glycol.[2] The NACI advises that individuals who are allergic to polyethylene glycol or who have had anaphylaxis-type allergic reactions in the past or those who carry an EpiPen should not take these vaccines. Milder side effects such as soreness at the injection site, headache, fatigue, and in some instances, mild flu-like

Table 1. Comparison of currently approved COVID-19 mRNA vaccines

	mRNA vaccines	
	Pfizer-BioNTech	**Moderna**
Health Canada approval	December 9, 2020	December 23, 2020
Population	Ages 16+	Ages 18+
Dose	30 mcg of mRNA per 0.3 mL (after dilution)	100 mcg of mRNA per 0.5 mL (no dilution)
Schedule	2 doses, 21 days apart	2 doses, 28 days apart
Route of administration	IM (deltoid)	IM (deltoid)
Storage temperature	–70° Celsius	–20° Celsius
Efficacy	95%	94.1%
Number of participants in Phase 3 trial	44,000 total (22,000 vaccine/22,000 placebo)	30,413 total (15,206 vaccine/15,207 placebo)
Side effects	Mild to moderate flu-like symptoms lasted ~2 days (more commonly after the 2nd dose)	Mild to moderate flu-like symptoms lasted ~2 days (more commonly after the 2nd dose)
Contraindications	Pregnant women; COVID-positive; previous anaphylaxis; allergy to ingredients; immunocompromised; precautions for those with bleeding disorders or on anticoagulant therapy.	Pregnant women; COVID-positive; previous anaphylaxis; allergy to ingredients; immunocompromised; precautions for those with bleeding disorders or on anticoagulant therapy.

Source: National Advisory Committee on Immunization webinars (https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals.html#a11)

symptoms have been documented with both of the mRNA vaccines, lasting only a few days. Interestingly, these side effects were more common in both vaccines after receipt of the 2nd dose. No serious or life-threatening safety concerns have been reported with either vaccine.[2] A comparison of the properties of the 2 mRNA vaccines appears in Table 1.

As new vaccine candidates currently being evaluated by Health Canada, such as the Oxford/Astra-Zeneca viral vector vaccine, receive their approval, a new set of guidelines will be published by Health Canada and the Public Health Agency of Canada. The properties of a viral vector vaccine will differ from those of the mRNA vaccines, so it will be crucial for us all to stay up-to-date with new information as it becomes available in order to best counsel our clients.

FINAL THOUGHTS

One of the strongest arguments that you can make to your clients regarding vaccination is that, prior to the advent of the first vaccine, developed by Edward Jenner in 1796 for smallpox, countless individuals died from smallpox. The outcome was the same for individuals who contracted other diseases such as polio, diphtheria, tetanus, typhoid, measles, mumps, cholera, tuberculosis, and the bubonic plague, all of which now have vaccines! Thanks to vaccines, these diseases have now been almost entirely eradicated. In fact, we can say that one of the greatest public health successes in the history of humanity has been mass vaccination.

As health care providers, we are taught to protect our clients from harm and are privileged to have the knowledge as well as the responsibility to educate them to make positive choices for their oral and overall health. This pandemic has taken a heavy toll on the world population over the past year, including here in Canada. Choosing to be vaccinated against SARS-CoV-2 will enable us all to play a role in decreasing the horrific effects of COVID-19 and allow us to return eventually to a normal life.

> *While the vaccine discovery was progressive, the joy I felt at the prospect before me of being the instrument destined to take away from the world, one of its greatest calamities (smallpox), blended with the fond hope of enjoying independence and domestic peace and happiness, was often so excessive that, in pursuing my favorite subject among the meadows, I have sometimes found myself in a kind of reverie.*
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> *—Edward Jenner*

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1. Government of Canada. Coronavirus disease (COVID-19) vaccines: Overview [Internet]. 2021 [cited 2021 January 10]. Available from: https://www.canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19/vaccines.html
2. Health Canada. Recommendations of the National Advisory Committee on Immunization (NACI) on the use of the Pfizer-BioNTech COVID-19 Vaccine [Webinar]. 2021 [cited 2021 January 10]. Available from: https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals.html#a11
3. Centers for Disease Control and Prevention. Understanding mRNA COVID-19 Vaccines [Internet]. 2020 [cited 2021 January 10]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/mrna.html

ISSUE AT A GLANCE

You will find 4 original research articles in this issue. **Iris Lin, Denise Laronde, Lewei Zhang Miriam Rosin, Ilena Yim,** and **Leigha Rock** explore the hypothesis that basement membrane degeneration may be a predictor of malignant progression in oral lesions with both lichenoid changes and dysplasia, allowing for early-stage diagnosis and treatment of oral cancers (pp. 9-16). **Batoul Shariati, Zul Kanji, Shimae Soheilipour, Lyana Patrick,** and **Afsaneh Sharif** report on revisions to a statistics and epidemiology course and their impact on the students' ability to demonstrate the "research use" competency required by the National Dental Hygiene Certification Board (pp. 17-29). **Navdeep Kaur, Daniel Kandelman**, and **Louise Potvin** describe the development and testing of a photonovel offering culturally and linguistically appropriate oral hygiene self-care information to Punjabi immigrants in Montreal, Canada (pp. 30-38). **Alix Clarke, Hollis Lai, Alexandra Sheppard,** and **Minn Yoon** examine the use of diagnostic score reporting as a feedback method for structured clinical assessments in dental hygiene education and its impact on student performance (pp. 39-47). **Clarke and colleagues** also review the literature on structured clinical assessments and describe how their findings were used to develop a practical diagnostic score reporting framework for use in dental hygiene programs (pp. 48-56).

In addition, we are pleased to publish a position paper on the state of the evidence of a causal relationship between periodontal disease and type 2 diabetes, written by **Salme Lavigne** and **Jane Forrest** for the Canadian Dental Hygienists Association (CDHA) (pp. 57-67). This position paper is the fourth in CDHA's series on the oral–systemic link. Finally, we recognize and thank the experts around the globe who reviewed manuscripts for the journal in 2020 (p. 73). We owe them, as always, a debt of gratitude.

PLAIN LANGUAGE ABSTRACTS

Lin I, Laronde DM, Zhang L, Rosin MP, Yim I, Rock LD. Basement membrane degeneration is common in lichenoid mucositis with dysplasia. *Can J Dent Hyg*. **2021;55(1):9-16**

In this study, tissue samples from 42 patients diagnosed with lichenoid mucositis with low-grade oral epithelial dysplasia were examined to determine if basement membrane degeneration in these lesions might predict an increased risk for oral cancer. While the research showed that basement membrane degeneration does not appear to be a predictor of malignant progression in lesions with both lichenoid and low-grade dysplastic features, dental hygienists should continue to monitor these lesions carefully in their clients. Dysplasia in lichenoid lesions can progress to cancer, so any significant change noted by dental hygienists should be referred promptly for a biopsy. Early detection and intervention have been proven to reduce the mortality rate of oral cancer.

Shariati B, Kanji Z, Soheilipour S, Patrick L, Sharif A. Enhancing learning in an online oral epidemiology and statistics course. *Can J Dent Hyg*. **2021;55(1);17-29**

Dental hygiene students pursuing a bachelor's degree must show that they can apply research methods and statistics in professional practice. Because statistics and epidemiology concepts are often difficult to understand, a fourth-year online statistics and epidemiology course at the University of British Columbia was revised in 2016 to address the challenges faced by students in mastering these subjects. The revisions included incorporating more time to absorb learning, increasing opportunities for peer-assessment and teamwork activities, and more regular instructor feedback. Forty-three (43) students were surveyed before and after the course revisions on their perceptions of the difficulty of the course and on their confidence in applying the skills taught. Students in the revised course were more confident in demonstrating the course objectives and felt less challenged to learn the content. The new delivery format of the course and the methods used to evaluate course renewal may be valuable in assessing curricula in other health programs.

Kaur N, Kandelman D, Potvin L. Development and pilot testing of an oral hygiene self-care photonovel for Punjabi immigrants: a qualitative study. *Can J Dent Hyg.* **2021;55(1):30-38**

Immigrant populations tend to have lower health literacy levels than their native-born counterparts. This article describes the development of a photonovel to convey basic oral hygiene instructions to an underserved immigrant population in Montreal, Canada. Members of that Punjabi immigrant community were recruited to talk about their experiences in receiving professional dental care services and their understanding of the importance of oral hygiene self-care. Based on their feedback, a photonovel on oral hygiene self-care was created and tested. Results show that this type of culturally and linguistically sensitive intervention may be an effective way to educate immigrant populations on key oral health topics.

Clarke A, Lai H, Sheppard ADE, Yoon MN. Effect of diagnostic score reporting following a structured clinical assessment of dental hygiene student performance. *Can J Dent Hyg*. **2021;55(1):39-47**

Dental hygiene students undergo structured clinical assessments of their skills and knowledge as part of their education program. In this study, 38 students at the University of Alberta participated in a mock structured clinical assessment during which some received a diagnostic score report (DSR) of their performance while others received an overall percentage grade of performance. After receiving their mock results, all students were asked to reflect on their performance. Those reflections were analysed by the authors and compared to the students' actual results on their clinical assessments. While the students who received a DSR appeared to reflect more accurately on their strengths and weaknesses, this awareness did not improve performance. More research is needed to determine if these reports, perhaps with more detailed, personalized information, could improve student performance.

Clarke A, Lai H, Sheppard ADE, Yoon MN. Development of diagnostic score reporting for a dental hygiene structured clinical assessment. *Can J Dent Hyg*. **2021;55(1):48-56**

Diagnostic score reporting (DSR) helps student make important connections between dental hygiene competencies, their education, and their clinical practice. This review describes a general framework for applying DSR within the context of a structured clinical assessment. Multidisciplinary research in the areas of structured clinical assessments, test development, and feedback in higher education was reviewed and analysed to produce a reporting framework that was piloted among students at the University of Alberta in 2016. This pilot testing showed how score reports could be generated efficiently without compromising confidentiality. The process used to develop a DSR for this dental hygiene program could be used as a guide for developing validated score reports in other programs.