

Vaccine hesitancy: Root causes and possible solutions

Salme E Lavigne*, PhD, RDH

I cannot believe that one year ago, I wrote my first editorial about the COVID-19 pandemic.¹ Never in my wildest imagination did I think that we would still be discussing it now, let alone dealing with a third wave. However, here we are.

If you recall, in my February 2021 editorial I discussed the federal government's appeal to dental hygienists, as health professionals, to step up and assist with educating our clients about both the safety and importance of receiving the COVID-19 vaccine in order to establish "herd immunity."² At that time, the mRNA vaccines (Pfizer-BioNTech and Moderna) were the only ones approved by Health Canada. Since then, two viral vector-based vaccines have been added to that list: AstraZeneca/COVISHIELD and Janssen (Johnson & Johnson).³ In order to educate our clients and encourage them to take one of these vaccines, we not only need to understand how the new vaccine additions work, but we must also address the topic of vaccine hesitancy and attempt to understand the underlying issues that prevent so many Canadians from getting vaccinated.

Viral vector-based vaccines use a harmless virus (typically a type of adenovirus similar to those that can cause the common cold) as a delivery system. This "vector" virus is not the virus that causes COVID-19. These adenoviruses have been used in many vaccines developed in the past and have been shown to be very safe. Once injected into the body, the vector virus produces the spike protein that is found on the surface of the SARS-CoV-2 virus. This subsequently stimulates the body to launch a strong immune response against this spike protein, ultimately producing sufficient antibodies to provide the necessary protection against SARS-CoV-2. Once antibodies have been produced, the spike protein itself goes away. Table 1 compares the 2 approved viral vector vaccines in Canada; a comparison of the mRNA vaccines was published as part of my February 2021 editorial.²

Dental hygienists should check Health Canada's website on a regular basis as vaccine distribution plans continue to change. A prime example is that the Pfizer-BioNTech vaccine has now been approved for adolescents between the



Salme E Lavigne

ages of 12 and 17 as well as for pregnant women. In addition, several provinces have recently halted the distribution of the first dose of the AstraZeneca vaccine due to the rising number of cases of vaccine-induced thrombosis with thrombocytopenia (VITT). It appears that sufficient vaccine is being saved for those wishing the second dose, although some provinces are now giving individuals the choice of an mRNA vaccine for dose 2.

VACCINE HESITANCY

In April 2021, the Canadian Dental Hygienists Association (CDHA) conducted its second member poll on vaccines.⁴ I was pleased to see that 75% of the 4,378 dental hygienists who responded had already received 1 dose of the vaccine and an additional 6% had received 2 doses—an improvement over the results of the first poll back in January! I was, however, disappointed to see that 5% of respondents were not sure if they wished to receive the vaccine and 4% were absolute "Nos." Although the number of individuals who completed the survey represents only 22% of CDHA's 20,000 members and 15% of the 30,000 registered dental hygienists in Canada, if this is a representative sample, then at least 1,200 dental hygienists may not be inclined to promote vaccination and an additional 1,500 are unsure. Given the invitation we received from Health Canada to help educate our client population and encourage them to have the vaccine, I cannot help but wonder what these dental hygienists are recommending to their clients? As regulated health professionals, dental hygienists have an obligation to support and promote the health of Canadians by assisting our national public health agency in encouraging everyone to eradicate this pandemic by achieving herd immunity. I would hope that no matter what a dental hygienist's personal beliefs are about vaccines, they would not project those beliefs onto their clients and discourage them from being vaccinated.

The question then arises as to why so many people are hesitant to receive a vaccine?

Vaccine hesitancy is not a new phenomenon. Since the introduction of vaccines in 1798, vaccine hesitancy has been recorded, particularly in parents who have chosen not to

*Scientific editor, *Canadian Journal of Dental Hygiene*

Correspondence: Salme E Lavigne; scientificeditor@cdha.ca

©2021 Canadian Dental Hygienists Association

Table 1. Comparison of currently approved viral vector-based COVID-19 vaccines in Canada

	AstraZeneca/COVISHIELD	Janssen (Johnson & Johnson)
Health Canada approval	February 26, 2021	March 5, 2021
Population	Ages 18+	Ages 18+
Dose	2 injections of 0.5 mL each	1 injection only of 0.5 mL
Schedule	4 to 12 weeks after 1st dose	N/A
Route of administration	IM (deltoid)	IM (deltoid)
Storage temperature	Regular refrigeration	Regular refrigeration
Efficacy	62% 2 weeks after 1st dose	66% after 2 weeks
Number of participants in Phase 3 trial	11,636 Total	43,000 Total
Common side effects	Pain at injection site; body chills; fever; fatigue	Pain at injection site; body chills; fever; fatigue
Rare side effects	Blood clots with low platelets; VITT	Blood clots with low platelets; VITT
Contraindications	Allergic reactions to ingredients. Unknown efficacy for those 65+ or pregnant women (not included in trials)	Allergic reactions to ingredients. Unknown safety for pregnant women (not included in trials)

Sources: AstraZeneca/COVISHIELD COVID-19 Vaccine: What You Should Know (<https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/astrazeneca.html>); Janssen (Johnson & Johnson) COVID-19 Vaccine: What You Should Know (<https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/janssen.html>)

vaccinate their children against some of the common childhood diseases. Fortunately, through herd immunity, the majority of the world’s major public health threats have been eradicated, such as smallpox, polio, tetanus, typhoid, measles, mumps, rubella, and pertussis. However, we have seen a resurgence of several of these diseases recently, such as measles, varicella, and pertussis, because of the refusal of a growing number of the world’s population to be vaccinated.⁵

Over the years, scientists, sociologists, ethicists, and philosophers have attempted to understand what causes vaccine hesitancy in a certain proportion of the population. Often and perhaps incorrectly, many public health and medical personnel believe that vaccine non-supporters do not understand the science. However, Dr. Maya Goldberg, a University of Guelph philosophy professor, claims it is not a lack of knowledge or a misunderstanding of science, but rather a low level of trust in the health care system and in scientists that shapes their beliefs.⁶ She also claims that this distrust is often driven by concerns about the credibility of industry-funded research.⁶ Interestingly, a group of Canadian researchers just published their study investigating COVID-19 vaccine hesitancy based on an analysis of 605 “tweets” from Canadian Twitter profiles.⁷ They identified 5 themes in these tweets: concerns over safety; suspicion about political or economical forces driving the pandemic or vaccine development; a lack of knowledge about the vaccine; antivaccine or confusing messages from authority figures; and a lack of legal liability from vaccine companies. These themes were then categorized and analysed using the Theoretical Domains Framework.⁷ Based on this study’s findings, dental hygienists could consider the following interventions to increase vaccine acceptance: 1) as a profession, launch campaigns through social media to educate the public about the importance of vaccination for global public health; 2) emphasize that

vaccines are rooted in science not politics; 3) mention celebrities, such as athletes, musicians, and other well-respected individuals, as examples of those who support the vaccine; 4) reiterate the safety of the vaccines (i.e., National Advisory Committee on Immunization [NACI] surveillance); 5) explain the rigorous vaccine development process; 6) ask clients about their specific concerns and respond accordingly. Most importantly, dental hygienists must refrain from expressing their personal beliefs about the vaccine if they are not supportive of it.

Returning to vaccine-hesitant dental hygienists, the CDHA April poll identified their top 5 concerns. Here they are along with my responses:

- 1. Do not have enough confidence in the vaccine development process. (57%)**
My October 2020 editorial⁸ detailed how vaccines are created and the stringent rules that must be followed prior to approval. It also noted that the chief executive officers of 9 manufacturing companies had signed a pledge to “uphold the integrity of the scientific process” in the race to develop effective COVID-19 vaccines.⁹ Additionally, my February 2021 editorial explained that the seemingly rapid development of the mRNA vaccines was made possible through global collaboration among researchers and the inherent efficiency of mRNA technology, rather than “cutting corners.”²
- 2. Do not think that pharmaceutical companies and governments are being transparent in the research they release to the public. (51%)**
Each country has its own monitoring agency to review the clinical trials and validate the results for both safety and efficacy. In Canada, we

have an independent review panel comprising 12 members with expertise in pediatrics, infectious diseases, immunology, medical microbiology, internal medicine, and public health (NACI). The purpose of this external non-industry/non-governmental agency is to ensure, through unbiased review, that vaccine research is conducted to a high standard prior to recommending approval of a vaccine. One can rest assured that all rules have been followed.

3. **Worried about the long-term efficacy of the vaccine. (51%)**

These vaccines have been approved for emergency use to eradicate a pandemic. Thus, it is true that long-term efficacy is unknown at this time. However, data on all vaccines continue to be gathered and, thus far, at the 6-month mark, the efficacy has been reported to be strong. Historically, some vaccines have required boosters while some do not. As time evolves and research continues, the experts will be able to determine if boosters are necessary.

4. **Worried about the possible long-term side effects associated with the vaccine. (81%)**

Once again, although the vaccines appear to be safe and effective at this time, the possibility of long-term effects exists. Currently, there is no evidence of any long-term effects, but there are many stories circulating that are not science-based that we as health professionals should be dismissing. We must have confidence in the current science in order to eradicate this life-threatening pandemic so that we can all return to a normal life.

5. **Concerned about the risk of blood clots with the AstraZeneca vaccine. (42%)**

This is an understandable concern since there have now been several documented cases in Canada, increasing the risk estimate to 1 occurrence in every 55,000 vaccines administered. The world statistics on this risk range from 1 in 26,500 to 1 in 127,300 according to the Ontario COVID-19 Science Advisory Table.¹⁰ However, we must remember that well over 2,000,000 doses of this vaccine have already been safely administered. At the time of writing, a temporary hold has been placed on the administration of first doses of this viral vector-based vaccine in 9 provinces. Second doses are being offered to those who had already received the first dose, with the assurance that the risk of blood clots is even lower with the second dose.

Dental hygiene is a science-based discipline, and although some of the concerns identified by poll respondents are valid, the emergency in which we find ourselves nationally and internationally requires us to weigh the benefits against the risks and above all follow

the science, trust our experts, and dispel the rumours, conspiracy theories, and false information that are circulating, particularly through social media. Never in our lifetimes have we experienced a pandemic; research is evolving and we are continuously learning.

What is most important for us to understand as health professionals is that we are facing an enormous global challenge with the COVID-19 pandemic. Our only hope of ending this threat is to reach herd immunity through global vaccination. The constantly mutating SARS-CoV-2 strains will continue to produce new variants until the world population reaches herd immunity. Only then can we return to any semblance of normality.

Alone, we can do so little; together, we can do so much –Helen Keller

REFERENCES

1. Lavigne SE. A history of pandemics: Lessons we can learn from the past. *Can J Dent Hyg.* 2020;54(2):55-57.
2. Lavigne SE. The federal government's call to dental hygienists for vaccine promotion. *Can J Dent Hyg.* 2021;55(1):3-6.
3. Health Canada. AstraZeneca/COVISHIELD COVID-19 Vaccine: What You Should Know [Internet]. Updated April 14, 2021. Available from: <https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/astrazeneca.html>
4. Canadian Dental Hygienists Association. COVID-19 Update for CDHA Members: May 6, 2021 [eBulletin] [cited 2021 May 13]. Available from: https://files.cdha.ca/newsEvents/SafetyAlerts/May6_2021_Member_update_EN.pdf
5. Atwell JE, Salmon DA. Pertussis resurgence and vaccine uptake: Implications for reducing vaccine hesitancy. *Pediatrics.* 2014;134(3):602. Available from: <https://pediatrics.aapublications.org/content/134/3/602>
6. Longthorne K. Reframing vaccine hesitancy. Guelph ON: Office of Research, University of Guelph; 2021. Available from: <https://www.uoguelph.ca/research/print/2369>
7. Griffith J, Marani H, Monkman H. COVID-19 vaccine hesitancy in Canada: Content analysis of tweets using the Theoretical Domain Framework. *J Med Internet Res.* 2021;23(4):e26874. Published online 2021 April 13. Doi: 10.2196/26874:10.2196/26874. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8045776/?report=printable>
8. Lavigne SE. The race for a COVID-19 vaccine. *Can J Dent Hyg.* 2020;54(3):107-109.
9. Biopharma leaders unite to stand with science [Media release]. *Business Wire*, September 8, 2020 [cited 2020 Sept 18]. Available from: <https://www.businesswire.com/news/home/20200908005282/en/>
10. Ontario COVID-19 Science Advisory Table. Risk of vaccine-induced thrombotic thrombocytopenia (VITT) following the AstraZeneca/COVISHIELD adenovirus vector COVID-19 vaccines. *Science Briefs.* Version 1.2, May 11, 2021. Available from: <https://covid19-sciencetable.ca/sciencebrief/vaccine-induced-immune-thrombotic-thrombocytopenia-vitt-following-adenovirus-vector-covid-19-vaccination-interim-guidance-for-healthcare-professionals-in-the-outpatient-setting/download.pdf>

ISSUE AT A GLANCE

We are pleased to feature 3 original research articles in this issue. Avraham Zini, Sigal Mazor, Hans Timm, Matthew L Barker, Julie M Grender, Robert W Gerlach, and Aaron R Biesbrock evaluate the effects of an oral hygiene regimen involving an oscillating-rotating electric toothbrush, bioavailable stannous fluoride dentifrice, cetylpyridinium chloride mouthrinse, and dental floss on the periodontal health of adults with established gingivitis and early periodontitis over 24 months (pp. 85–94). Mahnoor Shahab, Sharon M Compton, and Ava K Chow explore the variation in admission criteria for Canadian dental hygiene programs and how these criteria correlate with a program's success rate on the National Dental Hygiene Certification Exam (pp. 95–100). Padmini Hari, Sulagna Dutta, Nur Sulwana Binti Mohamad Hanapi, Tara Bai Taiyeb Ali, Betsy Thomas, Thean-Hock Tang, and Ashfaq Akram study the clinical efficacy and safety profile of a novel-designed isosceles-configured toothbrush in comparison to a standard reference toothbrush with end-rounded bristles (pp. 101–109).

In addition, this issue includes a literature review by Kelsey Henneberry, Shannon Hilland, and S Kimberly Haslam on dental hygienists' risk for noise-induced hearing loss and current hearing protection options (110–119). You will also find a short communication by Maria G Kallal, Sharon M Compton, Arlynn R Brodie, Breanne L Moran, and Minn N Yoon on the strengths and weaknesses of a free-service inner city dental clinic, as perceived by health brokers working with low-income and homeless individuals (pp. 120–123).

PLAIN LANGUAGE ABSTRACTS

Zini A, Mazor S, Timm H, Barker ML, Grender JM, Gerlach RW, Biesbrock AR. Effects of an oral hygiene regimen on progression of gingivitis/early periodontitis: a randomized controlled trial. *Can J Dent Hyg.* 2021;55(2):85–94.

This 2-year study examined the effectiveness of a combination of at-home oral care therapies in preventing gingivitis and increased probing pocket depth (PPD) in generally healthy adults. Ninety participants with established gingivitis and isolated sites with PPD >4 mm were assigned either to the regimen group (an oscillating-rotating electric toothbrush, dental floss, stannous fluoride toothpaste, and cetylpyridinium chloride mouthrinse) or to a usual care group (sodium fluoride dentifrice and manual toothbrush). Participants were examined at baseline and every 6 months for 24 months. Over 2 years, the oral health regimen was significantly and consistently more effective in reducing the number of bleeding sites and inflammation compared to usual care. It may offer long-term periodontal health benefits.

Shahab M, Compton SM, Chow AK. Admission criteria for Canadian dental hygiene programs. *Can J Dent Hyg.* 2021;55(2):95–100.

Canadian dental hygiene programs use a variety of admission criteria to evaluate prospective students. Given how resource intensive this selection process is, programs should know if they are identifying and selecting the most appropriate applicants. This study reviewed admission criteria from all 30 English-language dental hygiene programs in Canada to determine if they correlate with a program's success rate on the National Dental Hygiene Certification Exam (NDHCE). While all programs use grades as an admission criterion, those that require more post-secondary credits prior to admission tend to perform better on the NDHCE. Some programs also conduct interviews, but it is unclear which attributes are being evaluated. Because dental hygienists interact closely with the public, an assessment of a potential student's "soft skills" during interviews may be useful.

Hari P, Dutta S, Hanapi NSBM, Ali TBT, Thomas B, Tang TH, Akram A. Evaluation of isosceles-configured SUN Teeth™ toothbrush in dental plaque removal and gingival health. *Can J Dent Hyg.* 2021;55(2):101–109.

Toothbrush design has a significant impact on brushing efficacy, particularly in the areas that are difficult to clean. This study evaluated the clinical efficacy and safety of a toothbrush with bristles angled at 45° in comparison to a standard reference toothbrush. Researchers recruited 104 participants for this 4-week study, who were randomized into either the test or control group. Gingivitis and plaque scores were recorded on days 1, 14, and 28. Both scores were reduced at all time intervals in both groups, showing that the isosceles-configured (45°-angled) toothbrush is equivalent in plaque removal to the conventional, flat-bristled reference brush. The 45° angle of the test brush bristles may make it easier for clients to adopt the modified Bass brushing technique.

Henneberry K, Hilland S, Haslam SK. Are dental hygienists at risk for noise-induced hearing loss? A literature review. *Can J Dent Hyg.* 2021;55(2):110–119.

This article reviews 26 studies of noise-induced hearing loss among oral health professionals and describes current hearing protection options. Research shows that dental hygienists may be at risk of temporary and permanent hearing loss from noise in the dental setting. However, more research is necessary to determine the long-term effects of exposure to high-frequency noise from ultrasonic scalers. To prevent hearing loss, dental hygienists should schedule regular hearing exams with an audiologist and use active (electronic) sound control devices, as they block high-level sounds while still enabling 2-way communication with clients.