Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Safety of COVID-19 vaccination in patients with polyethylene glycol allergy: A case series

Matthieu Picard, MD, FRCPC[a],
Jean-Philippe Drolet, MD, FRCPC[b],
Marie-Soleil Masse, MD, FRCPC[c],
Charles A. Filion, MD, FRCPC[a], Faisal ALMuhizi, MD[d,e],
Michael Fein, MD, FRCPC[d,f],
Ana Copaescu, MD, FRCPC[d,f,g],
Ghislaine Annie C. Isabwe, MD, FRCPC[d,f],
Martin Blaquière, MD, FRCPC[h], and
Marie-Noël Primeau, MD, FRCPC[i]

Clinical Implications

Allergists may offer supervised mRNA coronavirus disease 2019 (COVID-19) vaccination to polyethylene glycol—allergic patients.

Polyethylene glycol (PEG) allergy is generally considered a contraindication to mRNA coronavirus disease 2019 (COVID-19) vaccines because they are formulated in lipid nanoparticles containing a PEGylated lipid.[1] However, given the high benefits of COVID-19 vaccination and the uncertain risk of allergy to mRNA vaccines in PEG-allergic patients, a shared decision making between patient and allergist is recommended by an international expert panel.[1]

To date, there are only 2 cases of patients who had a systemic allergic—like reaction to the first dose of the Pfizer-BioNTech vaccine that were subsequently diagnosed with PEG allergy.[2,3] To our knowledge, there is no report of mRNA COVID-19 vaccination in patients with a documented PEG allergy prior to vaccination.

COVID-19 vaccination was initiated on December 14, 2020, in the Province of Quebec, Canada.[4] Three COVID-19 vaccines are currently available: Pfizer-BioNTech, Moderna, and AstraZeneca.[4] Since May 13, 2021, the Astra Zeneca vaccine is no longer offered to unvaccinated patients given safety concerns regarding rare cases of vaccine-induced thrombotic thrombocytopenia.[4] Patients who had received AstraZeneca as a first dose can opt to receive a mRNA vaccine for their second dose.[4] Whereas the AstraZeneca vaccine does not contain PEG, it contains polysorbate 80, which may be cross-reactive with PEG in some patients.[1]

A group of allergists has been designated by the Association of Allergists and Immunologists of Quebec to evaluate and vaccinate patients with allergic-like reactions to COVID-19 vaccines or with a history of PEG allergy. Since the beginning of the vaccination campaign in Quebec, 9 allergists in 6 different hospitals evaluated 12 cases of confirmed or very likely PEG allergy. Patients were offered vaccination with either an mRNA or the AstraZeneca COVID-19 vaccine after discussion of the risks and benefits. Ten patients were vaccinated with an mRNA vaccine and 2 with the AstraZeneca vaccine. In this case series, we present the characteristics and vaccination outcomes of those 12 patients. All patients gave consent to be included in this case series and the study was institutional review board—approved.

All but 1 patient had a history of systemic reaction after oral ingestion of several grams of laxatives made of PEG 3350. Several patients also reported immediate reactions after injection of either methylprednisolone or medroxyprogesterone, which contain PEG 3350.[5] One patient only reported reactions after using skin care products containing PEG.

Six patients had a confirmed allergy to PEG 3350 through either a positive skin prick test (SPT) or a positive drug provocation test (DPT) to PEG 3350 (Table I and Appendix E1; available in this article's Online Repository at www.jaci-inpractice.org). Two of those patients also showed a positive intradermal test (IDT) to the Pfizer-BioNTech vaccine diluted 1:100, which is nonirritant.[6] The other 4 patients were not skin-tested to the vaccine. Four patients with a confirmed PEG 3350 allergy tolerated an mRNA vaccine: 3 received the Pfizer-BioNTech and 1 the Moderna. Patient 2 received both doses of the Pfizer-BioNTech vaccine in 4 steps. Patient 1, who seemed to have the lowest reaction threshold to PEG in our cohort, tolerated the Pfizer-BioNTech vaccine in a single step despite a positive IDT to the vaccine. Two patients received the AstraZeneca vaccine: patient 5 was vaccinated with 2 doses before allergy evaluation, and patient 6 opted to receive the AstraZeneca vaccine based on positive SPT and DPT results to PEG 3350 and before the AstraZeneca vaccine was no longer recommended for unvaccinated individuals.

A PEG allergy was considered very likely in 6 patients, although their skin test results were negative (Table II). Owing to time constraints and considering their high pretest probability, DPTs were not performed to confirm PEG allergy in those patients. Two patients also refused a DPT. In our cohort, most patients did not undergo SPT to high molecular weight (MW) PEGs or IDT to methylprednisolone acetate, which could be more sensitive than SPT to PEG 3350,[1,7,8] possibly explaining the low percentage of skin test—positive patients. It is also possible that their skin test reactivity to PEG waned over time, as previously shown,[7] or that an immunoglobulin E—mediated mechanism was not responsible for their initial reaction to PEG. All 6 patients tolerated an mRNA vaccine in a single step. Patient 11 suffered a second lifetime anaphylaxis to PEG 3350 between the first and the second doses of the Moderna vaccine. Whereas she had tolerated the first dose in 1 step, the second dose was administered without reaction in 5 steps given the positive IDT result to the vaccine diluted 1:100, the recent anaphylaxis to PEG 3350, and patient preference. Patient 12 reported a very mild and limited skin reaction with the second dose of the Pfizer-BioNTech vaccine that was judged unlikely to be allergic. No other patient reported a reaction with the second dose.

A plausible explanation for the lack of reactivity observed to the mRNA vaccines in this case series is that the MW and the dose of PEG contained in the vaccines were below the reaction threshold of our patients. Although the data are very limited given the rarity of PEG allergy, the amount of PEG, its route of

TABLE I. Patients with confirmed PEG allergy vaccinated against COVID-19

Patient	Age	Sex	PEG product causing reaction	Clinical manifestations of PEG allergy	Diagnostic tests for PEG allergy*	COVID vaccine administered*	Method of COVID vaccine administration	Clinical manifestations after vaccination	Follow-up
1	57	M	PEG 3350 and electrolyte solution (PegLyte) for bowel cleansing before colonoscopy	Skin pruritus starting after 15 g. Diffuse skin flushing and hypotension (83/56 mm Hg) after 60 g Treated with epinephrine 2 y before vaccination	Tested 1 wk before vaccination: SPT + to PEG 3350 (0.7 mg/mL) (size: 10/25)	Pfizer-BioNTech Skin tests 1 wk before vaccination: SPT − to vaccine (undiluted) IDT + to vaccine (diluted 1:100) (size: 5/15)	Single dose (0.3 mL) in allergy clinic 1 h observation	No reaction	Second dose administered in allergy clinic as a single dose without any reaction
2	37	F	PEG 3350 (Lax-A-Day) for constipation	Diffuse skin pruritus with hives and swelling of the face and hands starting 30 min after single dose (17 g) Treated with epinephrine 2.5 y before vaccination	Tested 1.5 y before vaccination: SPT + to PEG 3350 (70 mg/mL) (size: 8)	Pfizer-BioNTech Skin tests on day of vaccination: SPT − to vaccine (undiluted) IDT + to vaccine (diluted 1:100) (size: 8/25)	Divided doses every 15 min in allergy clinic: 1:10 dilution: 1. 0.05 mL Full-strength: 2. 0.05 mL 3. 0.1 mL 4. 0.15 mL 1 h observation	No reaction	Second dose administered in 4 steps (as first dose) because of patient preference without any reaction
3	35	F	PEG 3350 (Lax-A-Day) for constipation	Diffuse urticaria within minutes of a single dose (17 g) 2 y before vaccination	Tested 2 mo before vaccination: SPT − to PEG 3350 (70 mg/mL) DPT + to PEG 3350 (Lax-A-Day): diffuse urticaria 20 min after ingesting 2 g Treated with cetirizine	Pfizer-BioNTech	Single dose (0.3 mL) in allergy clinic 1 h observation	No reaction	Second dose administered in a vaccination center without any reaction
4	46	F	PEG 3350 (Emolax) for constipation	Diffuse urticaria and malaise within 2 min of a single dose (17 g) 5 mo before vaccination.	Tested 2 wk before vaccination: SPT − to PEG 3350 (concentration not recorded in file) DPT + to PEG 3350 (Emolax): diffuse urticaria and malaise 10 min after ingesting 2 g Treated with cetirizine and epinephrine.	Moderna	Divided doses every 20 min in allergy clinic: Full-strength: 1. 0.05 mL 2. 0.45 mL 1 h observation	No reaction	Second dose administered in a vaccination center without any reaction

(continued)

TABLE I. *(Continued)*

Patient	Age	Sex	PEG product causing reaction	Clinical manifestations of PEG allergy	Diagnostic tests for PEG allergy*	COVID vaccine administered*	Method of COVID vaccine administration	Clinical manifestations after vaccination	Follow-up
5	57	M	PEG 3350 (Lax-A-Day) for constipation	Face angioedema, throat and chest tightness within minutes of a single dose (17 g) Treated with cetirizine 1 y before vaccination	Tested 1 wk after the second dose of vaccine: SPT − to PEG 3000 (50%). SPT + to PEG 3350 (500 mg/mL) (size:10), PEG 20000 (10%) (size: 9), PEG 20000 (1%) (size: 9), PEG 20000 (0.1%) (size: 7), PEG 20000 (0.01%) (size: 9) SPT − to polysorbate 80 (20%) and PEG 35 castor oil† (527 mg/mL).	AstraZeneca	Both doses were administered in a vaccination center	No reaction	If needed, an mRNA vaccine could be administered as a single dose in the allergy clinic
6	69	F	PEG 3350 and electrolyte solution (PegLyte) for bowel cleansing before colonoscopy	Lip and tongue angioedema and diffuse urticaria within minutes after ingesting between 3 and 6 g 5 y before vaccination	Tested 1 wk before vaccination: SPT − to PEG 3000 (50%) SPT + to PEG 3350 (500 mg/mL) (size: 7/7), PEG 20000 (10%) (size: 10/30), PEG 20000 (1%) (size: 8/20), PEG 20,000 (0.1%) (size: 8/10), PEG 20000 (0.01%) (size: 6/8) SPT − to polysorbate 80 (20%) and PEG-35 castor oil† (527 mg/mL). DPT + to PEG 3350 (Lax-A-Day): diffuse urticaria and lip angioedema 10 min after ingesting 7 g Treated with cetirizine	AstraZeneca	Both doses were administered in a vaccination center	No reaction	If needed, an mRNA vaccine could be administered as a single dose in the allergy clinic

*Size of skin test: first number refers to wheal and second number to flare (mm); when only 1 number is shown, it refers to wheal and flare was not recorded.
†Also known as Cremophor EL.

TABLE II. Patients with a high probability of PEG allergy vaccinated against COVID-19

Patient	Age	Sex	PEG product causing reaction	Clinical manifestations of PEG allergy	Diagnostic tests for PEG allergy	COVID vaccine administered*	Method of COVID vaccine administration	Clinical manifestations after vaccination	Follow-up
7	43	F	PEG 3350 (Lax-A-Day) for constipation.	Acute rhinitis and diffuse pruritus within 5 min of a single dose (17 g) Several years before vaccination	Tested on day of vaccination: SPT − to PEG 3350 (170 mg/mL)	Pfizer-BioNTech	Single dose (0.3 mL) in allergy clinic 1 h observation	No reaction	If needed, can receive a second dose of Pfizer-BioNTech vaccine in a vaccination center without any special precautions Patient had tolerated AstraZeneca vaccine as a first dose
			Methylprednisolone (Depo-Medrol) on 2 different occasions (intra-articular) Contains PEG 3350 (28−29 mg/dose)	Immediate pruritus, rhinitis, and urticaria 3 y before vaccination	Tested on day of vaccination: IDT − to Depo-Medrol (0.01 mg/mL)				
8	46	F	PEG 3350 (Lax-A-Day) for constipation	Urticaria and abdominal pain 2 h after a single dose (17 g) More than 10 y before vaccination	Tested on day of vaccination: SPT − to PEG 3350 (170 mg/mL) Patient refused DPT	Pfizer-BioNTech	Single dose (0.3 mL) in allergy clinic 1 h observation	No reaction	Received second dose in allergy clinic without any reaction
			Methylprednisolone (Depo-Medrol) intra-articular Contains PEG 3350 (28−29 mg/dose).	Urticaria, angioedema, and dyspnea within minutes of injection Treated with epinephrine More than 10 y before vaccination	Tested on day of vaccination: IDT − to Depo-Medrol (0.01 mg/mL)				
			Medroxy-progesterone acetate (Depo-Provera) on 2 separate occasions Contains PEG 3350 (29 mg/dose)	Urticaria, angioedema, and dyspnea within minutes of injection Treated with epinephrine	Not tested				
9	36	F	PEG 3350 (Lax-A-Day) for constipation	Oral followed by hand and feet pruritus, dysphagia, and dyspnea within minutes of ingesting about 2 g Treated with epinephrine by paramedics 5 y before vaccination	Tested on day of vaccination: SPT − to PEG 3350 (170 mg/mL) IDT − to Depo-Medrol (0.01 mg/mL)	Pfizer-BioNTech	Single dose (0.3 mL) in allergy clinic 1 h observation.	No reaction	Received second dose in allergy clinic without any reaction

(continued)

TABLE II. *(Continued)*

Patient	Age	Sex	PEG product causing reaction	Clinical manifestations of PEG allergy	Diagnostic tests for PEG allergy	COVID vaccine administered*	Method of COVID vaccine administration	Clinical manifestations after vaccination	Follow-up
10	35	M	Skin care products containing PEG (MW not specified) such as shower gels, sunscreens, and lubricants	Diffuse pruritus and difficulty breathing within 1 h of using such products on multiple occasions Treated with salbutamol and antihistamine 3 y before vaccination	Tested 3 wk before vaccination: SPT − to PEG 3000 (50%), PEG 3350 (500 mg/mL), PEG 20,000 (10%), polysorbate 80 (20%), and PEG-35 castor oil† (527 mg/mL) Patient refused DPT	Pfizer-BioNTech	Single dose (0.3 mL) in a vaccination center	No reaction	Received second dose in vaccination center without any reaction
11	32	F	PEG 3350 (Lax-A-Day) for constipation PEG 3350 and electrolyte solution (PegLyte) for bowel cleansing before colonoscopy.	Diffuse flushing and pruritus, gum swelling, difficulty breathing within minutes of a single dose (17 g) Treated with an antihistamine and prednisone 2.5 y before vaccination Eyelid angioedema, difficulty breathing and diffuse pruritus 15 min after first dose (15 g) Treated with epinephrine Two mo after first vaccine dose and 6 mo before second vaccine dose	Tested 6 mo after most recent reaction to PEG 3350 and on same day of second vaccine dose SPT − to PEG 3350 (70 mg/mL) IDT − to Depo-Medrol (0.4 mg/mL)	Moderna Skin tests 6 mo after most recent reaction to PEG 3350 and on same day of second vaccine dose: SPT − to vaccine (undiluted). IDT + to vaccine (diluted 1:100) (size: 3/7)	First dose administered as a single dose (0.5 mL) in a vaccination center 2 mo before most recent reaction to PEG 3350 and before allergy referral	No reaction	Second dose administered in 5 steps given positive IDT to vaccine, anaphylaxis to PEG 3350 2 mo after the first vaccine dose and patient preference Divided doses every 20 min in allergy clinic: 1/10 dilution: 1. 0.05 mL Full-strength: 2. 0.05 mL 3. 0.1 mL 4. 0.15 mL 5. 0.2 mL 1.5 h observation No reaction
12	47	F	PEG 3350 (Emolax) for constipation	Sneezing, nasal congestion, urticarial, and dyspnea within minutes of a single dose (17 g) Treated with an antihistamine 8 mo before vaccination	Tested on day of vaccination: SPT − to PEG 3350 (concentration not recorded in file)	Pfizer-BioNTech Skin tests on day of vaccination: SPT − to vaccine (undiluted) IDT − to vaccine (diluted 1:100)	Single dose (0.3 mL) in allergy clinic 1 h observation	No reaction	Second dose administered in a vaccination center Patient reported redness on his chin within minutes after the dose, which resolved without any intervention If third dose necessary, it will be administered in allergy clinic

*Size of skin test: first number refers to wheal and second number to flare (mm); when only 1 number is shown, it refers to wheal and flare was not recorded.
†Also known as Cremophor EL.

administration, and its MW seem to influence the risk of reaction. Each dose of Pfizer-BioNTech mRNA vaccine contain 0.05 mg of PEG 2000 linked to a lipid.[5] The exact amount of PEG 2000 in the Moderna vaccine is not listed in its fact sheet, although it is likely in the same range.[5] In contrast, all patients in this case series, except 1, reported reactions to at least 28 mg of PEG 3350. However, most patients were not tested to PEGs of MWs below 3350 or to polysorbate 80, which is structurally similar to lower MW PEGs.[7] The only 2 patients tested to PEG 3000 and polysorbate 80 had negative results and were vaccinated with the AstraZeneca vaccine.

PEGylated lipids, such as the one in the PfizerBioNTech vaccine, can trigger basophil activation *ex vivo* in some PEG-allergic patients.[9] However, *in vivo*, the bioavailability of the PEGylated lipids to basophils and mast cells upon vaccine inoculation is unknown but could be minimal, thereby contributing to the observed lack of reactivity. This hypothesis could also help explain the lack of reaction in the 2 patients who had a positive IDT to the vaccine, although it could not be determined whether their skin test reactivity to the vaccine was caused by its PEGylated lipid component. It is also possible that vaccine administration in multiples steps favored tolerance in patients 2 and 11. Finally, even though all patients in this case series had a convincing history of PEG allergy, it is possible that some patients were no longer reactive to PEG at the time of COVID-19 vaccination.

This case series is the first to show that mRNA COVID-19 vaccines may be safely administered to some PEG-allergic patients. Importantly, we found that skin test reactivity to the vaccine, at a nonirritating concentration (1:100), does not reliably predict reactivity on vaccine inoculation. The absence of a standardized approach to patients with PEG allergy led to variability in their evaluation in different hospitals. Patients also differed in the time elapsed since their last reaction to PEG. This heterogeneity, the small number of patients evaluated, as well as the observational nature of this report limit the generalizability of our findings. Although, as rarely described,[2,3] some PEG-allergic patients may react to mRNA COVID vaccines, supervised administration of mRNA vaccines to PEG-allergic patients could be offered by allergists after discussion of its risks and benefits. More research is needed to establish the safety profile of mRNA COVID vaccines in larger cohorts of PEG-allergic patients.

[a]Division of Clinical Immunology and Allergy, Department of Medicine, Hôpital Maisonneuve-Rosemont, Université de Montreal, Montreal, Quebec, Canada
[b]Division of Clinical Immunology and Allergy, Department of Medicine, Centre Hospitalier Universitaire de Québec—Université Laval, Quebec, Quebec, Canada
[c]Division of Clinical Immunology and Allergy, Department of Medicine, Centre Hospitalier de l'Université de Montréal (CHUM), Montreal, Quebec, Canada
[d]Division of Allergy and Clinical Immunology, Department of Medicine, McGill University Health Centre (MUHC), McGill University, Montreal, Quebec, Canada
[e]Department of Internal Medicine, Security Forces Hospital Program, Riyadh, Saudi Arabia
[f]The Research Institute of the McGill University Health Centre, McGill University, Montreal, Quebec, Canada
[g]Department of Infectious Diseases, Centre for Antibiotic Allergy and Research, Austin Health, Heidelberg, Victoria, Australia
[h]Division of Allergy and Clinical Immunology, Department of Pediatrics, Centre Hospitalier Universitaire de Sherbrooke (CHUS), Sherbrooke, Quebec, Canada
[i]Division of Allergy and Clinical Immunology, Department of Medicine, Centre Intégré de Santé et Services Sociaux (CISSS) de Laval, Laval, Quebec, Canada

No funding has been received for this study.

Conflicts of interest: M. Fein has been on advisory boards and/or received consulting fees from ALK, Stallergenes, Medexus, Novartis, and Bausch Health. M. Blaquière has been on the advisory board of ALK and has received honoraria from Novartis, Medexus, ALK, and Starallergenes. M.-N. Primeau has been on Speakers' Bureau and/or advisory boards for ALK, Bausch Health, CSL Behring Canada, Mead Johnson, Medexus, Mylan, Novartis, Nutricia, Pediapharm, and Pfizer. The rest of the authors declare that they have no relevant conflicts of interest.

Received for publication August 9, 2021; revised November 15, 2021; accepted for publication November 16, 2021.

Available online December 20, 2021.

Corresponding author: Matthieu Picard, MD, FRCPC, Division of Clinical Immunology and Allergy, Université de Montréal, Hôpital Maisonneuve-Rosemont, 5415 boulevard de l'Assomption, Montreal, Quebec, Canada, H1T 2M4. E-mail: matthieu.picard@umontreal.ca.

2213-2198

https://doi.org/10.1016/j.jaip.2021.11.021

REFERENCES

1. Greenhawt M, Abrams EM, Shaker M, Chu DK, Khan D, Akin C, et al. The risk of allergic reaction to SARS-CoV-2 vaccines and recommended evaluation and management: a systematic review, meta-analysis, GRADE assessment, and international consensus approach. J Allergy Clin Immunol Pract 2021;9:3546-67.
2. Sellaturay P, Nasser S, Islam S, Gurugama P, Ewan PW. Polyethylene glycol (PEG) is a cause of anaphylaxis to the Pfizer/BioNTech mRNA COVID-19 vaccine. Clin Exp Allergy 2021;51:861-3.
3. Wolfson AR, Robinson LB, Li L, McMahon AE, Cogan AS, Fu X, et al. First-dose mRNA COVID-19 vaccine allergic reactions: limited role for excipient skin testing. J Allergy Clin Immunol Pract 2021;9:3308-20.e3.
4. Québec Ministry of Health and Social Services. Press releases from the Québec Ministry of Health and Social Services. Accessed August 6, 2021. https://www.msss.gouv.qc.ca/ministere/salle-de-presse/communiques/?idcat=3
5. Castells MC, Phillips EJ. Maintaining safety with SARS-CoV-2 vaccines. N Engl J Med 2021;384:643-9.
6. Marcelino J, Farinha S, Silva R, Didenko I, Proenca M, Tomaz E. Nonirritant concentrations for skin testing with SARS-CoV-2 mRNA vaccine. J Allergy Clin Immunol Pract 2021;9:2476-7.
7. Bruusgaard-Mouritsen MA, Jensen BM, Poulsen LK, Duus Johansen J, Garvey LH. Optimizing investigation of suspected allergy to polyethylene glycols. J Allergy Clin Immunol 2022;149:168-75.e4.
8. Sellaturay P, Nasser S, Ewan P. Polyethylene glycol—induced systemic allergic reactions (anaphylaxis). J Allergy Clin Immunol Pract 2021;9:670-5.
9. Troelnikov A, Perkins G, Yuson C, Ahamdie A, Balouch S, Hurtado PR, et al. Basophil reactivity to BNT162b2 is mediated by PEGylated lipid nanoparticles in patients with PEG allergy. J Allergy Clin Immunol 2021;148:91-5.

ONLINE REPOSITORY

Appendix E1. Methods

All sites performed skin prick test (SPT) to polyethylene glycol (PEG) 3350 by diluting PEG 3350 (Lax-A-Day, PegLyte, or Emolax) in water. Maximal concentrations used varied between sites from 70 mg/mL to 500 mg/mL. In patients with a history of a severe reaction to PEG 3350, skin testing could be initiated at lower dilutions at the discretion of the treating allergist. All sites used SPT to histamine (10 mg/mL) as positive control and SPT or intradermal text (IDT) with saline as negative control. Reading was done at 15 to 20 minutes. Positivity was defined as a wheal of 3 mm or larger with flare.

One site (McGill University Health Center) performed SPT to PEG 3000 (product number: 819015), PEG 20000 (product number: 81300), polysorbate 80 (Tween 80, product number: P1754), and PEG-35 castor oil (Cremophor EL, product number: 238470). These products were purchased from MilliporeSigma (Oakville, Ontario, Canada). The PEG-35 castor oil was diluted in ethanol 50% to reach a concentration of 527 mg/mL. The mixture was vortexed until the solution was clear. The PEG 3000, PEG 20000, and polysorbate 80 were diluted in water as previously described.[1] Concentrations used for SPT were PEG 3000 (50% wt/vol), PEG 20000 (0.01%, 0.1%, 1%, and 10% wt/vol), and polysorbate 80 (20% wt/vol).

One site (Centre Hospitalier Universitaire de Québec) performed IDT to methylprednisolone acetate (Depo-Medrol), which contains PEG 3350 (28 mg/mL). It was diluted in saline to a concentration of 0.01 mg/mL, corresponding to a PEG 3350 concentration of 0.007 mg/mL.

One site (Centre intégré de santé et services sociaux de Laval) performed IDT to methylprednisolone acetate (Depo-Medrol) diluted in saline to a concentration of 0.4 mg/mL (PEG 3350 concentration: 0.28 mg/mL). Skin testing to the Moderna vaccine was also performed using residual amounts of vaccine in the vial and within 6 hours of reconstitution. The SPT was done using the undiluted vaccine and IDT with the vaccine diluted 1:100 in saline. Twelve vaccine-tolerant patients were skin tested to the vaccine at these concentrations and exhibited negative results.

Three sites (Hôpital Maisonneuve-Rosemont, Centre Hospitalier de l'Université de Montréal, and Centre Hospitalier Universitaire de Sherbrooke) performed skin testing to the Pfizer-BioNTech vaccine using residual amounts of vaccine in the vial and within 6 hours of reconstitution. The SPT was done using the undiluted vaccine and IDT with the vaccine diluted 1:100 in saline as previously described.[2] Ten vaccine-tolerant patients were skin tested to the vaccine at these concentrations and exhibited negative results.

At the discretion of the treating allergist, patients could be offered a drug provocation test (DPT) to PEG 3350 prior to vaccination (if time allowed) or at a further time point after vaccination. All patients gave informed consent before undergoing a DPT. The DPTs were performed in hospital-based allergy clinics under close observation. The DPT protocols varied between allergists but all aimed at administering a standard dose of PEG 3350 (17 g for Lax-A-Day or Emolax) in 2 or 3 steps every 30 minutes starting at around one-tenth of the standard dose. The DPTs were stopped when patients showed objective signs of an immediate allergic reaction and their symptoms were readily treated according to the allergist's evaluation.

REFERENCES

1. Bruusgaard-Mouritsen MA, Jensen BM, Poulsen LK, Duus Johansen J, Garvey LH. Optimizing investigation of suspected allergy to polyethylene glycols. J Allergy Clin Immunol 2022;149:168-75.e4.
2. Marcelino J, Farinha S, Silva R, Didenko I, Proenca M, Tomaz E. Nonirritant concentrations for skin testing with SARS-CoV-2 mRNA vaccine. J Allergy Clin Immunol Pract 2021;9:2476-7.