

Short exposures and glove protection against (meth)acrylates in nail beauticians—Thoughts on a rising concern

Francisca Morgado¹  | Mariana Batista¹  | Margarida Gonalo^{1,2} 

¹Dermatology Department, Coimbra University Hospital, Coimbra, Portugal

²Clinic of Dermatology, Faculty of Medicine, University of Coimbra, Coimbra, Portugal

Correspondence

Dr Francisca Morgado, Dermatologia, Hospital da Universidade de Coimbra, Praceta Mota Pinto, P-3000-075 Coimbra, Portugal.

Email: fjacomemorgado@gmail.com

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Allergic contact dermatitis (ACD) caused by (meth)acrylates in nail aesthetics is a rising concern in the occupational setting^{1,2} Some technicians may have to abandon the job, as allergen avoidance is difficult.³ Aiming to evaluate the capacity of gloves to protect against occupational ACD, we performed patch tests with glove fragments placed between the allergens and patients' skin for different time periods, in patients with occupational ACD and positive patch test reactions to the (meth)acrylates and negative patch test results with gloves.

METHODS

Finn Chambers loaded with 2-hydroxyethylmethacrylate (HEMA) 2% pet. (Chemotechnique Diagnostics, Vellinge, Sweden) or patients' own products "as is" were applied on 3 × 3-cm fragments of different types of gloves used by the patients at work (thin nitrile gloves, thicker nitrile gloves, "medical" latex gloves, and domestic rubber gloves), and fixed on patients' backs or arms with tissue-type tape. Contact with the skin was maintained for different time intervals (30 minutes to 24 hours) in order to allow the allergen to permeate through the glove and reach the skin. A test chamber with HEMA 2% pet. was also applied directly

on the skin for the same time period for comparison (Figure 1A). After the respective time period, test chambers and glove fragments were removed, and the application areas were marked with a colour skin pen. Readings were performed on day (D) 3 and D5-D7, according to ESCD recommendations. All patients gave their written informed consent.

RESULTS

Case 1 was a 38-year-old nail aesthetician with hand eczema of 6 months' duration, and with a doubtful reaction to HEMA and positive patch test reaction to the nail gel "as is" (+++). Case 2 was a 56-year-old nail aesthetician with eyelid and hand eczema of 4 months' duration, and with positive patch test reactions to HEMA (++), hydroxypropyl methacrylate (HPMA) 2% pet. (++), hydroxyethyl acrylate 0.1% pet. (++), ethylene glycol dimethacrylate (EGDMA) 2% pet. (+), and triethylene glycol diacrylate (TREGDA) 0.1% pet. (+). Case 3 was a 50-year-old nail aesthetician with persistent pulpitis of 7 months' duration despite using nitrile gloves, and positive patch test reactions to HEMA (++), HPMA 2% pet. (++), EGDMA 2% pet. (++), TREGDA 0.1%

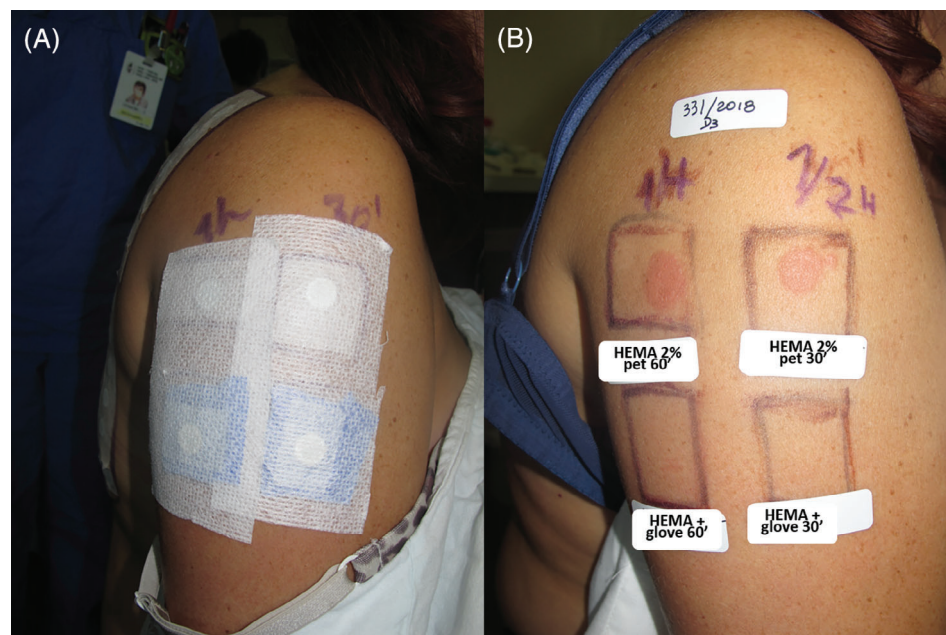


FIGURE 1 Illustration of the technique. (A), 2-Hydroxyethylmethacrylate (HEMA) on Finn Chambers applied directly on the skin (squares above) and over blue nitrile glove fragments (squares below), with occlusion for 30 minutes (left) and 60 minutes (right), with reactions on day 3. (B), Strong positive reactions after 30 and 60 minutes of contact with no protection (above), a negative result with protection for 30 minutes (right), but a positive reaction after 60 minutes of exposure over nitrile gloves (left)

pet. (++) , ethyl acrylate 0.1% pet. (++) , and tetrahydrofurfuryl methacrylate 2.0% pet. (+) .

Concerning patch tests results over glove fragments, in case 1 the patient's long-lasting nail gel polish (Shield) gave a positive reaction (+ or ++) after 4 hours of exposure in the areas protected with all types of gloves. When exposure was prolonged to 24 hours, there was a ++ to +++ reaction extending to the whole 3 × 3-cm area of contact with the glove fragment where the patch test chamber had been applied (Supporting Information Figure S1 and Table S1). In case 2, after exposure to the patient's nail gel and to HEMA through nitrile and latex gloves for 30 and 60 minutes, the D3 and D7 readings showed negative results, whereas the patch test with HEMA applied directly on the skin for only 30 minutes gave a positive reaction (+) (Supporting Information Figure S2 and Table S1). In case 3, there was a strong positive reaction to HEMA (++) when it was tested directly on the skin for 30 minutes, a negative result when it was tested over nitrile gloves for 30 minutes, but a positive reaction (+) when the exposure time over gloves was extended to 60 minutes (Figure 1B, Supporting Information Table S1).

DISCUSSION

The protective effect of gloves depends on the type of chemical, exposure time, and intrinsic characteristics of the gloves.⁴ Nitrile gloves are considered to be the best for preventing dermatitis caused by (meth)acrylates, but only if exposure is brief (15–20 min). As nail aesthetic procedures normally take longer than this, it was recommended to use 4H fingerstalls underneath the gloves,⁵ which is not easy, owing to the fine movements required. In a previous experiment with a single patient, allergen exposure through various types of gloves prevented skin reactivity even with longer exposure times (1 hour).⁶ Using a less sophisticated technique, we showed, in three cases, that gloves did not completely prevent elicitation of an allergic response to (meth)acrylates. Nevertheless, there is some interindividual variability: nitrile gloves prevented the reaction to HEMA after 1 hour of exposure in a patient with a less intense reaction (+) but not in the patient with a ++ reaction. Nevertheless, this patient was still protected for 30 minutes. Hence, we could suggest the use of nitrile gloves for a maximum of 30 minutes, and then replacement if the procedure is not finished. Interestingly, when a longer exposure time was used, (meth)acrylates seemed to diffuse from the nail gel in the test chamber to the whole glove fragment, inducing a reaction in the whole area of contact with the impregnated glove.

During this study, we also observed that a 30-minute exposure to HEMA was enough to elicit a positive patch test reaction in two individuals. Although, according to the international guidelines, epicutaneous tests are applied under occlusion for 48 hours, there are some data showing that shorter application times are enough to elicit a response, for example, to *p*-phenylenediamine (PPD) (5–15 minutes), cinnamal (20 minutes), and nickel (5 hours).^{7–10} In support of this observation, a recent study showed that PPD quickly penetrates the skin, bringing into question the gold standard of 48 hours of occlusion in diagnostic patch testing.¹¹ There are no studies concerning the application time needed for (meth)acrylates to penetrate the skin, but a 30-minute exposure may be enough. If such fast penetration could

be proven for all of the other allergens, a shorter duration of allergen application might facilitate the patch testing technique, particularly in hot countries or in patients exposed to high temperatures at work, where a 2-day occlusion may be cumbersome.

In conclusion, short contact with HEMA (<30 minutes) allows enough skin penetration into the epidermis to elicit a positive patch test reaction, suggesting that very short exposures or minor amounts penetrating through gloves can elicit ACD in the occupational setting.

ORCID

Francisca Morgado  <https://orcid.org/0000-0001-5006-4334>

Mariana Batista  <https://orcid.org/0000-0003-3442-615X>

Margarida Gonçalves  <https://orcid.org/0000-0001-6842-1360>

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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37/2018
DI

Vezig gel.
pobu luvu. (24h)

Nitulo glosse

Luvu Latex

Luvu Soueikice

Nitulo fine

Luvu vuvu

Online supplemental Table 1. Patch test results without and with the protection of different types of gloves

Allergen	Glove type	Patient 1		Patient 2				Patient 3		
	Exposure time	48hours		30min	1hour	2hours	48hours	30min	60min	48hours
HEMA 2% pet.	No glove	?+		+	+	+	++	++	++	++
	Thin Nitrile			-	-	-		-	+	
	Thick Nitrile			-	-	-				
	Latex glove			-	-	-				
Patients' nail gel "as is"	Exposure time	4hours	24hours	30 min	1hour	2hours	48hours			
	No glove	+++					++			
	Thin Nitrile	+	++	-	-	-				
	Thick Nitrile	+	++	-	-	-				
	Domestic rubber	++	+++							
	Latex glove	++	+++	-	-	-				

THIN
NITRILE

THICK
NITRILE

LATEX

NO GLOVE

Gel Purple

HEMA

Nail gel
PURPLE

HEMA

Nail gel
PURPLE

HEMA

30min

HEMA