

Acrylates in nail salons in Toronto, Canada

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BACKGROUND

- In recent years there has been rampant growth of nail salons in North American cities
- Nail technicians provide many services including manicures, pedicures and the application of artificial nails
- Mainstream media has drawn attention to health and safety as well as working conditions in these settings
- Nail salons are largely small businesses, concentrated in urban settings, and often employ immigrant women in precarious employment situations
- Regulation surrounding the products that are used in these settings is complex and contact with the occupational health and safety system is thought to be minimal
- There is concern about chemical exposures and their potential health effects, including allergic contact dermatitis that can result from skin contact with acrylates in nail products

OBJECTIVES

- To assess skin and inhalation exposure to acrylates among nail technicians in Toronto, Ontario

METHODS

- The study was approved by the Research Ethics Board at the University of Toronto
- Participants provided written informed consent

Skin Wipes

- Nail technicians’ dominant hand (n=4) or both hands (n=4) were wiped with a pre-moistened wipe (0.1mL 100% deionized water)
- Wipes were collected after providing either acrylic or shellac polish nail manicure services to clients and before washing their hands
- Positive control hand wipe samples were also collected from workers who deliberately contacted the products (n=3)

Surface Wipes

- Surface wipes (n=6) were collected with a pre-moistened wipe from manicure tables and the top of the trolley/table where the nail products were stored using a 10cm x 10cm template
- Positive control surface wipe samples (n=18) were collected by applying a drop of nail polish product onto a surface and wiping the contaminated area

Air Samples

- Full shift, personal air samples (n=75) were collected
- Samples were collected using a thermal desorption tube (passive) attached in the breathing zone

Analysis

- All samples were analyzed using gas chromatography mass spectrometry (GC/MS)
 - Wipe samples were analyzed for 8 acrylates[#]; air samples were analyzed for 4 acrylates^{*} (Box 1)
- Detection frequencies are reported for all samples
- For air samples, results are also reported as geometric mean (GM), arithmetic mean (AM) and range

Box 1. Acrylates Included in Laboratory Analysis

Methyl acrylate (MA) [#] [*]	2- hydroxyethyl acrylate (HEA) [#]
Ethyl acrylate (EA) [#] [*]	2- hydroxyethyl methacrylate (HEMA) [#]
Methyl methacrylate (MMA) [#] [*]	2- hydroxypropyl methacrylate (HPMA) [#]
Ethyl methacrylate (EMA) [#] [*]	Ethylene glycol dimethacrylate (EGDMA) [#]

[#] Wipe samples; ^{*} Air samples

RESULTS

- No acrylates were detected on nail technician’s hands or on surfaces in the salons
- Multiple acrylates were detected in positive control wipes (Table 1)
 - HEMA and HPMA were detected in positive control hand wipes
 - In positive control surface wipes MMA, EMA, HEA, HEMA and HPMA were detected in various products
- MMA and EMA were both detected in air samples (Table 1)
 - MMA: GM 30 ppb (range 2.1 – 4100 ppb, AM 350 ppb)
 - EMA: GM 6.4 ppb (range 1.9 – 3100 pbb, AM 100 ppb)
- MA and EA were not detected in any wipe or air samples; EGDMA was not detected in any wipe samples

Table 1. Detection Frequency (%) for Wipe and Air Samples

	MMA	EMA	HEA	HEMA	HPMA
HAND WIPES – Positive Control					
Regular polish (n=2) [*]	0	0	0	50	50
Shellac polish (n=1)	0	0	0	100	100
SURFACE WIPES – Positive Control					
Shellac polish (n=9)	0	44	56	78	44
Regular polish (n=2) [*]	0	50	0	0	0
Powder product (n=1)	100	100	0	0	0
Acrylic product (n=1)	100	0	0	0	0
5-free ^{**} shellac polish (n=2)	0	0	100	100	50
5-free ^{**} regular polish (n=3)	100	0	0	0	0
AIR SAMPLES					
Personal passive (n=75)	63	36	n.d.	n.d.	n.d.

^{*}One of the “regular polishes” was observed to be used with UV curing, suggesting that it was not regular polish as described on the bottle
^{**} 5-free is a marketing term used to describe products that claim to not contain any of the following: formaldehyde, dibutyl phthalate, toluene, camphor and formaldehyde resin
n.d. Not done, acrylate not included in laboratory analysis (See Box 1)



CONCLUSIONS

Despite confirmation from positive control samples that nail products contained acrylates and the finding of MMA and EMA in air samples, there was no detectable acrylate skin exposure or surface contamination.

Workers were observed to employ safe work practices with the acrylate-containing products (e.g., using gloves, cleaning surfaces before and after working on a client. It is possible workers modified their behavior as a result of the research study.

Interestingly, MMA was detected in air samples and in samples of products being used even though MMA is banned for use in cosmetics in Canada.

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