

A photograph showing a person in a red shirt, likely a nail technician, applying a substance to a client's nails. The client's hands are visible, and the technician is using a small applicator. The background is dark, suggesting an indoor setting like a nail salon.

NAIL SALON INDUSTRIAL HYGIENE EVALUATION

**Tuan N Nguyen, CIH, ARM
Evelyn Tovar, CIH
Safety and Health Services
State Compensation Insurance Fund**

PURPOSE:

- To evaluate for airborne chemical and dust exposures in nail salons
- To compare past exposure levels to current data to determine the effectiveness of changes that have been made over the past 10 years
 - Chemical substitution
 - Control measures
 - Work practices
 - Training and education

OBJECTIVES:

- To evaluate a broad spectrum of chemicals in order to provide a foundation for other in-depth studies
- To develop practical solutions that will help the nail salon operators to provide and maintain a safe workplace
- To evaluate approximately 15 nail salons



METHODS

Air Sampling: NIOSH, OSHA, 3M and EPA TO-15

Solvent vapors: Summa canisters, OVMs, aldehyde badges, pumps with Tenax tubes.

- Tentatively Identified Compounds (TICs)
- TVOC as Toluene

Dust: TSI Sidepak AM510 dust monitors with an impactor that has a particle size cut off at 2.5 microns in diameter (PM_{2.5})

Ambient air parameters: TSI Aircalc

Interviews with nail salon owners/station operators

Observation of physical operations and work practices



FINDINGS

- Most of the nail salons have between 4 to 8 nail stations
- Majority of owners and workers are Vietnamese or Chinese-Vietnamese
- The core group tends to be relatives or close friends
- New trends, most of the Vietnamese workers will graduate from Vietnamese owned beauty colleges
- Spa stations are being phased out due to time constraints and maintenance complexities
- Most salons now use plastic buckets wrapped with disposable plastic bags for pedicures

FINDINGS

- Majority of owners and workers don't know about Material Safety Data Sheets, chemical names and their health hazards
- Some workers wear comfort masks and don't understand their limitations
- Most nail salons have front and back doors that are kept open during business hours
- Most chemical distributors or manufacturers have no web sites or product Material Safety Data Sheets online.
- Ergonomic issues
- There are two types of nail care – Liquid only and powder (a term used by Vietnamese nail salon workers for acrylic nails)

AIR SAMPLING RESULTS - TWA

	CHEMICAL LEVEL MEASURED RANGES			
	AREA		PERSONAL	OSHA PEL
	8 HR Outdoor	8 HR Indoor	8 HR TWA	
COMPOUND	mg/m ³	mg/m ³	mg/m ³	mg/m ³
Ethanol	0.02 -- 0.76	1.20 -- ?	--	1900
Acetone	0.26 -- 1.60	6.50 -- 15.00	0.16 -- 1.2	1200
Isopropyl Alcohol	0.02 -- 0.39	2.00 -- 2.10	--	980
Ethyl Acetate	--	0.20 -- 0.50	0.01 -- 0.037	1400
Methyl Methacrylate	--	0.45 -- 1.00	0.014 -- 0.55	205
Toluene	0.01 -- 0.03	0.12 -- 0.14	--	188
n-Butyl Acetate	0.02 -- ?	0.10 -- 0.29	0.009 -- 0.012	710

PEL – PERMISSIBLE EXPOSURE LIMIT - 8-hour Time Weighted Averages (TWA) - are an average value of exposure over an 8 hour work shift.

AIR SAMPLING RESULTS - STEL

	15 MINUTE AREA	OSHA STEL
	RANGE	
COMPOUND	mg/m ³	mg/m ³
Ethanol	0.19 -- 3.7	---
Acetone	22 -- 51	1780
2-Propanol (Isopropyl Alcohol)	1.8 -- 14	1225
Ethyl Acetate	0.38 -- 5.4	---
Methyl Methacrylate	0.28 -- 1	410
Toluene	0.07 -- 0.19	560
n-Butyl Acetate	0.13 -- 1.9	950
2-Methylpropyl ester acetic acid	0.60 -- ?	---
2-Butanone (MEK)	0.03 -- 0.19	885
TVOC as Toluene	14 -- 31	---

STEL – Short term exposure limit

AIR SAMPLING RESULTS - TVOC AND PM_{2.5}

TVOC Level ranges	Outdoor 8 hour	Indoor 8 hour
TVOC as Toluene	0.98 - 3.30 mg/m ³	5.40 -- 9.20 mg/m ³

Less than 0.20 mg/m ³	No irritation or discomfort expected
0.20-3.0 mg/m ³	Irritation and discomfort may be possible
3.0-25.0 mg/m ³	Discomfort expected and headache possible
Greater than 25 mg/m ³	Toxic range where other neurotoxic effects may occur

PARTICULATE MATTER AVERAGE LEVELS				
Max				241 µg/m ³
Min				15 µg/m ³
Average				28 µg/m ³
TWA				18 µg/m ³
PM _{2.5}	EPA IAQ STANDARD	40 CFR 50.7(a)	24-hour	35 µg/m ³
PM _{2.5}	Respirable Dust TLV-TWA	ACGIH	8-hour	3000 µg/m ³

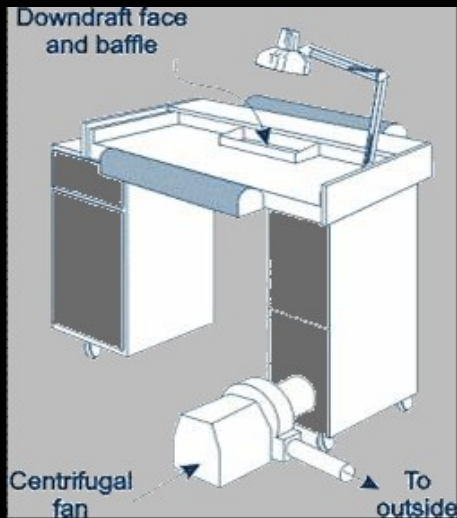
DISCUSSION

- Exposure levels are within the PEL and the STEL limits
- Additive or synergistic effects are not well understood
- Total Volatile Organic Compounds (TVOCs) were analyzed with the intent to use the EPA guideline as an indicator for indoor air quality

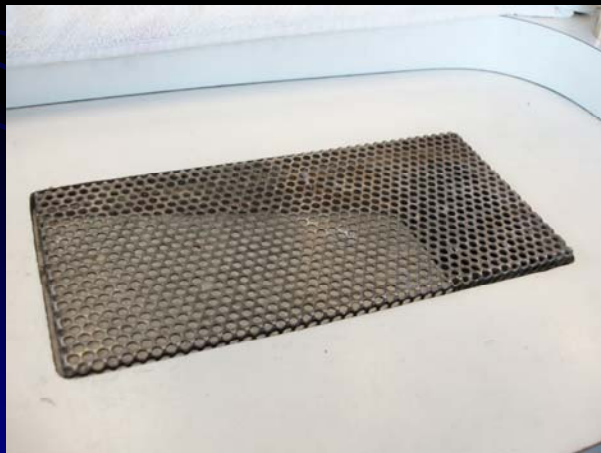
EXHAUST SYSTEMS

- Operators need to understand the maintenance procedures and benefits of using ventilation systems
- Need to exhaust and filter the air when using EMA or methacrylic acid (primer)
- Physical hazards: back injury from bending, slip trip and fall hazards carrying bucket of water

AIR CLEANING DEVICES



Manicure Table with downdraft exhaust dust collection



Lacking of maintenance and poor design

AIR CLEANING DEVICES



Desktop air cleaner with fan placed on workstation

AIR DILUTION AND CLEANING DEVICES



Door mounted exhaust fan



ESP placed on counter



ESP mounted on ceiling

CONCLUSION

- Need to collect more data as time and funding permit
- So far exposure levels are low but not sure about the long term health effects of the combination of multiple chemicals.
- Need to translate and train operators on hazard communication, MSDS and PPEs
- Some chemicals have no exposure limits for comparison. For example: Ethyl methacrylate