Chemical Exposures from Cosmetics: A Case Study of Nail Care Products

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Cosmetic widespread long-term use

- Women use an average of fifteen cosmetic products per day;
- Cosmetic use among men has been increasing dramatically.
Cosmetics Regulation

- Cosmetics fall under U.S. Food and Drug Administration (FDA), but FDA does **NOT** have legal authority to require:
  
  ✓ Pre-market testing of products by manufacturers
  
  ✓ Necessary information from industry for FDA to conduct its own pre-market testing
  
  ✓ Require that products sold for professional use include ingredients labels

- Industry has no incentive to conduct toxicity testing of their products for long-term effects such as cancer
California Safe Cosmetics Act

Reporting requirements apply to cosmetic companies if:

• The company makes $1 million or more annually in worldwide aggregate cosmetic sales;

• The company name is on the label of a cosmetic product sold in California after January 1, 2007;

• The product contains an ingredient identified as a known or suspected human carcinogen or reproductive toxicant.
What is the California Safe Cosmetics Program Public Database?

The California Safe Cosmetics Act (the Act) requires companies that manufacture cosmetics to report any cosmetics products that contain ingredients known or suspected to cause cancer, birth defects, or other reproductive harm. The California Safe Cosmetics Program (CSCP) collects this data and makes it available to the public through this website.

Are you curious to see what ingredients have been reported for your shampoo? Want to compare the ingredients of different sunscreens? You can search the database for a type of product; a specific product name; or a brand or company name.

You can also read more about chemical ingredients, learn about how chemical exposure can affect your health, test your knowledge of cosmetics, or learn more about the California Safe Cosmetics Program by clicking on links to the right.

More information on the California Safe Cosmetics Act and cosmetics in the news is also available.

http://www.safecosmeticsact.org/search/
Why the Interest in Nail Salon Workers

Nail Salon Workforce

- Rapid growth due to tripling of nail salons in last two decades
  - California workforce comprised over 100,000 licensed manicurists
- Vietnamese comprise ~60-80% of workforce in California
- 95% female workers
Growth of cosmetologists and manicurists in California

Figure 1. Number of Actively Licensed Cosmetologists By Year (1970-2005)

Figure 2. Number of Actively Licensed Manicurists By Year (1970-2005)

Source of data: California Board of Barbering and Cosmetology Licensee file of cosmetologists and manicurists from 1970-2005
Workforce Context and Complexities

- **Employee vs. Independent contractor**
  - Lack employee benefits - health care
  - Owners are also workers

- **Workplace hazards**
  - Exposures to multiple chemicals over long periods of time
  - Small poorly ventilated salons
  - Limited or lack of product labeling

- **Immigrant workers in Nail Salons**
  - Language barriers
  - Cultural factors
## Select Compounds in Nail Products

<table>
<thead>
<tr>
<th>Compounds</th>
<th>Nail care use</th>
<th>Potential Health Effects</th>
<th>Route(s) of Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>Nail polish remover</td>
<td>Shortens menstrual cycle</td>
<td>Inhalation, dermal</td>
</tr>
<tr>
<td>Dibutyl Phthalate (DBP)*</td>
<td>Nail polish</td>
<td>Endocrine disruption; developmental and reproductive effects</td>
<td>Inhalation, dermal</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>Nail hardener, disinfectant</td>
<td>Known carcinogen; respiratory effects</td>
<td>Inhalation, dermal</td>
</tr>
<tr>
<td>Methylene Chloride*</td>
<td>Artificial nail solvent</td>
<td>Possible carcinogen</td>
<td>Inhalation, dermal</td>
</tr>
<tr>
<td>Methyl Ethyl Ketone (MEK)</td>
<td>Nail polish thinners</td>
<td>Damaged liver and kidney, reproductive effects</td>
<td>Inhalation, dermal</td>
</tr>
<tr>
<td>Methyl Methacrylate (MMA)</td>
<td>Artificial nails</td>
<td>Respiratory effects - asthma; neurological symptoms</td>
<td>Inhalation, ingestion</td>
</tr>
<tr>
<td>Titanium Dioxide</td>
<td>Acrylic nail powder, nail polish</td>
<td>Possible carcinogen</td>
<td>Inhalation</td>
</tr>
<tr>
<td>Toluene*</td>
<td>Nail polish, nail polish thinner, nail adhesives</td>
<td>Developmental toxicant; endocrine disruption</td>
<td>Inhalation, dermal</td>
</tr>
</tbody>
</table>

*relevant to biomonitoring
Toxic Trio: chemicals of concern

These three compounds referred to as “toxic trio” in nail polishes

1) **Dibutyl Phthalate**
   *Use*: provide flexibility
   *Health impacts*: endocrine disruptor; reproductive effects; cross placenta and affect fetal development

2) **Formaldehyde**
   *Use*: nail-hardening agent; tool disinfectant; hair straightening products
   *Health impacts*: known carcinogen (nasopharyngeal and leukemia)

3) **Toluene**
   *Use*: creates a smooth finish & keeps pigment from separating in bottle
   *Health impacts*: endocrine disruptor; reproductive & developmental effects
Past Research Studies
Descriptive Survey of Vietnamese Nail Salon Workers

- Health and safety of nail salon issues emerged from community
- Mutual interest between community and research partner

Cancer Prevention Institute of CA
- Cancer prevention
- Environmental/occupational health
- Community-based research

Asian Health Services
- Community health center in Oakland, CA
- Large Underserved AAPI Population
- Vietnamese patients nail salon workers
- Community-based

Nail Salons
Study Methods and Findings

Research methods
1) Two focus groups (N=20 workers and owners)
2) In-person surveys in salons (N=201 workers from 74 salons)*

*conducted by former and current nail salon workers

Major findings
- Half the salons had poor methods for ventilation
- 80% of workers reported health concerns due to work
- Nearly 50% of workers reported acute health symptoms (headaches, dizziness, difficulty breathing, skin irritations)

Follow-up Study: Cancer

Record-linkage study to examine cancer rates in workforce

RESULTS: No excess cancer risk found for any sites

CONSIDERATIONS: Workforce is still fairly young and short observation time; may require extending years of study

Follow-up Study: Air Monitoring

Conducted air monitoring with 80 workers from 20 salons during their work-shift

**Personal monitoring**
- Toluene levels 2x higher than recommended indoor air

**Area monitoring**
- Detected methyl methacrylate (100% MMA monomer banned from nail products)
- Total volatile organic compounds (TVOC) - higher levels than recommended indoor air

**Acute Health Problems**
- Measured levels may explain why workers (>25%) reporting uncomfortable health symptoms (headaches, skin irritations, breathing problems).

Ongoing research studies
Intervention Study

Keeping a Healthy Occupational Environment & Developing Empowerment Program

NIEHS 2R01ES019598
Randomized Controlled Trial

• Goal: Evaluate the effectiveness of a train-the-trainer intervention
  ✓ salon owners are trained around best practices to reduce chemical exposures and then train their workers

• Conduct personal air monitoring (toluene, methyl methacrylate, methyl ethyl ketone, & TVOCs) and surveys

• Regions: 1) Marin/Contra Costa, 2) Alameda, 3) Santa Clara, and 4) Orange County/Los Angeles
5 Ways To Reduce Your Chemical Exposure

1. Use less toxic products
2. Ventilate nail stations
3. Protect face and hands
4. Handle and store chemicals properly
5. Practice healthy work habits
Study Design

- **T1**, **T2**, **T3** = Assessments include survey & personal air monitoring

Diagram:
- **RANDOMIZE**
  - **Nail salons (N=90)**
  - **Comparison Group (N=45 salons)**
- **Intervention Group (N=45 salons)**
  - **T1***
  - **Owner training**
  - **Worker training**
  - **T2***
  - **Full Intervention**
  - **T3***
  - Complete
  - **Delayed Full Intervention**
  - **Owner training**
  - **Worker training**
Research Gaps and Emerging Products
Research Gaps

• Better exposure assessment
  ✓ Going beyond single chemical to multiple chemicals; looking at synergistic effects and potential predispositions
  ✓ Tying exposure to sources (i.e., products and their usage)
  ✓ Biomonitoring that provides more insights into exposure

• Need for longitudinal study on respiratory, reproductive, cancer and other health outcomes
  ✓ Cross-sectional may have selection bias; long latency periods; and lack of reliable and relevant health surveillance

• Better research around health literacy and effective health communication for immigrant workforces
  ✓ Powerful stakeholder - links to manufacturers as well as consumers
Emerging Products and Trends

Industry is constantly changing, with new trends and products marketed to consumers and workforce

• False sense of safety with little research
  ✓ Gel polishes

• Regrettable substitutes
  ✓ Triphenyl phosphate (TPP) as substitute for dibutyl phthalates (DBP)
Research Challenges

Intense amount of work when working with immigrant population in small business sector

- Language barriers
- Cultural issues (e.g., choose livelihood over health)
- Risks posed to livelihood
  - small profit margin and reliance on customers' decision-making
- Owner-worker dynamics
- High turn-over of workers and salon businesses
- Distrust and fear of government due to historical experiences in Vietnam and interactions with inspectors
- Low health literacy, especially in chemicals
Research Opportunities

- Raising awareness on chemical exposures can be empowering for workforce

- Biomonitoring would provide information (e.g. phthalates exposure) connecting to “body burden”
  - Potential to identify occupational sources

- Effective health communication of results to drive multi-level change
  - Influence individual and salon level changes
  - Influences workers, owners and consumers to buy safer alternatives/ affect industry
  - Influence policy-makers to change regulations