Assessing Occupational Exposure in Black Hair Salons

Co-Investigators:

Anna M. Abrams  Allison F. Marill
Alexis J. Cooper  Ramya B. Ramakrishna
Jay D. Feinstein  Teleah I. Slater
Annie E. Fortnow  Cassidy L. Tatun
Omkar A. Kulkarni  Raymond H. C. Trott
Sarah A. Lemelman  Sandra E. Watemberg
Laura J. Goldin
Joseph G. Allen  Theodore A. Myatt
James H. Stewart  Matthew A. Fragala
Our Partners
History and Background

the cool one

new Epic first permanent curl relaxer that goes on cool stays cool!

Forget hot combs and stinging chemicals. The Cool One—New Epic curl relaxing lotion—is here at last from Gillette. So gentle your hairstylist can apply it without gloves. So soft it relaxes even extra-curl or color-treated hair with comfortable ease. New cool Epic won’t revert—in rain or heat. Lasts and lasts. Conditions. Leaves bounce and body for sleek styling. Why wait? Get The Cool One—now at your hairstylist.

HAIR STORY
UNTANGLING THE ROOTS OF BLACK HAIR IN AMERICA

“A comprehensive and color-balanced look at a truly unique subject.” - Essence

AYANA D. BYRD & LORE THARPS

NOW... MORE THAN EVER
Fashion Demands Straight Hair!

Look around you! Today, every smart, modern hair styling must start with straight hair! And how to have straight hair? Why with Perma-Strate, of course, the original and world’s largest selling cream hair straightener.

Only Perma-Strate gives you such easy-to-manage, natural-looking straight hair that can be dressed, combed, or styled in any way desired. So economical to use... one creamy application keeps hair permanently relaxed for 3 months or longer, with no burn, no redness, no scalp irritation. Even the makers of dyes, tints, and bleaches recommend Perma-Strate because it actually reconditions the hair as it softly straightens. Yes, fashion demands straight hair. That’s why you should demand Perma-Strate, the home permanent hair relaxer, preferred and recommended by top stars like Rosetta Perry and Count Basie.

Perma-Strate
Original World’s Largest Selling Cream Hair Straightener

A complete home kit only $2.25 plus tax at drug and beauty counters, or if not available, order from Perma-Strate, 271 Vance, Memphis, Tenn.

When hair is dull, dry, and brittle, get Perma-Strate HAIR SHEEN, the double-duty hair conditioner and dressing. Only $1.00 plus tax.
Black Hair Procedures

- Chemical (relaxers, dyes, extensions)

- Natural (twists, curly styles)
# Common Services and Their Health Effects

<table>
<thead>
<tr>
<th>Salon Tasks</th>
<th>Chemicals</th>
<th>Associated Health Effects (from HSDB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relaxers</td>
<td>Calcium hydroxide</td>
<td>Moderate skin irritant, avoid inhalation</td>
</tr>
<tr>
<td></td>
<td>Sodium hydroxide</td>
<td>Severe skin irritant, can cause second and third degree burns</td>
</tr>
<tr>
<td></td>
<td>Propylene glycol</td>
<td>Skin irritant</td>
</tr>
<tr>
<td></td>
<td>Guanidine carbonate</td>
<td>Skin and strong eye irritant</td>
</tr>
<tr>
<td></td>
<td>Polyethylene glycol</td>
<td>Respiratory tract irritant. Skin and eye irritant</td>
</tr>
<tr>
<td>Brazilian Blowouts</td>
<td>Methyleneglycol</td>
<td>Carcinogen; skin, eye, and respiratory irritant</td>
</tr>
<tr>
<td></td>
<td>Bixa Orellana (Annatto) Seed Extract</td>
<td>Can cause headache, dizziness, weakness, or nausea</td>
</tr>
<tr>
<td></td>
<td>Cyclopentasiloxane</td>
<td>No known health effects when inhaled or when in contact with skin</td>
</tr>
<tr>
<td></td>
<td>Glycerin</td>
<td>Eye irritant</td>
</tr>
<tr>
<td></td>
<td>Limonene</td>
<td>Skin, eye, and respiratory irritant</td>
</tr>
<tr>
<td></td>
<td>Linalool</td>
<td>Eye and skin irritant</td>
</tr>
<tr>
<td></td>
<td>Hexyl Cinnamal</td>
<td>Eye and skin irritant</td>
</tr>
<tr>
<td></td>
<td>Benzyl Benzoate</td>
<td>Eye and skin irritant</td>
</tr>
</tbody>
</table>
Hazardous Chemicals and Known Hazards

- Sodium Hydroxide
- Ammonia
- Ammonium Thioglycolate
- Formaldehyde
Methods: Study Design

Our study was approved by the Brandeis University Institutional Review Board (IRB).

Questions we investigated:

- What are the daily workplace sources and concentrations of VOCs, aldehydes, carbon monoxide, carbon dioxide and Particulate Matter (PM) 2.5 in black hair salons?

- What health concerns are associated with the services provided in the salon?
What We Tested For

- Volatile Organic Compounds (VOCs)
- Aldehydes
- Particulate Matter $2.5 \mu m$
- Carbon Dioxide
- Carbon Monoxide
- Temperature
- Relative Humidity
Recruitment

❖ Online search for 90 Black hair salons

❖ Canvassed with a flyer and the help of the Resilient Sisterhood Project

❖ 10 salons agreed to participate

➢ salon recruitment limited by the amount of equipment
Equipment

Summa Canister

Q-Trak

Dust-Trak

Carbonyl
Demographics

- 6/10 stylists 45 years or older
- Average of 22 years of experience
- Size of hair salons varied
- No standard ventilation system

[Stylist Work Hours Per Week Diagram]
Results: Questionnaire

Self Reported Health Symptoms and Physical Injuries Experienced at Work

- Leg/Foot Problems
- Back Pain
- Loss of Function in Fingers
- Cuts
- Pain in Hands
- Pain in Wrists
- Chemical Burn
- Chronic Pain of Hips and Thighs
- Anxiety
- Stress
- Difficulty Breathing
- Headaches
- Fatigue/Tiredness
- Nausea
- Eye Irritation
- Nose Irritation
- Skin Irritation

Number of Stylists

Check all that apply

1. How would you rate your overall health?
   - 1 Poor
   - 2 Fair
   - 3 Good
   - 4 Very Good
   - 5 Excellent
### Summary of Findings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Measured in # of Salons</th>
<th>Average</th>
<th>Minimum</th>
<th>Median</th>
<th>Maximum</th>
<th>Guideline</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2(ppm)</td>
<td>10</td>
<td>1133</td>
<td>464</td>
<td>1197</td>
<td>1880</td>
<td>800 ppm</td>
<td>ASHRAE</td>
</tr>
<tr>
<td>PM2.5(ug/m3)</td>
<td>10</td>
<td>394</td>
<td>22</td>
<td>295</td>
<td>1030</td>
<td>35 ug/m3</td>
<td>EPA</td>
</tr>
<tr>
<td>Formaldehyde (ug/m3)</td>
<td>10</td>
<td>2.67</td>
<td>0.15</td>
<td>2.255</td>
<td>6.52</td>
<td>0.18 ppb</td>
<td>EPA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8 ppb</td>
<td>ATSDR MRL (Chronic)</td>
</tr>
<tr>
<td>Benzene (ug/m3)</td>
<td>10</td>
<td>1.33</td>
<td>0.59</td>
<td>1.15</td>
<td>2.4</td>
<td>0.36 ug/m3</td>
<td>EPA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 ppb</td>
<td>ATSDR MRL (Chronic)</td>
</tr>
<tr>
<td>Tetrachloroethylene (ug/m3)</td>
<td>8</td>
<td>104.09</td>
<td>0.58</td>
<td>2.18</td>
<td>810</td>
<td>11 ug/m3</td>
<td>EPA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>400 ppb</td>
<td>NIOSH REL</td>
</tr>
<tr>
<td>Dichlorobezene- 1,4(ug/m3)</td>
<td>6</td>
<td>8.66</td>
<td>0.72</td>
<td>1.2</td>
<td>34</td>
<td>0.26 ug/m3</td>
<td>EPA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10 ppb</td>
<td>ATSDR MRL (Chronic)</td>
</tr>
<tr>
<td>Chloroform(ug/m3)</td>
<td>5</td>
<td>0.97</td>
<td>0.51</td>
<td>0.65</td>
<td>2.2</td>
<td>0.12 ug/m3</td>
<td>EPA</td>
</tr>
<tr>
<td>Total Chronic VOCs (ppb)</td>
<td>10</td>
<td>23.13</td>
<td>3.03</td>
<td>9.92</td>
<td>133.34</td>
<td></td>
<td>EPA</td>
</tr>
<tr>
<td>Total Aldehydes (ppb)</td>
<td>10</td>
<td>20.15</td>
<td>1.03</td>
<td>11.135</td>
<td>107.15</td>
<td></td>
<td>EPA</td>
</tr>
</tbody>
</table>
Indoor Carbon Dioxide Level (Afternoon Snapshot) vs Guidance Limit

- CO₂ (ppm)
- ASHRAE Guidance Limit
Particulate Matter 2.5 Levels in Salons, Afternoon Snapshot

PM 2.5 Concentration (µg/m³)

Salon Code

A B C D E F G H I J

PM 2.5
NAAQS Outdoor Limit
Follow-Up Testing

4 Hour Levels of PM 2.5 in Salon E

- Hair dryer used
- Flat iron used
- Hair dryer and flat iron
- Second flat iron used

PM 2.5 (ug/m^3)

EPA Outdoor PM 2.5 Limit (ug/m^3)
Concentrations of Benzene Levels in Salons compared to EPA's Risk-Based Screening Carcinogenic Target Risk Levels

- Benzene Levels (ug/m³)
- Carcinogenic Target Risk (ug/m³)

Salons:
- A
- B
- C
- D
- E
- F
- G
- H
- I
- J

Benzene Concentrations in ug/m³ in salons:
- A: 0.6
- B: 0.6
- C: 2.4
- D: 1.2
- E: 1.2
- F: 0.6
- G: 1.8
- H: 1.8
- I: 2.4
- J: 1.8

Carcinogenic Target Risk: ≤ 0.36 ug/m³
Concentrations of Chloroform Levels in Salons compared to EPA's Risk-Based Screening Carcinogenic Target Risk Levels

Chloroform concentrations in ug/m3 in salons

Salons

Chloroform Levels (ug/m3)

C

D

E

H

I

≤ 0.12 ug/m3
Conclusion

- Insignificant data to correlate air quality with negative health effects

- Most salons had levels of CO\textsubscript{2} that were above the ASHRAE ventilation standard of 800 ppm

- Some VOC concentrations were found to exceed EPA guideline and at least some VOCs were found in all salons

- PM\textsubscript{2.5} was detected at levels significantly above outdoor regulations in 80% of the salons
Study Limitations

• Malfunctioning equipment

• $\text{PM}_{2.5}$ and $\text{CO}_2$ readings were done in snapshots

• Selection bias

• Short time frame to perform study
Recommendations

• Explore PM$_{2.5}$ further in salons

• PM Characterization

• Ventilation assessment

• Increase number of health survey participants
Outstanding Questions

● How do these workplace exposures impact black hair salon workers and clients short and long term health problems?

● What methods (ie. better ventilation, different products, protective equipment) can help reduce these exposures?

● Is there a direct correlation between flat irons and high levels of particulate matter in hair salons?

● What are the implications of particulate matter spikes on health of workers?

● If we did further tests in black hair salons of urine or rinse water, would we find additional chemicals that could negatively affect human health?
Thank You

Laura Goldin
Susanna Kroll
Briana Sheehan
Joseph G. Allen
Matthew A. Fragala
Theodore A. Myatt
James H. Stewart

Lilly Marcelin
Deborah Brown
Peter Philbrook  Dan Curran  Dan Boudreau
Black Women for Wellness
MA OTA
Paul Shoemaker
Silent Spring Institute
Clean Water Action
Healthy Cosmetology Committee
ACE