Developed by
Western Massachusetts Coalition for Occupational Safety and Health
Funded by
The Toxics Use Reduction Institute
Spring, 2002
Cosmetology

Health Hazard Overview

W – What is the hazard?
E – How does it enter my body?
E – How am I exposed?
D – What can I do to limit my exposure?
**AREC Health and Safety Model**

- **Anticipate**: Preparing to deal with hazardous products in the salon.
- **Recognition**: Identifying the products involved and the dangers they present.
- **Evaluation**: Discovering how these products can cause illness and harm the environment.
- **Control**: Selecting methods and products to eliminate or reduce any danger.
Safety Hazards

• Pose an immediate risk of a sudden, traumatic injury.

• Examples: burn, electric shock, explosion, fall, etc.
Health Hazards

Can cause disease or interfere with the normal operation of your body.

- Includes exposure to:
  - Chemicals – hazardous products
  - Biologicals – bacteria, viruses, mold
  - Noise – equipment
  - Extreme temperature - equipment
Difference Between: Health and Safety Hazards

- Heath hazards can show up immediately or years after an exposure.

- Some of the symptoms caused by health hazards, such as itchy eyes, headache or a rash, are very common.

- People react differently to the same health hazard, but more similarly to a safety hazard.
What Makes A Chemical Hazardous to Your Health?

- **Toxicity** - ability of chemical to do harm
- **Dose** - amount your body receives
- **Duration and Frequency** - length and number of times you are exposed
- **Vulnerability** - your body’s sensitivity
What Makes A Chemical \textit{Hazardous} to Your Health?

- \textit{Timing and Age} – when in the physical development of your body you are exposed

- \textit{Routes of Exposure} - the way that you come into contact with a chemical

- \textit{Response} – how your body handles it (metabolism)

- \textit{Reaction and Interaction} - the chemical’s reaction with other chemicals that you are exposed to
**Toxicity**

The ability of a chemical to harm a person or animal.

**Toxicology**

Is the study of the effects of chemicals on living organisms.
Toxicity of a chemical in the body is determined by:

- The amount of chemical absorbed (dose).
- Whether the by-products (metabolites) of the chemical from being processed by your body are toxic.
- The ability of the body to detoxify and eliminate the chemical and its by-products.
• **Absorption**
  The process by which a toxic agent crosses body membranes (e.g. skin and eyes) and enters the bloodstream.

• **Distribution**
  Once in the bloodstream, a chemical can be distributed throughout the body.
Fate of Chemicals in the Body

• **Metabolism**
  Is the process that breaks down a chemical so it can be excreted.

• **Excretion**
  Is the elimination of substances from the body. Excretion can occur by several routes including perspiration, respiration, human milk, urine, feces.

• **Storage**
  Some chemicals that are fat-soluble are stored in body cells.
Target of Toxicant
*What does it affect?*

Can disrupt:

- A cell
- An organ
- A person’s system
**Dose and the Body’s Response**

- **Dose** refers to:
  - The amount of chemical you absorb and that reacts with the body, *and*
  - The amount of time you are exposed to a chemical.

- **Response** is the biological effect caused by the exposure. The larger the dose, the greater the response or “damage.” Larger doses can be caused by an increased:
  - concentration of chemical
  - length of exposure
Dose and the Body’s Response

- Coma/Death
- Moderate/Severe
- Minor Symptoms
- No Visible Response

Dose Increase

CNS motor dysfunction

Irritant
There are two ways that your body can react to a dose:

1) Reacts to any dose, regardless of amount

2) Reacts when there is a certain amount, "Threshold"
**Dose and the Body’s Response**

LD₅₀ *Lethal Dose* of a substance that could kill 50% of an animal test population.

LC₅₀ *Lethal Concentration* of a substance in the air that could kill 50% of an animal test population.

*If the LD₅₀ is low, then the product is very toxic!*
Concentration

It is measured by:

- Per unit mass or weight (mg/kg)
- Per unit area of skin surface (mg/cm²)
- Per unit volume of air inhaled (ppm or %).
Exposures impact the body based on *how long* and *how often* you are exposed:

**Acute:** A single, short-term exposure from a minute to a few days, or

**Chronic:** A repeated exposure over a period of time from months to years.
Acute Health Effects

• Generally caused by high doses

• Appear immediately or shortly after an exposure

• May be minor or serious
Chronic Health Effects

- May take years to show up.

- Usually caused by many repeated exposures to a low level exposure over a period of time.

- Effects are usually permanent:
  - Some chemicals accumulate in the body.
  - Damage does not have a chance to be repaired due to constant exposure.

Example: Asthma from Hairspray
Chronic Health Effects

• If the amount of time, “8 hours”, that you’re exposed to a chemical, is more than the amount of time you need to eliminate the chemical, then you accumulate the chemical.

• You have “16 hours” away from the job, and some chemicals may take longer for your body to process and for the damage to be repaired.

• Also, if the organs (liver, kidney, lungs) that detoxify chemicals are compromised, they cannot detoxify as well.
**Latency Period:**
*Time between exposure and health effect*

*Man comes in contact with a toxin.*

**Immediate Effect**
- 3:05 PM
- Death

**Delayed Effect**
- 10:00 PM
- Death
Your Body’s Sensitivity

- Heredity/Genetics
- Age
- Pregnancy
- Gender
- Alcohol, Tobacco
- Diet
- Lifestyle

- Existing health condition
- Weight
- Other medications, drugs, chemicals
- Previous exposure
Timing of Exposure and Age

- **Elders**
  Have weaker immune systems.

- **Adults**
  Are the least vulnerable.

- **Children**
  Are still developing their immune systems.

- **Fetus**
  Are still developing their body systems. The system damaged depends on what stage of development the fetus was when the exposure occurred.
**How Does A Chemical Affect Your Body?**

- **Local Effect**
  - When there is an effect at the *location* the chemical came in *contact* with your skin, eyes, nose, throat, lungs.
  - Examples: burns, rash

- **Systemic Effect**
  - When the chemical passes through the skin or lungs, distributed into the *blood stream* and to an *organ*.
  - Example: kidney damage

- **Local and Systemic Effects**
  - Some chemicals have both effects.
  - Example: Phenols in disinfectant
How Do Chemicals Get into Your Body?

*Routes of Exposure*

- Breathing (*Inhalation*)
- Swallowing (*Ingestion*)
- Piercing of skin (*Injection*)
- Skin Absorption
- Eye Absorption
Routes of Exposure: Breathing

A major route of exposure for the Cosmetologist and Customer

Respiratory System

- Nose
- Throat
- Air-tubes
- Lungs

If you spread out a human lung, it would cover an area the size of a tennis court!
Routes of Exposure: *Breathing*

- **What forms can be inhaled?**
  - gases, vapors, mists
  - particulates

- **What activities generate these forms?**
  - Vapors from mixing and using products, and sterilizing solution
  - Powders from product mixing and buffing
  - Fine mists from hairsprays which can stay in the air for long periods.
What can happen to a chemical when you breath it in?

- Stays in lungs
- Carried into bloodstream
- Exhaled
- Coughed out
Why can’t you use your sense of smell to tell if you are getting exposed to chemicals?

• Some chemicals do not smell.

• Sometimes, by the time that you smell it, it is too late.

• Our noses can get used to smells or can be exhausted by them.

• A cold or allergy can effect your ability to smell.
Salon Respiratory Hazards

Vapors from mixing ingredients

Vapors from nail products
Aerosols

- Aerosols have three components:
  - Propellant
  - Solvent
  - Active ingredients

- Aerosols can affect your body by:
  - Destroying cilia in air tubes.
  - Building up in lungs is the hair sprays uses resins to hold hair in place.
  - Causing asthma.
Routes of Exposure: *Skin*

*How can chemicals affect your skin?*

- Can harm skin directly
- Can pass through skin directly and enter bloodstream

*This is one of the major routes of exposure for the Cosmetologist and the Customer*
Routes of Exposure: *Through the Scalp*

Why is it a major route of exposure for the client?

- The scalp has the richest blood supply in the body.
- The hair follicles are the largest in the body.
- There are a large number of sweat & sebaceous glands.
- It is a large surface area.

Graphic from Milady’s Standard Book of Cosmetology, 2000
Routes of Exposure: *Skin*

- Exposure can come from solids, liquids, gases.
- Chemicals more readily enter through the skin on the scalp and on scrotum than anywhere else on the body.

Graphic from Milady’s Standard Book of Cosmetology, 2000
Absorption is enhanced by:

- Breaking top layer of skin (cuts and cracks).
- Wetting skin increases its permeability 2-3 fold.
- Increasing temperature of skin, which causes sweating, which can dissolve solids.
- Increasing blood flow to skin.
- Altering pH of the skin.
- Defatting the skin through the use of shampoos and solvents.
Route of Exposure: *Injection*

The skin must be penetrated or punctured by contaminated objects for injection to occur.
Routes of Exposure: Eyes

How can chemicals affect the eyes?

- Chemicals can harm eyes directly.
- Eyes can absorb chemicals from mists and vapors.
- Chemicals can get trapped behind contact lenses.
Routes of Exposure: *Eyes*

**What Are Some of the Chemicals of Concern?**

- **Acids** – burns
  The immediate damage from acids are a good indicator of the long-term damage.

- **Alkalis** – burns
  The immediate damage does not indicate the long-term damage which could get worse.

- **Solvents** – dissolve fats, cause pain and cloud the cornea.
Routes of Exposure: Swallowing

Usually Accidental!

Will cause direct harm if it is an irritant or a corrosive.

Chemicals found:
- In food & drink laying around
- On counter where food is prepared
- On clothes, cigarettes
- On hands, beard
What Types of Adverse Health Effects Do Chemicals Cause?

- Irritation
- Allergy
- Dermatitis
- Major Organ Damage
- Cancer
- Reproductive Effects
Irritants

• **Reaction** - Cause an immediate reaction when they come in contact with skin, eyes, nose, throat or lungs.

• **Symptoms**
  – Eyes: burning, watering, itching, redness
  – Nose: runny nose
  – Throat: scratchy throat
  – Lung: cough, hard to breathe
  – Skin: dry, scaly, inflamed
Allergy

• **Reaction:** An immune response and sensitization to a chemical.

• **Symptoms:** Once you have been sensitized, a chemical can cause a reaction every time you use it regardless of the amount.
  - Stuffy nose and sneezing
  - Watery eyes
  - Wheezing and coughing
  - Itchy skin rash
  - Swelling

*Example:* allergy to an aniline tint

*Example:* latex allergy

Graphic from Milady’s Standard Book of Cosmetology, 2000
Allergic Sensitizers

• A chemical that causes people to develop an allergic reaction after exposure to it.

• Could have:
  – Acute reaction - rash
  – Chronic reaction - asthma

Examples:
• EMA in Acrylic Nails
• Formaldehyde in nail finishes
Dermatitis

The most common health hazard for cosmetologists!

- **Reaction:**
  - An inflammation of the skin, “skin rash”

- **Types:**
  - Contact: with a skin irritant
  - Allergic: an allergic reaction
    (from skin contact or breathing in)

- **Symptoms:**
  - Flaking, dryness, redness
  - Itching, burning of the skin
TARGET ORGAN TOXICITY

• As the bloodstream circulates toxic chemicals throughout the body, every organ is in contact with the material.

• Many poisons also show a selective affinity for a particular organ and produce specific effects on them:
  – Neurotoxins affect the nervous system
  – Hemotoxins affect circulatory system

• The liver and kidney aid in removing poisonous substances. However, some toxic substances also accumulate in these same organs.
Example of a Target Organ Effect

Neurotoxicity - Central Nervous System

• **Reactions:**
  – breathing a chemical in or getting it on skin

• **Effects - Peripheral Nervous System (arms, legs)**
  – *Motor*: weakness, uncoordinated, fatigue, tremor
  – *Sensory*: numbness, tingling, visual or hearing problems

• **Effects - Central Nervous System (brain)**
  – *Thought Processes*: memory loss, confusion
  – *Emotional State*: nervousness, irritableness, depression, apathy, mood swings

• **Examples:**
  – acetone, acetates, and toluene in nail products
Cancer

• **Reaction:**
  – A *carcinogen* alters genes that control cell growth.
  – Causes uncontrolled growth and spread of abnormal cells.

• **Symptoms:**
  – Has long *latency period*, may not show up immediately.
  – May show up as tumors.

Example: Coal Tar Dyes
Will you always get Cancer if you are exposed to a Carcinogen?

No, but your risk is higher if:

- You are exposed over a long period of time, or
- You are exposed to a large amount

Anyone who is exposed:

- can get cancer but not everyone will get cancer.
- there is no way to measure a safe amount.
Reproductive Hazards

• *Mutagens* – change genetic information in egg or sperm, e.g., cancer

• *Teratogens* – damage developing baby in the womb, e.g., birth defects

• *Damage to Reproductive Organs* – in men and women, e.g., sterility, impotence, miscarriage
Effects of Chemical Combinations

*When some chemicals combine, they can produce different effects than they do individually.*

These combinations are called:

- **Additive Reaction**: $2+2=4$
- **Synergism Reaction**: $2+2=6$
- **Potentiation Reaction**: $0+2=4$
- **Antagonism Reaction**: $2+2=2$
Additive Reaction $2+2=4$

Two chemicals are combined and produce an effect equal to the sum of the two chemicals.
Synergism Reaction $2+2=6$

Two chemicals are combined and produce an effect that is greater than the sum of the effect of each agent given alone.
Potentiation Reaction $0+2=4$

Is a type of synergism where one chemical (the potentiator) is not usually toxic if present alone, but has the ability to increase the toxicity of other chemicals.
Antagonism Reaction $2+2=2$

Occurs when two chemicals are combined and they interfere with each other’s actions or one interferes with the action of another chemical.
Smoking and Chemicals

• Smoking increases the number of chemicals in your body.
• The combined effect of chemicals from the smoke and chemicals you work with put you at greater risk.
• Smoking damages your lung’s ability to protect themselves.
• Chemicals on your hands or in the air can get on your cigarettes, and you can breathe or swallow them when you smoke.
### Exposure Guidelines: Permissible Exposure Limits

**P - Permissible**

**E - Exposure**

**L - Limit**

*Over 20 years old!*

- The maximum chemical exposure limits for workers for an 8 hour day during a 40 hour work week.

- Occupational Safety and Health Administration (OSHA)

- Enforceable

- Assumes that the worker:
  - Has a 16 hour rest period in between exposures
  - Is not exposed to anything else
  - Is healthy
Exposure Guidelines: Threshold Limit Values

<table>
<thead>
<tr>
<th>T - Threshold</th>
<th>L - Limit</th>
<th>V - Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Air concentrations of chemicals that workers can be exposed to without adverse effects.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Developed by the American Conference of Governmental Industrial Hygienists (ACGIH)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Not enforceable.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Exposure Guidelines:

Threshold Limited Value - Time Weighted Average

The **TWA** for an 8-hour work day, 40 hour work week

*Averages the concentrations of exposures based on the duration of each exposure.*
Exposure Guidelines:

*Threshold Limited Value - Short-Term Exposure Limit*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sets worker exposure for:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Up to 15 minutes at a time</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Up to 4 times a day</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• With at least 60 minutes in between successive exposures</td>
</tr>
</tbody>
</table>
Exposure Guidelines:

Threshold Limited Value - Ceiling

Ceiling level should never be exceeded!
### Exposure Guidelines

*Immediately Dangerous to Life and Health*

<table>
<thead>
<tr>
<th>I</th>
<th>immediately</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>dangerous to</td>
</tr>
<tr>
<td>L</td>
<td>life and</td>
</tr>
<tr>
<td>H</td>
<td>health</td>
</tr>
</tbody>
</table>

- Exposure at that concentration would cause death or permanent adverse health effects.
- The lower the number, the more hazardous the chemical.
- National Institute of Occupational Safety and Health (NIOSH)
## Exposure Guidelines

### Recommended Exposure Limits

<table>
<thead>
<tr>
<th>R</th>
<th>recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>exposure</td>
</tr>
<tr>
<td>L</td>
<td>limits</td>
</tr>
</tbody>
</table>

- NIOSH recommendations
- Not enforceable
- Similar to TLVs
- Often lower than PELs
Hierarchy of Controls

- Product Substitution
  - Engineering Controls
    - Work Practices
      - Personal Protective Equipment