Chemical Health Hazards In the Salon

Developed by

Western Massachusetts Coalition for Occupational Safety and Health

Funded by

The Toxics Use Reduction Institute

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Cosmetology

Health Hazard Overview

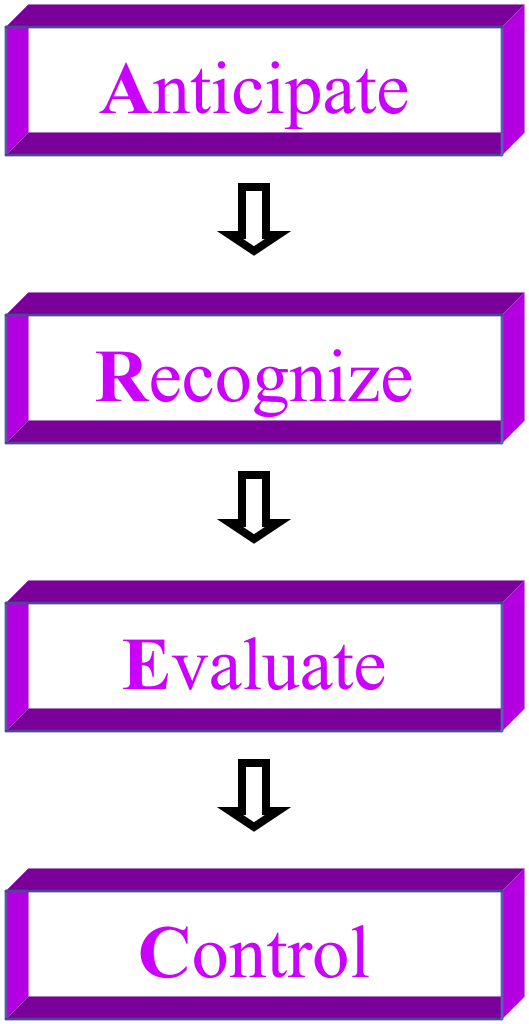
W – *What* is the hazard?

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



Anticipation: **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.**

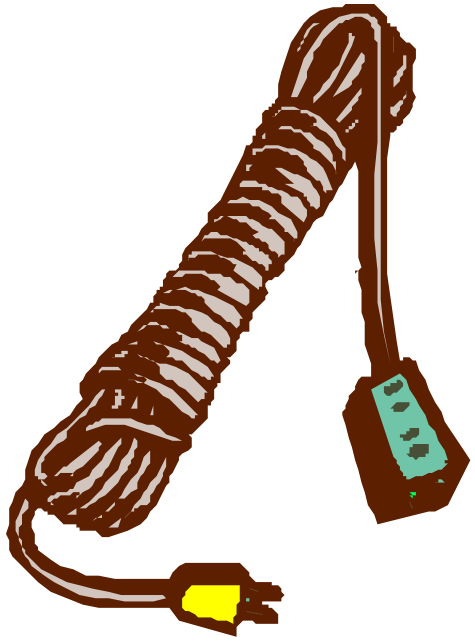
Control: **Selecting methods and products to eliminate or reduce any danger.**

Safety Hazards

- **Pose an immediate risk of a sudden, traumatic injury.**

- **Examples:**

  burn, electric shock, explosion, fall, etc.

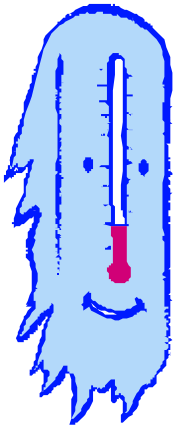


Health Hazards

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 *Hazardous* to Your Health?

- ***Timing and Age*** **– when in the physical development of your body you are exposed**
- ***Routes of Exposure*** **- the way that you come into contact with a chemical**
- ***Response*** **– how your body handles it (metabolism)**
- ***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

Toxicity of a chemical in the body is determined by:

- **The amount of chemical absorbed (dose).**
- **Whether the by-products (metabolytes) 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.**

Transport of Chemicals in the Body

- ***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.

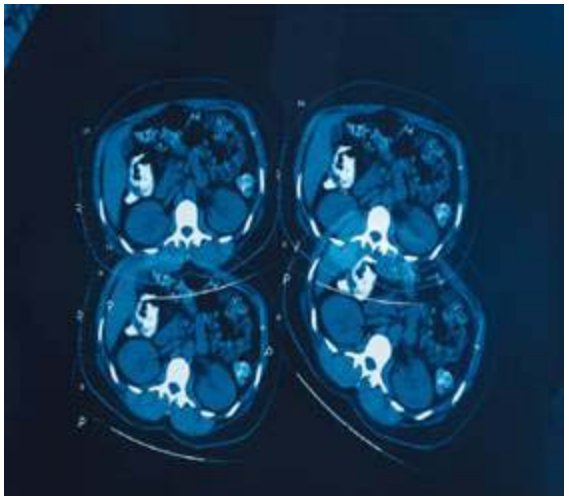
- ***Storage***

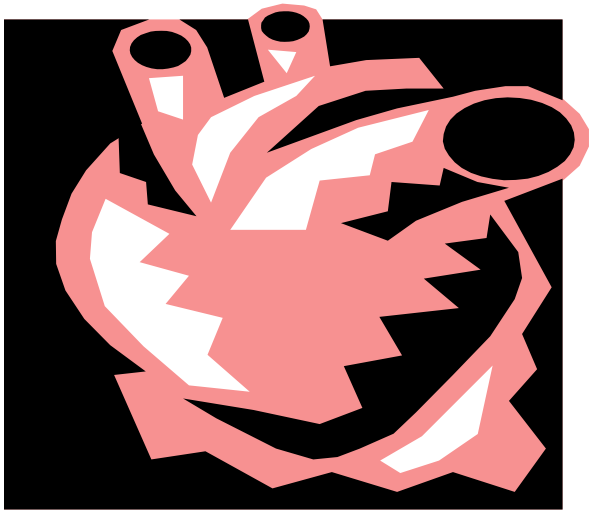
  Some chemicals that are fat-soluble are stored in body cells.

Target of Toxicant
What does it affect?

Can disrupt:

- **A cell**
- **An organ**
- **A person's system**



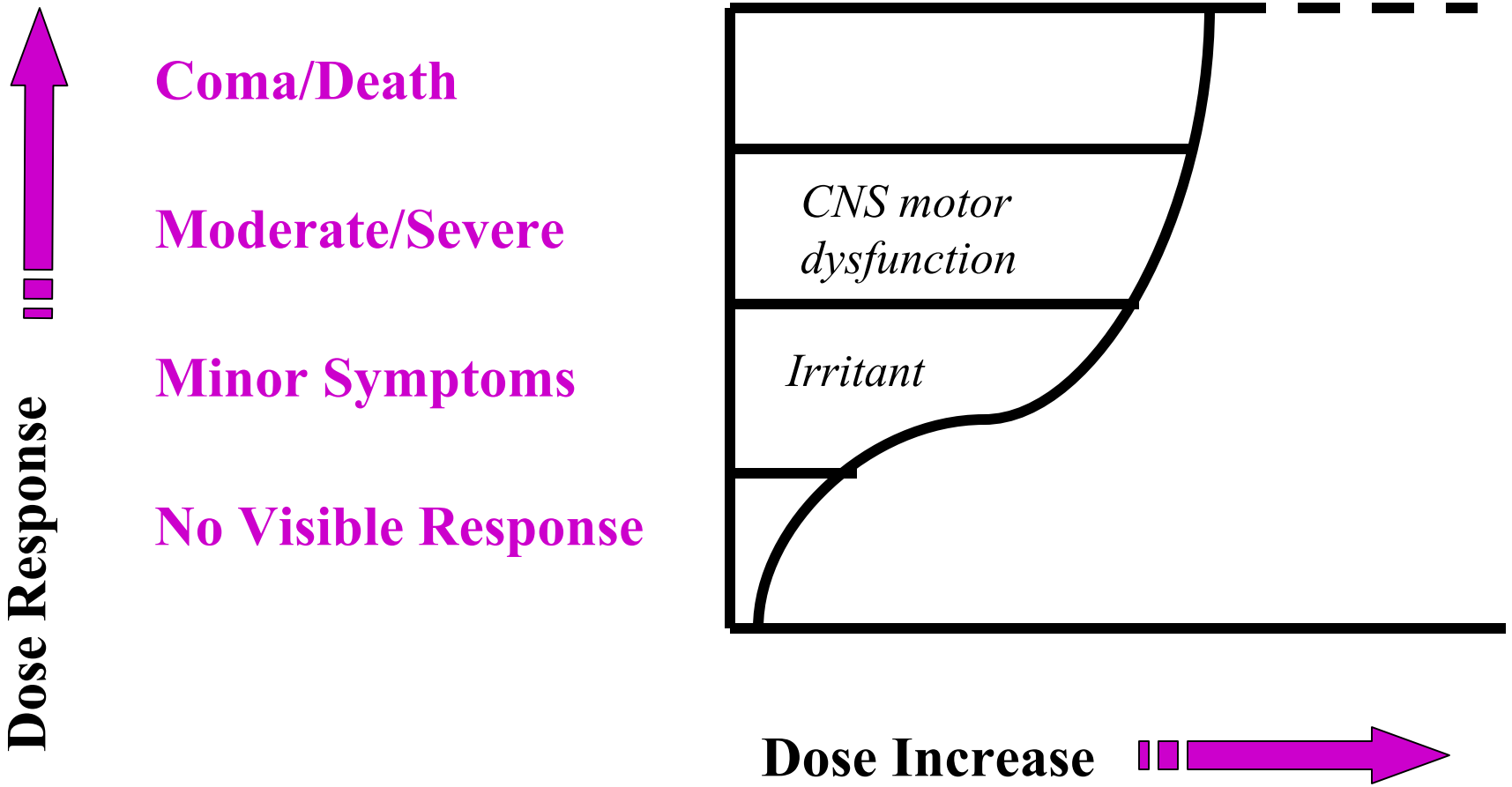


Dose and the Body's *Response*

- ***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*

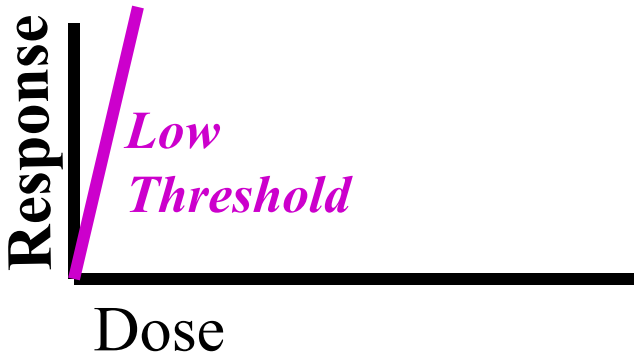


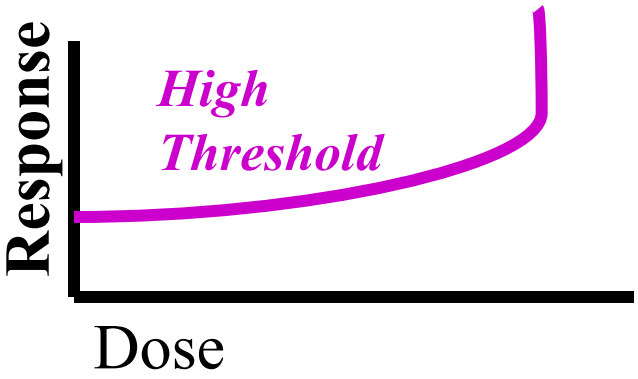
Dose and the Body's *Response*

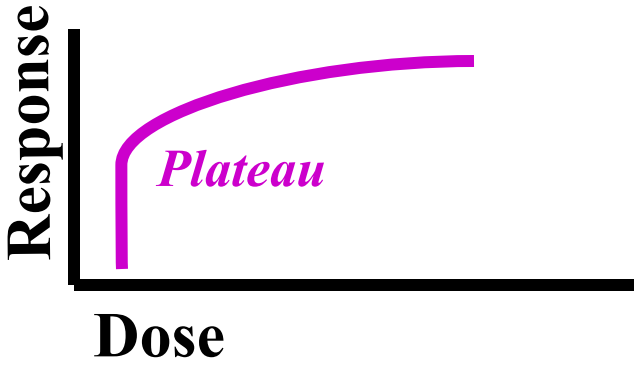
There are two ways that your body can react to a dose:

1) Reacts to any dose, regardless of amount

2) Reacts when there is a certain amount, "*Threshold*"



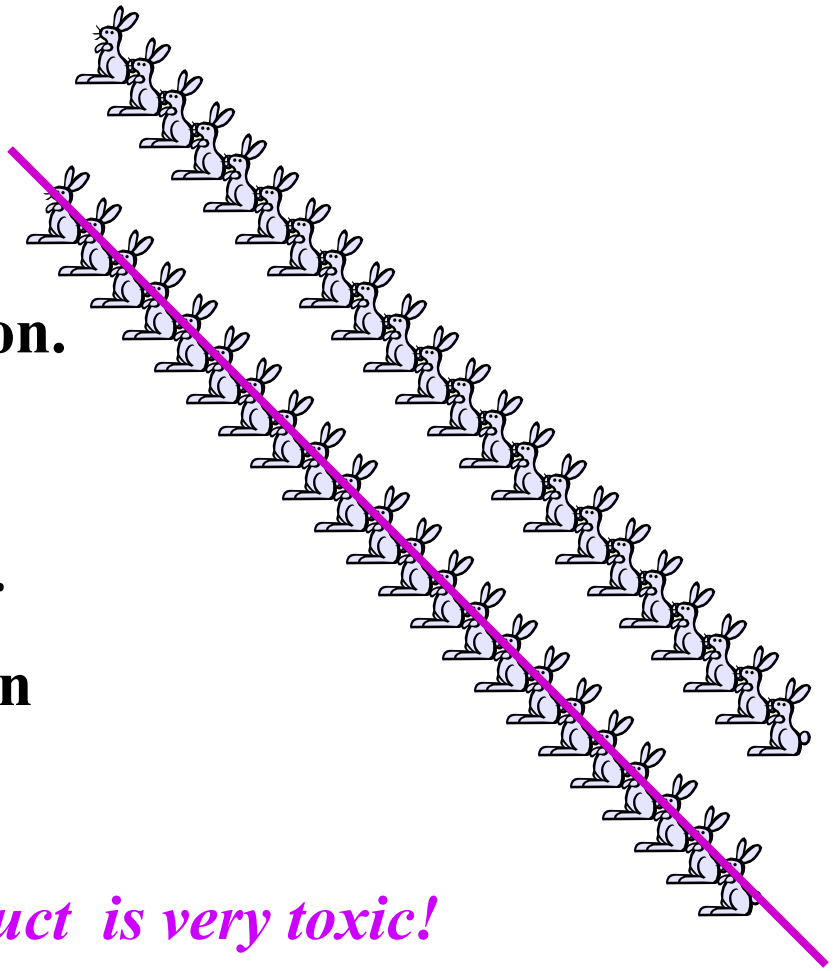




Dose and the Body's *Response*

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

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

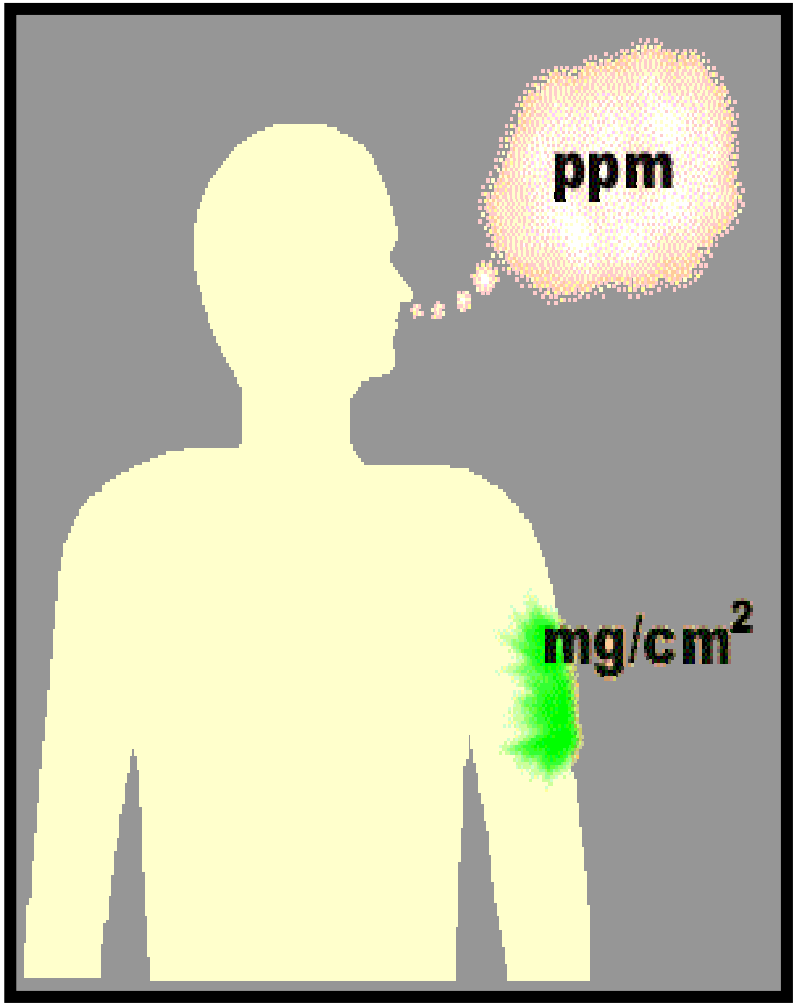


If the LD_{50} is low, then the product is very toxic!

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 %).**



Duration and Frequency

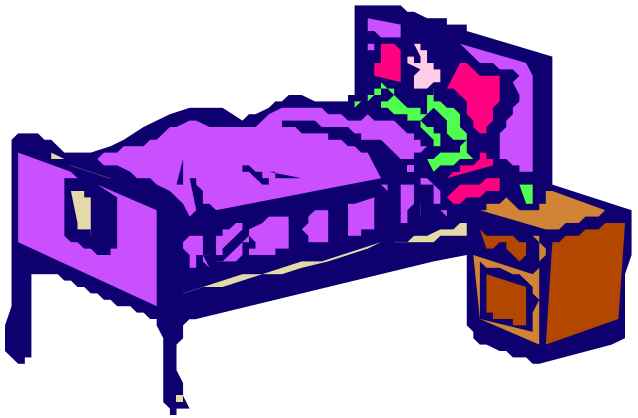
Exposures impact the body based on *how long* and *how often* you are exposed:

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

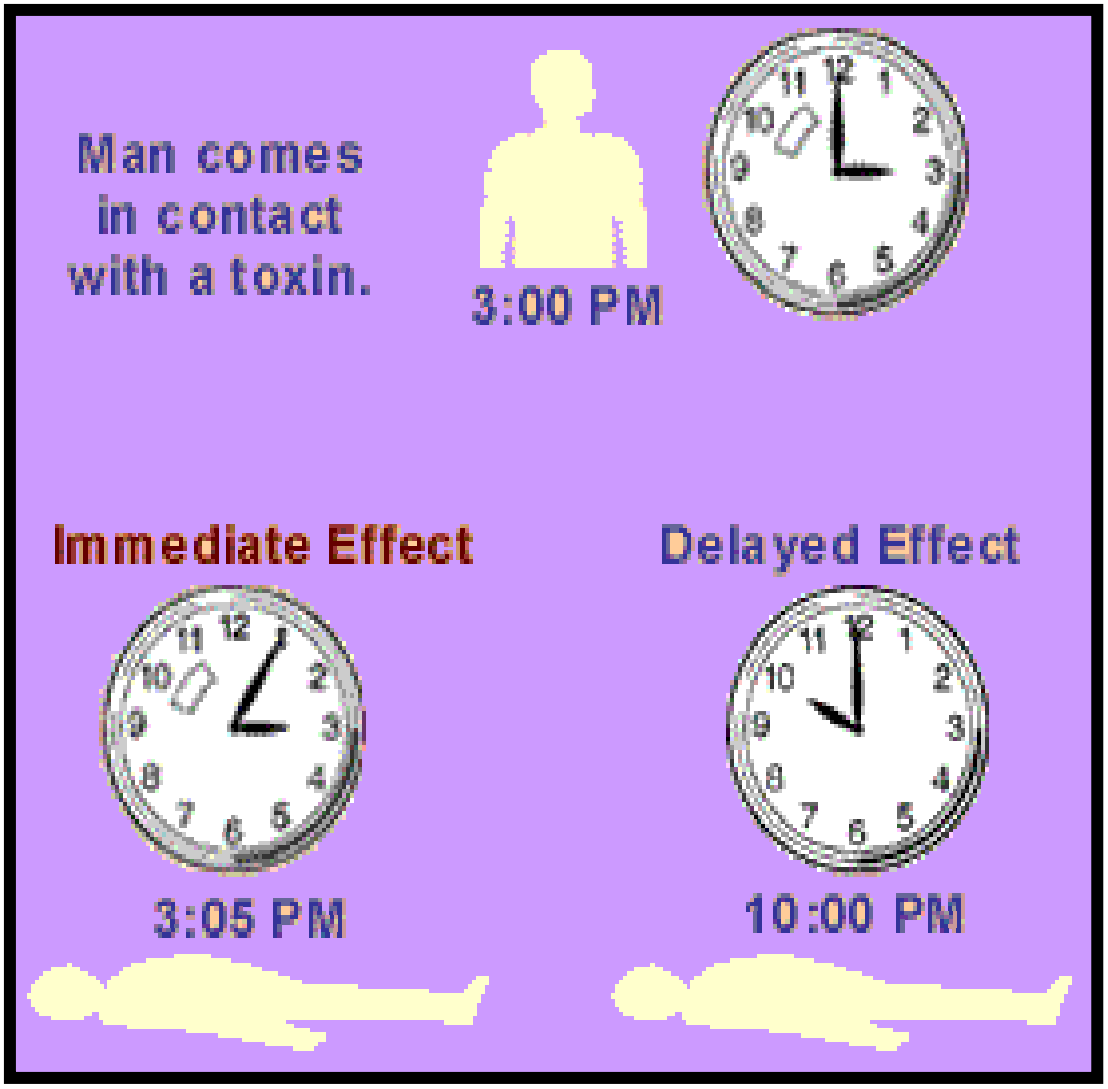
- **If the amount of time, "8 hours", that you're exposed to a chemical, is more than the amount of time you need to eliminate the chemical, then you accumulate the chemical.**

- **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



Your Body's Sensitivity

- **Heredity/Genetics**
- **Age**
- **Pregnancy**
- **Gender**
- **Alcohol, Tobacco**
- **Diet**
- **Lifestyle**
- **Existing health condition**
- **Weight**
- **Other medications, drugs, chemicals**
- **Previous exposure**

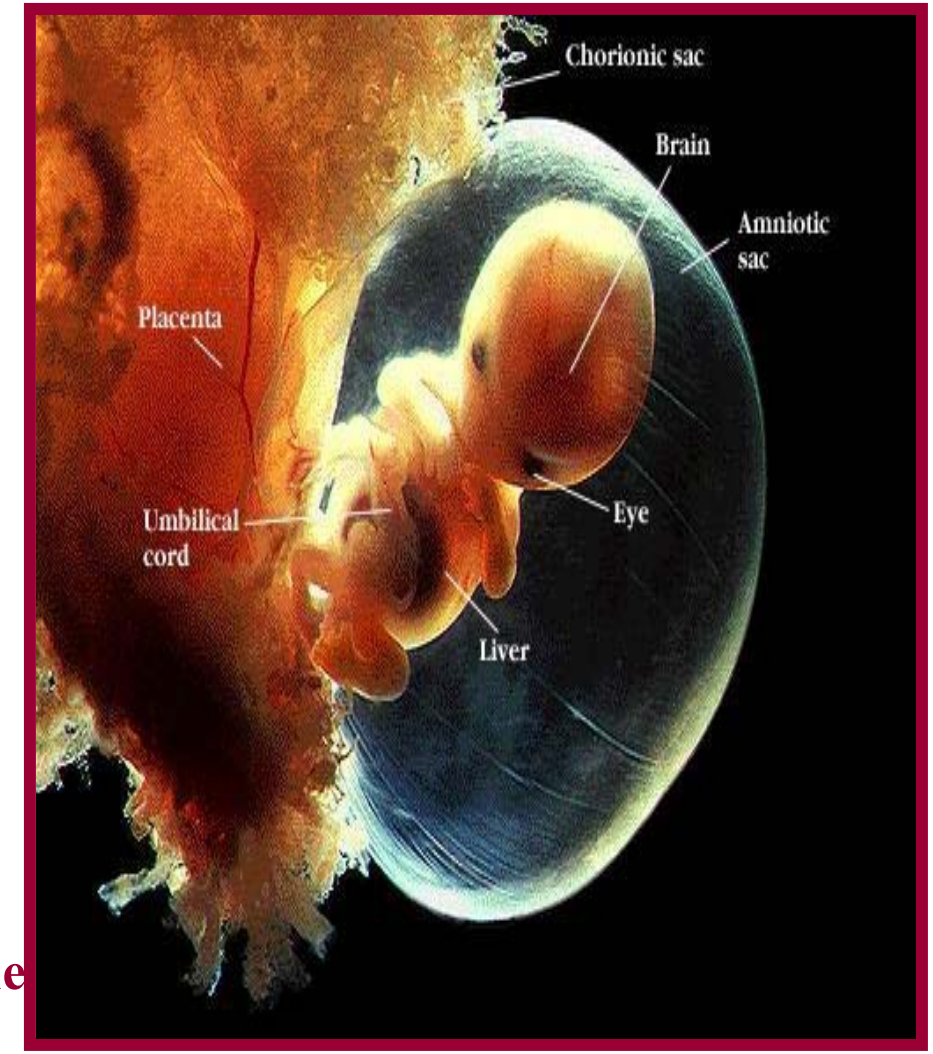
Timing of Exposure and Age

- ***Elders***
  Have weaker immune systems.

- ***Adults***
  Are the least vulnerable.

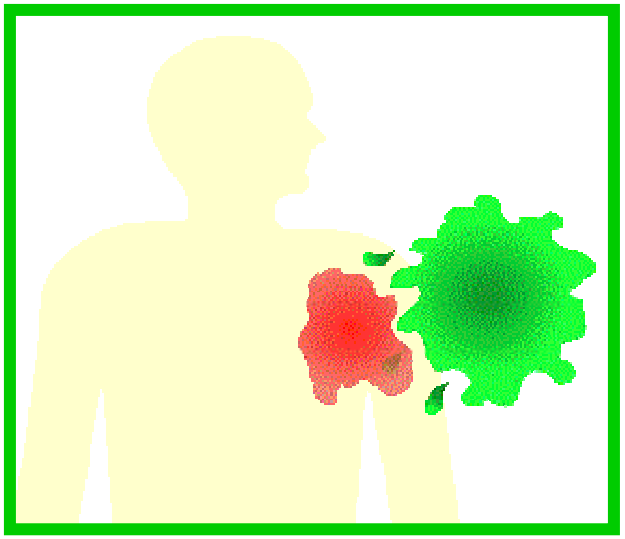
- ***Children***
  Are still developing their immune systems.

- ***Fetus***
  Are still developing their body systems. The system damaged depends on what stage of development the fetus was when the exposure occurred.

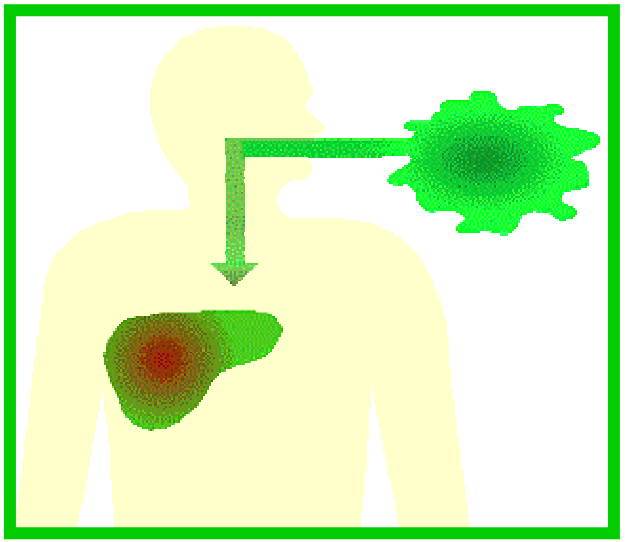


How Does A Chemical Affect Your Body?

- ***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**

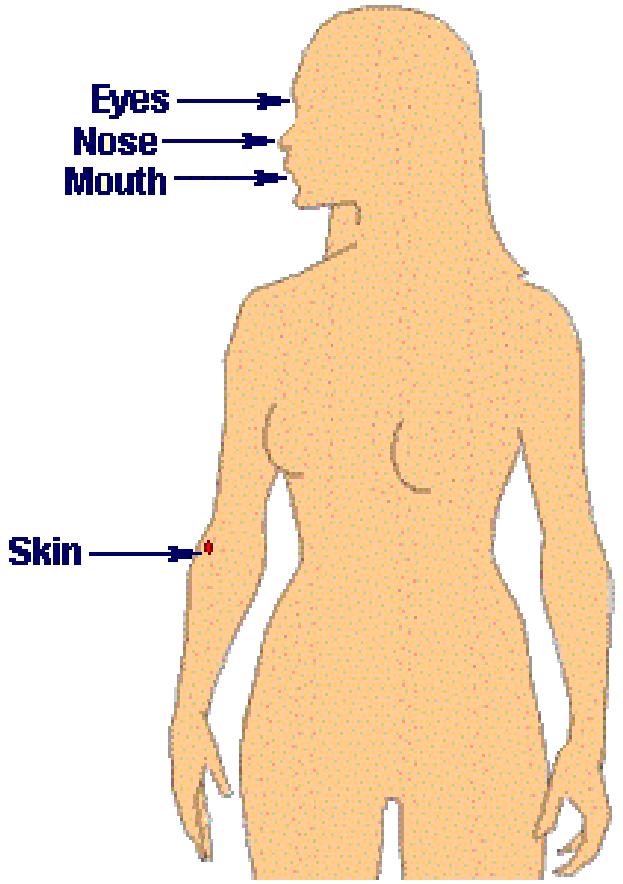


- ***Local* and *Systemic Effects***
  - **Some chemicals have both effects.**
  - **Example: Phenols in disinfectant**

How Do Chemicals Get into Your Body?

Routes of Exposure

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

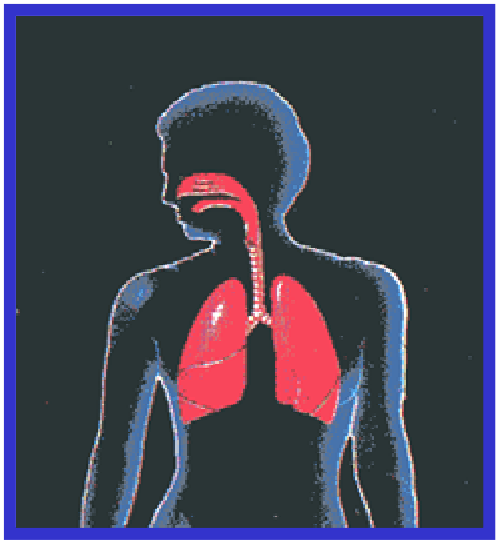


Routes of Exposure: *Breathing*

A major route of exposure for the Cosmetologist and Customer

Respiratory System

- **Nose**
- **Throat**

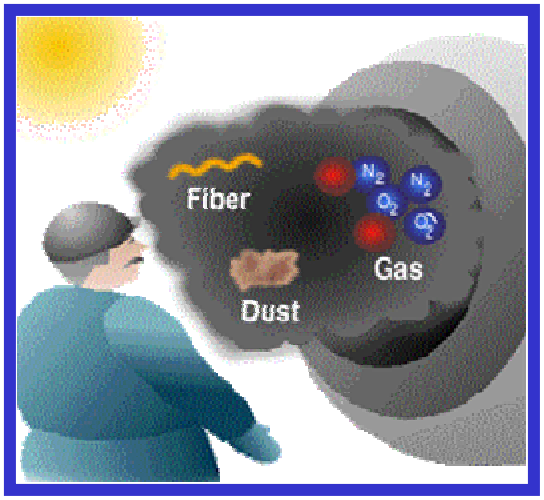


- **Air-tubes**
- **Lungs**

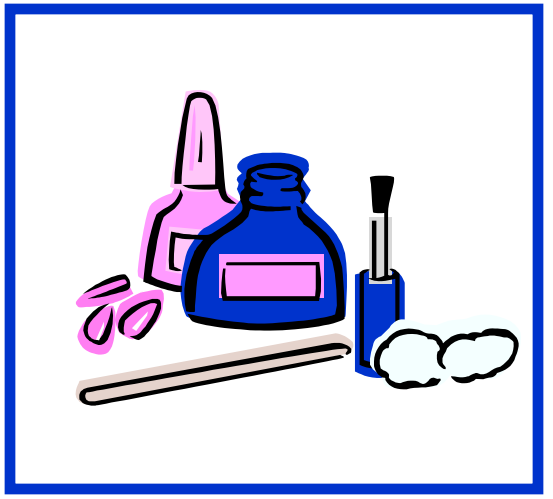
If you spread out a human lung,
it would cover an area the size of a tennis court!

Routes of Exposure: *Breathing*

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

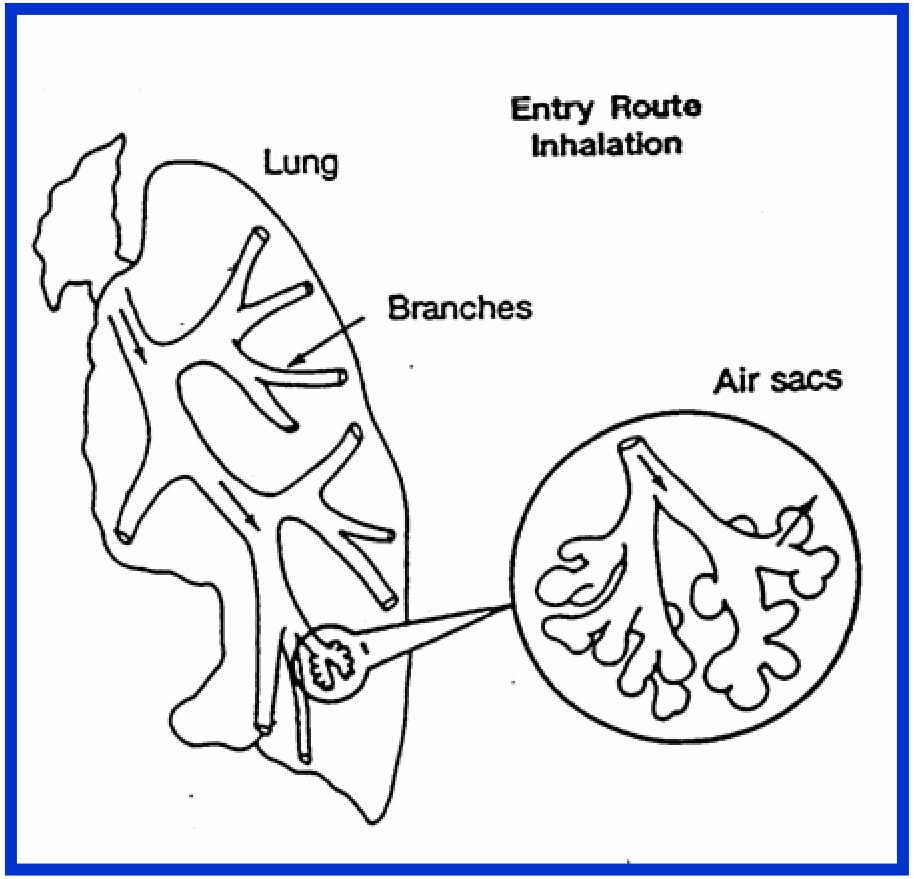


- ***What activities generate these forms?***
  - **Vapors from mixing and using products, and sterilizing solution**
  - **Powders from product mixing and buffing**
  - **Fine mists from hairsprays which can stay in the air for long periods.**



What can happen to a chemical when you breath it in?

- **Stays in lungs**
- **Carried into bloodstream**
- **Exhaled**
- **Coughed out**



The air sacs absorb oxygen and chemicals into the bloodstream.

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

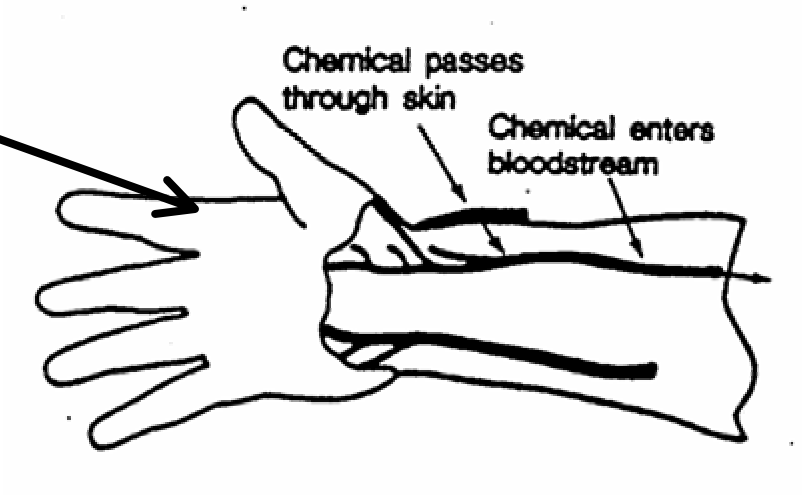
- **Aerosols have three components:**
  - **Propellant**
  - **Solvent**
  - **Active ingredients**

- **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.**

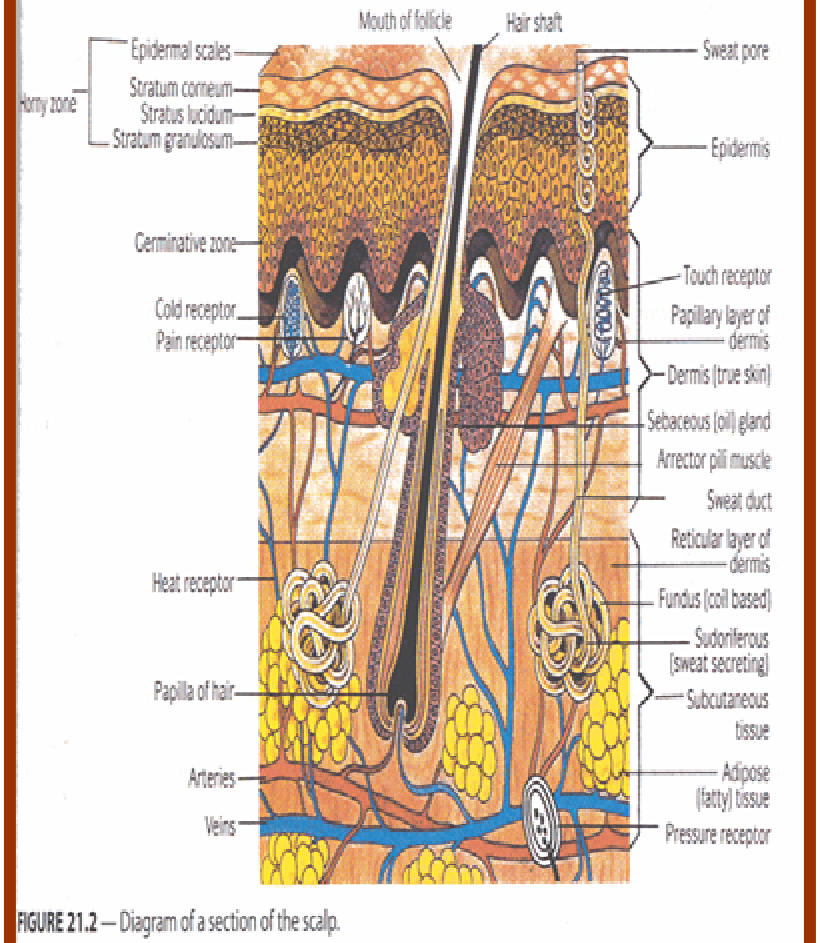


FIGURE 21.2 — Diagram of a section of the scalp.

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 any where else on the body.**

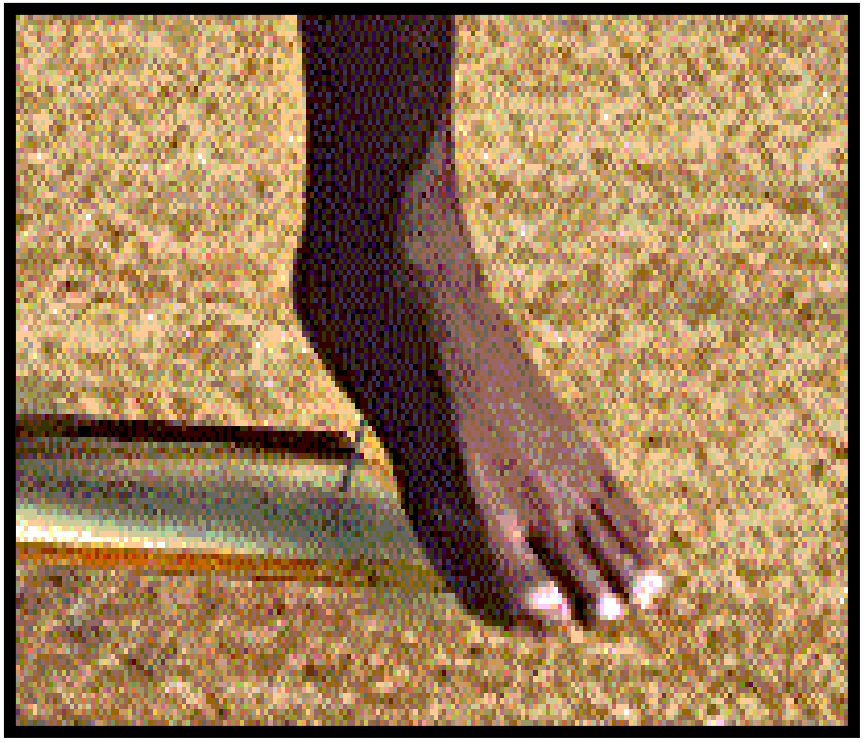
Graphic from Milady's Standard Book of Cosmetology, 2000

Routes of Exposure: *Skin*
What Activities Increase Absorption?

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*

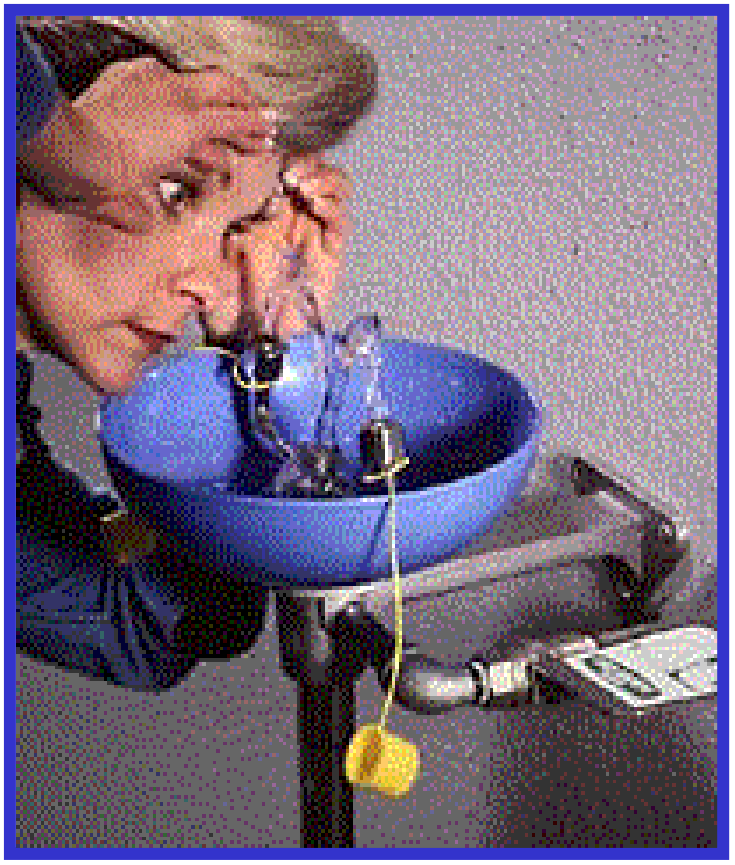


The skin must be penetrated or punctured by contaminated objects for injection to occur.

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?

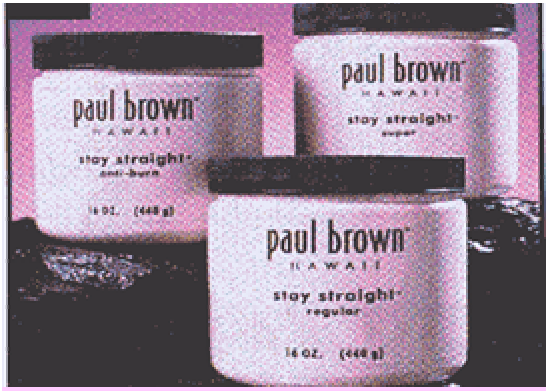
- ***Acids*** **– burns**

  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.

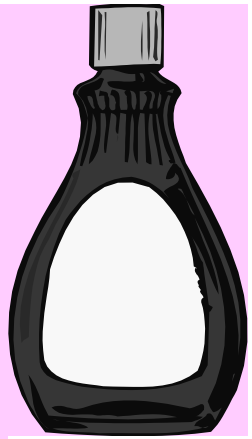
- ***Solvents*** **– dissolve fats, cause pain and cloud the cornea.**



Lye Based Product
Sodium Hydroxide

Toluene

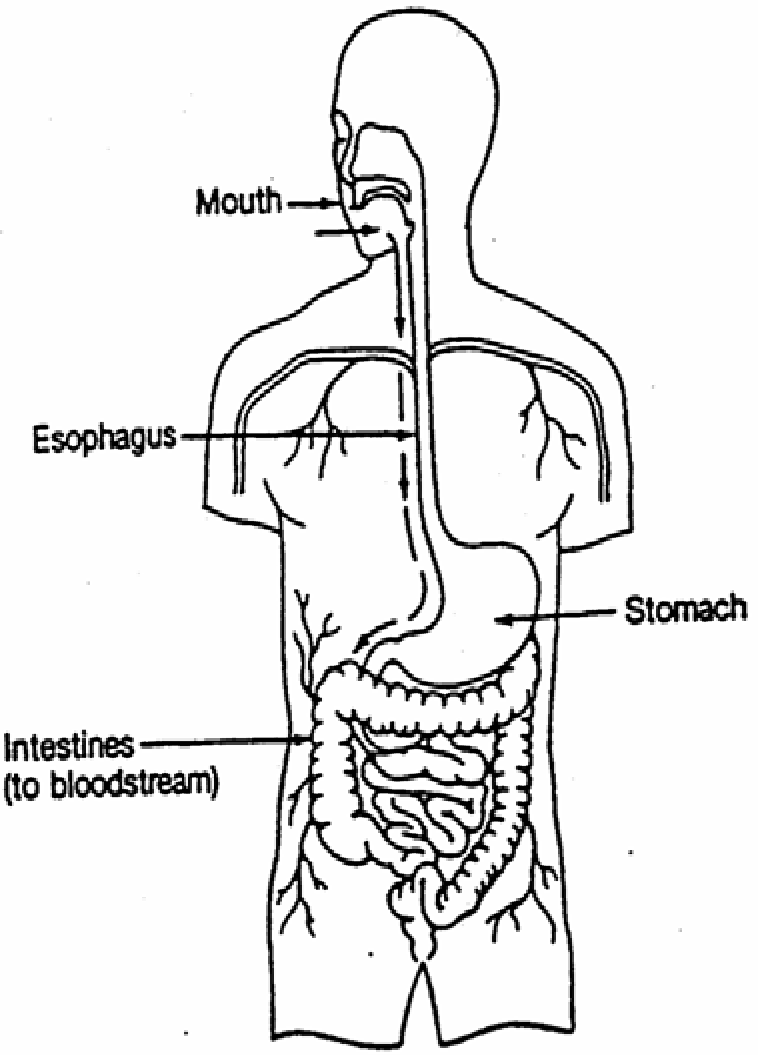
Acetone



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 breath**
  - **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**

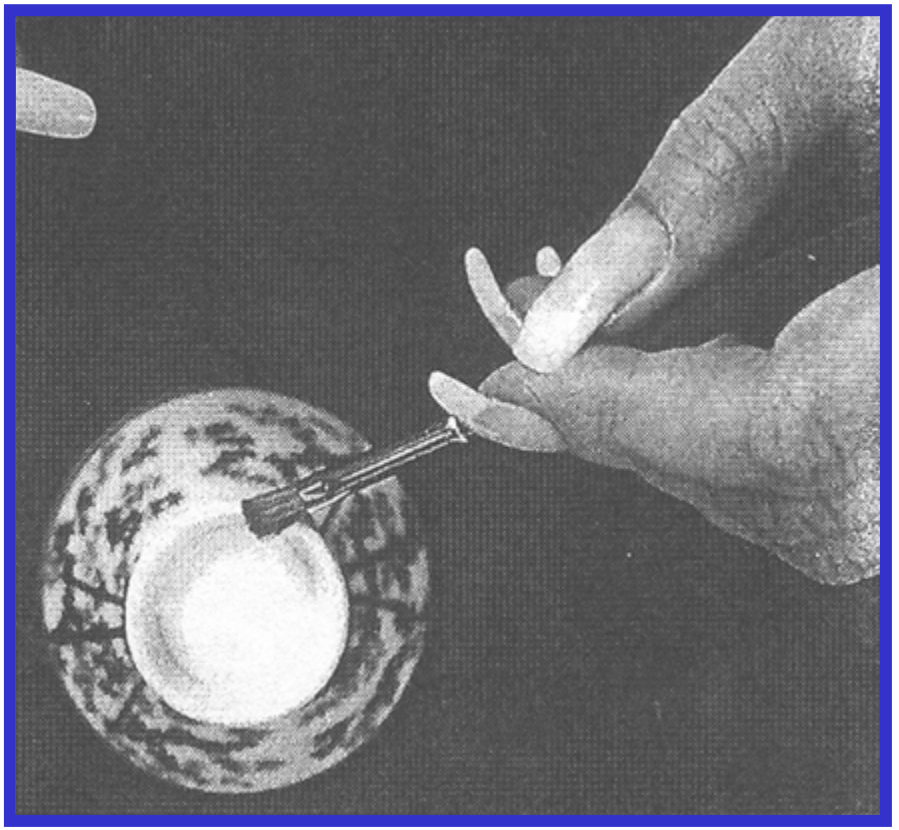
Example: **allergy to an aniline tint**

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

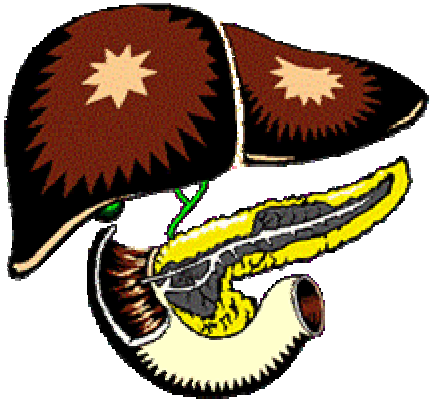
Dermatitis

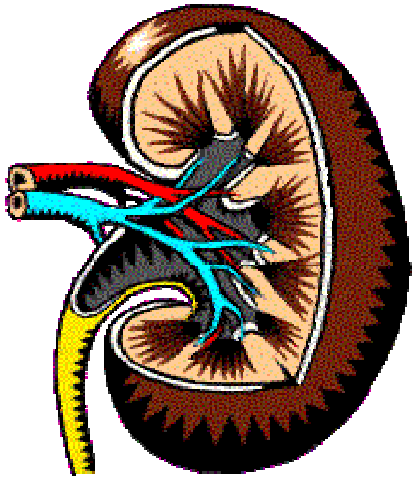
The most common health hazard for cosmetologists!

- ***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.**

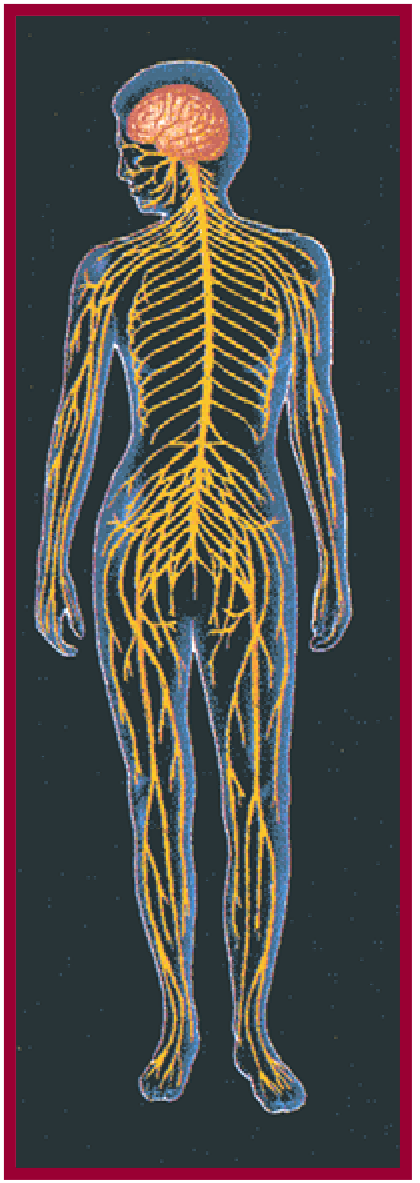




Example of a Target Organ Effect

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

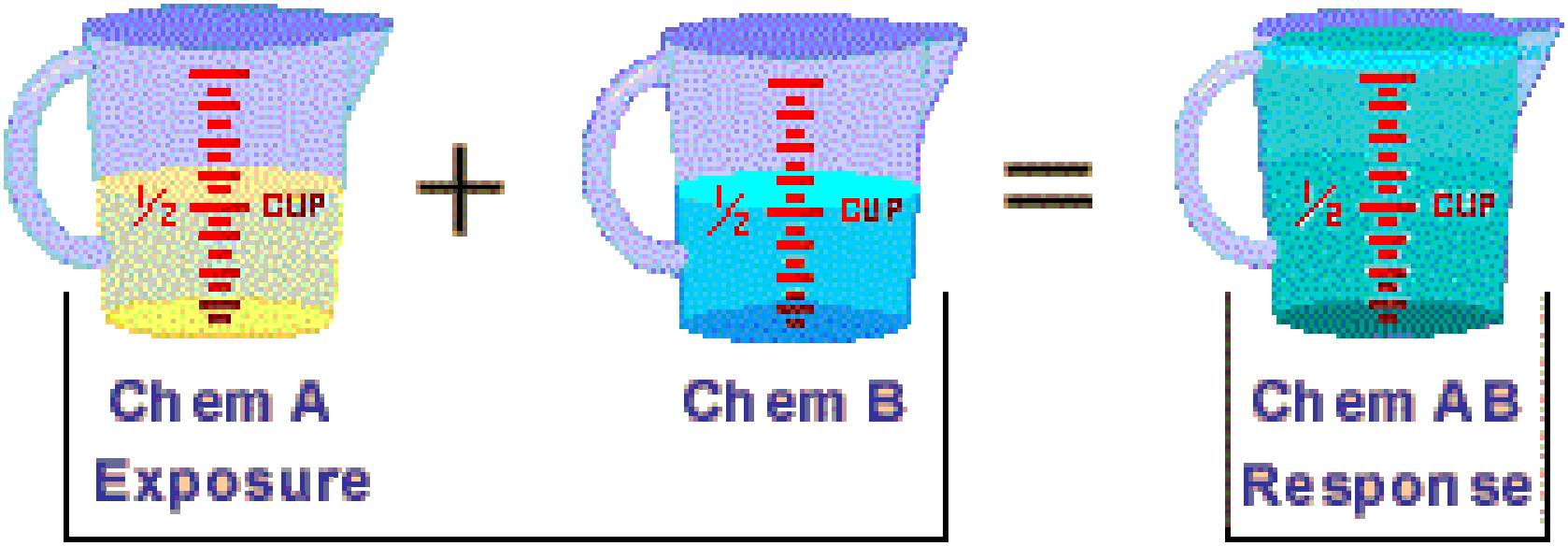
Effects of Chemical Combinations

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

These combinations are called:

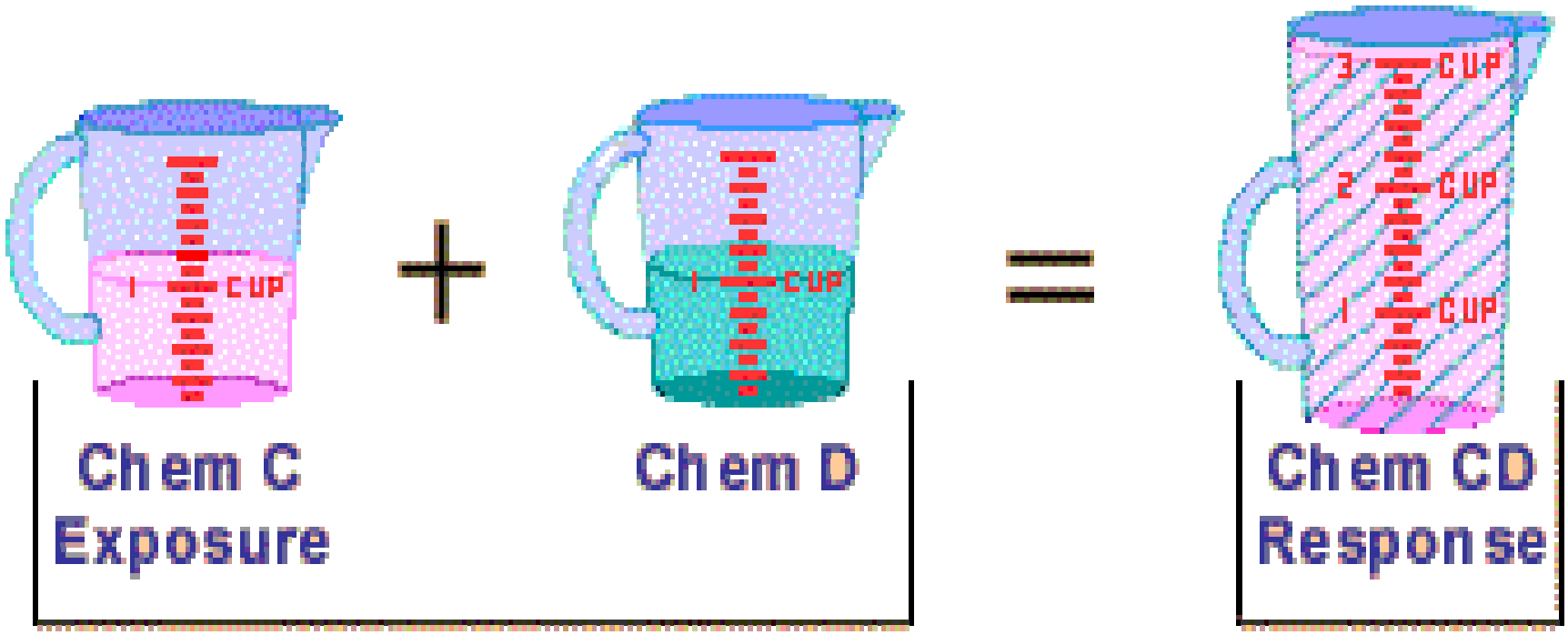
Additive Reaction	**2+2=4**
Synergism Reaction	**2+2=6**
Potentiation Reaction	**0+2=4**
Antagonism Reaction	**2+2=2**

Additive Reaction 2+2=4



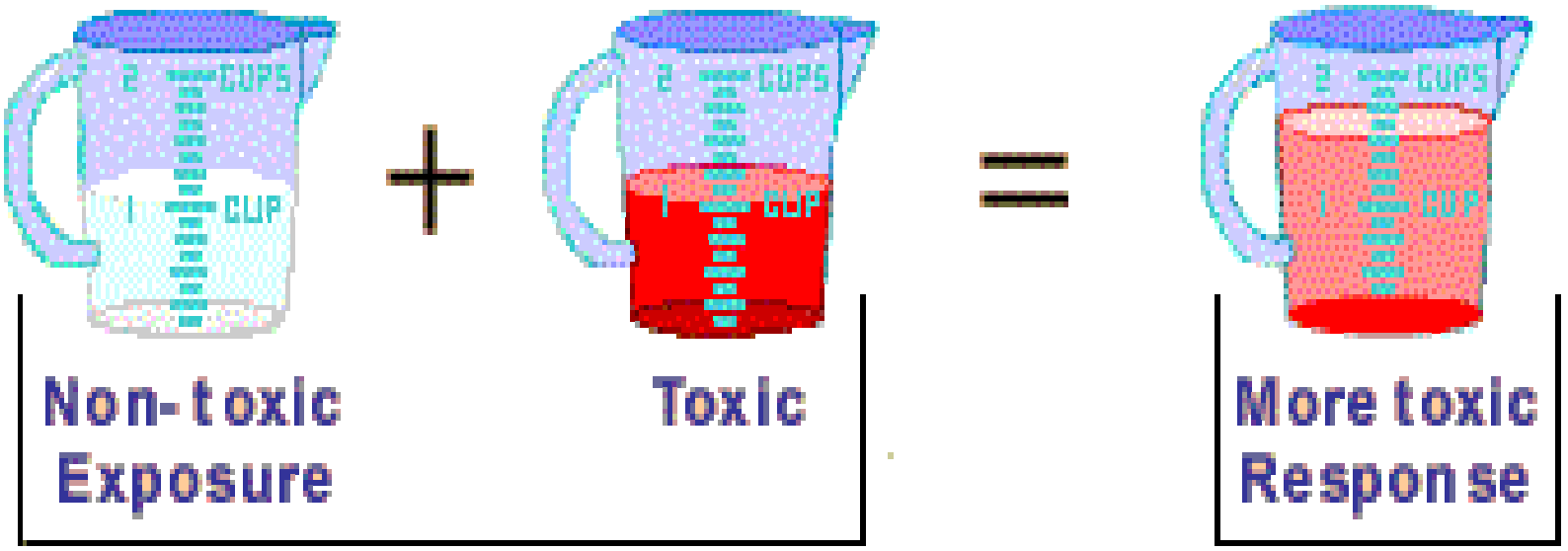
Two chemicals are combined and produce an effect equal to the sum of the two chemicals.

Synergism Reaction 2+2=6



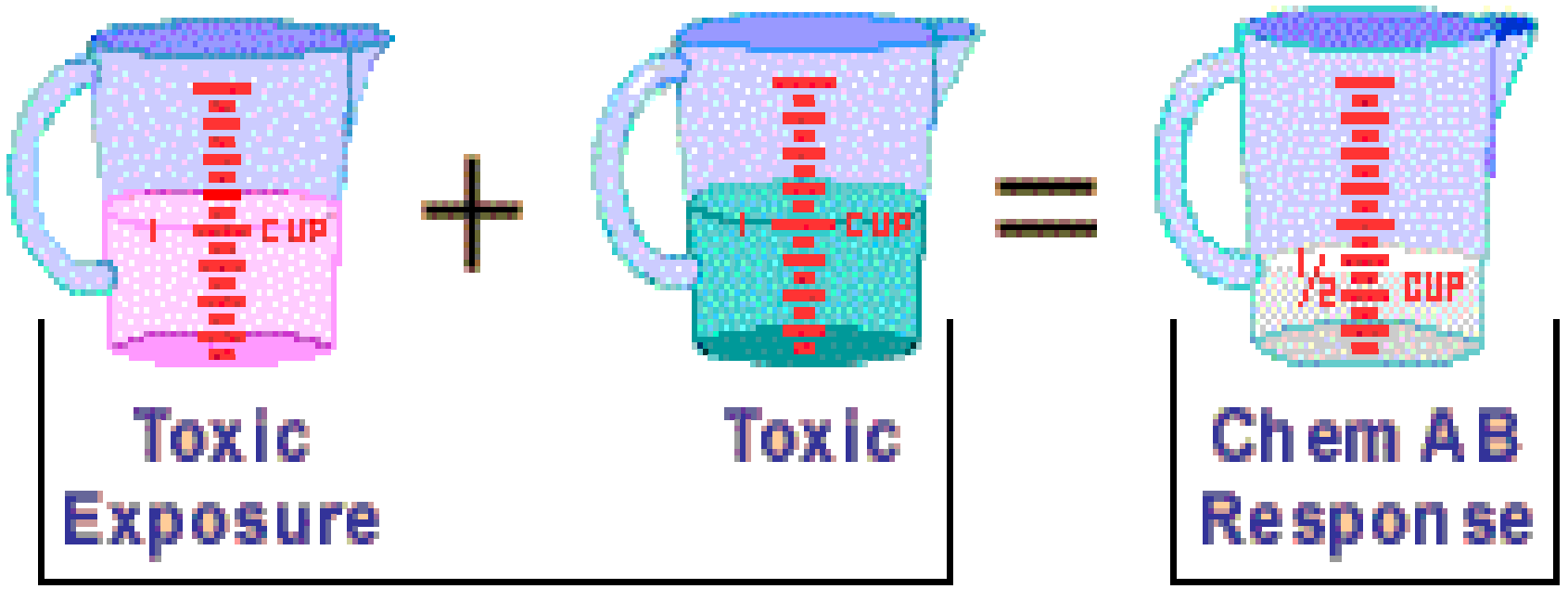
Two chemicals are combined and produce an effect that is greater than the sum of the effect of each agent given alone.

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

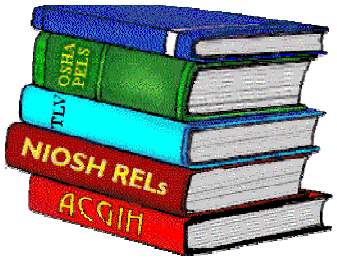


Occurs when two chemicals are combined and they interfere with each other's actions or one interferes with the action of another chemical.

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

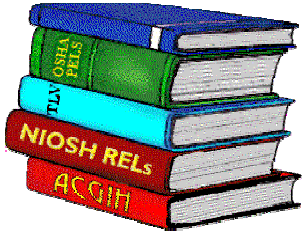
L - Limit

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



T - Threshold

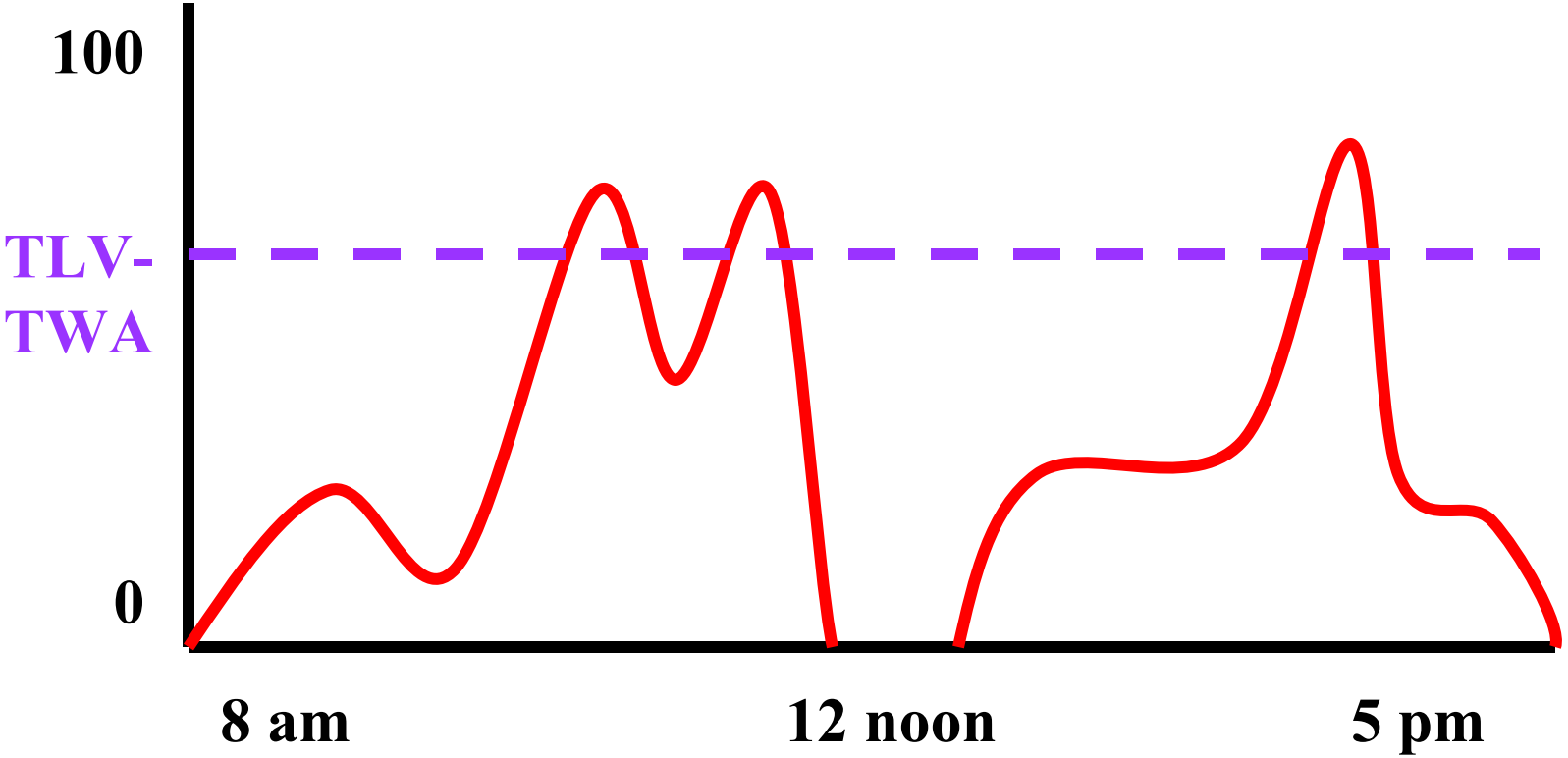
L - Limit

V - Values

- ***Air* concentrations of chemicals that workers can be exposed to without adverse effects.**
- **Developed by the American Conference of Governmental Industrial Hygienists (ACGIH)**
- **Not enforceable.**

Exposure Guidelines:

Threshold Limited Value - Time Weighted Average

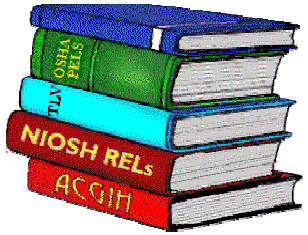


The TWA for an 8-hour work day, 40 hour work week

Averages the concentrations of exposures based on the duration of each exposure.

Exposure Guidelines:

Threshold Limited Value - Short-Term Exposure Limit



S – short

T – term

E – exposure

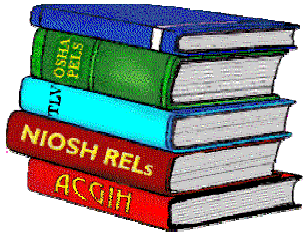
L – limits

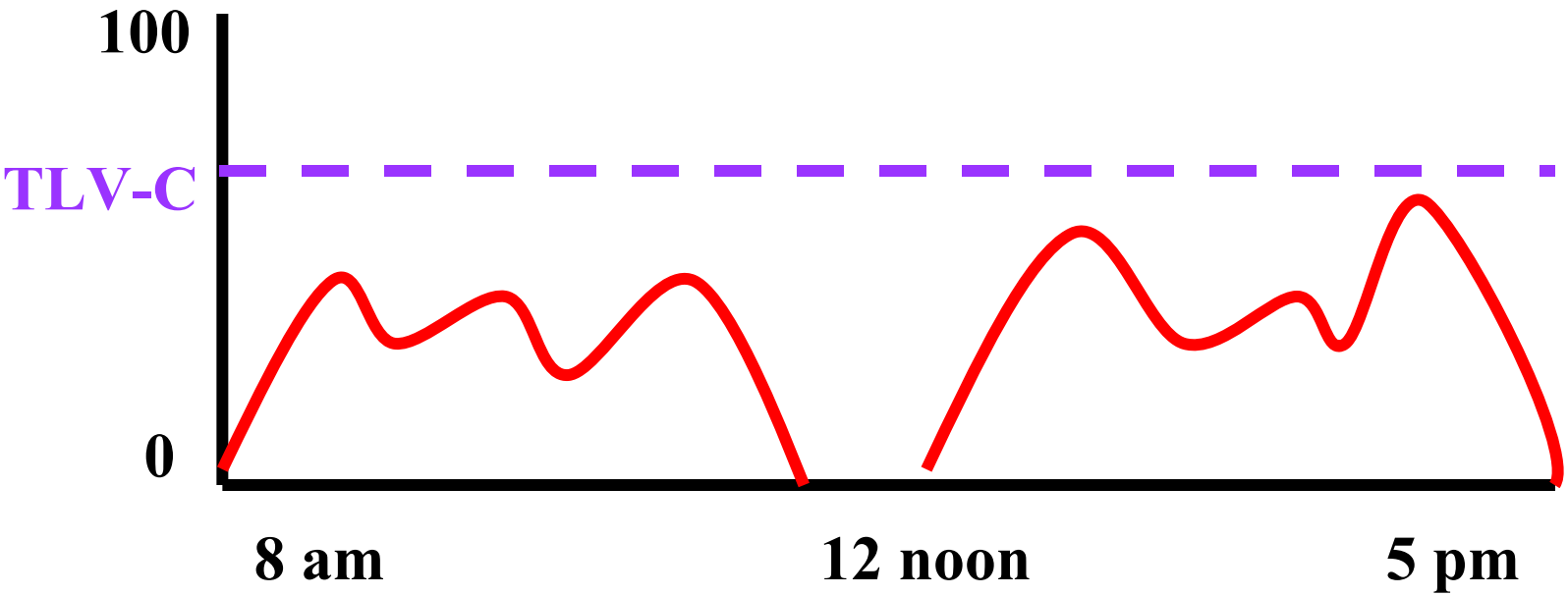
Sets worker exposure for:

- **Up to 15 minutes at a time**
- **Up to 4 times a day**
- **With at least 60 minutes in between successive exposures**

Exposure Guidelines:

Threshold Limited Value - Ceiling

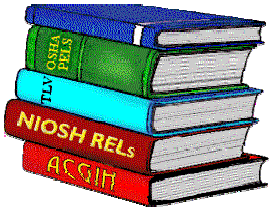




Ceiling level should never be exceeded!

Exposure Guidelines

Immediately Dangerous to Life and Health



I – immediately

D – dangerous to

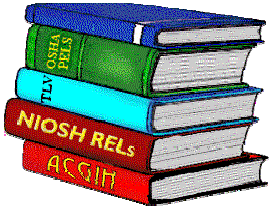
L – life and

H – health

- **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



R – recommended **E – exposure** **L – limits**	• **NIOSH recommendations** • **Not enforceable** • **Similar to TLVs** • **Often lower than PELs**

Hierarchy of Controls

- **Product Substitution**

- **Engineering Controls**

- **Work Practices**

- **Personal Protective Equipment**