

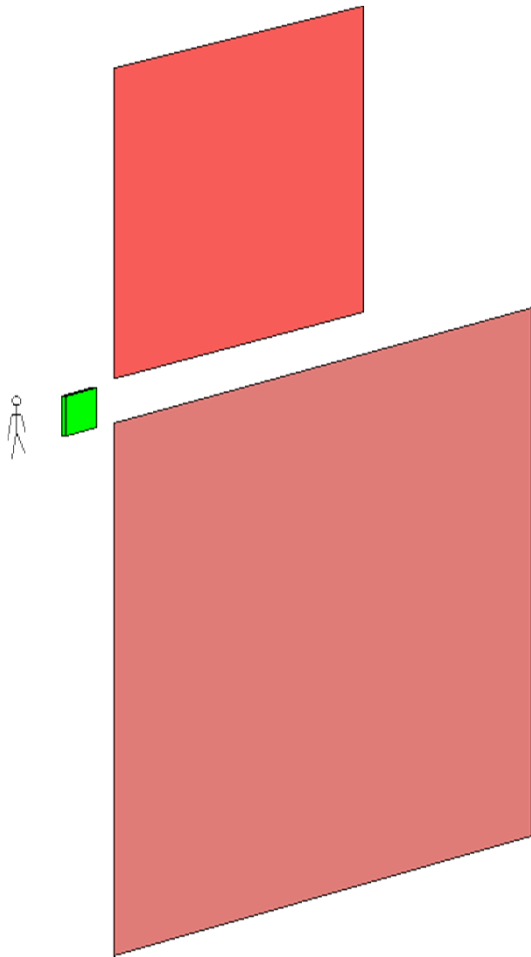
Avoid Hazardous Chemical and Biological Exposures by Any Route

Demo Session 1

Routes of Hazardous Chemical and Biological Exposure

- Inhalation
- Skin Contact
- Ingestion
- Injection

Your Enormous Surface Area

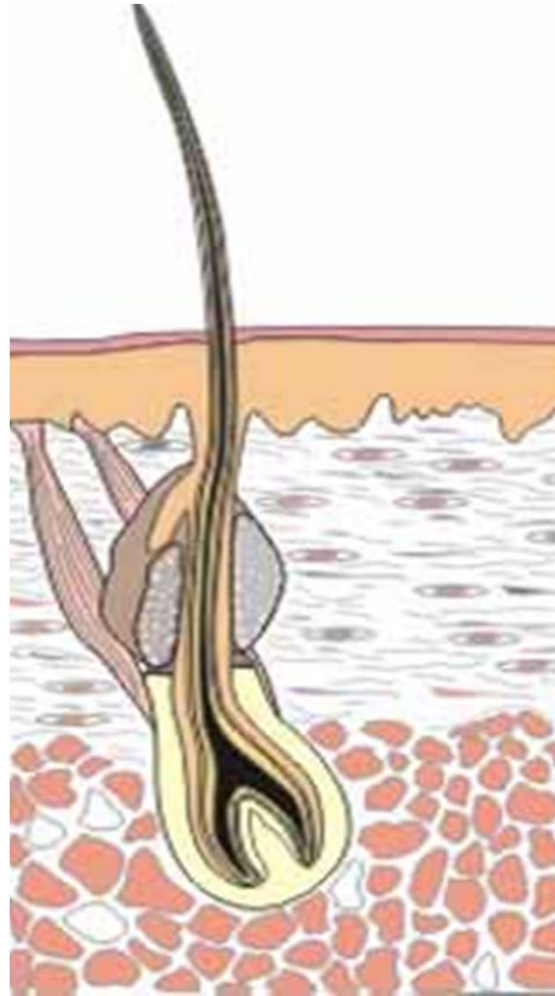


- Person's surface is $\sim 400 \text{ m}^2$
- Skin's surface area is $\sim 2 \text{ m}^2$
- Lungs' surface area is $\sim 100 \text{ m}^2$
- Each day we breathe about 20,000 times
- Intestines' surface area is $\sim 300 \text{ m}^2$
- Lungs and intestinal linings are paper-thin

Your Skin...Exposed



Take a Postage Stamp



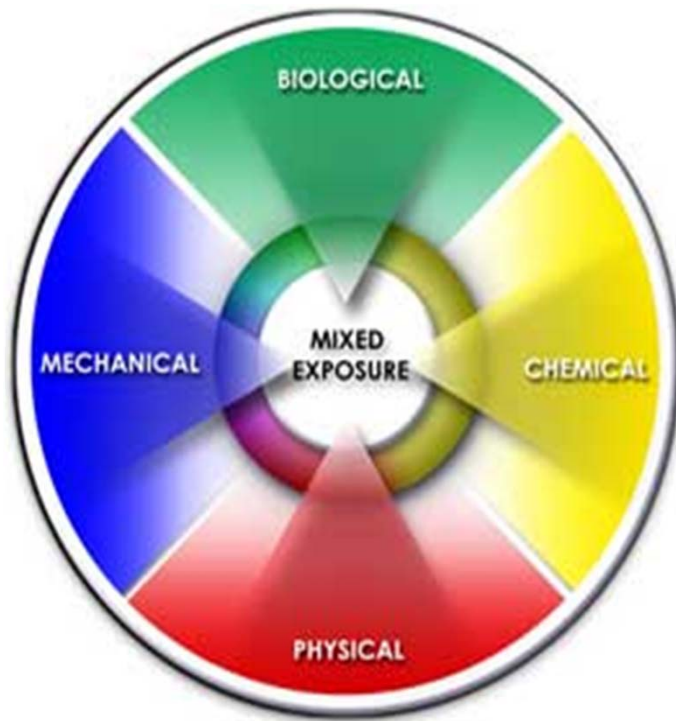
Stick it on your Arm

You've just covered

- 16 million cells
- 55 hairs
- 8 meters of nerves
- 17,000 nerve endings
- 5 meters of blood vessels
- 500 sweat glands
- 83 oil glands

Prevent Exposure to Your 2M² of Skin

that's a lot of stamps



Prevent Skin Exposure...Prevent Health Effects

Direct Effects: corrosion, irritation, staining
(acids, bases, phenols)

Sensitization: allergic dermatitis & asthma
(Ni, Cr, formaldehyde,
isocyanates)

Systemic Effects:

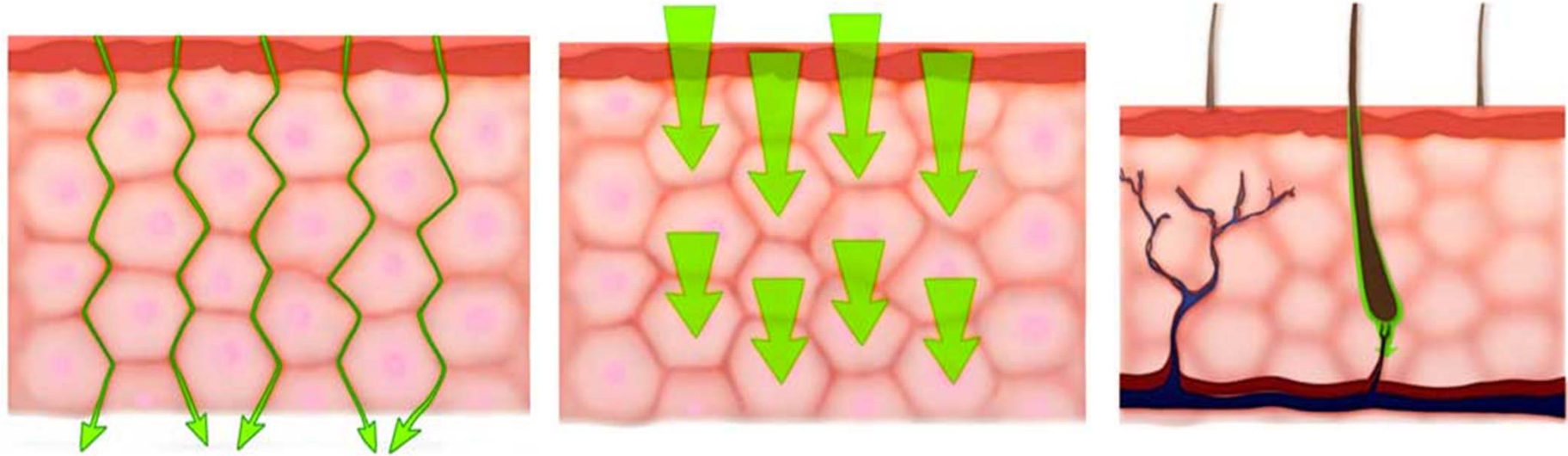
Chemicals absorb through skin, travel
via blood to the body to cause
toxic effects

to central nervous system, kidneys, liver,

etc

Source: [CDC - Skin Exposures and Effects - NIOSH Workplace Safety and Health Topic](#)

How do Chemicals Absorb through the Skin?



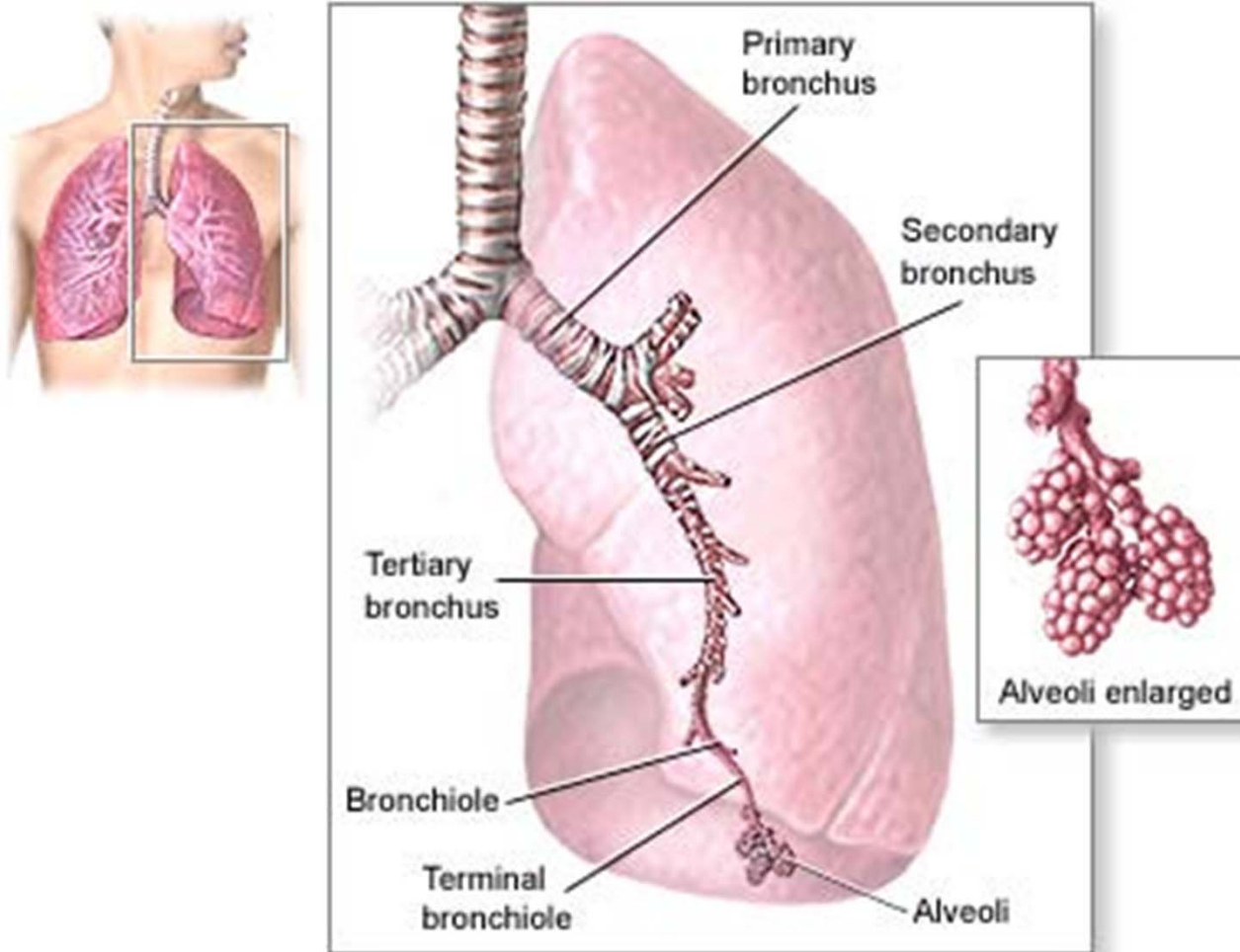
Intracellular Permeation
through lipid “mortar”
between skin cells

Through Skin Cells

Through Hair follicles,
Glands (minor)

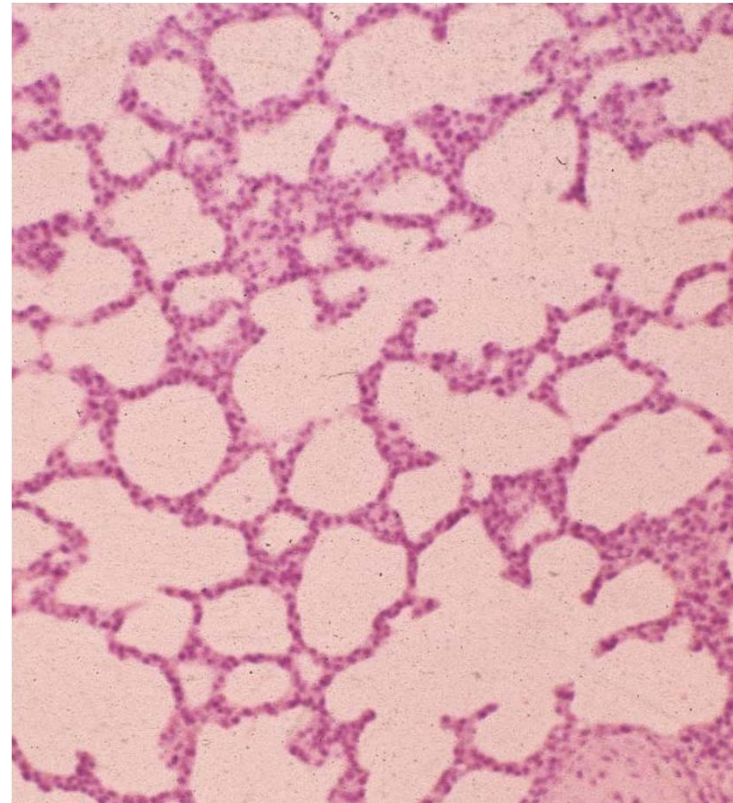
Choose the Right Glove

Your Lungs ... Exposed

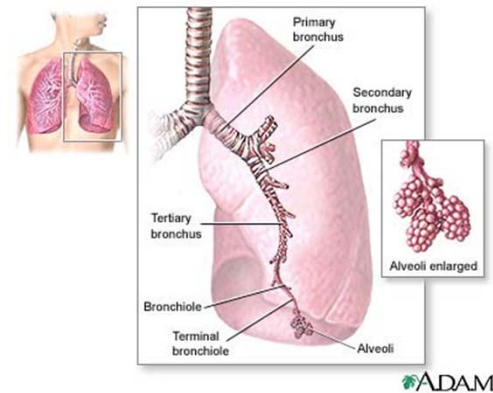
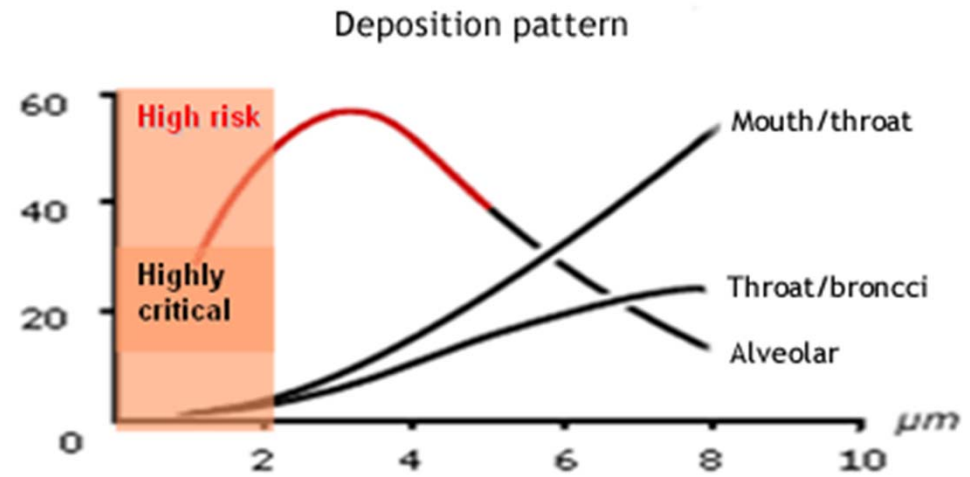
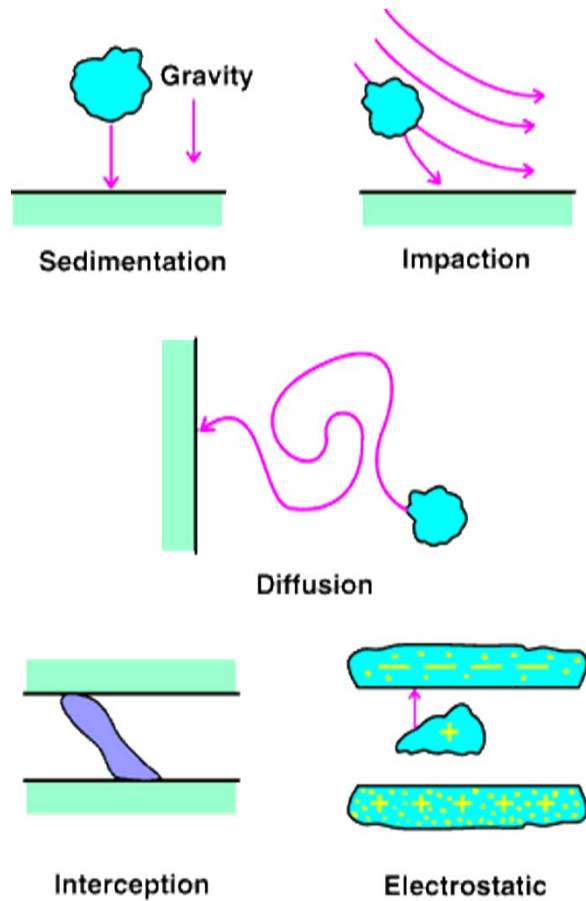


Alveoli

Where the gas exchange happens



How do particles interact with the lungs?



Prevent exposures to your lungs



VP Demo

1-Butanol

- **VP = 4.4 mmHg @ 20°C**
- (PID correction factor = 4.7)
- Exposure limit = 20 ppm
- Health effects (eye and URT irr)
- VHR = 289
- Odor Threshold = 11 ppm
- Irritation Threshold = 20 ppm

VP Demo

Ethyl Ether

- **VP = 442 mmHg @ 20°C**
- (PID correction factor = 1.1)
- Exposure limit = 400 ppm (TWA), 500 ppm (STEL)
- Health effects (URT irr, CNS impair)
- VHR = 1454
- Odor Threshold = 0.33 ppm
- Irritation Threshold = 200 ppm

VP, Exposure Limits, **Warning** Properties and Health Effects

Chemical	Exposure Limit (Health Effect)	Vapor Pressure (mm Hg @20°C)	Vapor Hazard Ratio (VHR)	Odor Threshold	Irritation Threshold
ethanol	1000 ppm (URT irr)	43.9	58	180 ppm	1000 ppm
isopropanol	200 ppm (eye and URT irr, CNS impair)	32.4	213	43 ppm	200 ppm
toluene	20 ppm (visual impair, female repro. pregnancy loss)	28.5	1875	10 ppm	100 ppm
benzene	1 ppm (leukemia)	75	98684	12 ppm	3000 ppm
p-nitrochlorobenzene	0.1 ppm (MeHb-emia)	0.09 (@25°C)	1184	?	?

Avoid Hazardous Chemical and Biological Exposures by Any Route

Demo Session 2

Keys to Avoid Exposure Routes When Handling Chemical & Biological Materials

- Inhalation (Use Fume Hood/Biological Safety Cabinets/PPE as backup if necessary)
- Skin Contact (Wear Gloves and Lab Coats)
- Ingestion (Hand Washing and Keep Fingers Out of Mouth)
- Injection (Consistent and Careful Handling of Sharps)

Materials and Methods

Demo Session Two/#1

Materials	Methods	Objective
<ol style="list-style-type: none">1. Powdered Florescence in Small Screw-Top Bottle2. Powder Transfer Tool3. Disposable Gloves4. Lab Bench Absorbent Pads5. Disposable Wipes6. Cleaning Solvent7. Black Light8. Disposal Bag	<ol style="list-style-type: none">1. Student put gloves on2. Student is asked to take a small amount of powder and place on absorbent pad3. Student cleans off transfer tool w/solvent4. Student is asked to take glove off5. Student hand and measuring tool is shown under black light to observe contamination	<ol style="list-style-type: none">1. Seeing graphical evidence using florescence to show how poor technique can create biological and chemical contamination

Materials and Methods

Demo Session Two/#2

Materials	Methods	Objective
<ol style="list-style-type: none">1. Glo Germ Florescence Solution in Screw-Top Bottle2. Disposable Gloves3. Pipettor w/ Disposable Tips4. Disposable Cups for Solution5. Lab Bench Absorbent Pads6. Disposable Wipes7. Cleaning Solvent8. Black Light9. Disposal Bag	<ol style="list-style-type: none">1. Student put gloves on2. Student is asked to take a small amount of solution and transfer to disposable cup with pipettor3. Student is asked to take glove off4. Student hand and pipettor is shown under black light to observe contamination	<ol style="list-style-type: none">1. Seeing graphical evidence using florescence to show how poor technique can create biological and chemical contamination