

## BI 121 Lecture 17

*We're so close. Let's  
shine on the exam!*



**I. Announcements Exam II Thursday Dec 7<sup>th</sup>  
@ 8:00 am! 12 n lab section report to 112 HUE,  
1 pm lab section 130 HUE. Others, except AEC, here!  
Discussion-Review, this Thursday, here in 100 WIL!**

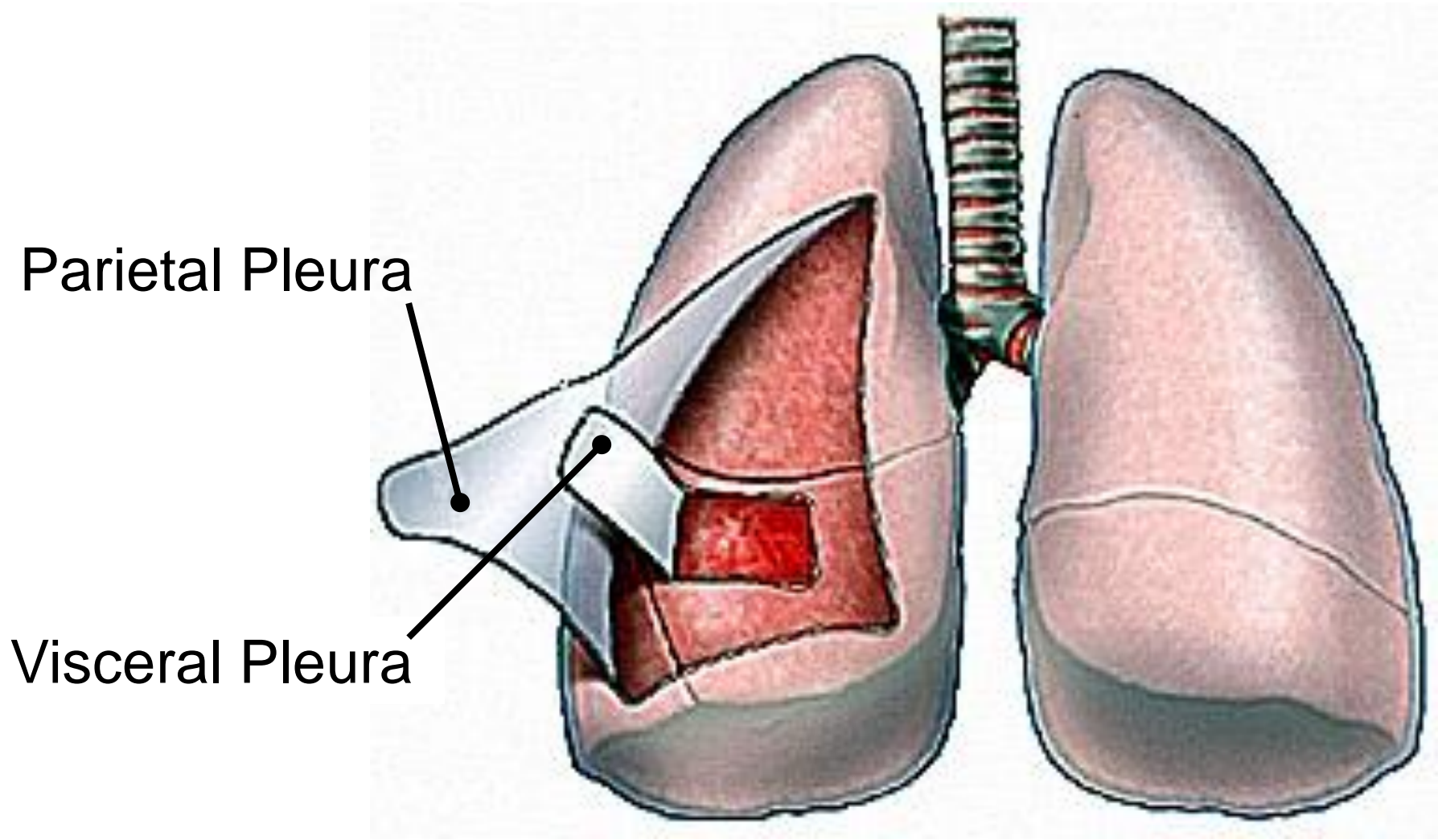
**II. Respiratory System Connections LS ch 12, DC Module 7+  
LS fig 12-5, 12-6, 12-8, 12-9, pp 349-52**

- A. Pulmonary membranes?
- B. What happens in a gunshot wound or impalement injury? Pneumothorax?

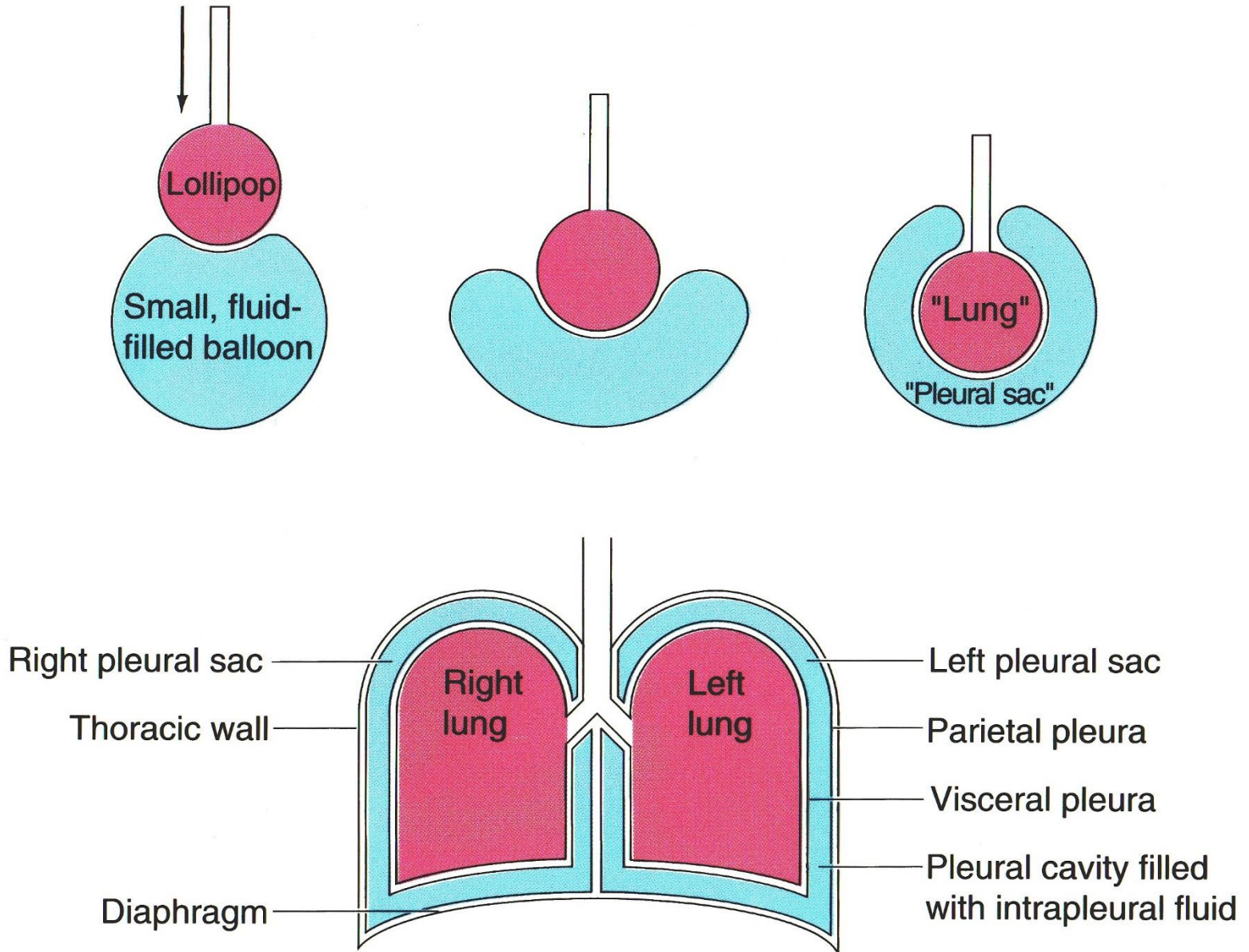
**III. Physiology of Cigarette Smoking LS + DC + ACS +...**

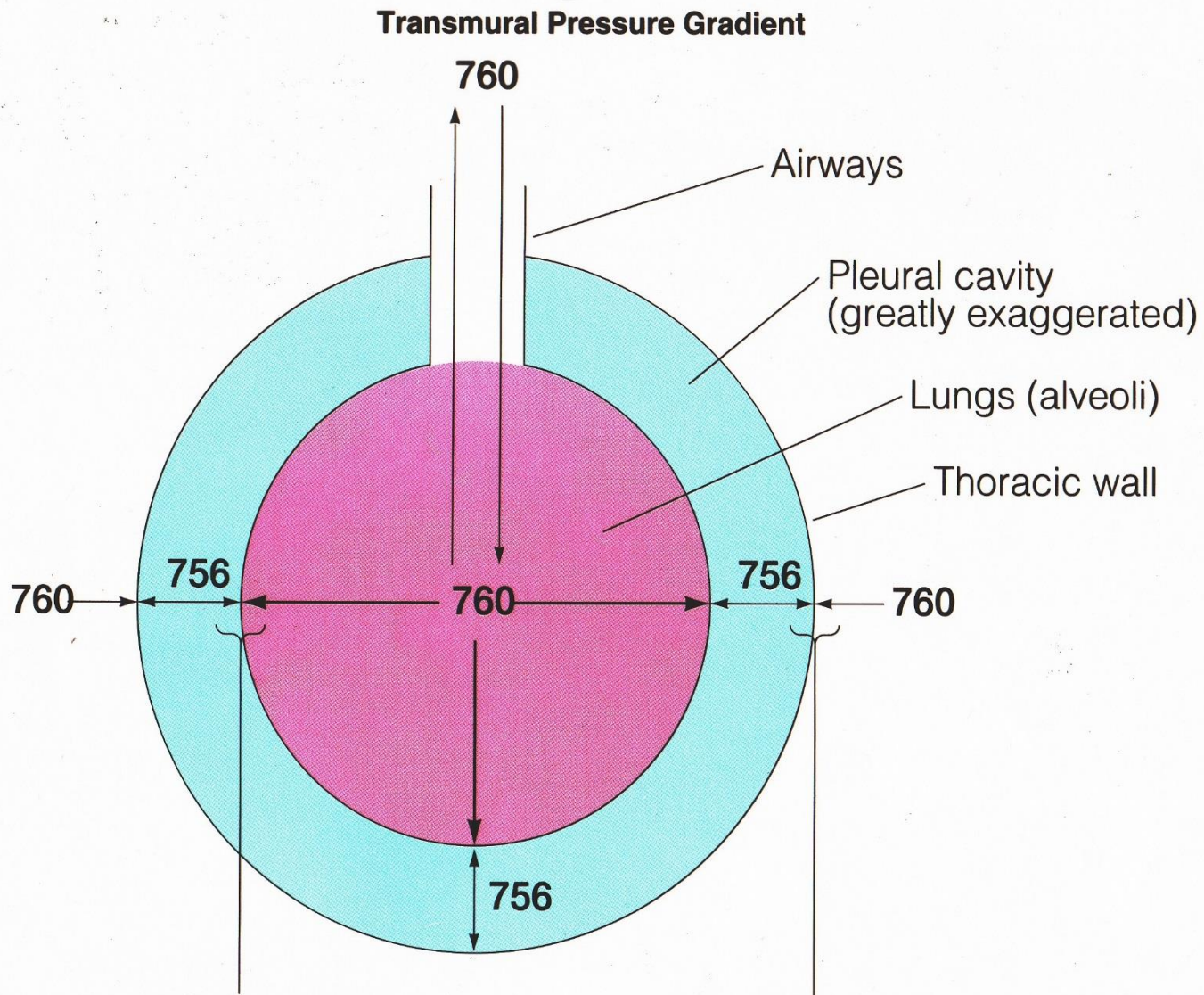
- A. ANS, autonomic nerves & nicotine? Chemical route
- B. Emphysema? 2nd-hand smoke?... LS p 356, 365
- C. UO Smoke-Free since Fall 2012! Help is available!

# *Pleura/Peritonea/Lung Membranes*



# Pleural Sac

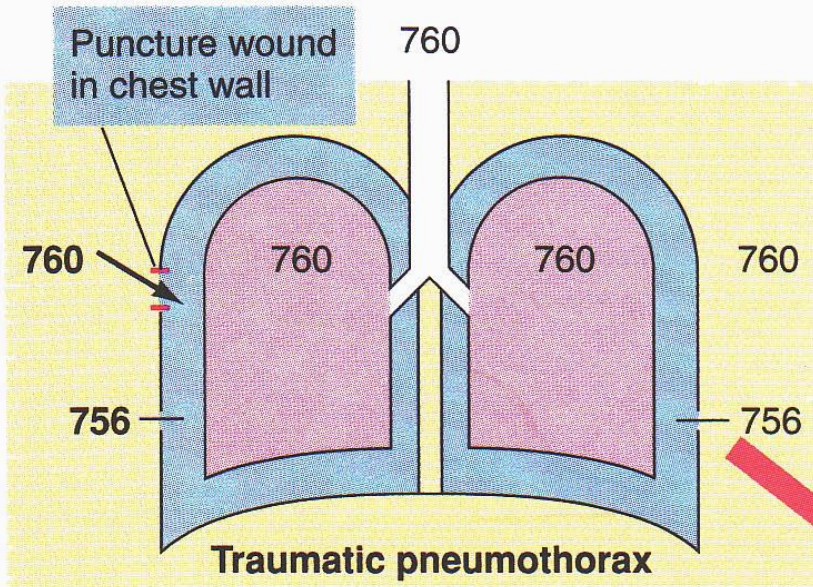




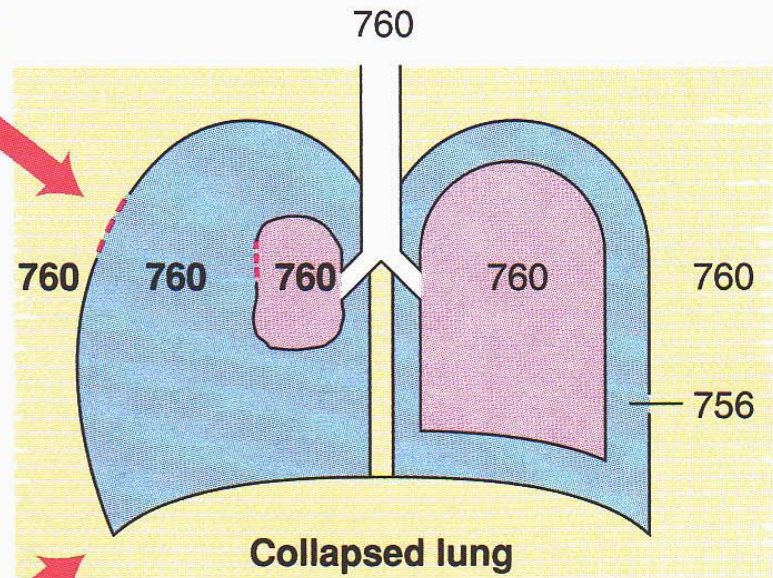
**Transmural pressure gradient  
across lung wall = intra-alveolar  
pressure — intrapleural pressure**

Numbers are mm Hg pressure.

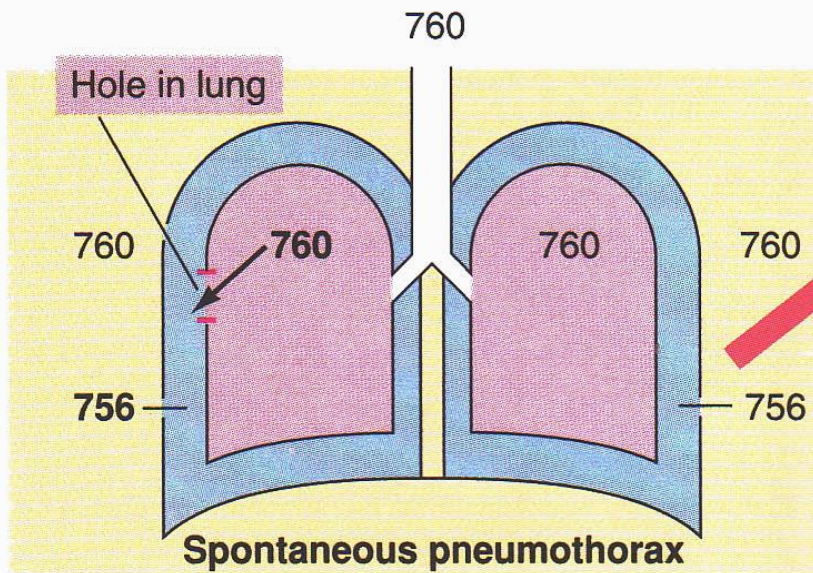
**Transmural pressure gradient  
across thoracic wall = atmospheric  
pressure — intrapleural pressure**



(a)

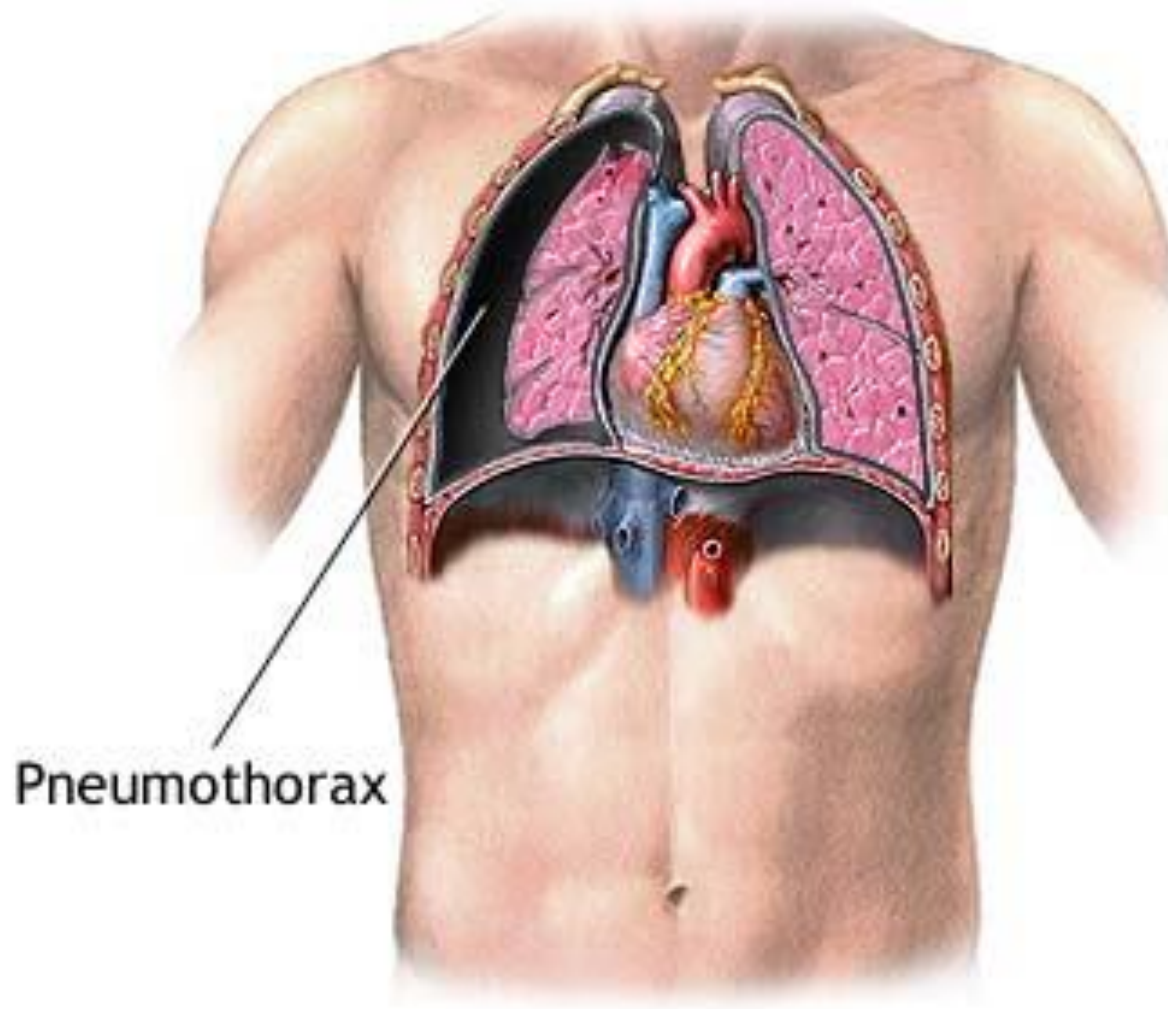


(b)



(c)

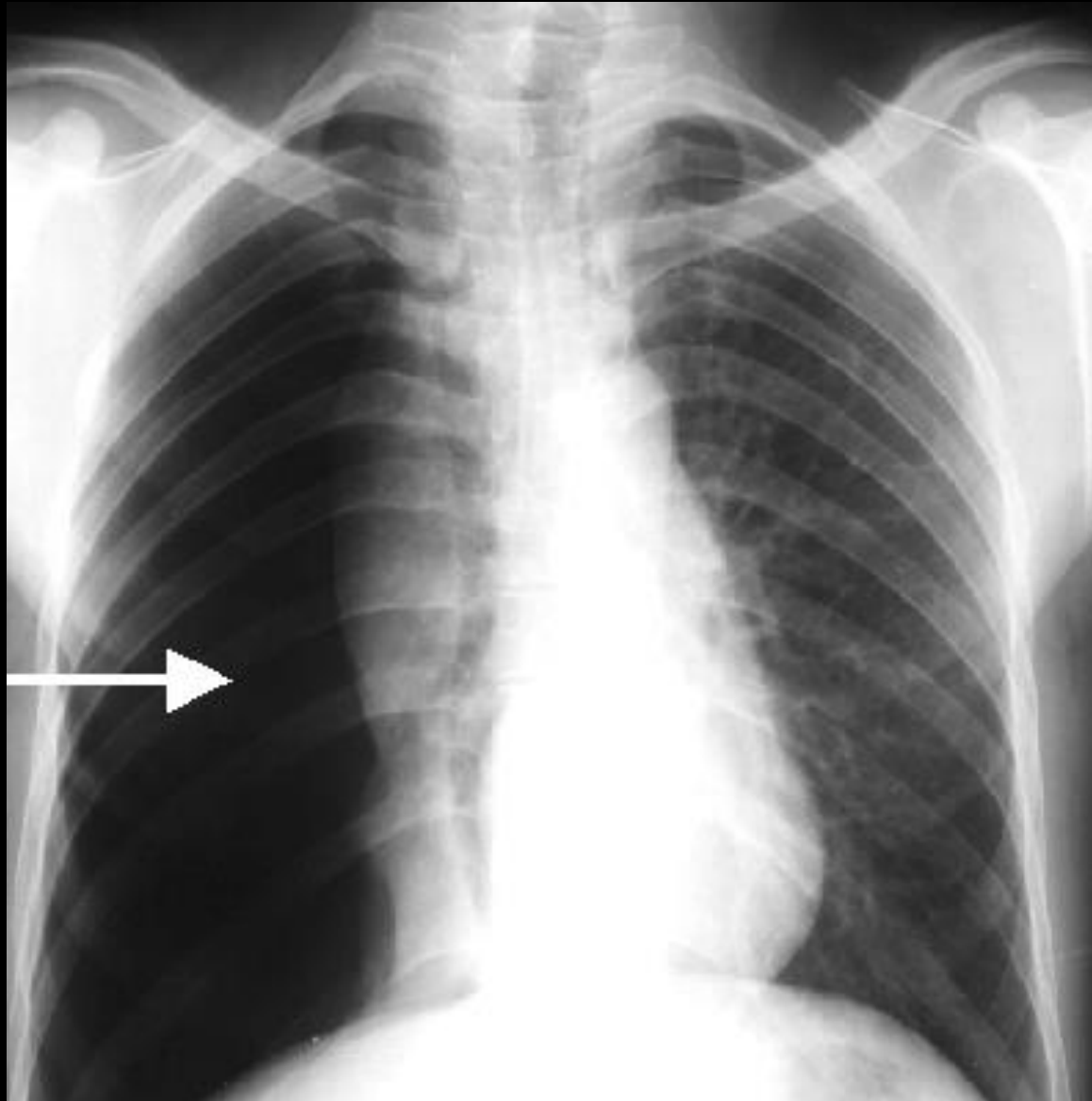
# *Pneumothorax ≡ Air enters intrapleural space*



ADAM.

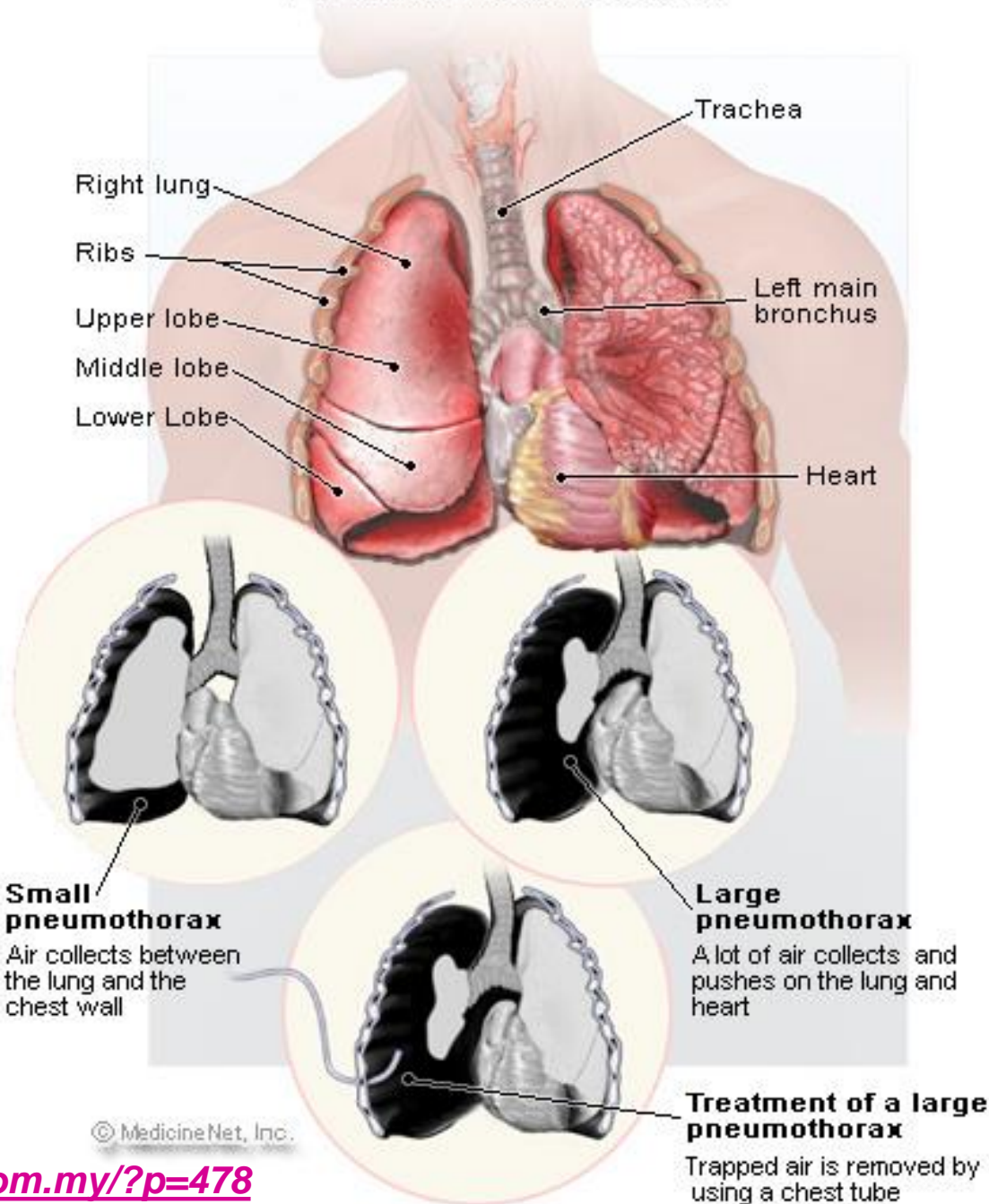
[http://www.nlm.nih.gov/medlineplus/ency/presentations/100150\\_2.htm](http://www.nlm.nih.gov/medlineplus/ency/presentations/100150_2.htm)

# ***X-ray of patient with pneumothorax***



**<http://easypediatrics.com/treatment-of-pneumothorax>**

# Pneumothorax



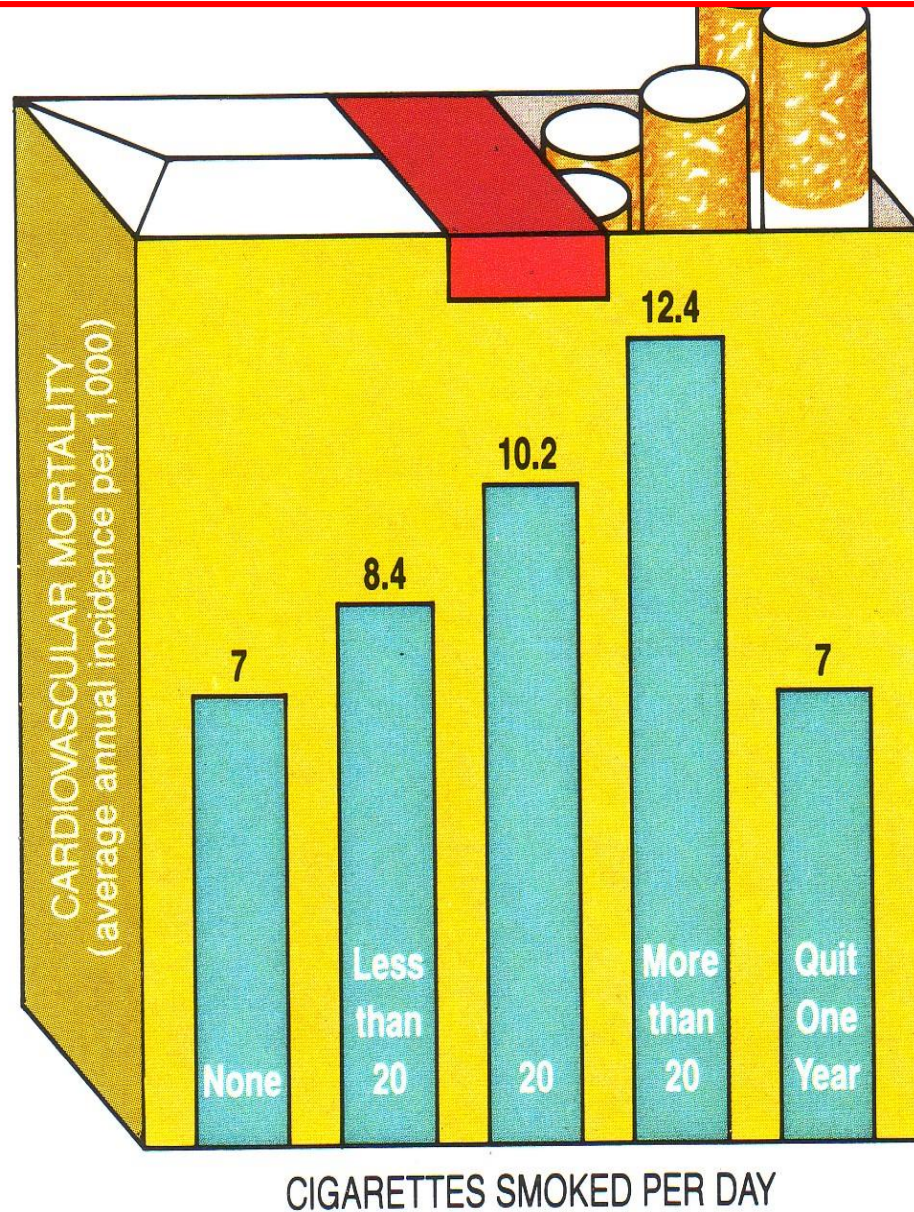


# ***American Cancer Society Great American Smoke Out!***

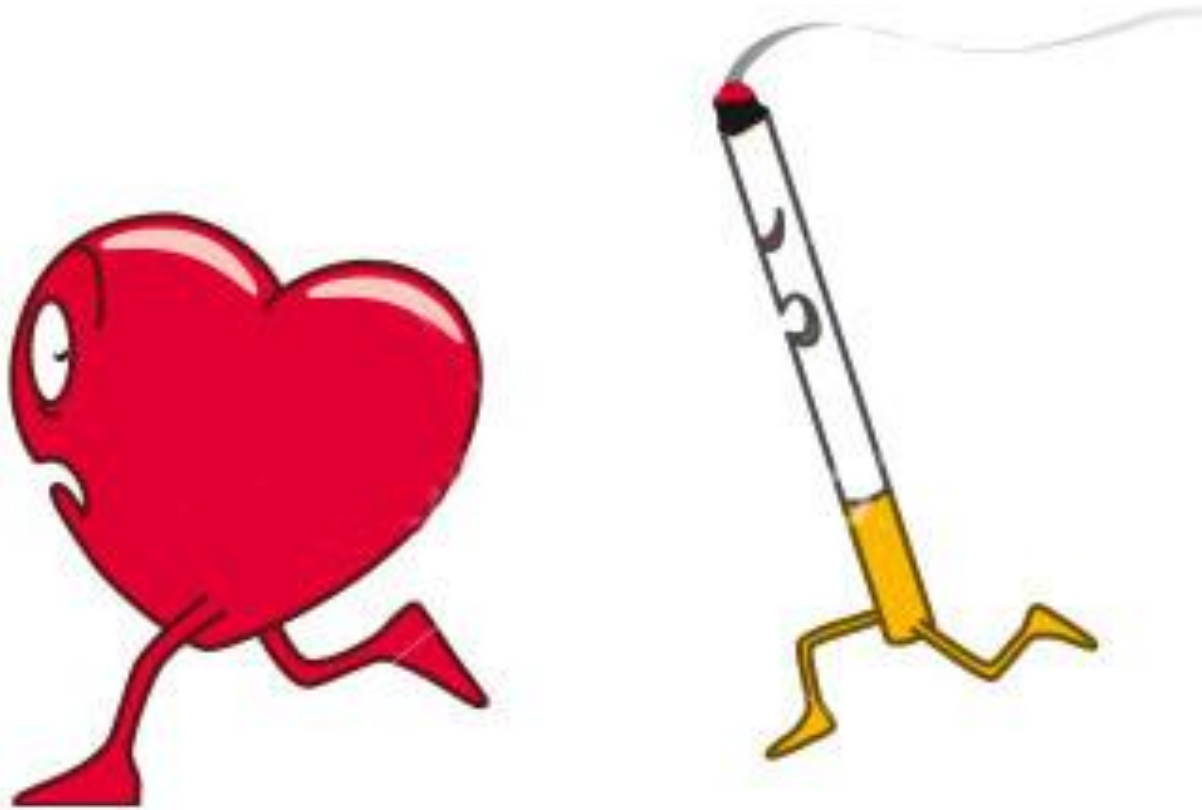


**[http://www.cancer.org/healthy/stayawayfromtobacco/  
greatamericansmokeout/](http://www.cancer.org/healthy/stayawayfromtobacco/greatamericansmokeout/)**

# Cigarette Smoking: #1 Preventable Cause of Premature Death in the US



***Not only the Lungs, but the Heart, Brain & 100s  
of Other Tissues & Organs Adversely Affected!***



***Tobacco smoke = Deadly mix of > 7000 chemicals!***

**[http://www.cdc.gov/tobacco/data\\_statistics/sgr/  
50th-anniversary/index.htm#fact-sheets](http://www.cdc.gov/tobacco/data_statistics/sgr/50th-anniversary/index.htm#fact-sheets)**

**[https://www.cdc.gov/tobacco/data\\_statistics/sgr/  
/2010/consumer\\_booklet/pdfs/consumer.pdf](https://www.cdc.gov/tobacco/data_statistics/sgr/2010/consumer_booklet/pdfs/consumer.pdf)**

## Cancer-causing Chemicals



**Formaldehyde**  
Used to embalm dead bodies



**Benzene**  
Found in gasoline



**Polonium 210**  
Radioactive and very toxic



**Vinyl chloride**  
Used to make pipes

## Toxic Metals



**Chromium**  
Used to make steel



**Arsenic**  
Used in pesticides



**Lead**  
Once used in paint



**Cadmium**  
Used in making batteries

## Poison Gases



**Carbon monoxide**  
Found in car exhaust



**Hydrogen cyanide**  
Used in chemical weapons



**Ammonia**  
Used in household cleaners



**Butane**  
Used in lighter fluid



**Toluene**  
Found in paint thinners

Tobacco smoke contains a deadly mix of **more than 7,000 chemicals**. Hundreds are toxic. About 70 can cause cancer. Here are some of the chemicals.

**Cigarette + Smoke: > 7000 Chemicals; ~600 Tobacco Company Additives  
Atherogenic, Carcinogenic (C), Tumor Initiating, Tumor Promoting (TP),  
Toxic (T), Cornucoppia of Unknowns, Synergistic, Reactive...?**

4-aminobiphenyl	C	140 ng <u>per cigarette</u> ...
benz(a)anthracene	C	40-200 ng
benzene	C	400 µg
benz(o)pyrene	C	40-70 ng
carbon monoxide	T	26.8-61 mg
formaldehyde	C	1500 µg
hydrazine	C	90 ng
hydrogen cyanide	T	14-110 µg
2-naphthylamine	C	70 ng
nitrogen oxides	T	500-2000 µg
N-nitrosodimethylamine	C	200-1040 ng
N-nitrosodiethanolamine	C	43 ng
N-nitrospyrrolide	C	30-390 ng
phenol	TP	70-250 µg
polonium 210	C	0.5-1.6 pCi
quinoline	C	15-20 µg
O-toluidine	C	3 µg

**SOURCES: US Surgeon General's Office, American Cancer Society, American Heart Association.**

phoric Acid, Pimenta Leaf Oil, Pine Needle Oil, Pine Oil, Scotch, Pineapple  
entrate, alpha-Pinene, beta-Pinene, D-Piperitone, Piperonal, Pipsissewa L  
Potassium Sorbate, 1-Proline, Propenylguaethol, Propionic Acid, Propyl  
Hydroxybenzoate, Propylene Glycol, 3-Propylideneephthalide, Prune Juice  
ne, Pyroligneous Acid And Extract, Pyrrole, Pyruvic Acid, Raisin Juice Co  
mol, Rose Absol, Rum, Rum Ether, Rye Extract,  
age Oleoresin, S alwood Oil, Yellow, Sclareolide, Ska  
; Snakeroot Oil, ium Benzoate, Sodium Bicarbonate  
nate, Sodium C e, Sodium Hydroxide, Solanone, Spe  
ct, Gum and Oil, Sucrose Octaacetate, Sugar Alcohols, Sugars, Tagetes  
ic Acid, Tea Leaf and Absolute, alpha-Terpineol, Terpinolene, Terpinyl Ac  
3-Tetrahydroquinoxaline, 1,5,5,9-Tetramethyl-13-Oxatricyclo(8.3.0.0(4,9))  
5, and 3,4,5,6-Tetramethylethyl-Cyclohexanone, 2,3,5,6-Tetramethylpyraz  
chloride, Thiazole, 1-Threonine, Thyme Oil, White and Red, Thymol, Tob  
pherols (mixed). Tolu Balsam Gum and Extract Tolualdehydes para-Tol

- Absorbs H<sub>2</sub>O
- Preserves tobacco
- Antifreeze & de-icing
- Polyester compounds
- Artificial smoke in
- Theater & e-cigarettes

## TOBACCO ADDITIVES

The tobacco industry has acknowledged that nearly 600 chemicals are added to cigarettes. It is not clear, however, how much of the various additives are used or which combinations appear together. Some of the chemicals among cigarette additives most questioned by tobacco opponents include:

■ **Megastigmatrienone:** A flavoring that tobacco companies contend is found naturally in grapefruit juice.

■ **Dehydromenthofuro lactone:** A flavoring that tobacco companies say is found in peppermint.

■ **Ethyl furoate:** Found naturally in coffee, kiwi and peanuts.

■ **Maltitol:** A sweetener used in chewing gum and diabetic candy.

■ **Sclareolide:** A synthetic form of a naturally occurring tobacco element.

■ **Ammonia:** A processing aid.

■ **Methoprene:** An insecticide that toxicologists say is biodegradable.

■ **Other additives:** Yeast, wine, caffeine, beeswax, beta carotene, chocolate, coconut oil.



## **freebase nicotine!!**

Ammonia converts nicotine, the additive agent in tobacco, into a more volatile form, Pankow said. “Ammonia is the thing that helps tobacco companies hook the smoker by providing a means of delivering the nicotine.”

Last October, a former tobacco industry employee revealed that secret industry documents indicated that ammonia was added to tobacco to double the impact of nicotine. Research now indicates that ammonia can boost nicotine availability up to 100x! The Oregon Graduate Institute (now a part of [OHSU](http://www.ohsu.edu)) was the 1<sup>st</sup> to research!

<http://pubs.acs.org/doi/abs/10.1021/es970402f>  
<http://www.nasw.org/users/sperkins/nicotine.html>



# Tobacco-free Campus

For better health,  
smoking and use of  
tobacco products are  
prohibited everywhere  
on our property.



UO's Josh Buehler

U.S. Surgeon General  
Regina Benjamin

## SMOKE AND TOBACCO-FREE UNIVERSITY



**September 1, 2012**

For a healthier community and cleaner  
environment, the University of Oregon  
will be smoke and tobacco free



**Ready to Quit Tobacco?**

Visit [tobaccofree.uoregon.edu](http://tobaccofree.uoregon.edu) for free and low cost resources



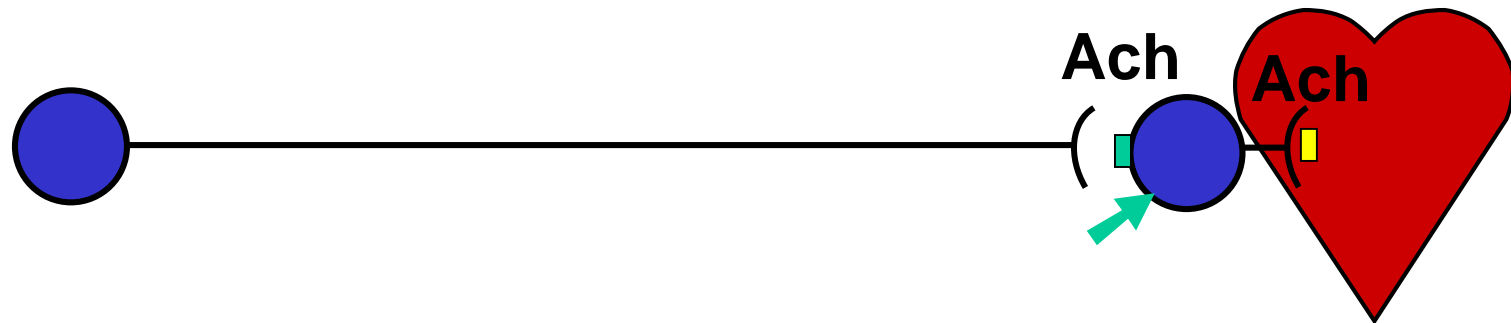
UNIVERSITY OF OREGON

[tobaccofree.uoregon.edu](http://tobaccofree.uoregon.edu)



For a healthier community and cleaner  
environment, the University of Oregon  
is smoke and tobacco-free.

## Parasympathetic

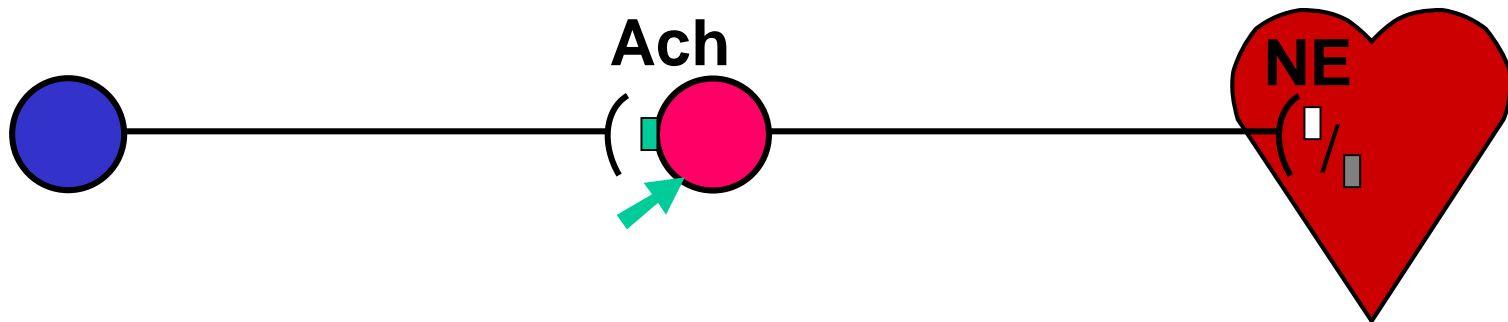


Ach = Acetylcholine

■ = Nicotinic Receptor

■ = Muscarinic Receptor

## Sympathetic



NE = Norepinephrine

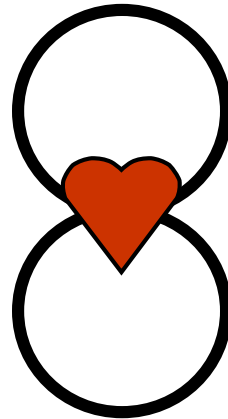
□ =  $\alpha$  Receptor ( $\alpha_1$ ,  $\alpha_2$ )

■ =  $\beta$  Receptor ( $\beta_1$ ,  $\beta_2$ )

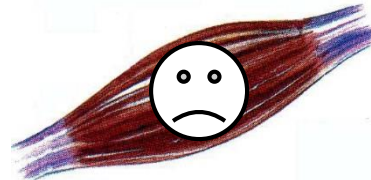
# ***Cigarettes ≡ Patient-Assisted Drug-Delivery System Inhaling Bypasses the Systemic Circulation & Is Powerfully Reinforcinging!***



Pulmonary

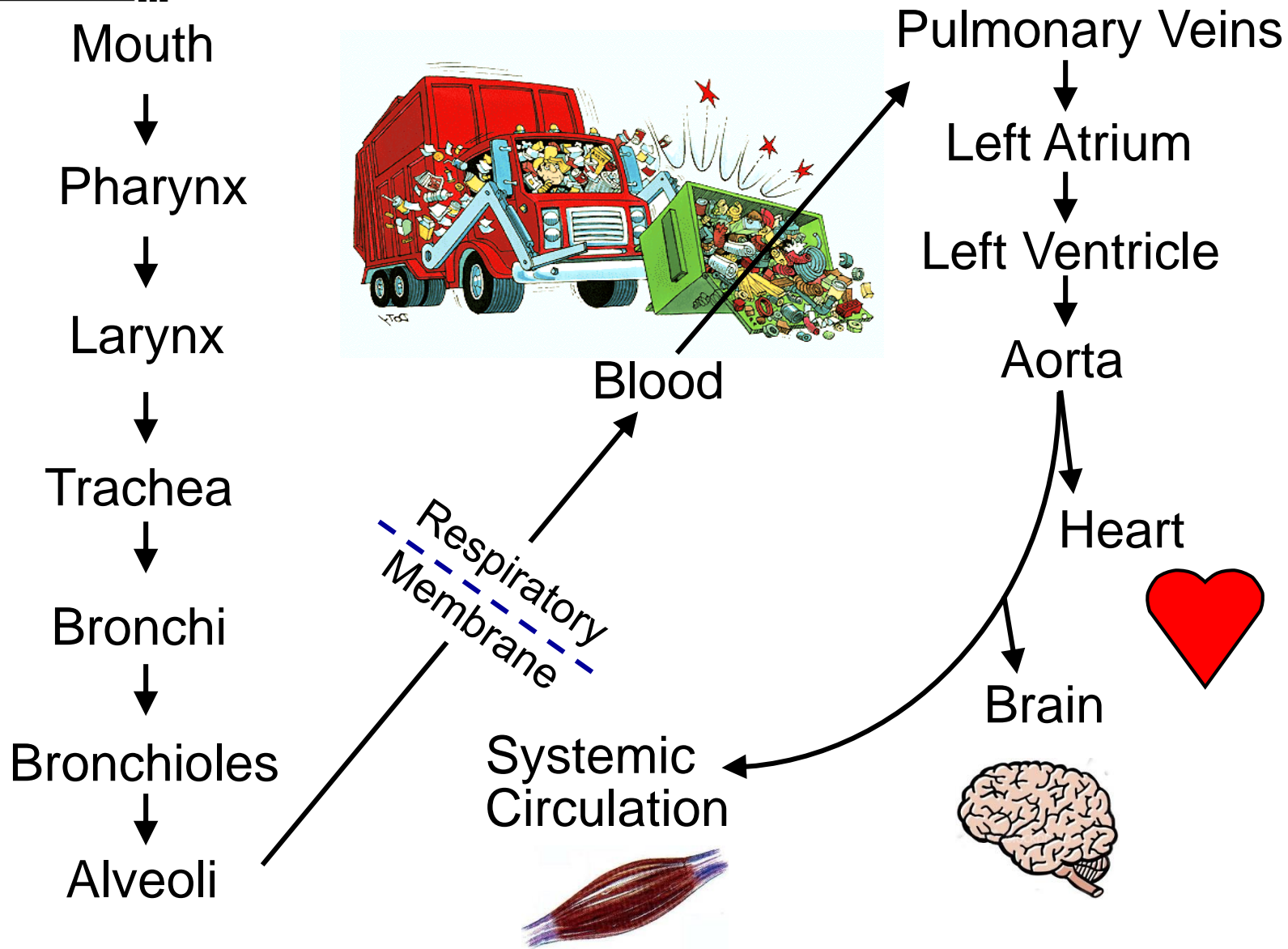


Systemic



# Tracing the Route of Cigarette Smoke

## Puff to Brain Time 5 to 8 seconds!!





# *Keep it Basic?*

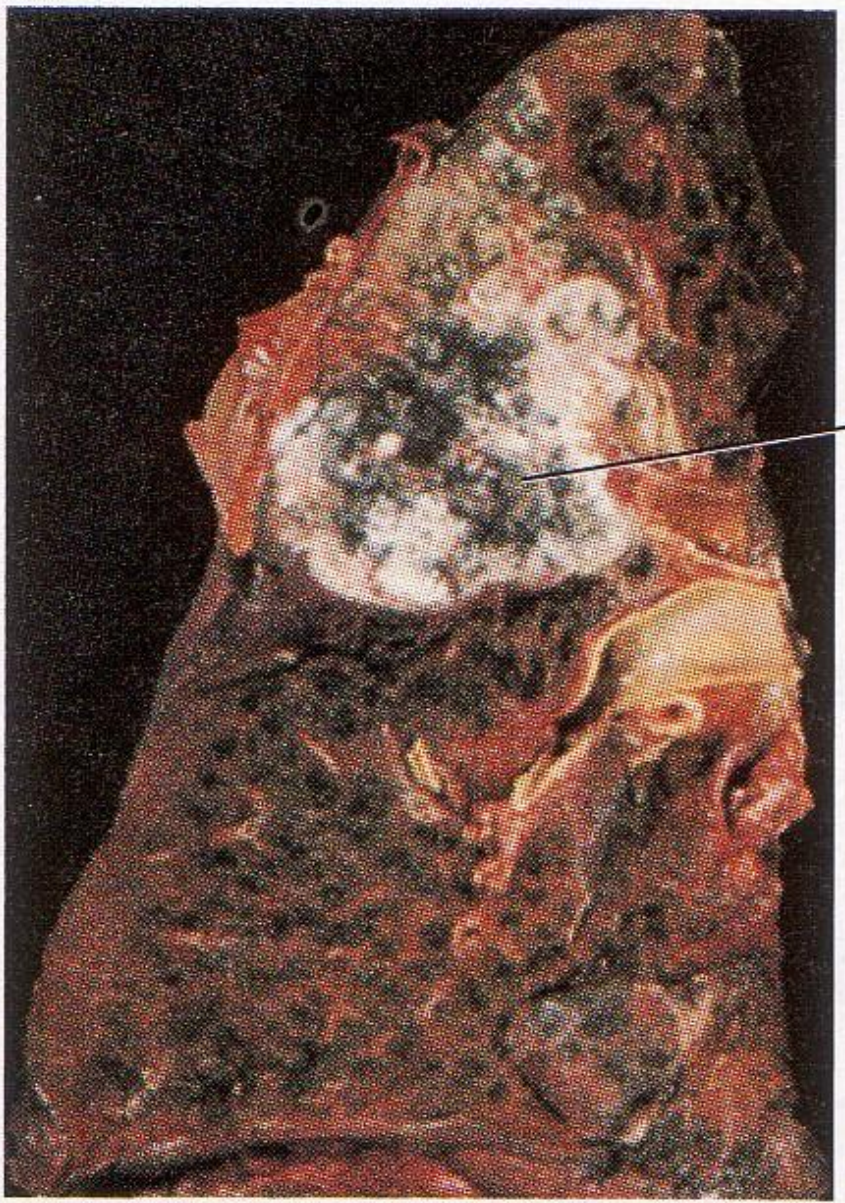
**Cigarette smoking is the most important preventable cause of premature death in the U.S. accounting for 443,000 annual deaths.**

[http://www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/health\\_effects/tobacco\\_related\\_mortality/#cigs](http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/tobacco_related_mortality/#cigs)

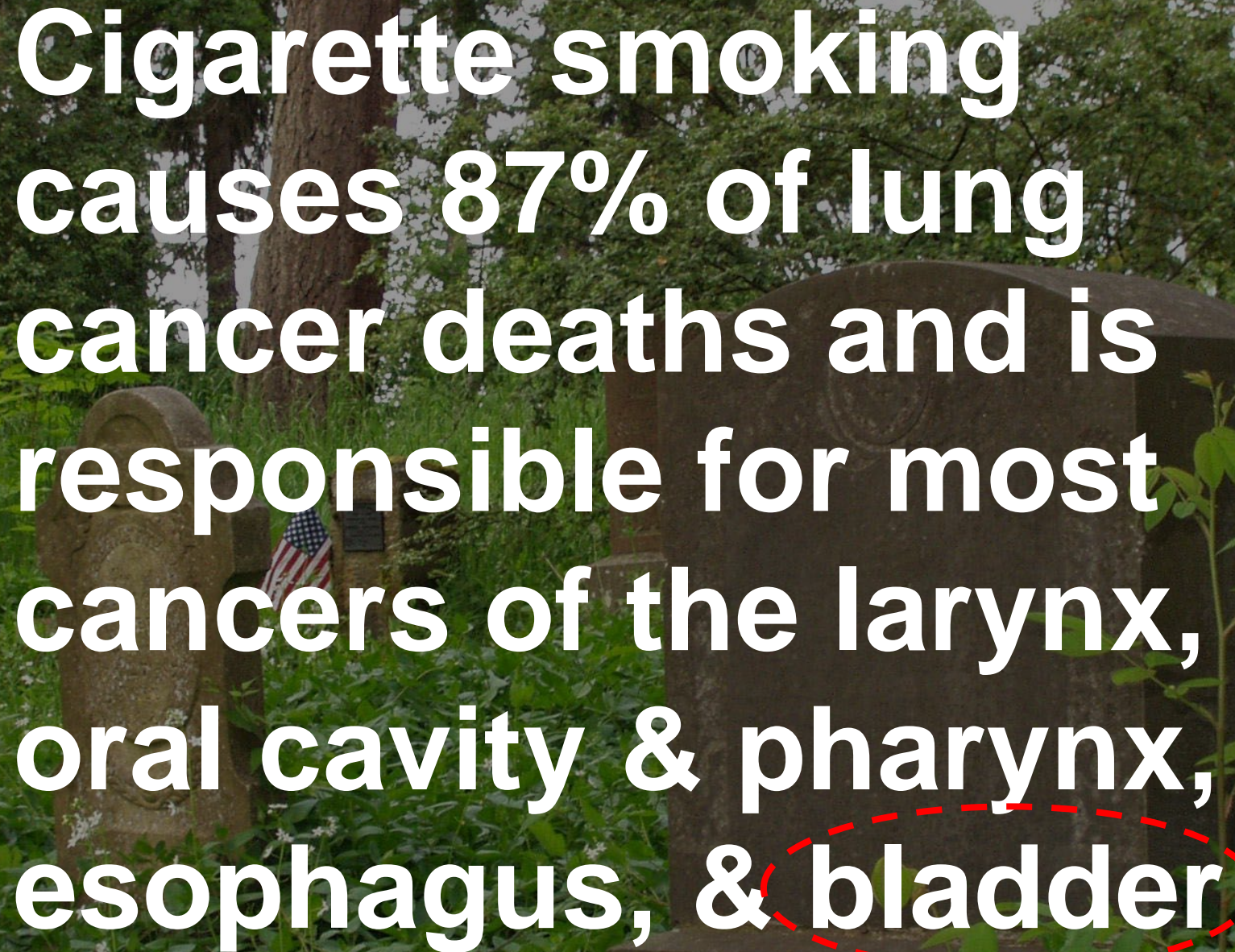
***We know about lung cancer, but what about...?***



**(a)**

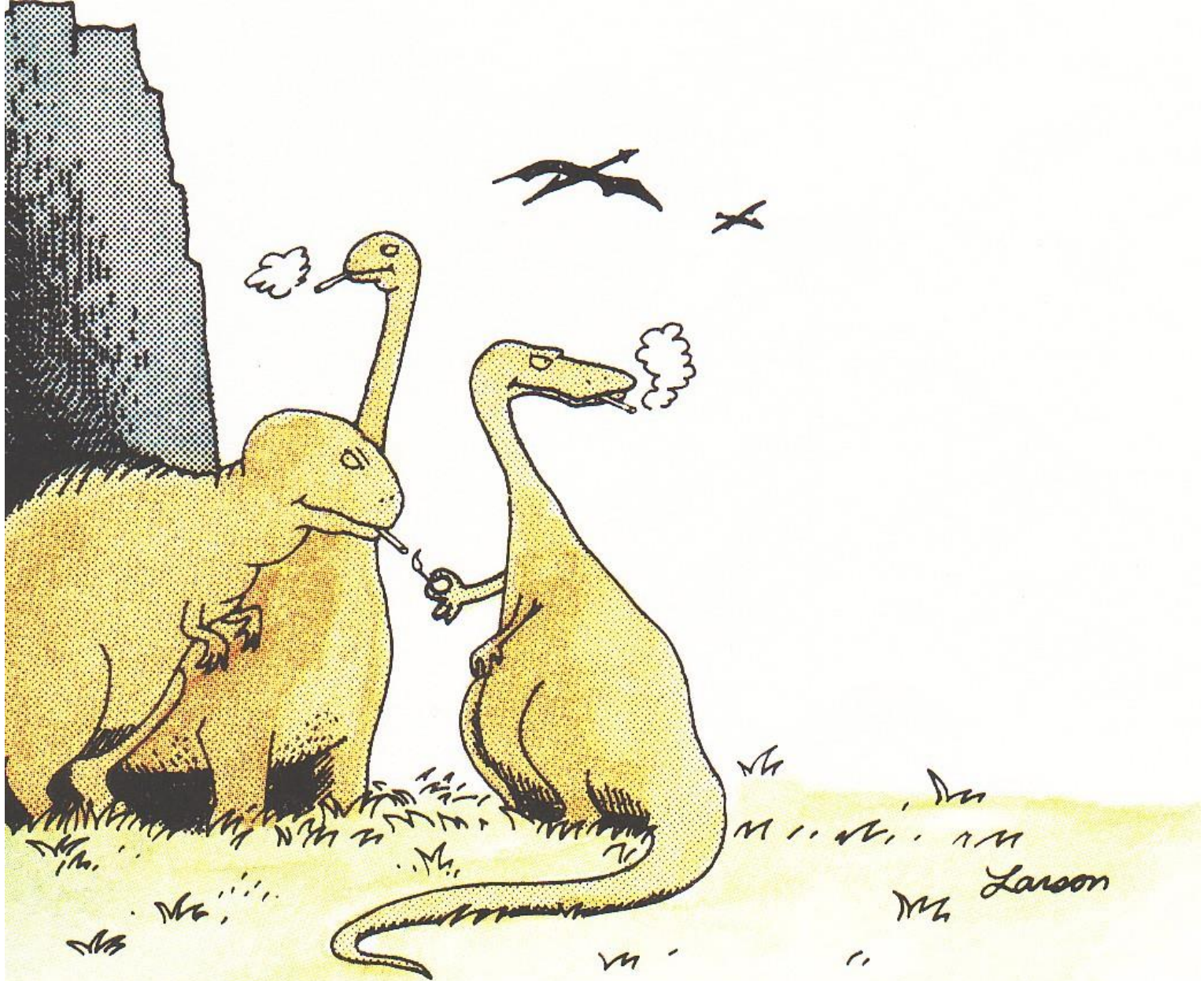


**(b)**

A photograph of a cemetery with several tombstones and lush green trees in the background. A semi-transparent grey text box is overlaid on the image, containing white text. The word 'bladder' in the text is circled with a red dashed line.

**Cigarette smoking causes 87% of lung cancer deaths and is responsible for most cancers of the larynx, oral cavity & pharynx, esophagus, & bladder**





**The real reason dinosaurs became extinct**

# Macho Man?

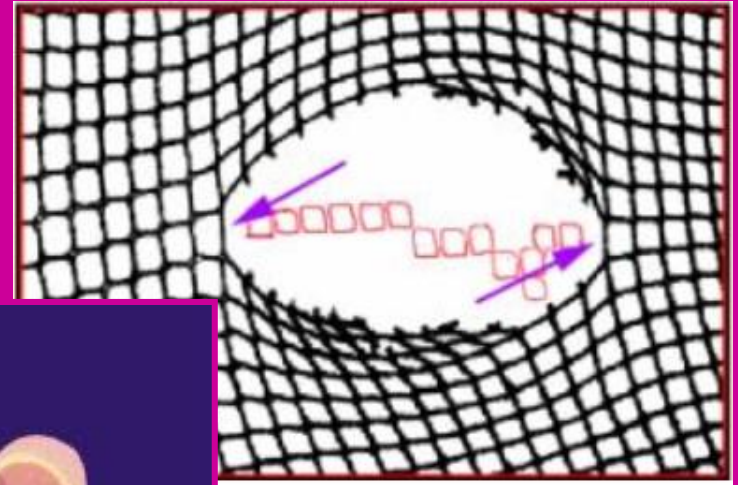
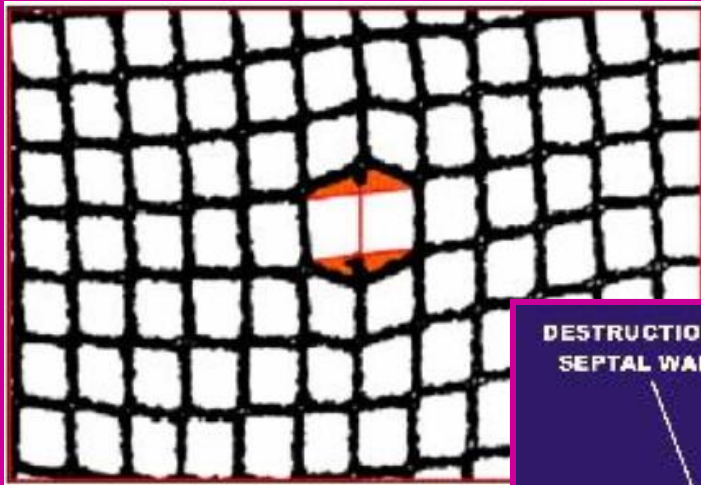
A billboard advertisement featuring two men in cowboy attire. The man on the left is wearing a light-colored cowboy hat, a denim jacket over a red shirt, and a cowboy belt. The man on the right is wearing a darker cowboy hat and a dark jacket. They are standing next to a brown horse. The background is a clear blue sky. The billboard is mounted on a metal structure with a sign that says 'MS' at the top and '0A1405' at the bottom.

Bob, I've got Emphysema.

WARNING: Cigarette Advertising Makes  
Smoking Look Cool And Cowboys Look Stupid.

0A1405

# *Emphysema ≡ Corrosion of Alveolar Walls with ↓ SA & Labored Breathing*

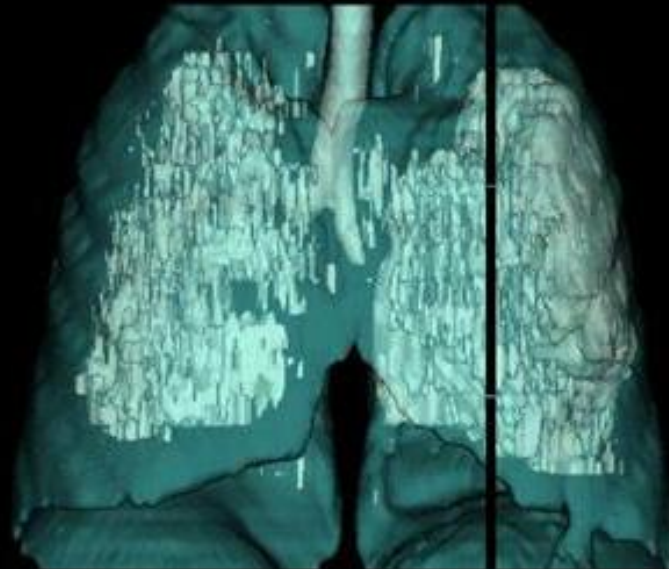
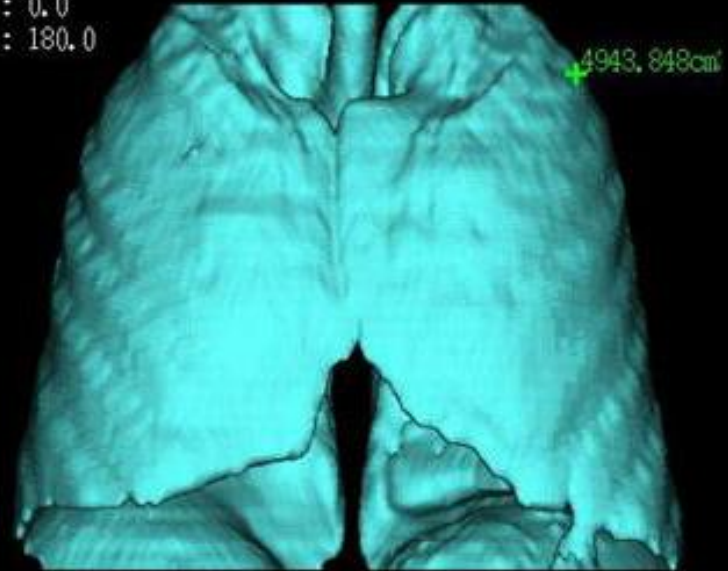


# CT Densitovolumetry in Heavy Smoker with Emphysema Indicating ~ 22% Compromise of Lung Parenchyma

Y : 0.0  
Z : 180.0



Y : 0.0  
Z : 180.0



SOURCE: Corrêa da Silva, 2001, from *Emphysema Imaging* Ali Nawaz Khan

<http://www.realityunfiltered.com/>



Terrie Hall, who has appeared in television commercials for Tobacco.Reality.Unfiltered., started smoking when she was 18. She smoked two packs a day for twenty-two years before she was diagnosed with throat cancer. She had a permanent tracheotomy and has fought cancer seven times. The photo to the right is of Terrie as a teenager. Photos: Tobacco.Reality.Unfiltered.



# Why you have to tell your gynecologist you smoke. Even if it's only at parties.



You figure an occasional cigarette can't hurt, and you really don't want to listen to the "stop smoking" lecture from your doctor. But if you want any type of hormonal birth control, smoking is a vitally important issue.

Hormonal birth control is a prescription drug, and while the risks are rare, they can be serious, and smoking, even a little, increases the risks, especially if you're over 35.

**Risks include blood clots, stroke, and heart attack.** If you have a history of these conditions or certain cancers, you shouldn't use hormonal birth control.

Of course, you should tell your healthcare professional if you could be pregnant, and because hormonal birth control doesn't protect against HIV or sexually transmitted diseases, learn how to stay safe and healthy.

**Hormonal birth control has been used safely by millions of women for 45 years, and is 99% effective when used correctly.**

It could be a good choice for you. To find out, talk to your healthcare professional. And to help you get started, there's a list of questions to ask at: [www.orthowomenshealth.com](http://www.orthowomenshealth.com)



Be smart about your body.  
Be smart about your birth control.

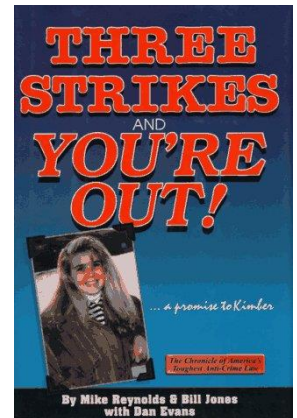
# On the Pill & Smoke?

## Increased Risk of:

1. Blood Clots

2. Heart Attack

3. Strokes!



**Breathing 2<sup>nd</sup>-hand  
smoke for as little as  
1/2 hr activates  
platelets almost as  
much as if you were a  
pack-a-day smoker**

2<sup>nd</sup>-hand smoke is the 3<sup>rd</sup> leading preventable cause of death in the US!

A photograph of a man in a tuxedo and a woman in a formal dress. The man is on the left, smiling and looking towards the woman on the right. He has a lit cigarette in his mouth. The woman is looking back at him. The background is a soft, out-of-focus grey.

"Mind if I smoke?"

*"Care if I die?"*

Each year ~45,000 Americans die due to 2<sup>nd</sup>-hand smoke exposure!



News: Health, Toxicology, Pollution

## Health risks of e-cigarettes emerge

*Vaping pollutes lungs with toxic chemicals and may even make antibiotic-resistant bacteria harder to kill*

By JANET RALOFF 4:31PM, JUNE 3, 2014



<https://www.sciencenews.org/article/health-risks-e-cigarettes-emerge>

**DEEP BREATH** Half of the pollutant vapors inhaled by an e-cigarette user may make it into the lungs, a new study finds.

Magazine issue: Vol. 185 No. 13, June 28, 2014

Electronic cigarettes, marketed as safer than regular cigarettes, deliver a cocktail of toxic chemicals including carcinogens into the lungs, new studies show. Using e-cigarettes may even make bacterial infections resistant to antibiotics, according to one study.

Engineers developed e-cigarettes several years ago to provide tobacco users a smoke-free source of nicotine. The devices heat up a liquid that a user inhales, or “vapes.” Because e-cigarettes burn nothing, they release no smoke.

“There’s no question that a puff on an e-cigarette is less toxic than a puff on a regular cigarette,” says Stanton Glantz, director of the Center for Tobacco Control Research and Education at the University of California, San Francisco. But few studies have looked at the toxicity of their vapors. As a result, scientists have been circumspect about describing e-cigarettes as safe.

For a May 13 review in *Circulation*, Glantz and his team pored over emerging data on what vapers are inhaling and found, he says, greater risk than scientists had thought. E-cigarettes deliver high levels of nanoparticles, the researchers found, which can trigger inflammation and have been linked to asthma, stroke, heart disease, and diabetes (*SN: 7/18/09, p. 26*). The levels “really raise concerns about heart disease and other chronic conditions where inflammation is involved,” he says.

E-cigarettes are no longer niche products, he and others note. Vaping product sales last year were projected to hit an estimated \$1.7 billion, report li-Lun Chen and Corinne Husten of the Food and Drug Administration’s Center for Tobacco Products in Rockville, Md., in a special May issue of *Tobacco Control* on e-cigarettes. E-cigarette sales may exceed those of traditional cigarettes within 10 years, the pair reports. At least 1 in 5 smokers has tried e-cigarettes, as have 10 percent of U.S. high school students, according to the U.S. Centers for Disease Control and Prevention.

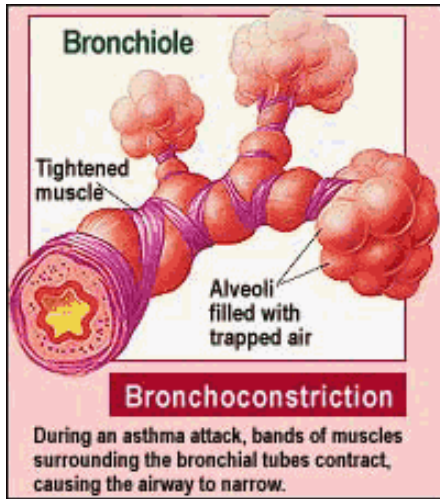
Those people may think vaping is safe, but FDA has seen no data establishing anything like that, writes the agency’s Priscilla Callahan-Lyon in the same journal. She reviewed data from 18 studies on e-cigarettes’ vapors and found that most contain at least traces of the solvents in which nicotine and flavorings had been dissolved. Those solvents, she reports, are known as lung irritants.

And the solvents can transform into something even more worrisome: carbonyls. This group includes known cancer-causing chemicals, such as formaldehyde, and suspected carcinogens, such as acetaldehyde. Because early e-cigarettes didn’t deliver the same powerful hit of nicotine that burning tobacco does, engineers developed second-generation technology that allows users to increase an e-cigarette’s voltage, and thus temperature, to atomize more nicotine per puff.

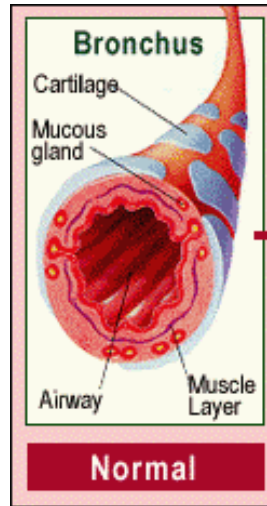


More than 250 different brands of electronic cigarettes are available on the market (a few examples shown), and many dozens of solutions are used to generate the devices’ vapors.

# SMOKING ≡ ASTHMA?



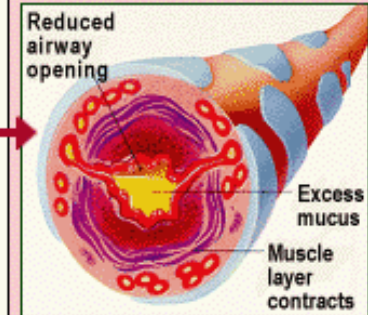
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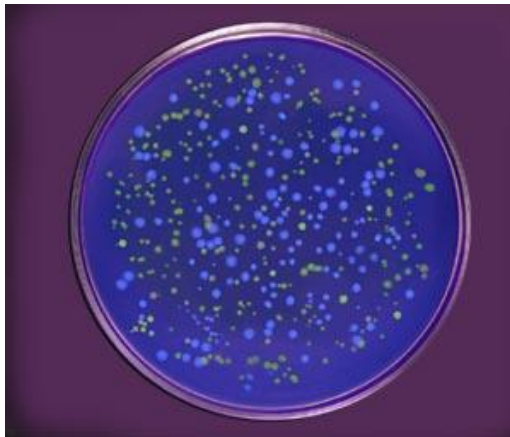
## Asthma Triggers

- Allergens
- Drugs
- Exercise
- Occupational stimuli
- Infections
- Environmental changes
- Air pollutants
- Chemical irritants
- Emotions
- Weather/Temp.
- Food additives

## Inflammation

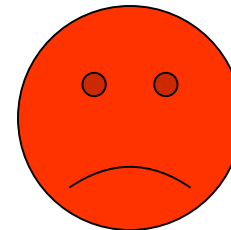


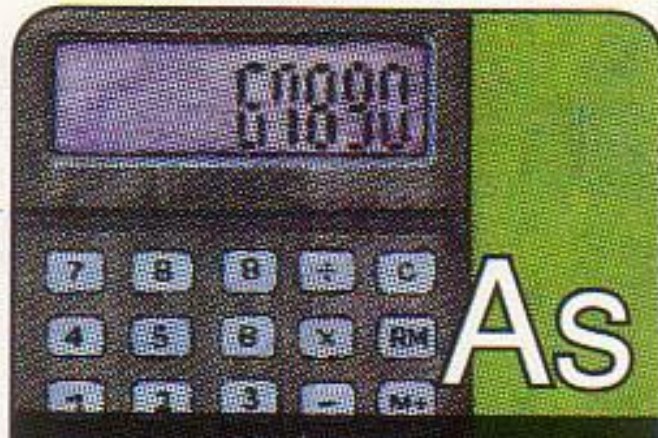
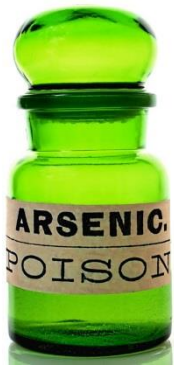
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**Petri-dish Effect**

Ugh!!  
Cough!  
Cough!!






**As**

**Arsenic 33**

- o Shotgun pellets
- + Metal for mirrors
- v Glass, lasers
- v **Light emitting diodes=LED**
- x 74.9216



**Po**

**Polonium 84**

- o **Nuclear batteries**
- o Neutron source
- o Antistatic agents
- o Film cleaner
- x (209)



Sunflowers are planted along with our organic tobacco to attract beneficial insects to protect our organic crops...



To be buried with  
sunflowers?  
Compost?

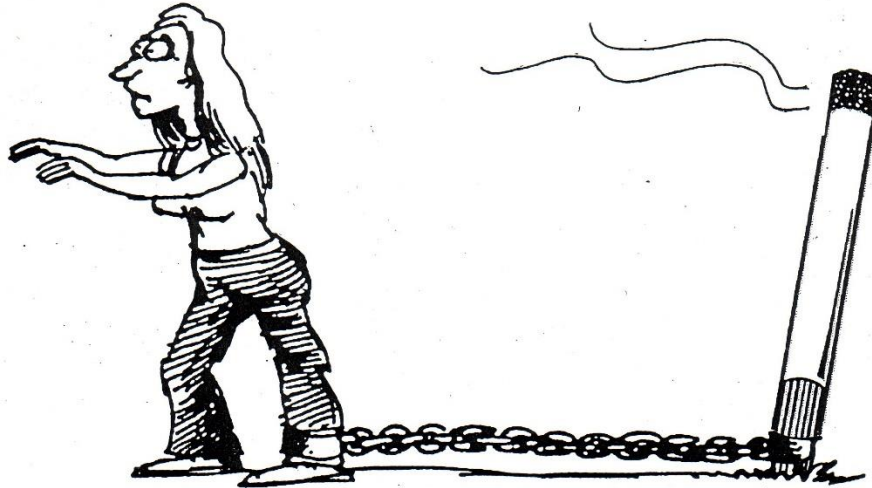


**Cigarettes & 2<sup>nd</sup>-hand smoke!!**

...and to **avoid** the use of chemical pesticides.



**Cigarettes got you on a tight leash?**



# **Free Yourself**

## **Smoking Cessation**

### **Workshop**

**Wednesdays, 3:30-4:30 p.m.**  
**January 22 to March 5, 1997**

**Student Health Center, Medical Library**  
**Free to UO students**

**Call 346-4456 to register**



***...Thanks for helping us  
for almost 20 yr!!***

# Stop Smoking Through Acupuncture

If you're serious about quitting the smoking habit, now's your chance.  
In honor of the great American Smoke Out



Tom Williams, a licensed acupuncturist in Eugene, provides stop-smoking treatments to relieve cravings and irritability at the four-session stop smoking workshop that begins at the Health Center November 18th in conjunction with the Great American Smokeout on November 19th. Call 346-4456 to sign up.

## Educational Session\*

Wednesday, November 18, 4-5 pm

\*You must attend this session in order to receive acupuncture treatment.

## Acupuncture Sessions

Thursday, November 19, 4-6 pm

Friday, November 20, 4:30-6 pm

Monday, November 23, from 4:30-6 pm

All sessions meet in the medical library in the basement of the University Health Center.

**Space is limited, so sign up now  
by calling the Health Education  
office at 346-4456.**

*\$30 fee that will be donated to the American Lung Association is requested.*

UNIVERSITY

HEALTH CENTER

*We're a matter of degrees* ◆

Open daily 8 a.m. to 6 p.m., except Tuesdays (9 a.m.) and Sundays (10 a.m.).  
Appointments and after hours: 346-2770 • Web: [darkwing.uoregon.edu/~uoshc](http://darkwing.uoregon.edu/~uoshc)

## **Nicotine Addiction & Help Quitting Smoking**

[http://www.cancer.org/healthy/stayawayfromtobacco/guide  
toquittingsmoking/guide-to- quitting-smoking-help-phys-nrt](http://www.cancer.org/healthy/stayawayfromtobacco/guide-toquittingsmoking/guide-to- quitting-smoking-help-phys-nrt)

## **2<sup>nd</sup>-Hand Smoke or ETS & 3<sup>rd</sup>-Hand Smoke?**

[http://www.cancer.org/cancer/cancercauses/tobaccocancer/  
secondhand-smoke](http://www.cancer.org/cancer/cancercauses/tobaccocancer/secondhand-smoke)

## **2<sup>nd</sup>-Hand Smoke Addictive?**

[http://www.ncbi.nlm.nih.gov/pubmed?term=2nd%20hand  
%20smoke%20addictive](http://www.ncbi.nlm.nih.gov/pubmed?term=2nd%20hand<br/>%20smoke%20addictive)

<http://www.ncbi.nlm.nih.gov/pubmed/20211642>

<http://www.ncbi.nlm.nih.gov/pubmed/19936715>

<http://www.ncbi.nlm.nih.gov/pubmed/21840504>



