

# Smoking & Occupational Cancers



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# Introduction

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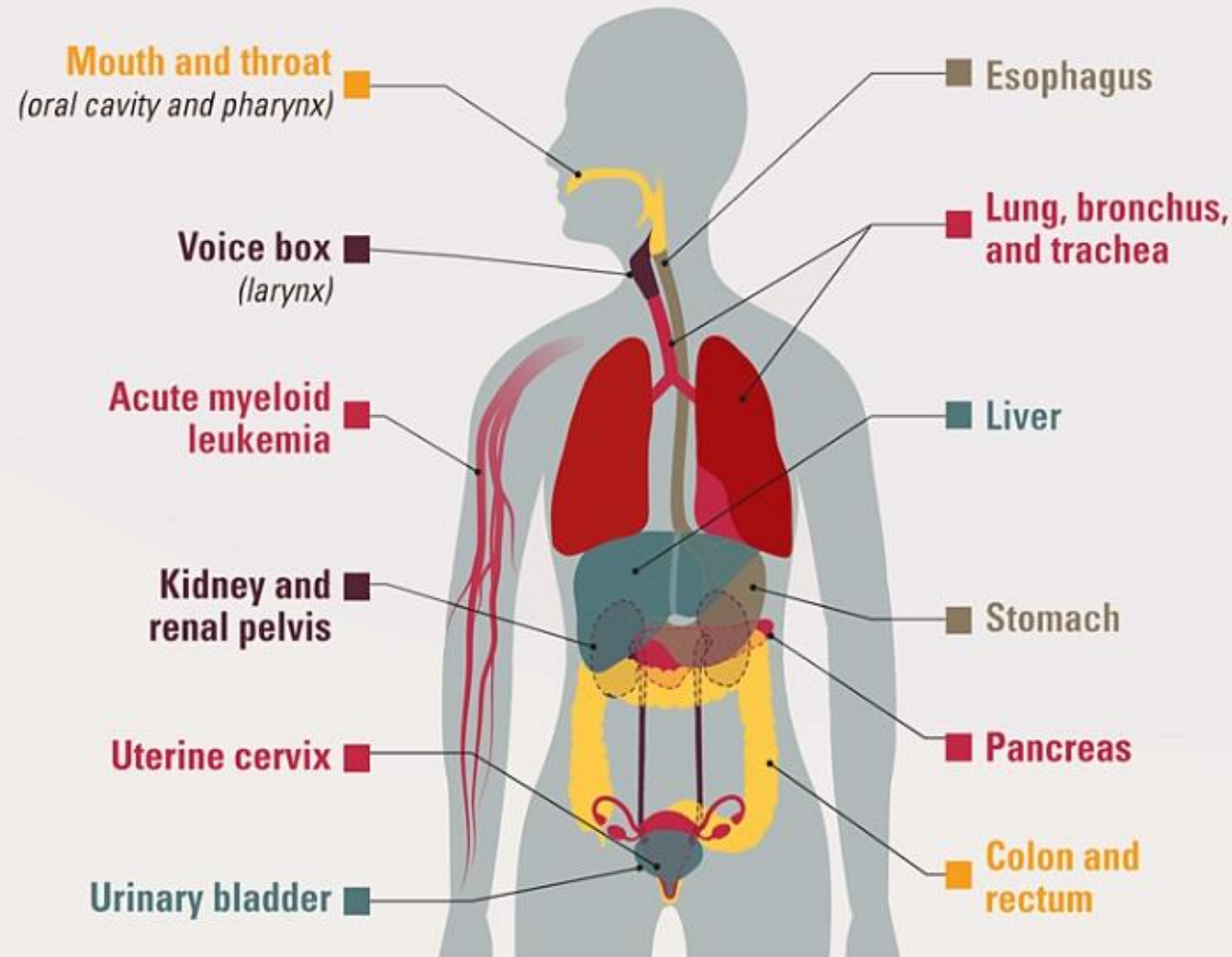
- Tobacco smoke contains thousands of chemicals, many of which are known to be carcinogens.
- The combustion of tobacco produces over 60 known carcinogens, including polycyclic aromatic hydrocarbons (PAH) and N-nitrosamines.
- Tobacco exposure is a well-established cause of lung cancer, and is thought to account for nearly one third of all cancer deaths.
- In North America, about 85% of lung cancers and about 30% of all cancers are attributable to smoking.

# Introduction

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- All cancer deaths are attributable to occupational exposures:
  - Among males: 4% and 14%
  - Among females: 1% to 3%
- Nearly half of all recognized human carcinogens are occupational carcinogens.

# Tobacco use\* causes cancer throughout the body.



\* Tobacco use includes smoked (cigarettes and cigars) and smokeless (snuff and chewing tobacco) tobacco products that, to date, have been shown to cause cancer.

# Blue-collar workers Vs. white-collar workers

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- Smoking prevalence was higher among blue-collar occupations than white-collar workers
- Blue-collar workers experience greater exposure to workplace toxins which can add to, or even multiply, their risk of adverse health effects from tobacco smoking.
- Among blue-collar workers, workers in the restaurant, bar, and gaming industries are exposed to much higher levels of environmental tobacco smoke (ETS) than are office workers.

# Blue-collar workers Vs. white-collar workers

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- They may be due to early smoking initiation, those who start smoking at a young age are more likely to be employed in blue-collar and service occupations.
- Job-related stress has been associated with increased smoking intensity and decreased success at Quitting.
- Workplace culture may also play a role in that blue-collar workplaces may be more supportive of smoking and more tolerant of ETS exposure.

# *Tobacco use and exposure to chemical and physical agents in the workplace*

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- *There is increasing evidence of adverse health effects due to the combined actions of tobacco use and exposure to chemical and physical agents in the workplace.*
- *National Institute for Occupational Safety and Health:*
  - *The use of and/or carrying of tobacco products into the workplace be curtailed in situations where employees' may be exposed to physical or chemical substances which can interact with tobacco products.*
  - *Additionally, curtailment of the use of tobacco products in the workplace should be accompanied by simultaneous control of worker exposure to physical and chemical agents.*
- *These recommendations are based on evidence which indicates that smoking can act in combination with hazardous agents to produce or increase the severity of a wide range of adverse health effects.*

## *Six ways have been identified by which smoking can interact with workplace exposures*

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1. Certain toxic agents in smoke may also occur in the workplace, thus increasing exposure to the agent:
  1. The average end-of-shift COHb concentration found:
    1. Non-smoking & unexposed: 1.5%
    2. Smoker & unexposed: 4.0%
    3. Non-smoking & furnace workers: 4.9%
    4. Smoker & furnace workers: 7.4%
  2. acetone, acrolein, formaldehyde, arsenic, cadmium, hydrogen cyanide, hydrogen sulfide, ketones, lead, methyl nitrite, nicotine, nitrogen dioxide, phenol, and polycyclic aromatic compounds



## *Six ways have been identified by which smoking can interact with workplace exposures*

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2. Workplace chemicals may be transformed into more harmful agents by smoking. The heat generated by burning tobacco (**875°C**) can transform workplace chemicals into more harmful:

- **Polymer fume fever** is a disease caused by inhalation of degradation product fumes from heated **Teflon**
- **Chlorinated hydrocarbons** that have the potential for conversion to **phosgene**

## *Six ways have been identified by which smoking can interact with workplace exposures*

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3. Tobacco products may serve **as vectors** by becoming **contaminated** with toxic agents found in the workplace, thus facilitating entry of the agent into the body:

- boron trifluoride, carbaryl, dinitro-ortho-creosol, inorganic fluorides, formaldehyde, lead, inorganic mercury, methyl parathion, organotin

## *Six ways have been identified by which smoking can interact with workplace exposures*

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### 4. **Additive** biological effect:

- combined worker exposure to **chlorine** and **cigarette smoke**



## *Six ways have been identified by which smoking can interact with workplace exposures*

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5. Smoking may act **synergistically** with toxic agents:

- Asbestos
- radon daughters
- gold mine exposures (arsenic)
- exposures in the rubber industry

## *Six ways have been identified by which smoking can interact with workplace exposures*

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6. Smoking may contribute to accidents in the workplace. The total accident rate was more than twice as high among smokers as among non-smokers:

- Smoking were caused by loss of attention
- preoccupation of the hand for smoking
- Irritation of the eyes, and cough
- Smoking can also contribute to fire and explosions
- Effect of medical conditions associated with smoking such as decrements in cardiovascular fitness
- confounding factors such as the greater use of drugs or alcohol among workers who are smokers

# Occupational cancers & smoking

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- Lung cancer
- Bladder cancer
- Acute myeloid leukemia



# Lung Cancer

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- Asbestos
- Radon gas
- Arsenic
- Diesel exhaust



# Asbestos & smoking

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- Asbestos Occupational exposure is estimated to account for 5–10% of global lung cancer cases.
- Asbestos fibers are also known to trap tobacco particulates, explaining the synergistic effect of asbestos with tobacco smoking on lung cancer.
- The rate of lung cancer among non-smokers and asbestos exposed workers: 3.5 fold
- The rate of lung cancer among smokers and asbestos exposed workers: 14.4-fold
- Increased risk: with no requirement for asbestosis.



# Radon gas & smoking

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- Radon Radon is a gas naturally produced from the decay of uranium in the ground.
- Time spent below the ground, such as in basements or mines, especially in geographic regions with high Uranium concentrations, is associated with radon exposure.
- Underground workers mining for metals or uranium are known to have markedly increased risk of squamous cell carcinoma of the lungs and other organs.
- Residential radon exposure is the **second greatest risk factor for lung cancer** in the Western world, accounting for an estimated **10%** of cases.
- Radon exposure has a **synergetic effect** on lung cancer risk with tobacco smoking .

# Arsenic & smoking

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- Arsenic exposures:
  - Copper smelting
  - Fur handling
  - Pesticide production
- Rate ratio for death from lung cancer in relation to no arsenic-exposed nonsmokers:
  - 3.0 for arsenic-exposed nonsmokers
  - 4.9 for smokers without occupational arsenic exposure
  - 14.6 for arsenic-exposed smokers
  - The interaction between arsenic and smoking indicating a **multiplicative effect**.

# Diesel exhaust & smoking

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- Less-than-multiplicative effect between DE exposure and tobacco smoking in determining lung cancer risk.
- But the hypothesis of multiplicative interaction cannot be rejected.

# Bladder cancer & smoking

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- The second greatest preventable risk factor for bladder cancer is occupational exposure to carcinogens, including aromatic amines, polycyclic aromatic hydrocarbons, and chlorinated Hydrocarbons.
- These compounds are commonly found in the industrial production of dyes, paint, metal, rubber or petroleum products, firefighters, hairdressers, and farmers who use fungicides.

# Bladder cancer & smoking


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- 50%-65% of cases of bladder cancer are estimated to be attributable to tobacco smoke, the largest risk factor for the disease In both males and females.
- Occupational exposures are estimated to be responsible for 18% of bladder cancer cases.
- Greater tobacco smoke and occupational exposure in men may help explain the 3-4-fold gender discrepancy in bladder cancer incidence.
- Tobacco smoke contains known carcinogens such as beta-naphthylamine and polycyclic aromatic hydrocarbons.

# Acute myeloid leukemia (AML) & smoking

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- Occupational exposure to **benzene**:
  - Rubber industry
  - Shoemaking
  - Petroleum production
  - Chemical production
  - Printing
- Environmental exposure to **benzene**:
  - Petrol
  - Exhaust fumes
  - Tobacco smoke
    - For smokers, up to **80%** of benzene exposure is due to tobacco smoke.

A human lung silhouette is centered against a light blue background. The left side of the lung is filled with a pile of discarded cigarette butts. The right side of the lung is filled with a vibrant bouquet of various colorful flowers, including purple, blue, and pink blossoms, along with green foliage. The text "IT'S NEVER TOO LATE TO QUIT SMOKING" is printed in bold, black, sans-serif capital letters across the middle of the lung silhouette.

**IT'S NEVER TOO  
LATE TO QUIT  
SMOKING**



**Healthworks**  
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