

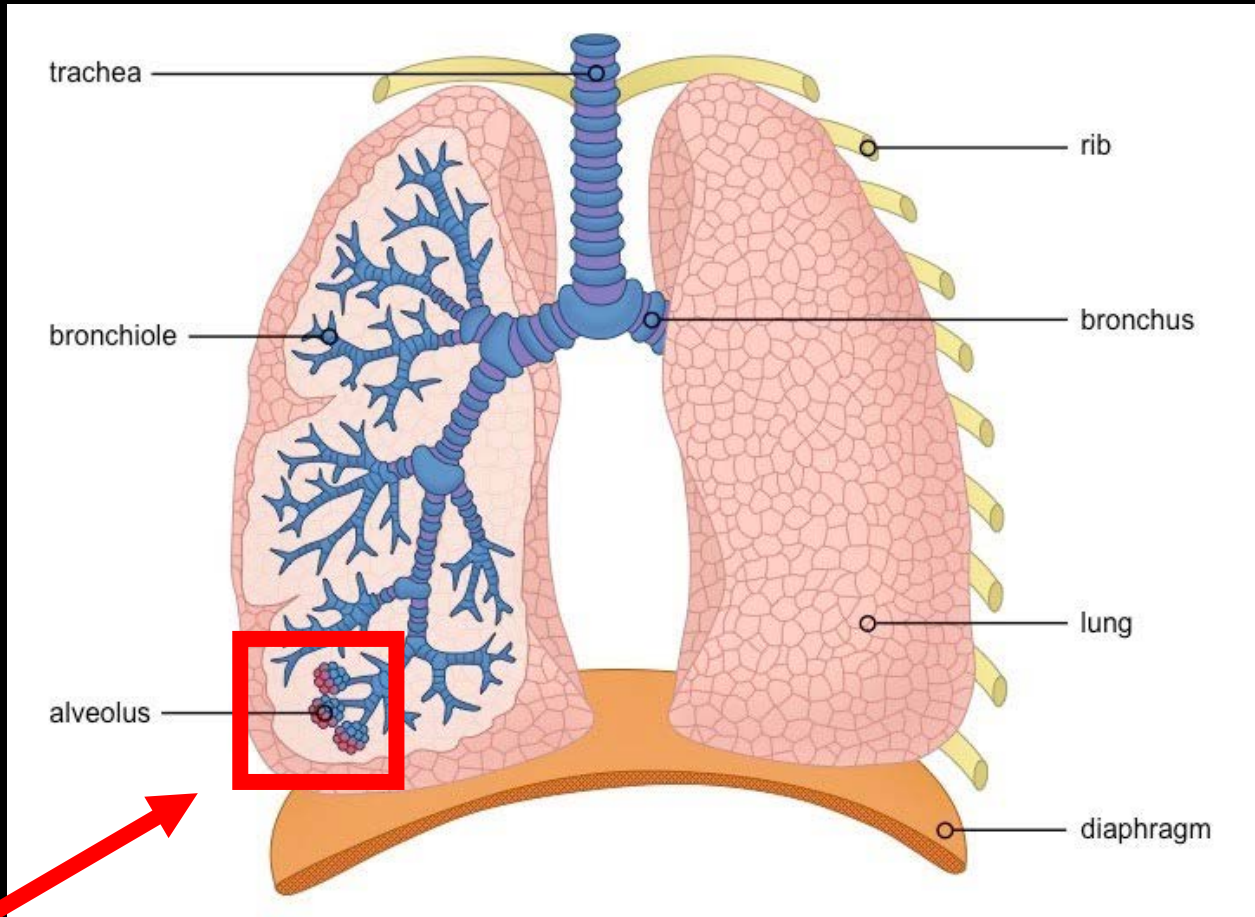
Simple Coal Workers' Pneumoconiosis: Not So Simple

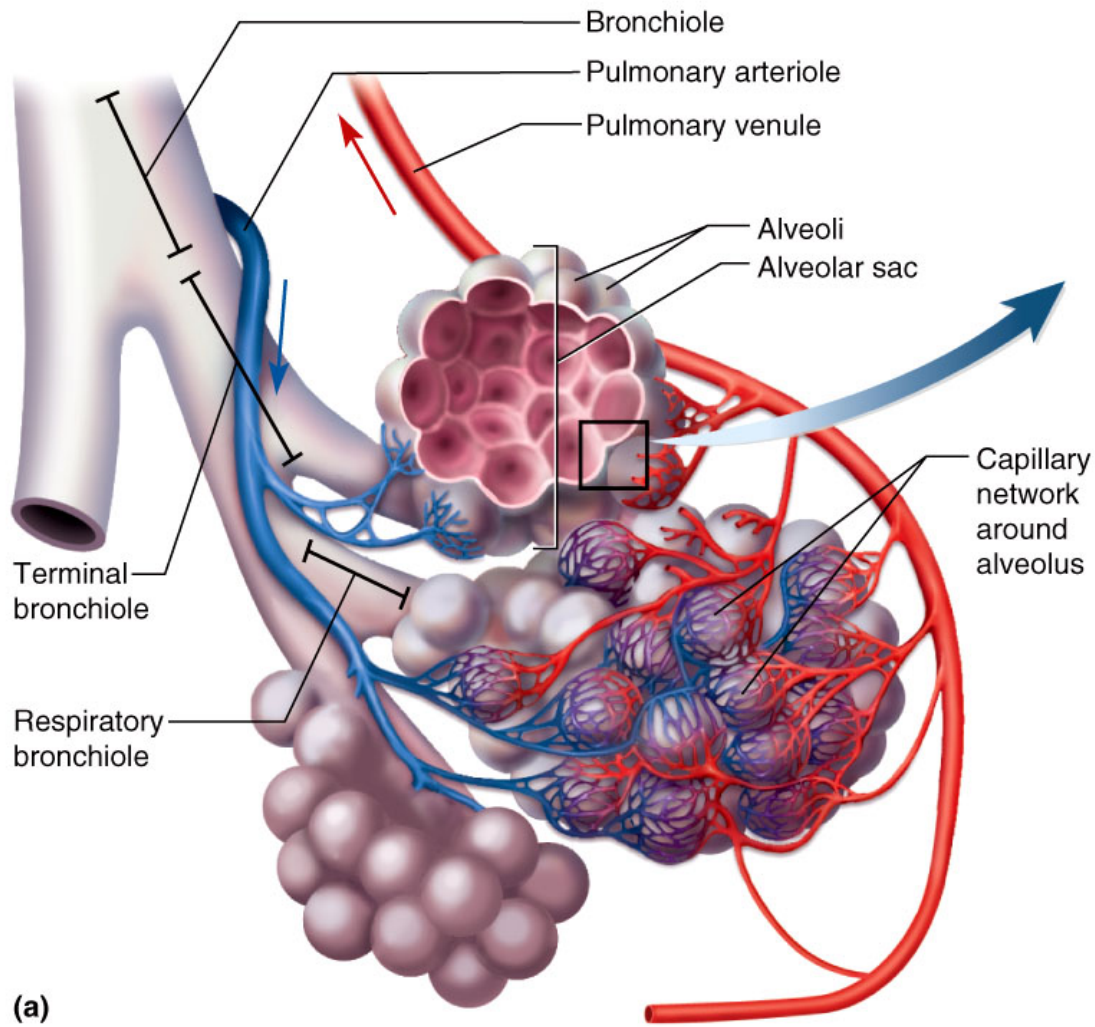
Leonard Go, MD

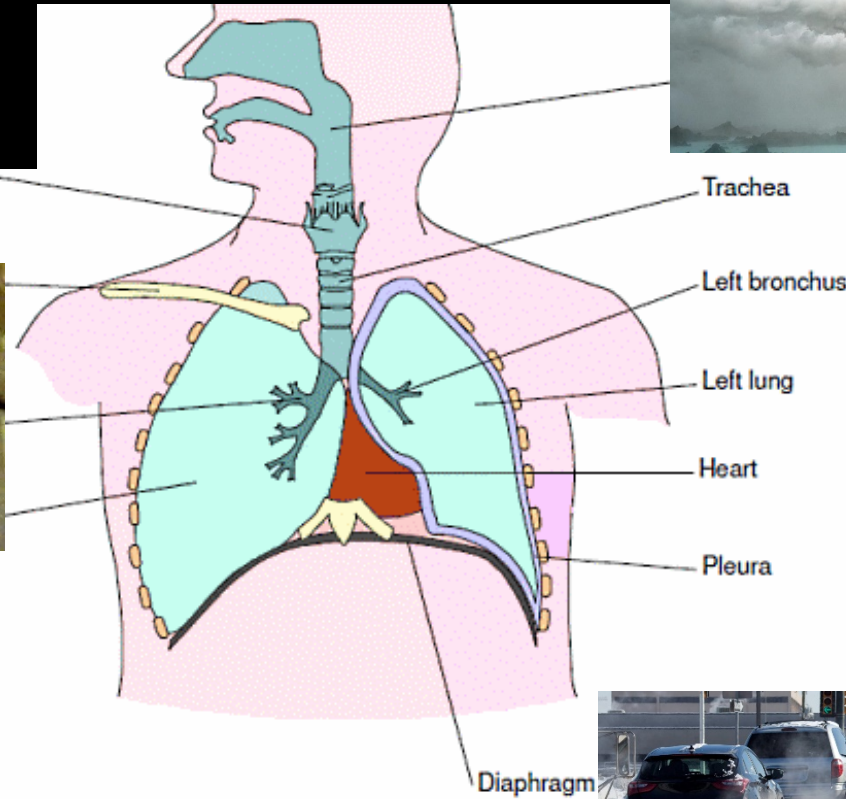
MinER Center

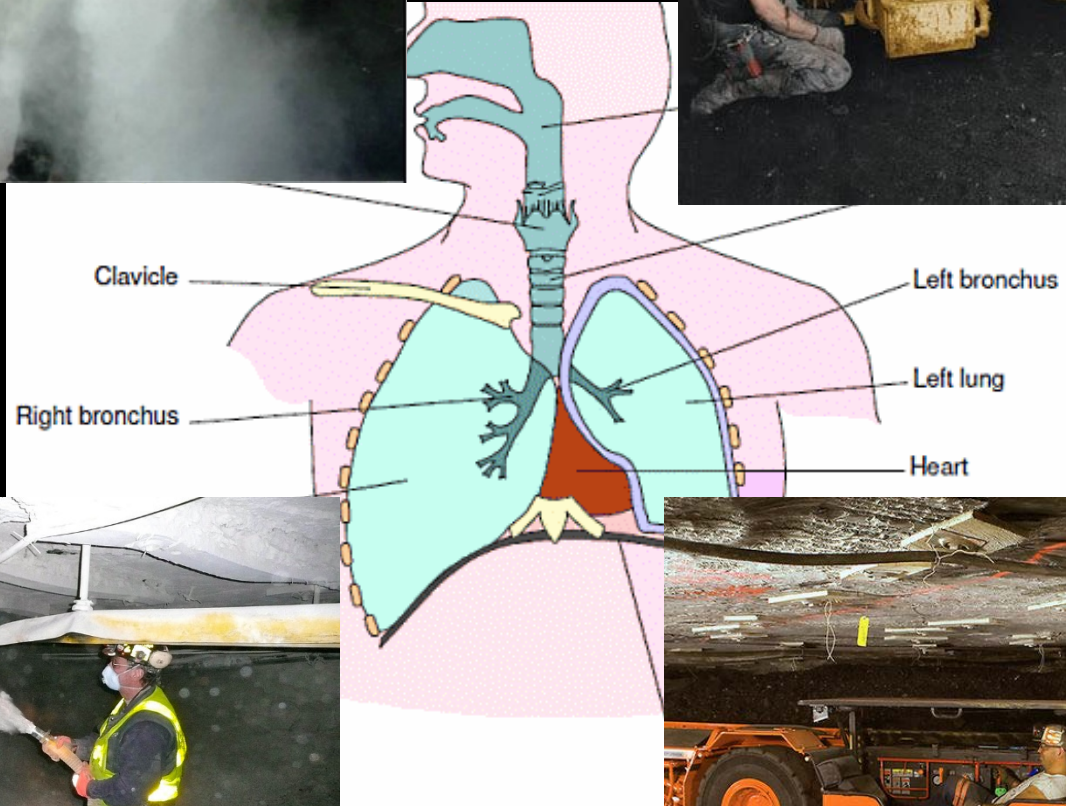
University of Illinois at Chicago School of Public Health

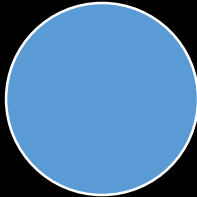
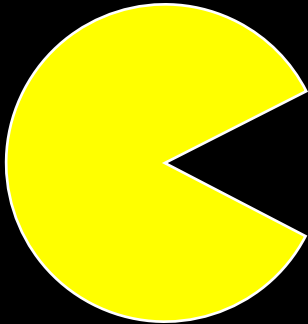
24 February 2020

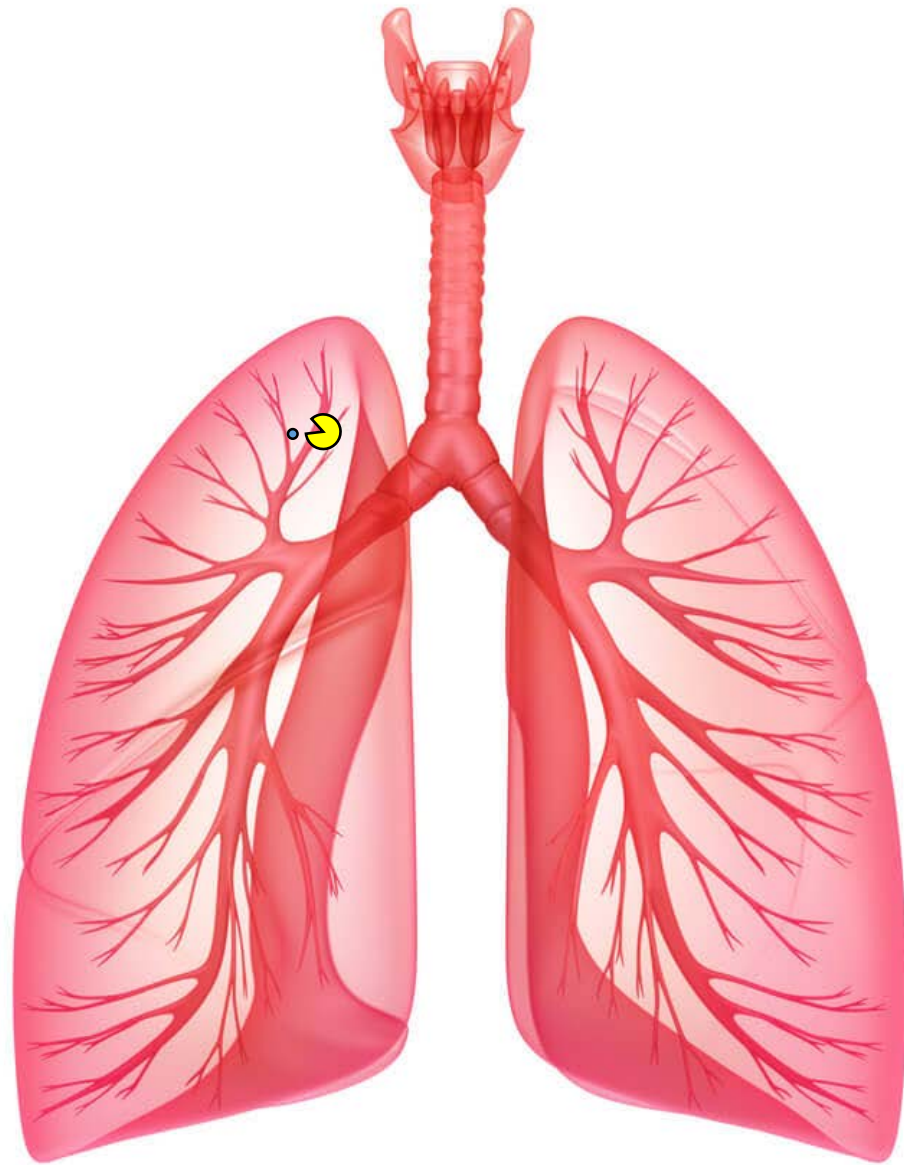


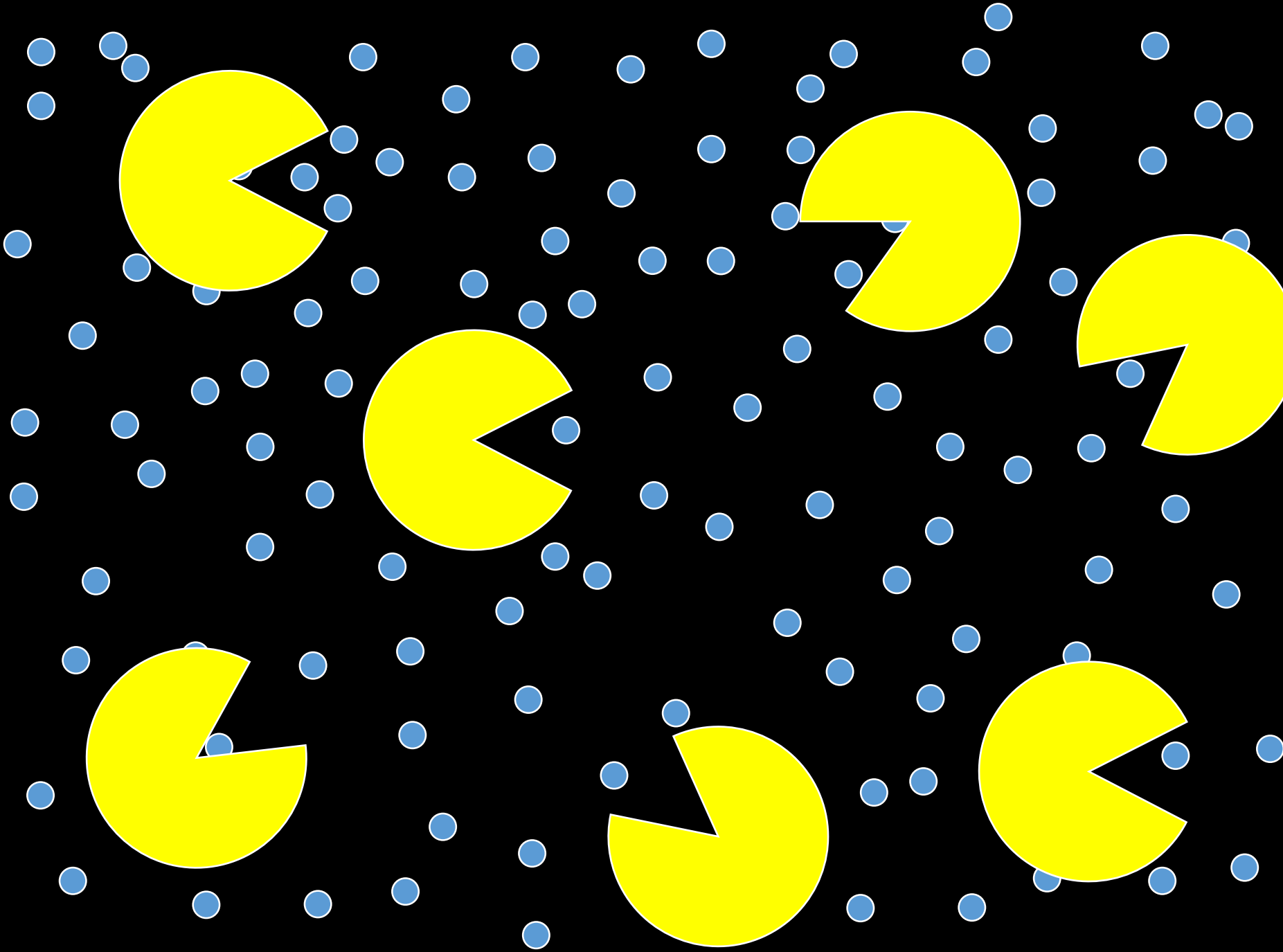
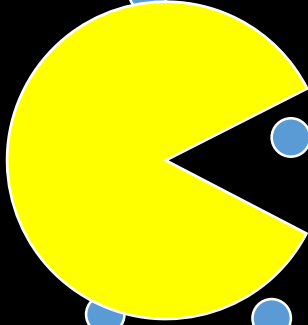
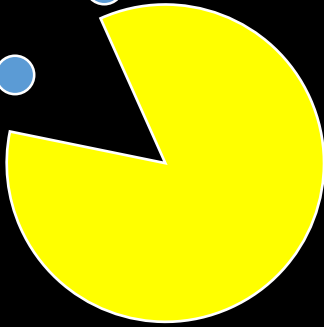
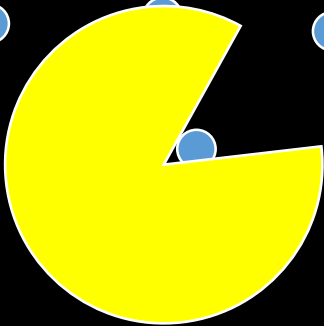
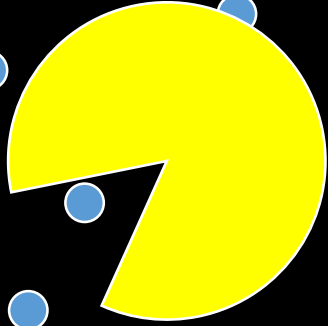
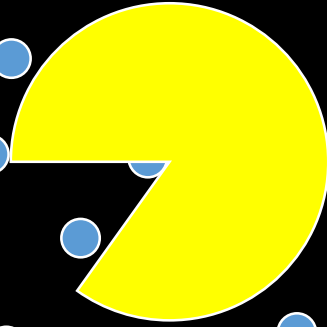
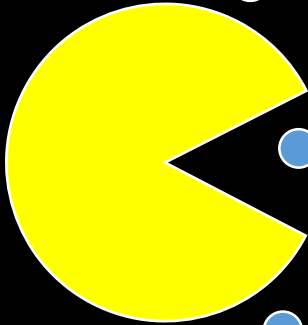
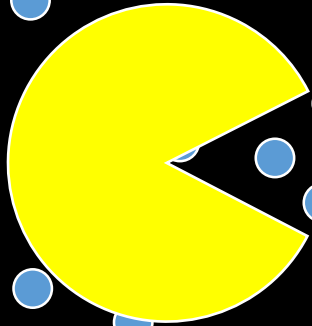


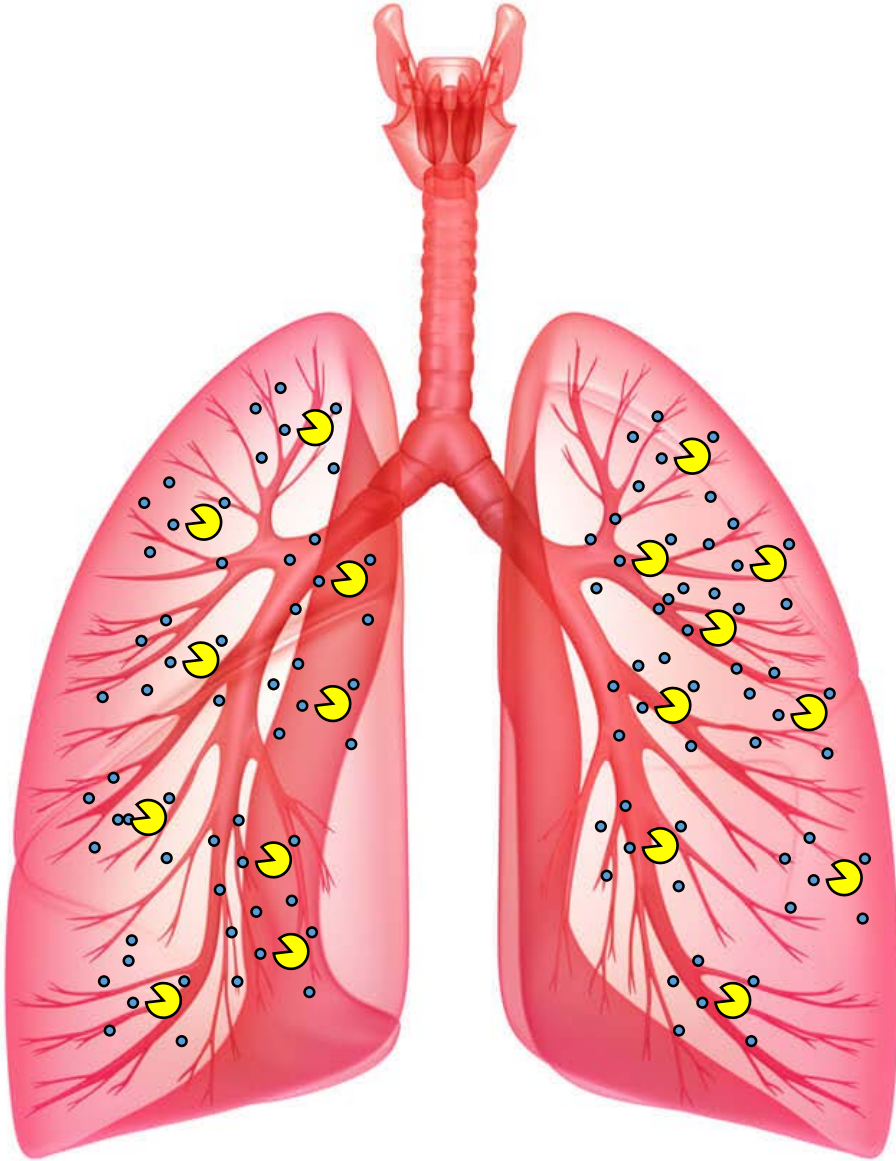








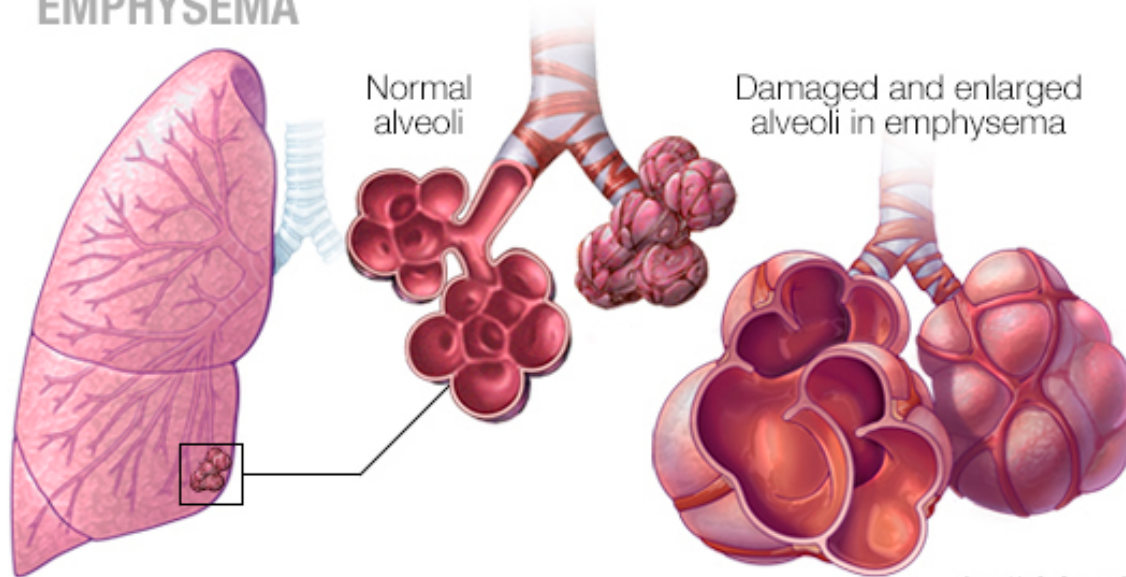




Cavities

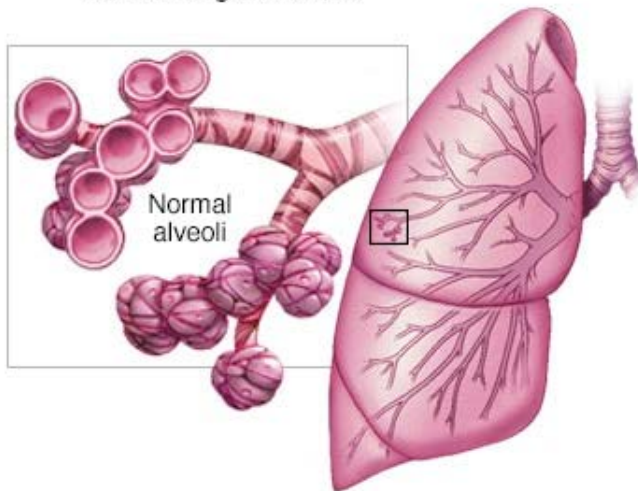


EMPHYSEMA



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Normal lung and alveoli



Alveoli in pulmonary fibrosis



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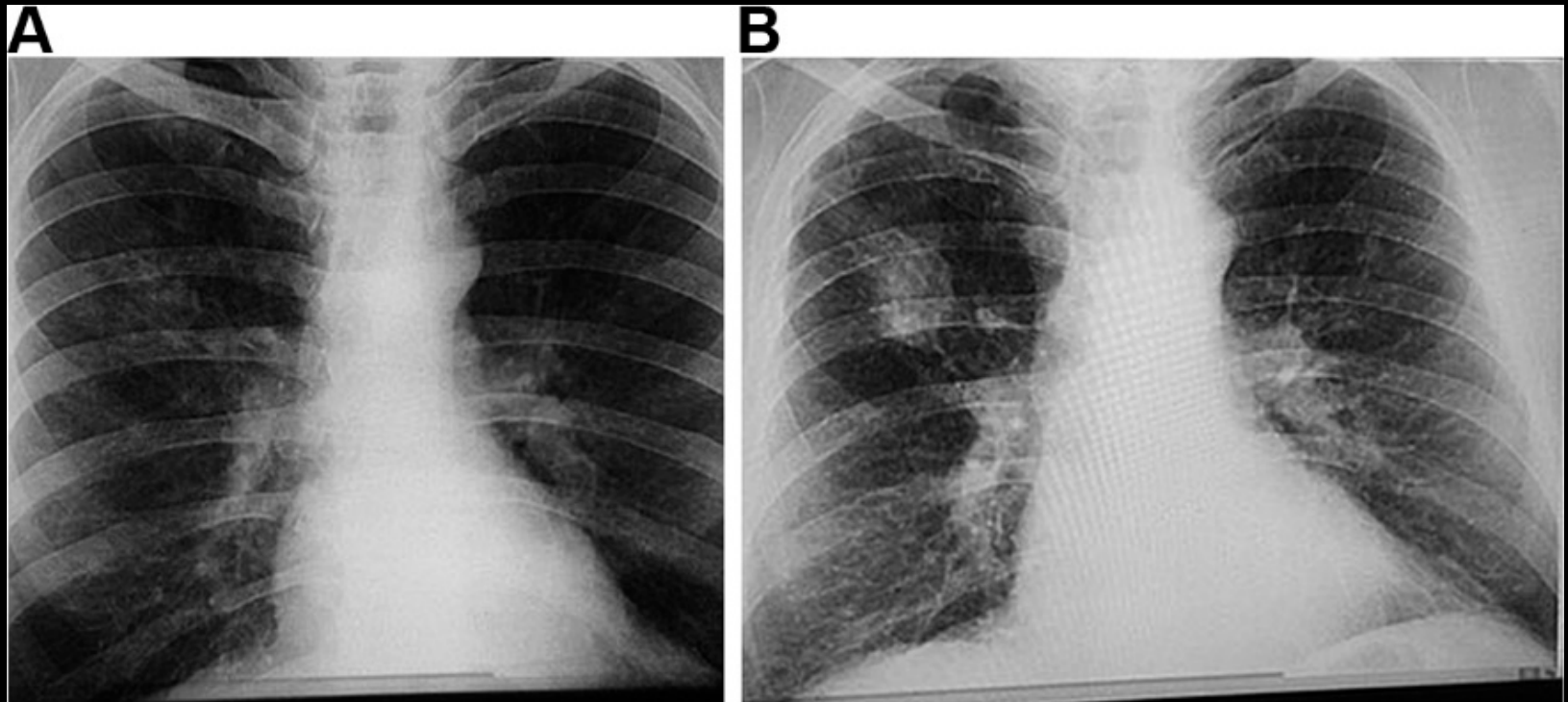
Coal Workers' Pneumoconiosis

Coal Workers' Pneumoconiosis (CWP)

- “Simple” vs. “complicated” pneumoconiosis
 - Based on size of lesions
 - Loosely correlates with symptoms and degree of abnormality on lung function tests
 - False impression that “simple” means “benign”

Myth: Simple CWP starts as rounded opacities in the upper lung zones

- Important because this determines how a doctor looks at and interprets a chest x-ray or CT scan

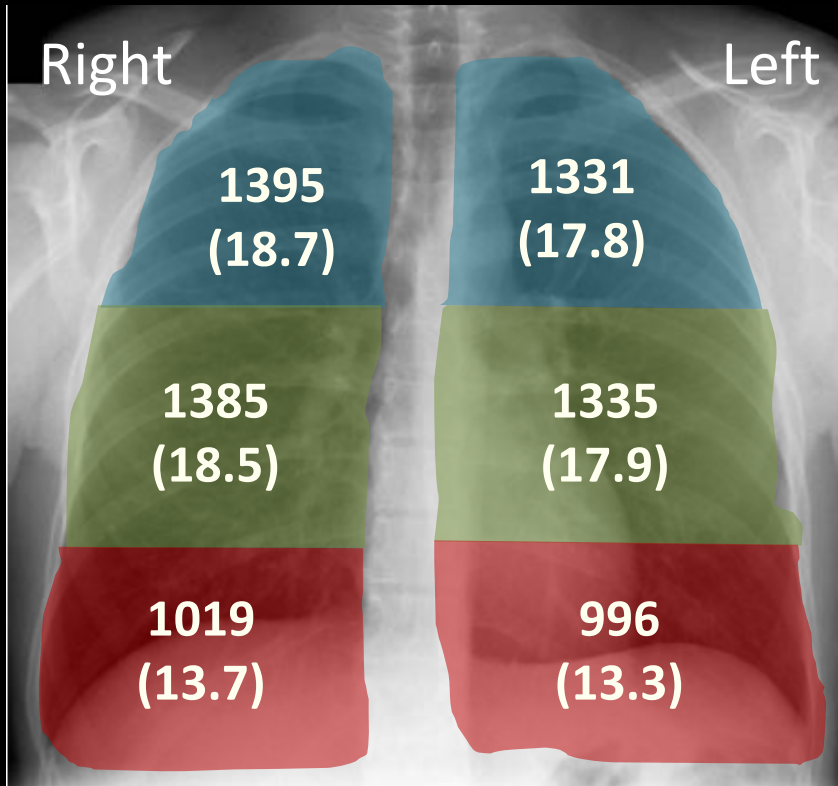


Small Opacities

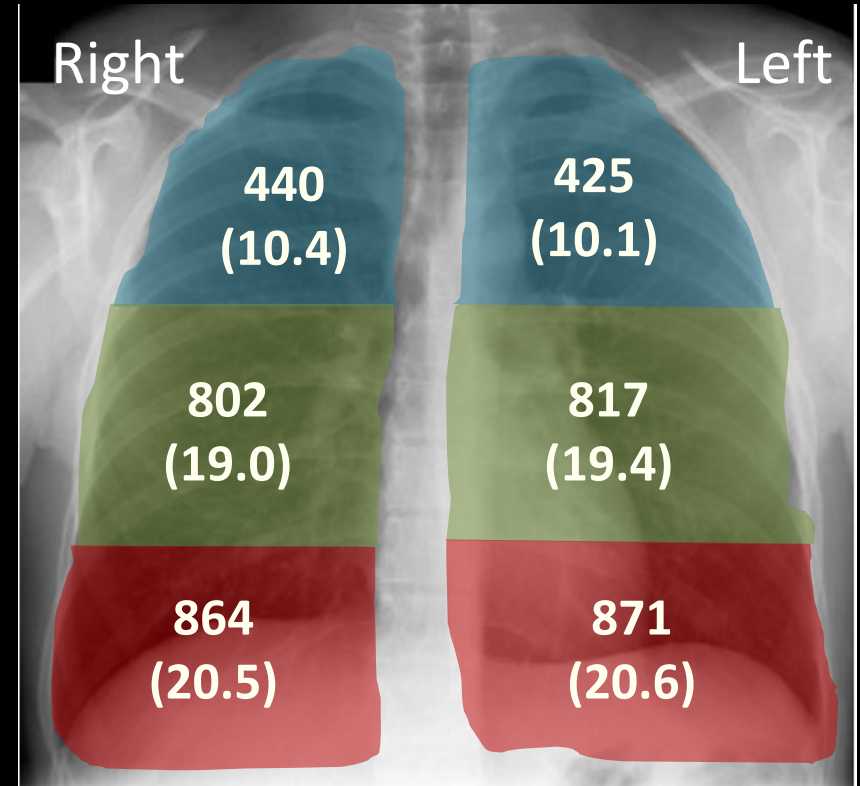
- Not all opacities are rounded
 - 37.9% of all miners had irregular opacities, tended to be lower-zone predominant
- Distribution of opacities may be “atypical”
 - 5.9% of miners with rounded opacities had low- or low/mid-zone abnormalities
 - 2.4% of miners with irregular opacities had upper- or upper/mid-zone abnormalities

Distribution by Shape

Rounded



Irregular



Small Opacities

- In an individual miner, CMDLD *cannot* be ruled out based solely only on
 - Size of opacities
 - Shape of opacities
 - Distribution of opacities

Myth: CWP cannot develop or worsen once a miner stops being exposed to coal mine dust

- Important because this affects how we look at
 - The risk of lung disease getting worse after a miner leaves their work
 - How we look at active coal miners and their lifetime risk of disease

CWP After Mining

- Can radiographic CWP develop after cessation of coal mine dust exposure?
- Francois et al., 1990
 - 3070 former miners in France
 - No radiographic evidence of pneumoconiosis on CXR at retirement

CWP After Mining

- Francois et al.
 - 741 new cases (24%) in CXRs performed after retirement
 - Rate higher
 - In younger age groups, decreasing after age 70
 - With greater mining tenure

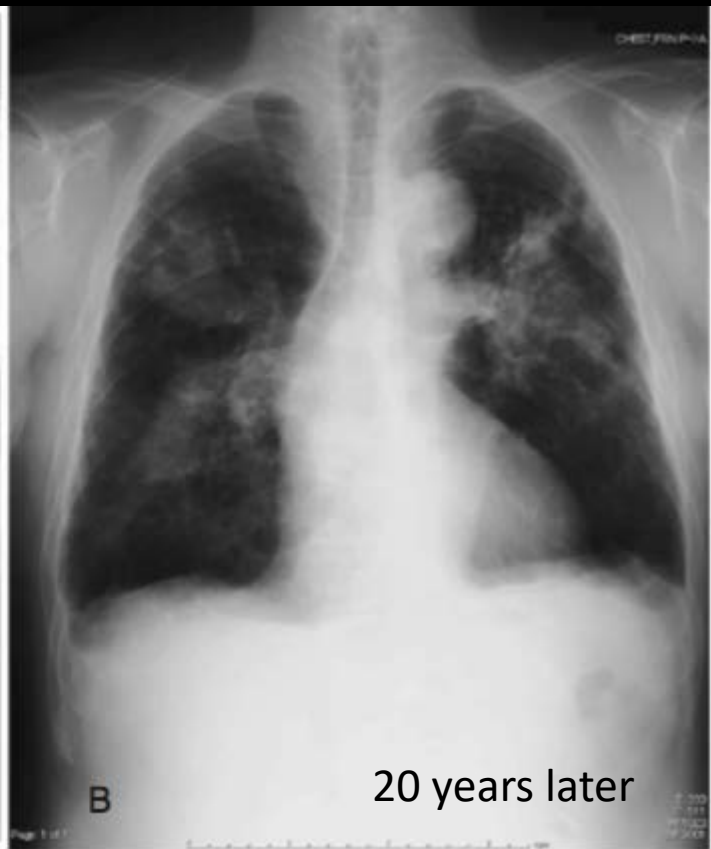
Radiographic category	Number
Category 1	535 (69%)
Category 2	186 (21%)
Category 3	20 (<1%)
PMF	72 (10%)

CWP Progression After Mining?

- Does CWP progress after mine dust exposures stop?
- Kimura et al. 2010
 - Hokkaido, Japan – 1985-2005
 - Started with 1091 miners with category 1 to category B CXRs at around retirement
 - Specifically excluded category 0
 - Follow up CXRs at 10 years and 20 years



A End of employment



B 20 years later

CWP Progression After Mining

- Kimura et al. results:
 - 62% of 207 after 10 years with progression
 - 29% of 85 after 20 years
 - Many progressed from simple to complicated CWP
 - 31% of category 1 films in 10 years
 - 55% of category 2 films
 - Progressors vs. non-progressors not distinguishable by age, initial spirometry, tenure

PMF After Mining

- US Department of Labor data, 2000-2013
- N = 1905 with multiple claims for Federal Black Lung benefits
- Evaluated changes in chest x-ray readings across claims

Results: First and Final CXRs

Table 1. Comparison of International Labour Office (ILO) interpretations of large opacities from CXRs of former U.S. coal miners applying for benefits from the Department of Labor Black Lung Benefits Program, 2000 – 2013.¹

Large Opacity Score at First CXR	Large Opacity Score at Final CXR	Miners (n)
O	O	1,825
A	A	1
O	A	48
O	B	17
O	C	6
A or B	O	8

¹ CXRs ranged from 2000 to 2014, associated with claims made to the DOL BLBP between 2000 and 2013.

Coal Workers' Pneumoconiosis

- There is not just one pattern of pneumoconiosis
 - Need for clinicians and radiologists to be aware of spectrum of disease
 - Need for government awareness
- Pneumoconiosis can develop or worsen after a miner stops working
 - Need for continued monitoring after coal mine career
 - Implications for screening, permissible dust levels
 - Factor to be considered by active miners with disease