

# Pneumoconiosis

## Pneumoconiosis-

- Pneumoconioses encompass a group of **chronic fibrosing diseases** of the lung resulting from exposure to organic and inorganic particulates, most commonly mineral dust

Table 15-6 Lung Diseases Caused by Air Pollutants

Agent	Disease	Exposure
Mineral Dusts		
Coal dust	Anthracosis Macules Progressive massive fibrosis Caplan syndrome	Coal mining (particularly hard coal)
Silica	Silicosis Caplan syndrome	Metal casting work, sandblasting, hard rock mining, stone cutting, others
Asbestos	Asbestosis Pleural plaques Caplan syndrome Mesothelioma Carcinoma of the lung, larynx, stomach, colon	Mining, milling, manufacturing, and installation and removal of insulation
Beryllium	Acute berylliosis Beryllium granulomatosis Lung carcinoma (?)	Mining, manufacturing
Iron oxide	Siderosis	Welding
Barium sulfate	Baritosis	Mining
Tin oxide	Stannosis	Mining
Organic Dusts That Induce Hypersensitivity Pneumonitis		
Moldy hay	Farmer's lung	Farming
Bagasse	Bagassosis	Manufacturing wallboard, paper
Bird droppings	Bird-breeder's lung	Bird handling
Organic Dusts That Induce Asthma		
Cotton, flax, hemp	Byssinosis	Textile manufacturing
Red cedar dust	Asthma	Lumbering, carpentry
Chemical Fumes and Vapors		
Nitrous oxide, sulfur dioxide, ammonia, benzene, insecticides	Bronchitis, asthma Pulmonary edema ARDS Mucosal injury Fulminant poisoning	Occupational and accidental exposure

ARDS, Acute respiratory distress syndrome.

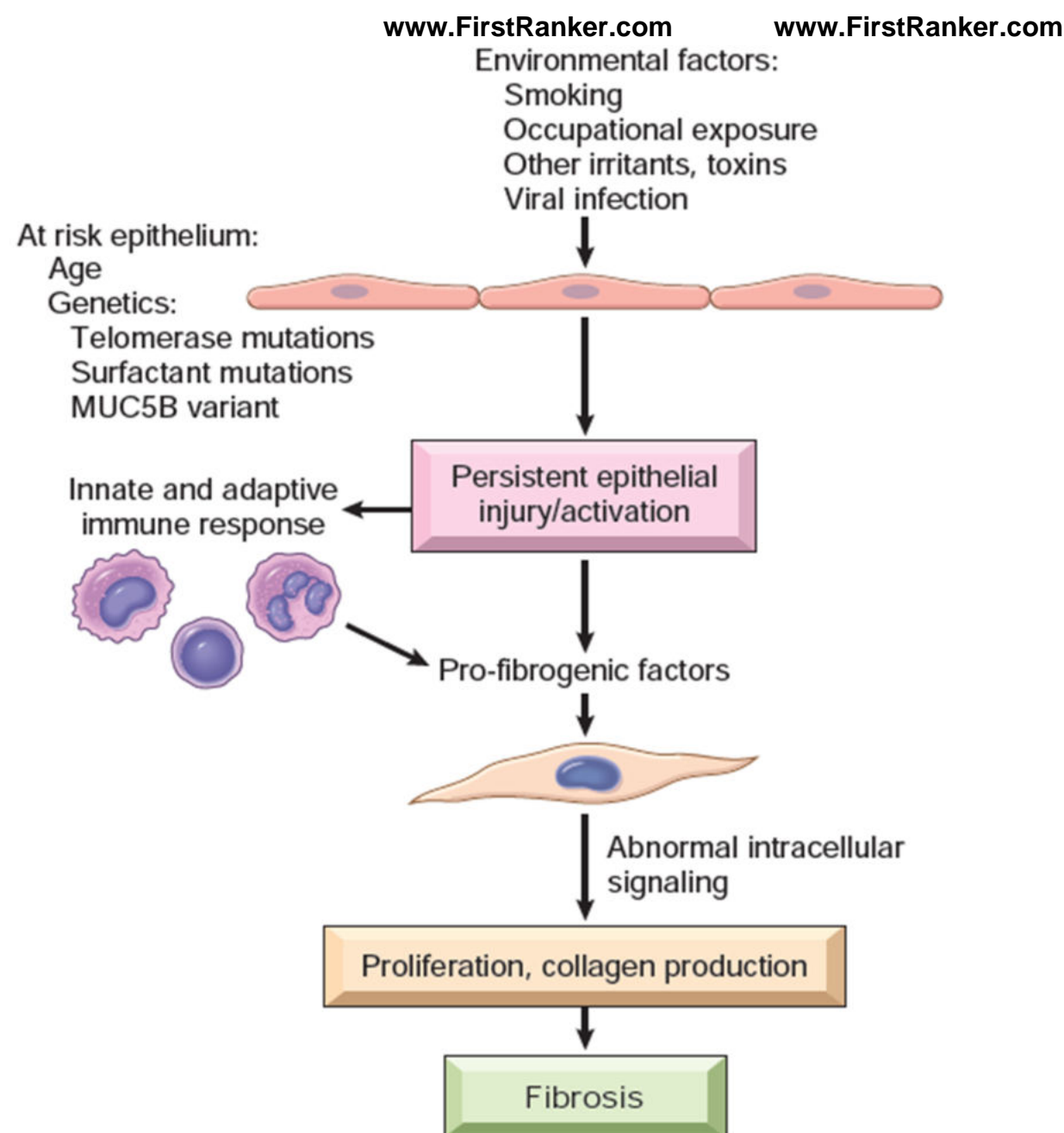
• **Pathogenesis-**

- (1) **amount of dust**
- (2) **size, shape**, and buoyancy of the particles
  - small particles,1 to 5 μm –acute lung injury
  - Large particle-evoke fibrosing collagenous pneumoconioses
- (3) particle **solubility** and physiochemical reactivity-small particles composed of injurious substances of high solubility
- (4) additional effects of other irritants

- particles stimulate resident innate immune cells in the lung
- invokes systemic response
- a genetic predisposition

## Particles size

- 2.5–10  $\mu\text{m}$ -
  - bronchi and bronchioles
  - removed by mucociliary action
- <2.5  $\mu\text{m}$ - acini
- <100 nm-penetrate alveolar walls



## Silicosis

- Silicosis is the most common pneumoconiosis in the world, and crystalline silica (e.g., quartz) is the usual culprit
- caused by inhalation of proinflammatory **crystalline silicon dioxide**

## Pathogenesis-

➤ crystalline and amorphous forms

- crystalline forms (including quartz, cristobalite, and tridymite)- much more fibrogenic
- Phagocytosed silica crystals activate the inflammasome, leading to the release of inflammatory mediators, particularly IL-1 and IL-18

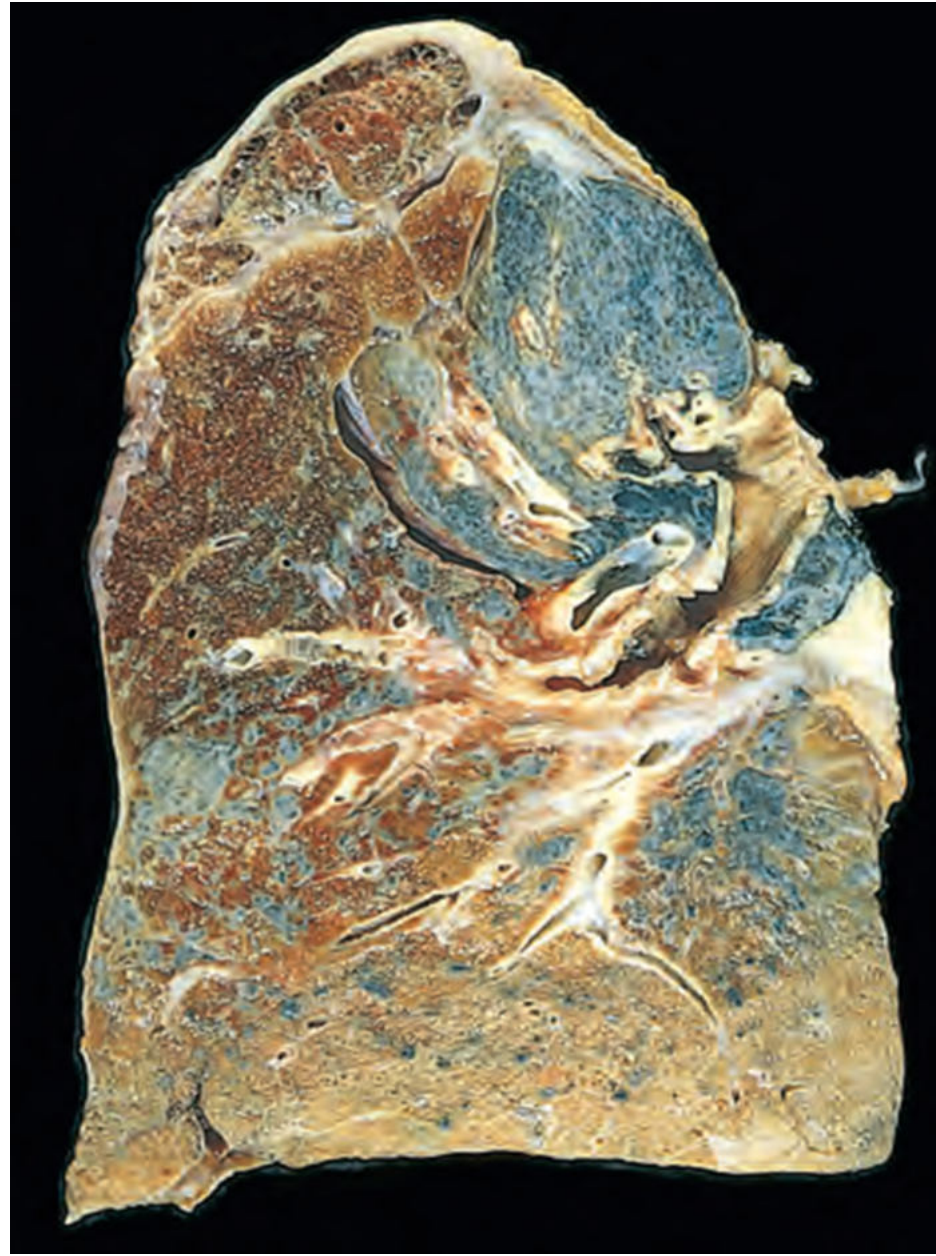
- disease may continue to worsen even if the patient is **no longer exposed**
- It is associated with an increased susceptibility to ***tuberculosis***
- Patients with silicosis have double the risk for developing **lung cancer**

- **SIMPLE NODULAR SILICOSIS:** most common form of silicosis
- **PROGRESSIVE MASSIVE FIBROSIS:** nodular masses greater than 2 cm in diameter, in a background of simple silicosis
  - bilateral
  - 5–10 cm
  - Central cavitation

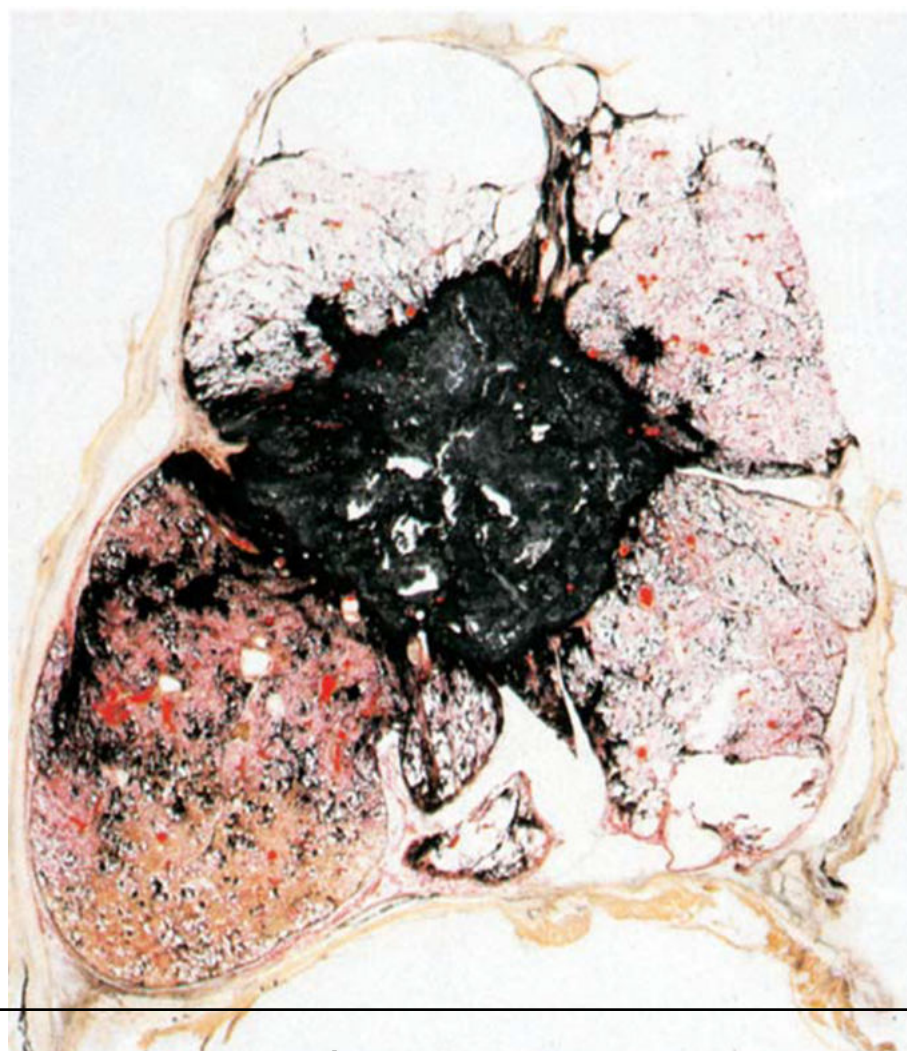
- **ACUTE SILICOSIS:**
  - heavy exposure to finely particulate silica during sandblasting or boiler scaling
  - it is associated with diffuse fibrosis of the lung
  - Silicotic nodules are not found
  - Microscopically, Dense eosinophilic material accumulates in alveolar spaces



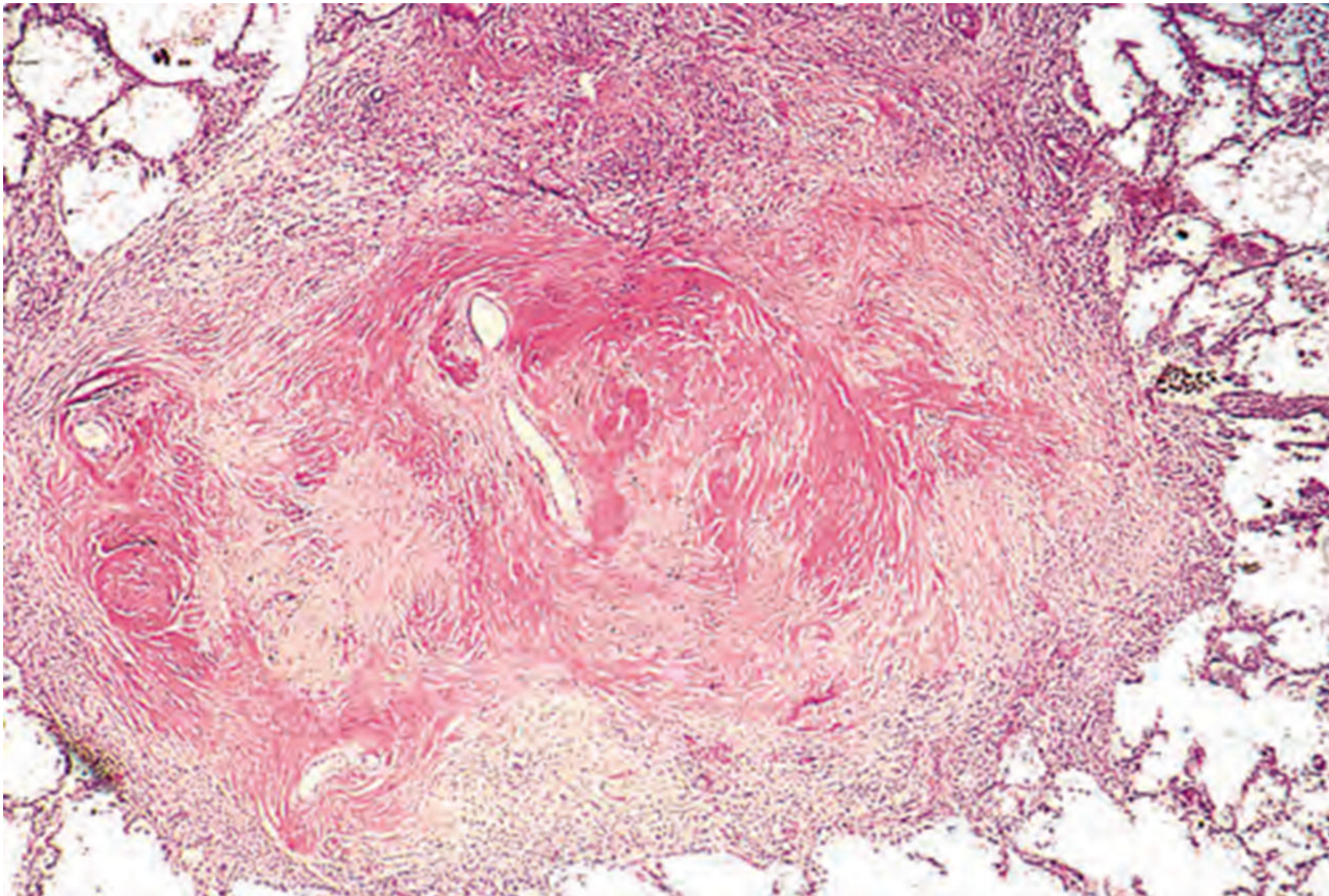
# Gross



## Progressive massive fibrosis







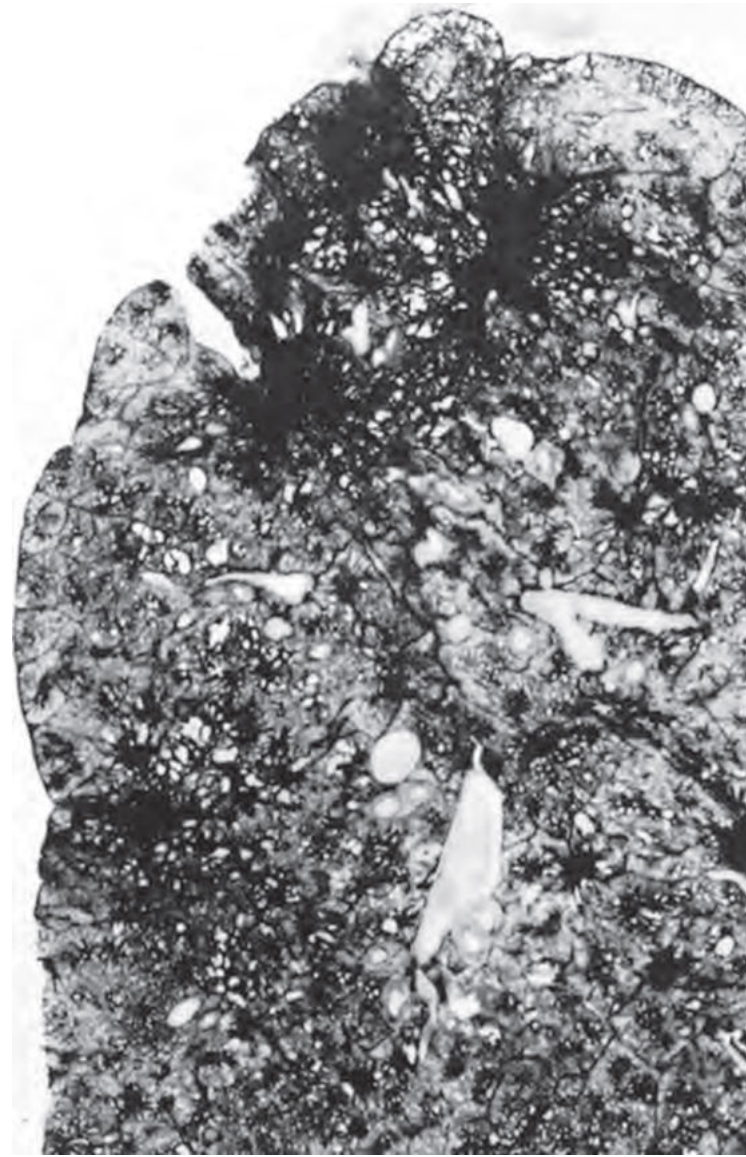
Several coalescent collagenous silicotic nodules

## Coal Workers' Pneumoconiosis

- caused by inhalation of coal particles and other admixed forms of dust
- Contaminating silica in the coal dust favour progressive disease
- develop **emphysema** and **chronic bronchitis** independent of smoking







## Asbestos-Related Diseases

- Asbestos (Greek, “unquenchable”) includes a group of fibrous silicate minerals that occur as thin fibers
  - Chrysotile accounts for the bulk of commercially used asbestos
  - The amphiboles include **amosite**, **crocidolite**, tremolite, actinolite and anthophyllite.

- ASBESTOSIS: Asbestosis is diffuse interstitial fibrosis resulting from inhalation of asbestos fibers
- historically seen in asbestos miners, millers and insulators

#### ETIOLOGIC FACTORS:

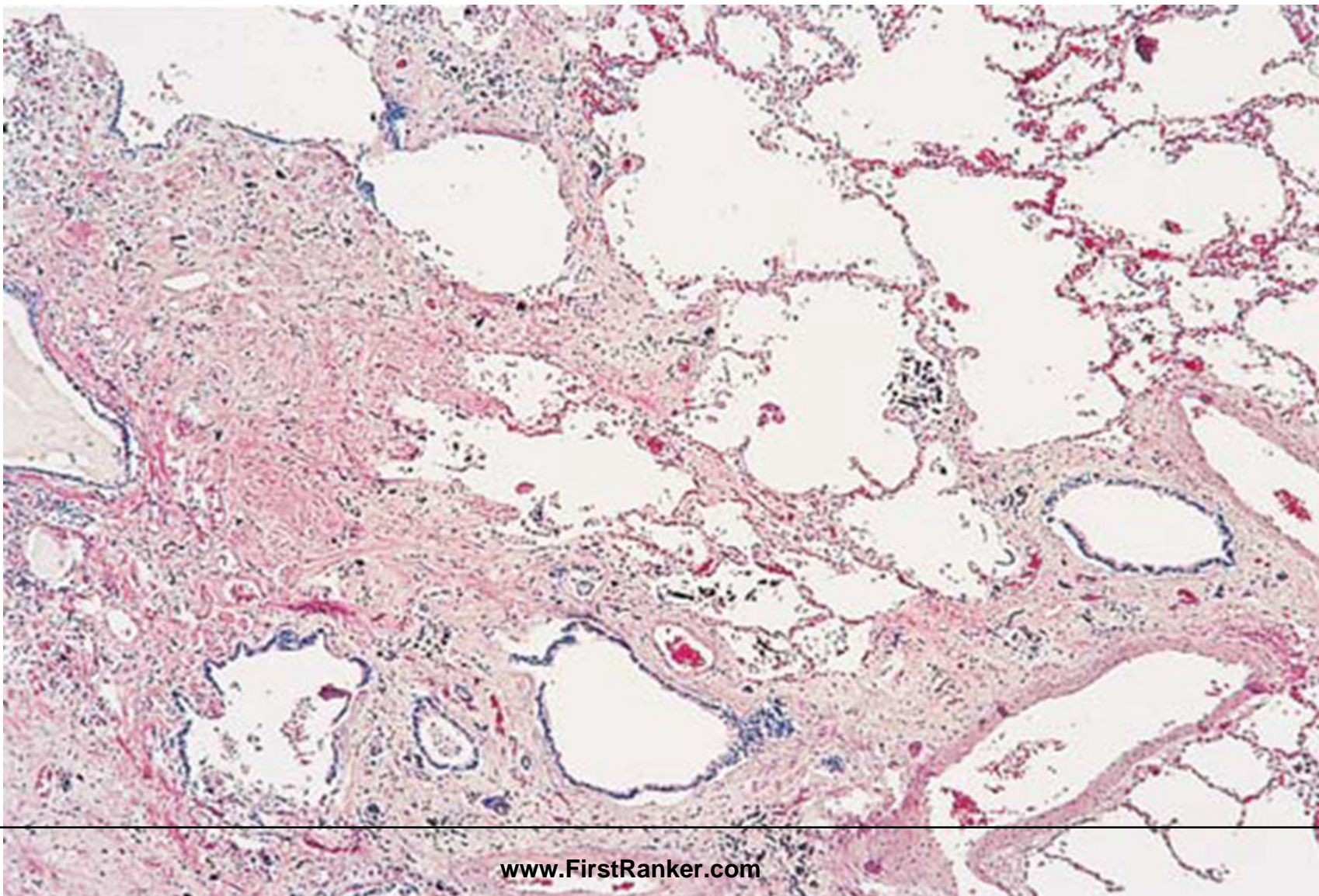
- Asbestos fibers may be **long (up to 100  $\mu\text{m}$ )** but **thin (0.5–1  $\mu\text{m}$ )**, so their aerodynamic particle diameter is small
- They deposit in distal airways and alveoli, particularly at bifurcations of alveolar ducts
- first lesion is an alveolitis



## **PATHOLOGY:**

- bilateral, diffuse interstitial fibrosis
- asbestos bodies in the lung In early stages, fibrosis
- end-stage or “honeycomb” lung

## **Asbestosis**

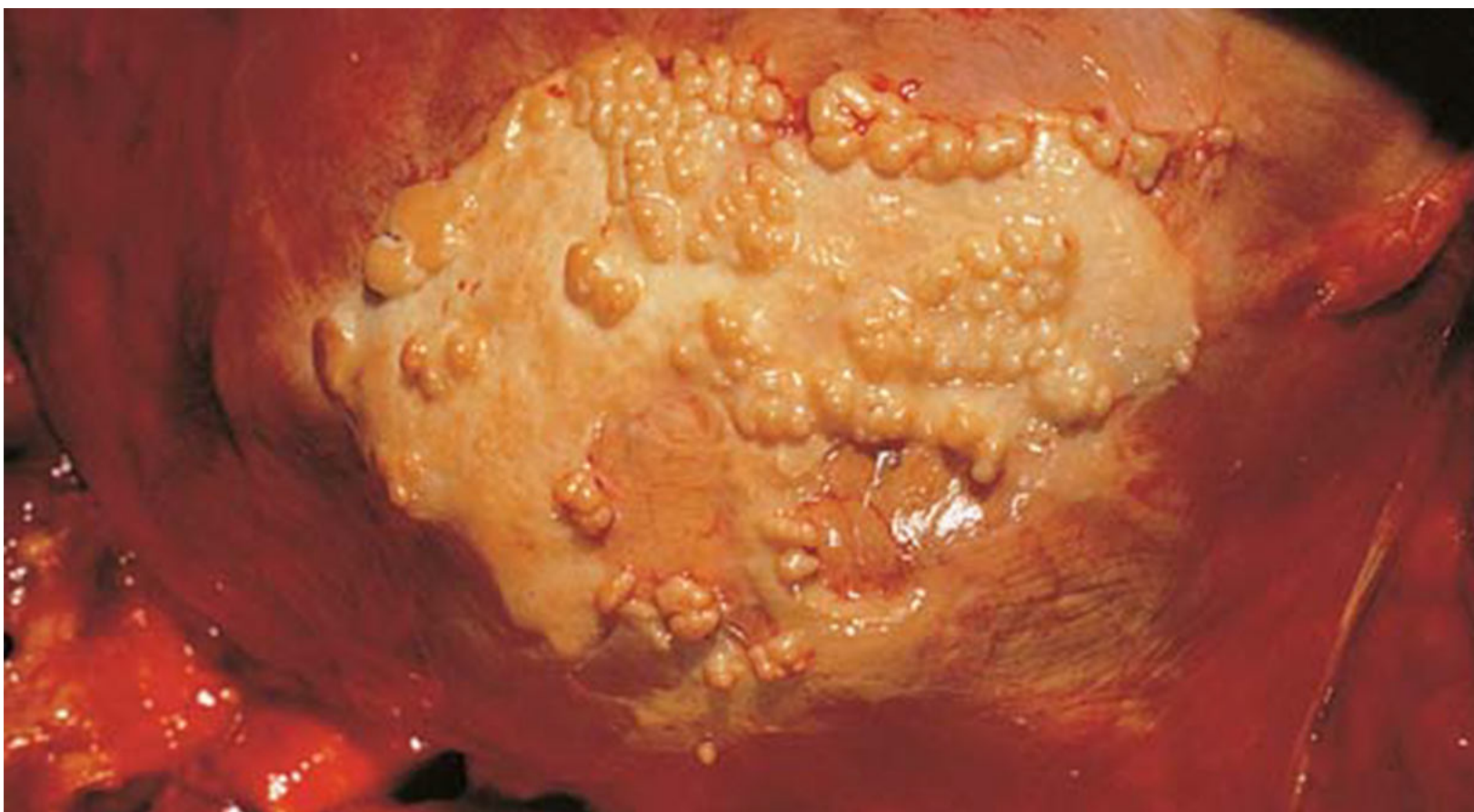




## Asbestos bodies



## Pleural plaque



- BENIGN PLEURAL EFFUSION
- PLEURAL PLAQUES-
  - most common manifestation of asbestos
  - well-circumscribed plaques of dense collagen often calcified
- DIFFUSE PLEURAL FIBROSIS
- ROUNDED ATELECTASIS
- MESOTHELIOMA
- CARCINOMA OF THE LUNG

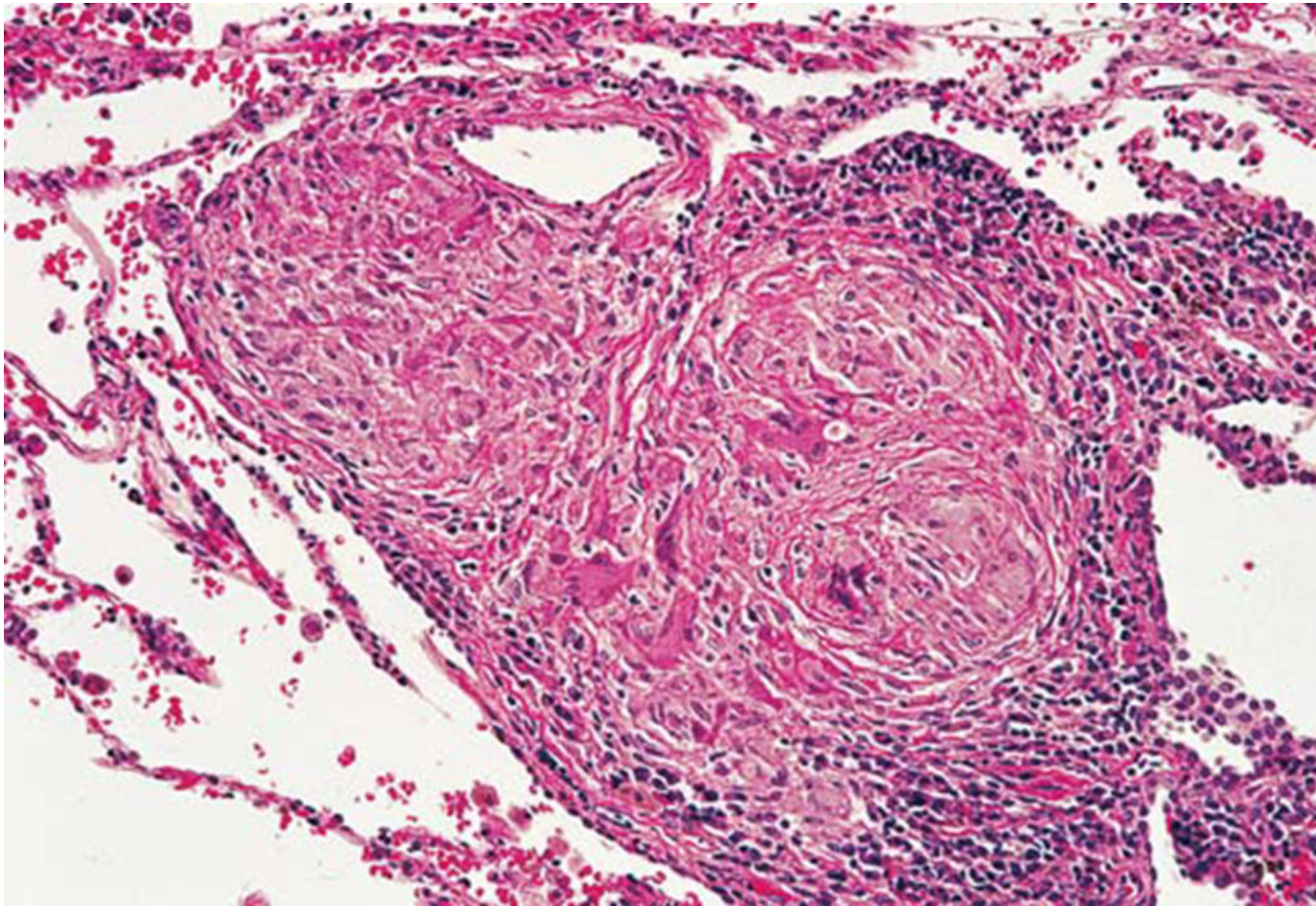
## Berylliosis

- pulmonary disease that follows the inhalation of beryllium
- materials in aerospace, industrial ceramics and nuclear industries





## Berylliosis



## Talcosis

- Prolonged and Heavy Exposure to Talc Dust
- magnesium silicates
- lubricants, and in cosmetics and pharmaceuticals
- Associated minerals such as silica may contribute to the fibrotic changes
- Tiny nodules to severe fibrosis
- Foreign body granulomas associated with birefringent plate-like talc particles

# Thank you

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