

Respiratory system – Pathology

CHRONIC INTERSTITIAL(RESTRICTIVE, INFILTRATIVE) LUNG DISEASES

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SILICOSIS

- The most prevalent chronic occupational disease in the world
- Inhalation of crystalline silica mostly in occupational settings
- quartz is the most common

- Amorphous silica is less pathogenic
- Workers in sandblasting and hard-rock mining are at high risk.

PATHOGENESIS

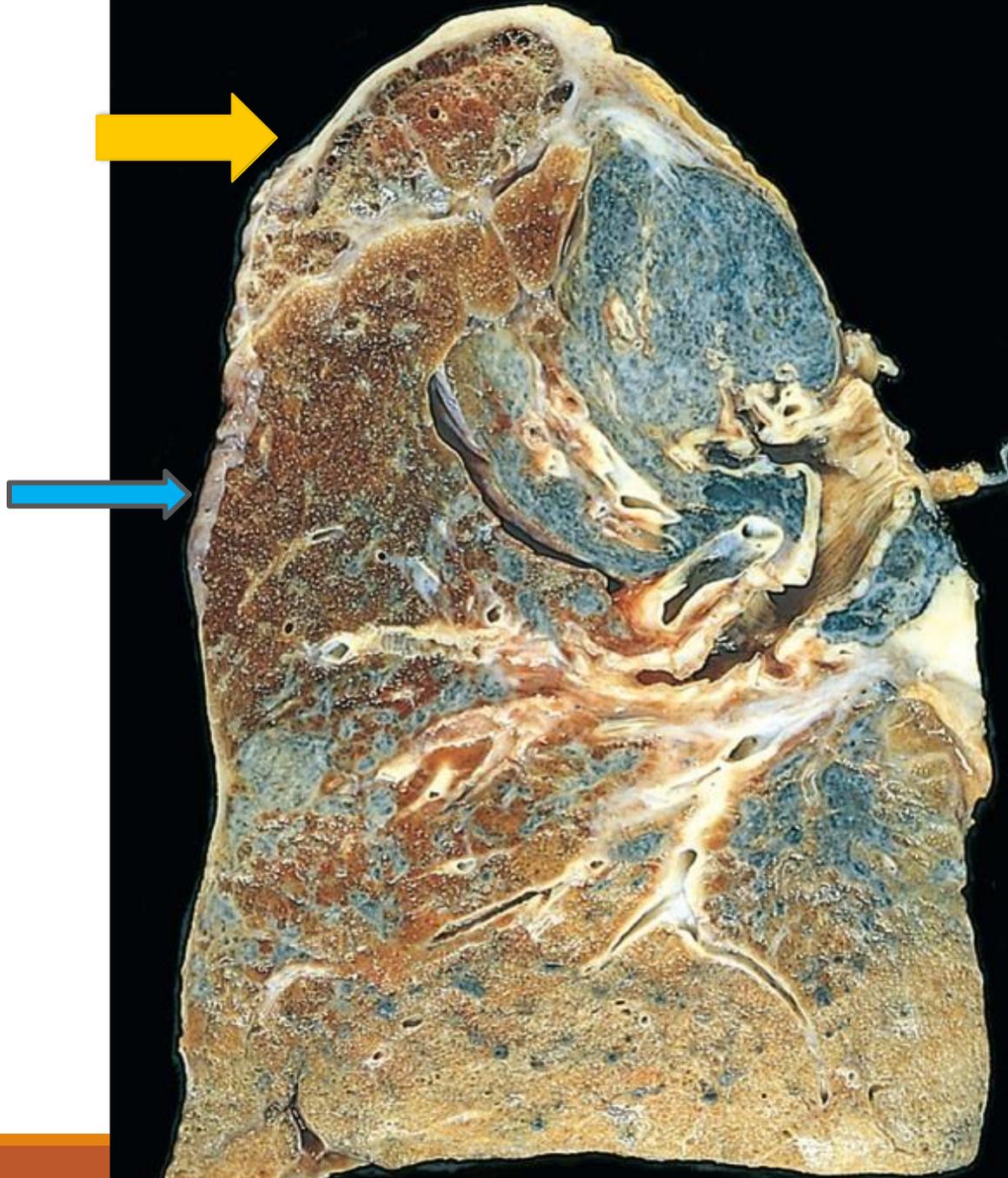
- After inhalation, the particles interact with epithelial cells and macrophages.
- Activating the inflammasome and the release of inflammatory mediators by pulmonary macrophages
 - IL-1, TNF, fibronectin, lipid mediators, oxygen-derived free radicals, and fibrogenic cytokines.

- When mixed with other minerals, the fibrogenic effect of quartz is reduced.
- This fortuitous situation is common place, as quartz in the workplace is rarely pure.

MORPHOLOGY, SILICOTIC NODULES:

- **Macroscopically:**

- early stages are tiny, barely palpable, discrete, pale-to-black (if coal dust is present) nodules
- Upper zones of the lungs

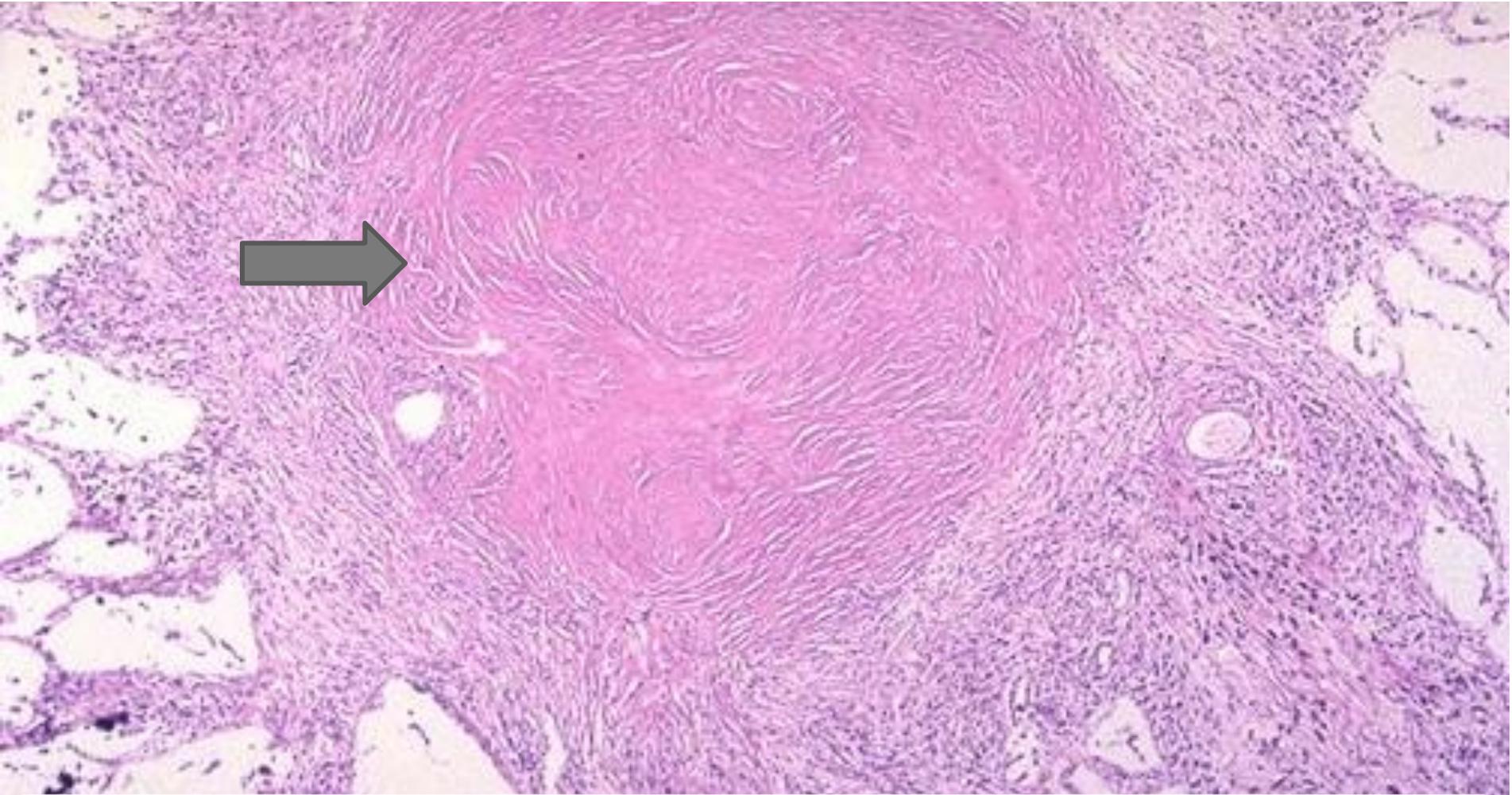


Courtesy of Dr. John Godleski, Brigham and Women's Hospital, Boston, Massachusetts.

- **Microscopically:**
- Silicotic nodules:
 - Concentrically arranged hyalinized collagen fibers surrounding amorphous center.
 - With “whorled” collagen fibers
- Polarized microscopy reveals weakly birefringent silica

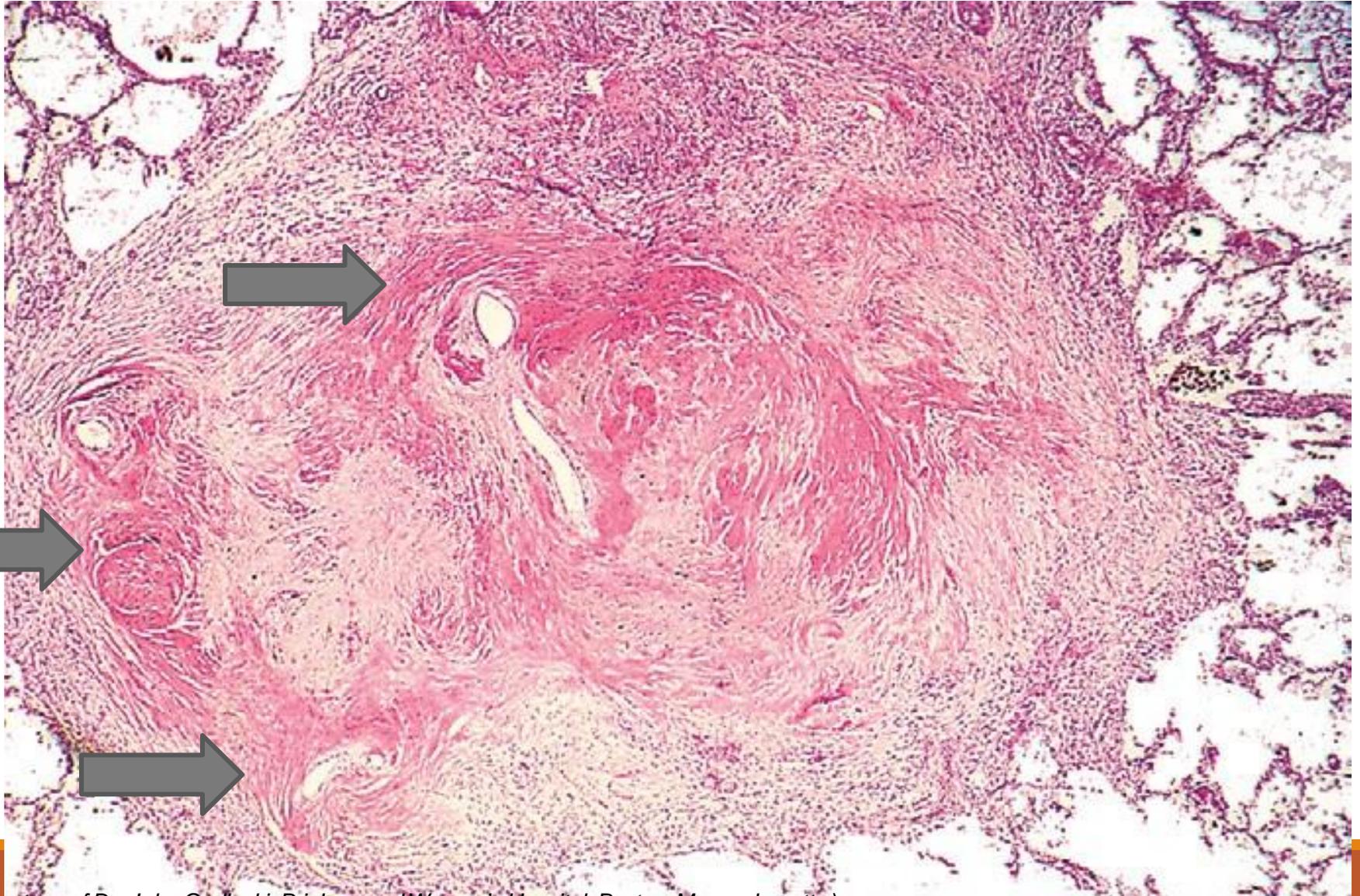
- Nodules may coalesce into hard, collagenous scars, with eventual progression to PMF
- Fibrotic lesions also may occur in hilar lymph nodes and pleura.

SILICOTIC NODULE

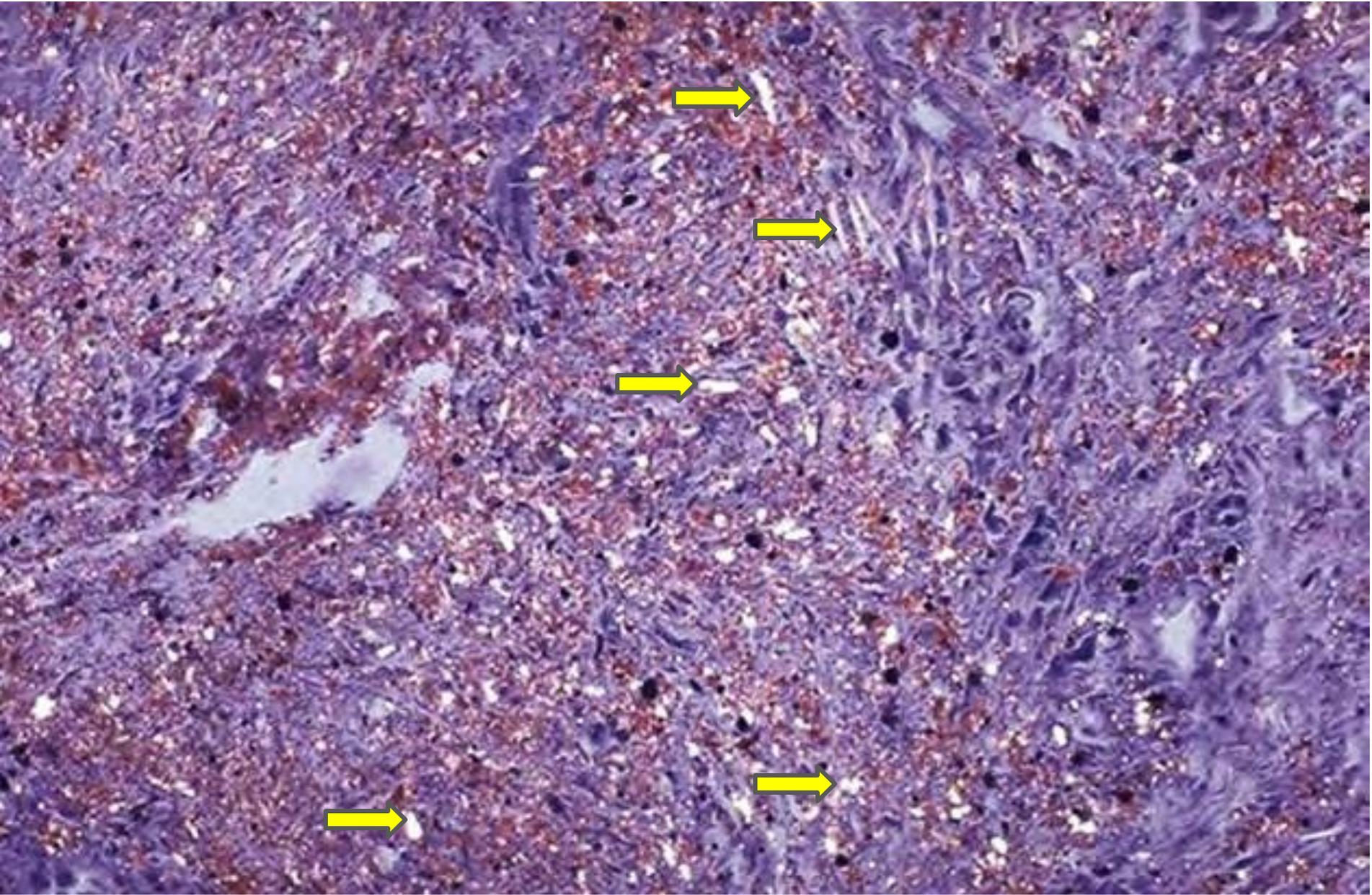


Concentrically arranged hyalinized collagen fibers surrounding amorphous center

SEVERAL COALESCENT COLLAGENOUS SILICOTIC NODULES



Courtesy of Dr. John Godleski, Brigham and Women's Hospital, Boston, Massachusetts.)



Silica crystals

CLINICAL FEATURES:

- Asymptomatic: detected as fine nodularity in the upper zones of the lung on routine chest radiographs
- after PMF: Shortness of breath, pulmonary hypertension and cor pulmonale
- slowly progressive, impairing pulmonary function to a degree that limits physical activity.

- Increased susceptibility to tuberculosis
- lung cancer ?

ASBESTOSIS AND ASBESTOS- RELATED DISEASES



ASBESTOS

- Family of crystalline hydrated silicates with a fibrous geometry.

ASSOCIATED WITH:

- parenchymal interstitial fibrosis (asbestosis);
- localized fibrous plaques or, rarely, diffuse pleural fibrosis.
- pleural effusions
- Lung carcinomas
- malignant pleural and peritoneal mesotheliomas
- laryngeal carcinoma

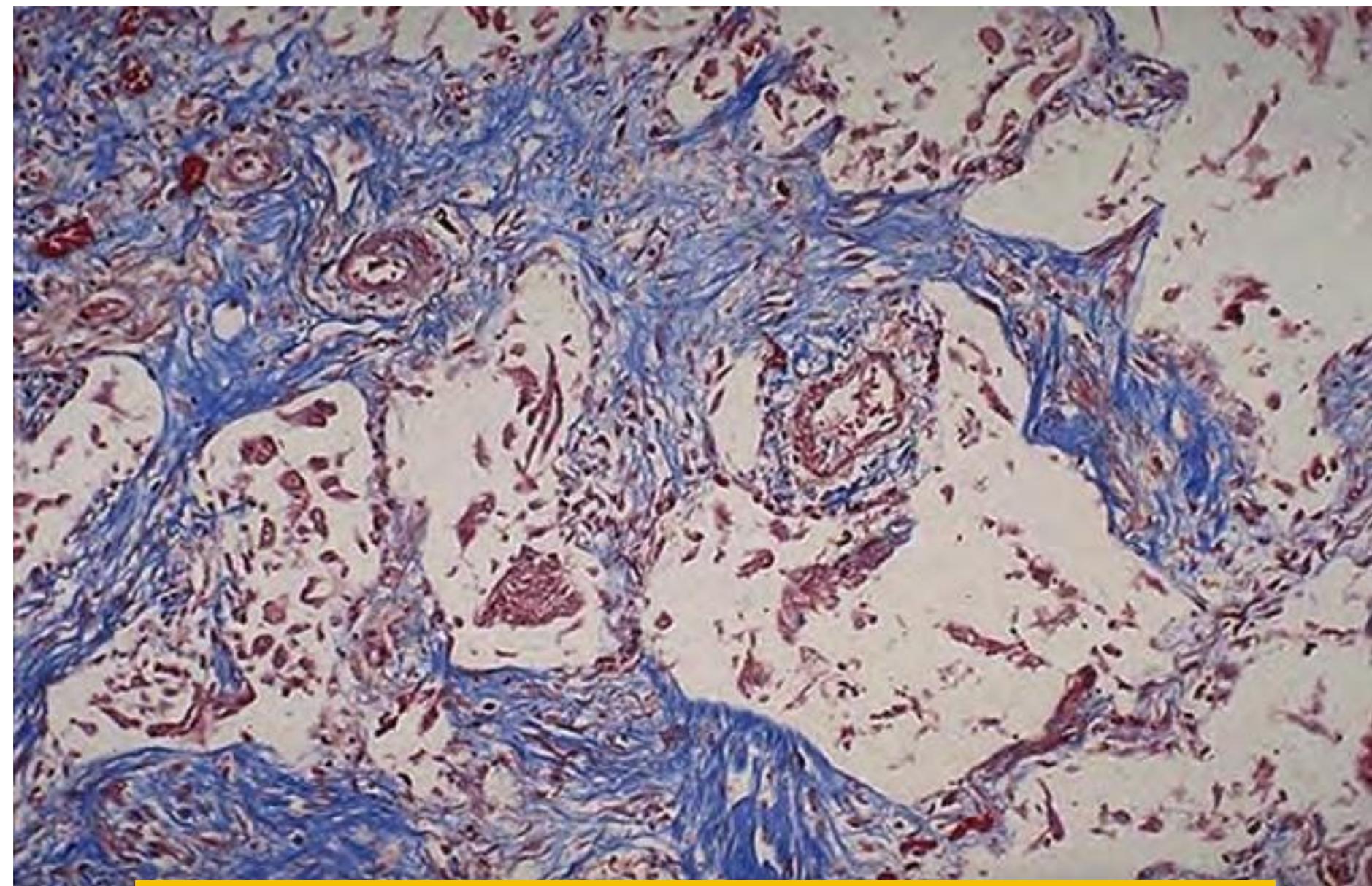
PATHOGENESIS:

- once phagocytosed by macrophages  asbestos fibers activate the inflammasome and damage phagolysosomal membranes
release of proinflammatory factors and fibrogenic mediators
 cellular and fibrotic lung reactions
- 1. tumor initiator and a promoter
 - mediated by the oncogenic effects of reactive free radicals
 - generated by asbestos fibers on the mesothelium.

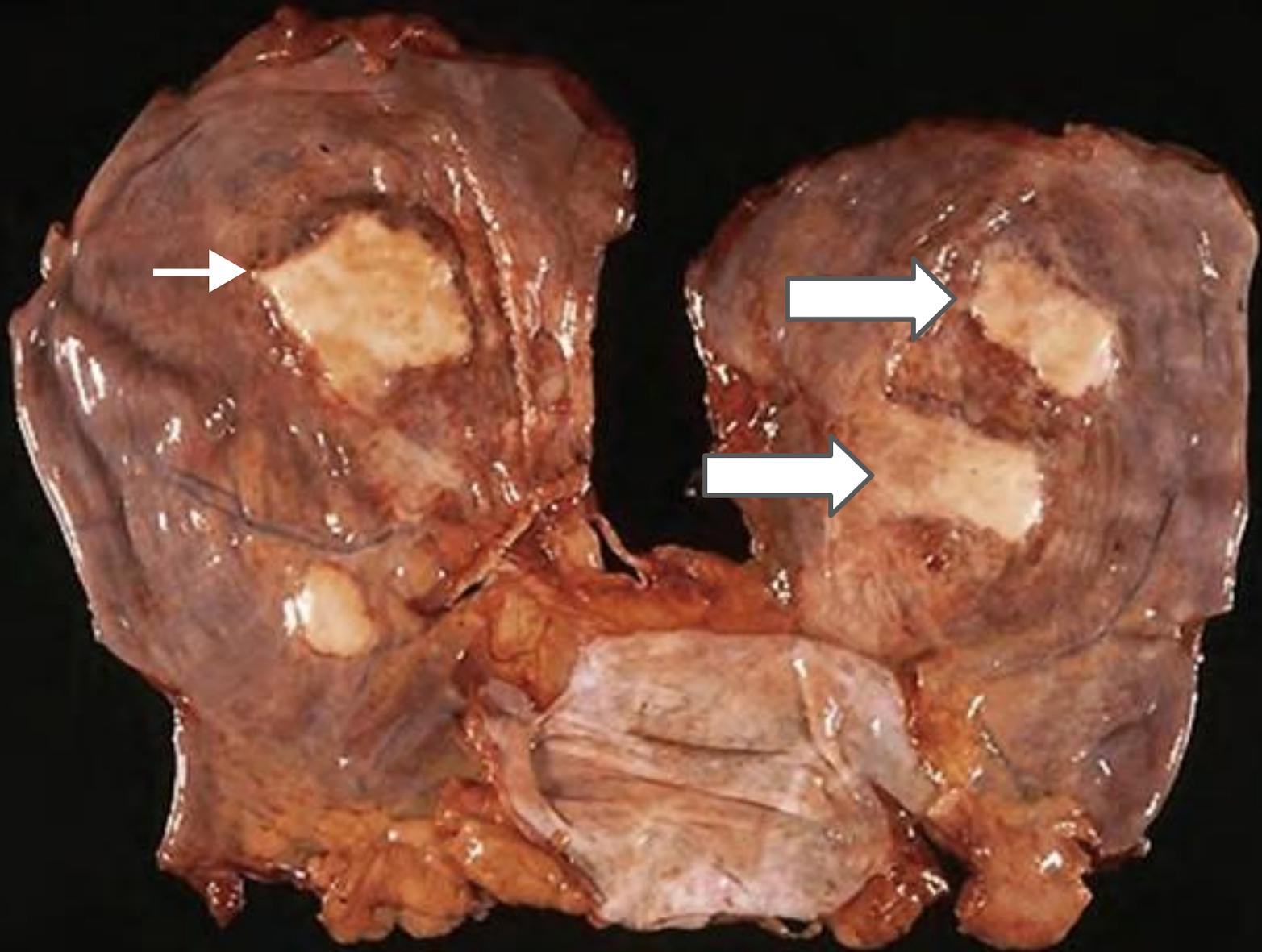
- Asbestos and tobacco:
 - The adsorption of carcinogens in tobacco smoke onto asbestos fibers results in remarkable synergy between tobacco smoking and the development of lung carcinoma in asbestos workers.



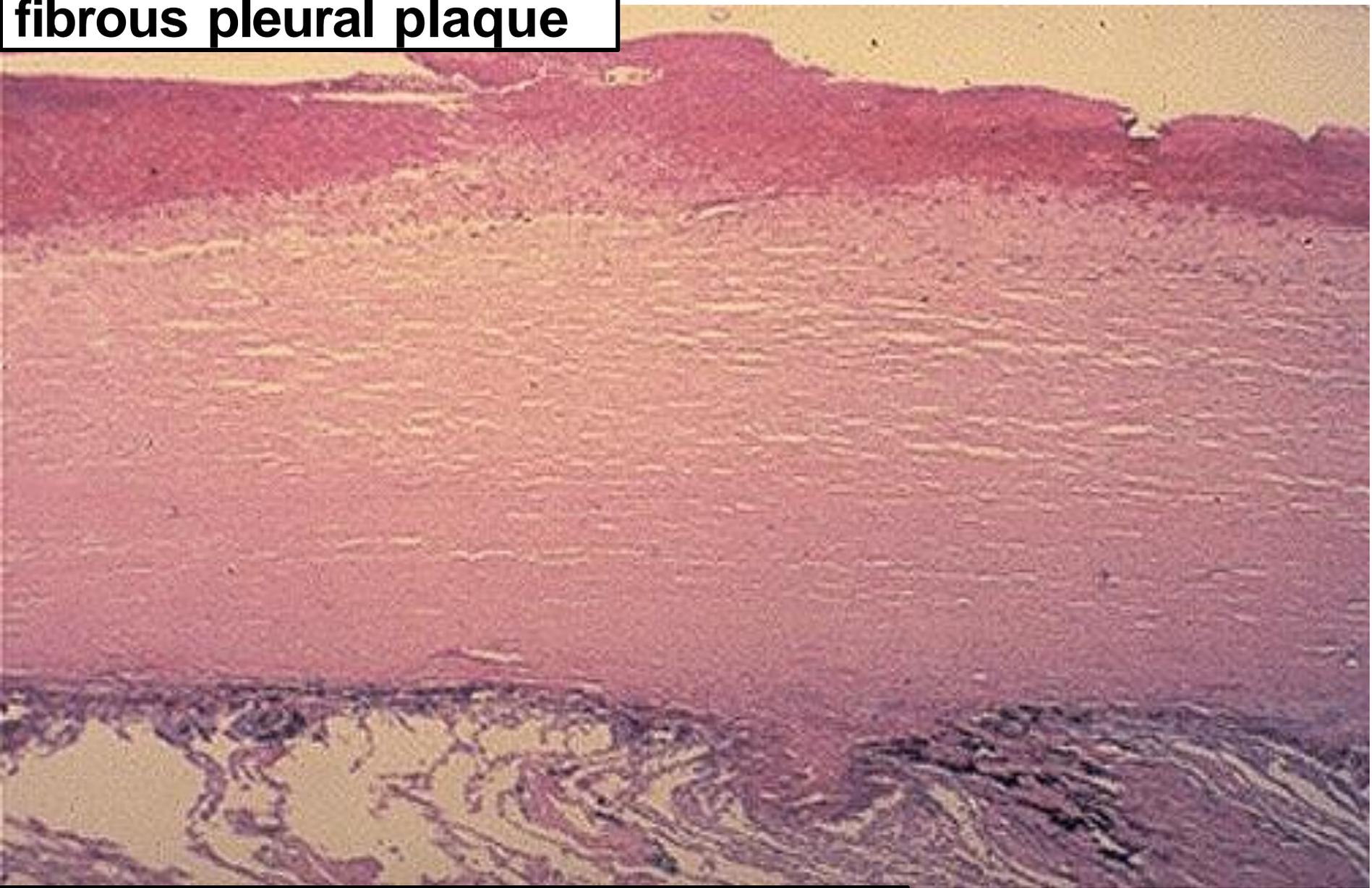
MORPHOLOGY



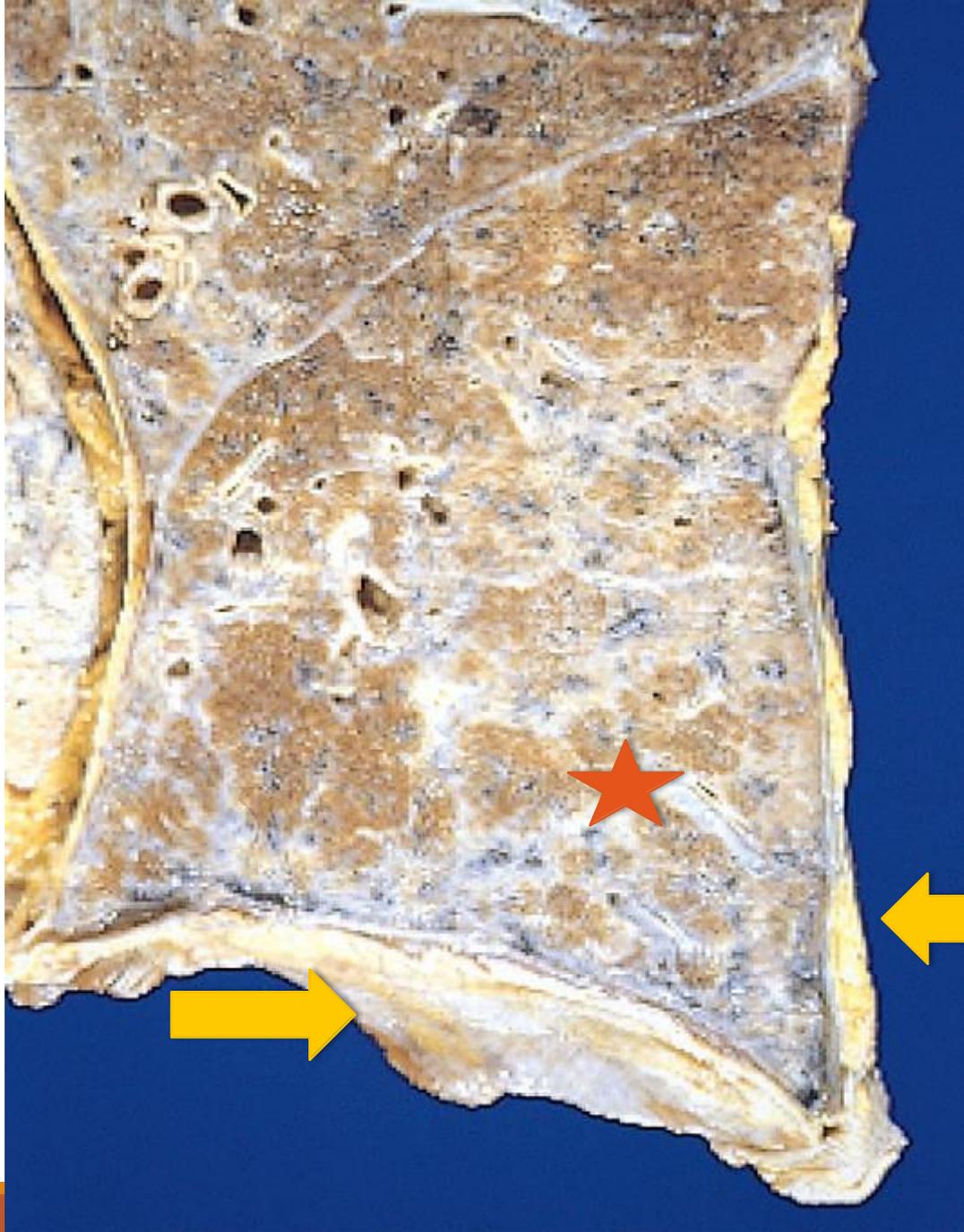
diffuse pulmonary interstitial fibrosis



fibrous pleural plaque



dense laminated layers of collagen (pink)



MORPHOLOGY

- Diffuse pulmonary interstitial fibrosis indistinguishable from UIP.
- **Asbestos bodies:**
 - golden brown, fusiform or beaded rods with a translucent center.
 - Formed of asbestos fibers coated with an iron-containing proteinaceous material
- Begins in the lower lobes and subpleurally

- **Pleural plaques:**
- the **most common** manifestation of asbestos exposure
- well-circumscribed plaques of dense collagen containing calcium anterior and posterolateral aspects of the parietal pleura and over the domes of the diaphragm

CLINICAL FEATURES:

- Progressively worsening dyspnea 10 to 20 years after exposure.
- cough and production of sputum.
- static or progress to congestive heart failure, cor pulmonale, and
- death.

OUTCOMES:

- The risk for developing lung carcinoma is increased 5-fold for asbestos workers
- the relative risk for mesothelioma is more than 1000 times greater than the risk for lung cancer
- Concomitant cigarette smoking increases the risk for lung carcinoma but not for mesothelioma.
- Lung or pleural cancer associated with asbestos exposure carries a particularly poor prognosis.

PULMONARY EOSINOPHILIA

PULMONARY EOSINOPHILIA

- number of disorders of immunologic origin, characterized by pulmonary infiltrates rich in eosinophils

DIVIDED INTO:

- Acute eosinophilic pneumonia with respiratory failure
- Simple pulmonary eosinophilia (Loeffler syndrome)
- Tropical eosinophilia
- Secondary eosinophilia
- Idiopathic chronic eosinophilic pneumonia

- **Acute eosinophilic pneumonia with respiratory failure:**
 - rapid onset of fever, dyspnea, hypoxia
 - respond to corticosteroids.

- **Simple pulmonary eosinophilia (Loeffler syndrome):**
 - transient pulmonary lesions
 - eosinophilia in the blood
 - benign clinical course

- Tropical eosinophilia:
- caused by infection with microfilariae and helminthic parasites



Figure 1: a) Microfilaria of *W. bancrofti* in a thick blood smear stained with Giemsa; b) Microfilaria of *B. malayi* in a thin blood

- **Secondary eosinophilia:**

- in association with asthma, drug allergies, and certain forms of vasculitis

- **Idiopathic chronic eosinophilic pneumonia:**

- disease of exclusion, once other causes of pulmonary eosinophilia have been ruled out.

SMOKING-RELATED INTERSTITIAL DISEASES

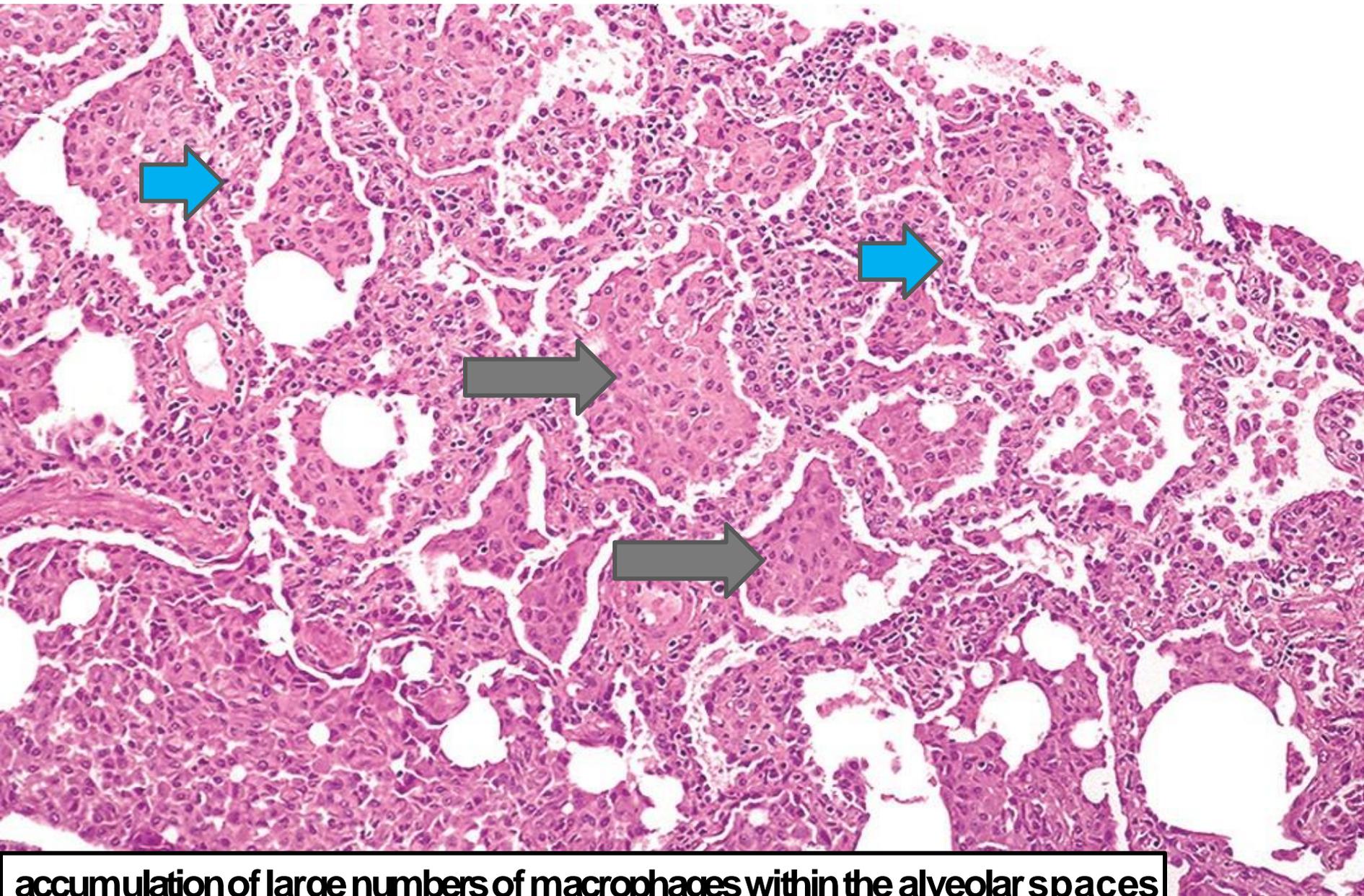


SMOKING-RELATED INTERSTITIAL DISEASES

- Desquamative interstitial pneumonia (DIP)
- respiratory bronchiolitis

DESQUAMATIVE INTERSTITIAL PNEUMONIA (DIP)

- The most striking histologic feature of DIP is the accumulation of large numbers of macrophages containing dusty-brown pigment
- (smoker's macrophages) in the air spaces
- Lymphocytes in alveolar septa
- +/- mild Interstitial fibrosis



accumulation of large numbers of macrophages within the alveolar spaces
only slight fibrous thickening of the alveolar walls.

Outcome:

- good prognosis
- excellent response to steroids and smoking cessation, however, some patients progress despite therapy.

RESPIRATORY BRONCHIOLITIS

- common lesion in smokers
- presence of pigmented intraluminal macrophages akin to those in DIP, but in a “bronchiolocentric” distribution (first- and second-order respiratory bronchioles).
- Mild peribronchiolar fibrosis.
- As with DIP, presents with gradual onset of dyspnea and dry cough
- symptoms recede with smoking cessation.



THANK YOU!