

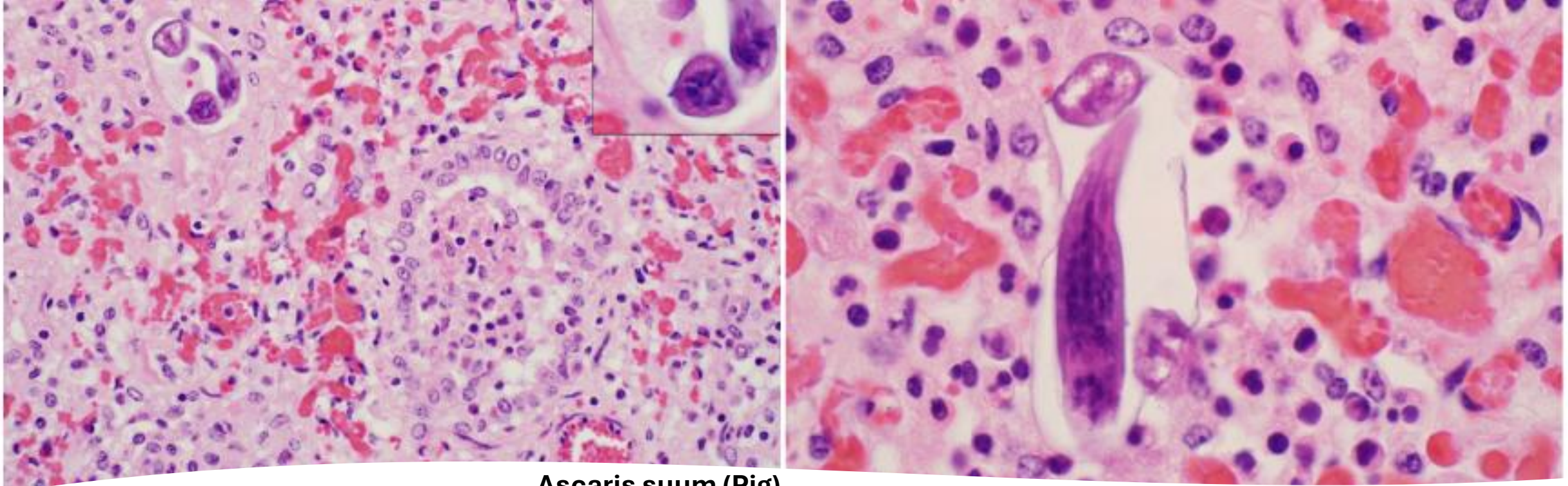


VERMINOUS PNEUMONIA

General Information



- **Causative agent:** Parasites
- Verminous pneumonia is caused by **parasitic infections** of the lungs.
Depending on the parasite species, they may:
 - **Live permanently** in the lungs or bronchi,
 - **Migrate temporarily** to the lungs during their life cycle, or
 - **Accidentally reach** the lungs as part of an abnormal migration.
- The resulting pulmonary changes depend on:
 - The **type of parasite**,
 - The **host species**, and
 - The **duration and intensity** of infection.
- In general, lesions are associated with **catarrhal**, **purulent**, or **granulomatous inflammation**, and in chronic cases, **fibrosis** may occur.



Ascaris suum (Pig)

- During migration, larvae pass through **liver** → **lungs** → **intestine**.
- Causes **hypersensitivity-related interstitial pneumonia**.
- In heavy infections, may be fatal.

Parascaris equorum (Horse)

- Larvae reach the lungs during migration, causing **catarrhal or purulent bronchopneumonia**.

Migrating Parasites

<https://ecampusontario.pressbooks.pub/pathologyoftherespiratorysystem/chapter/respiratory-diseases-of-cattle/>

Toxocara canis (Dog)

- Larvae migrate from the **intestine to the lungs** via the bloodstream, then back to the intestine through the bronchi.
- Can also be transmitted through **milk (galactogenic infection)**.
- May cause **calcified granulomatous nodules** in the lungs.

Strongyloides papillosus (Ruminants)

- Infective larvae penetrate the **skin**, migrate through the **blood and lymph** to the **lungs**, then to the **digestive tract**.
- Causes **hemorrhage and pneumonia**.

Bunostomum spp.

- *B. phlebotomum* in cattle; *B. trigonocephalum* in sheep and goats.
- Leads to **enteritis, anemia, weakness**, and sometimes **pneumonia**.

Echinococcus spp.

- Hydatid cysts often develop in the **lungs and liver** of ruminants.
- Cysts contain **clear fluid, daughter cysts,** and **protoscolices**.
- When infected by bacteria, cysts may **suppurate (form abscesses)** or **calcify**.
- Rupture can cause **allergic or fatal anaphylactic reactions**.

Small Lungworms (Protostrongylidae Family)

- **Protostrongylus spp. (*P. rufescens*, *P. brevispiculum*)**
- Found in **sheep, goats, camels**.
- Need **snails** as intermediate hosts.
- Lesions mainly in **diaphragmatic lobes**, forming **yellowish-brown nodules** that protrude on the pleura.
- **Muellerius capillaris**
- Seen in **goats and old sheep**.
- Adult worms live in **alveoli**.
- Lesions are **greenish-gray or reddish nodules** that later **calcify**.
- **Fibrosis** and **peribronchial cell infiltration** are common.
- **Cystocaulus ocreatus**
- Up to **9.5 cm** long.
- Found in **diaphragmatic lobes**, forming **brown cyst-like nodules** up to **walnut size**, containing worms.

Metastrongylus spp. (Pig Lungworm)

- Common in **domestic and wild pigs**, occasionally in **ruminants, dogs, and humans**.
- *M. apri*, *M. pudendotectus*, *M. salmi*, *M. confusus*.
- **Earthworms** are intermediate hosts.
- Larvae cause **hemorrhage** during migration; adults live in **bronchi**.
- Induce **bronchitis, obstruction, emphysema**, and **atelectasis**.
- Often complicates **enzootic pneumonia**.

Dictyocaulus Species (Large Lungworms)

- Belong to the **Metastrongylidae** family.
- Three main species:
 - ***Dictyocaulus viviparus*** – cattle, deer, camel
 - ***D. filaria*** – sheep, goats
 - *D. arnfieldi* – donkeys, horses

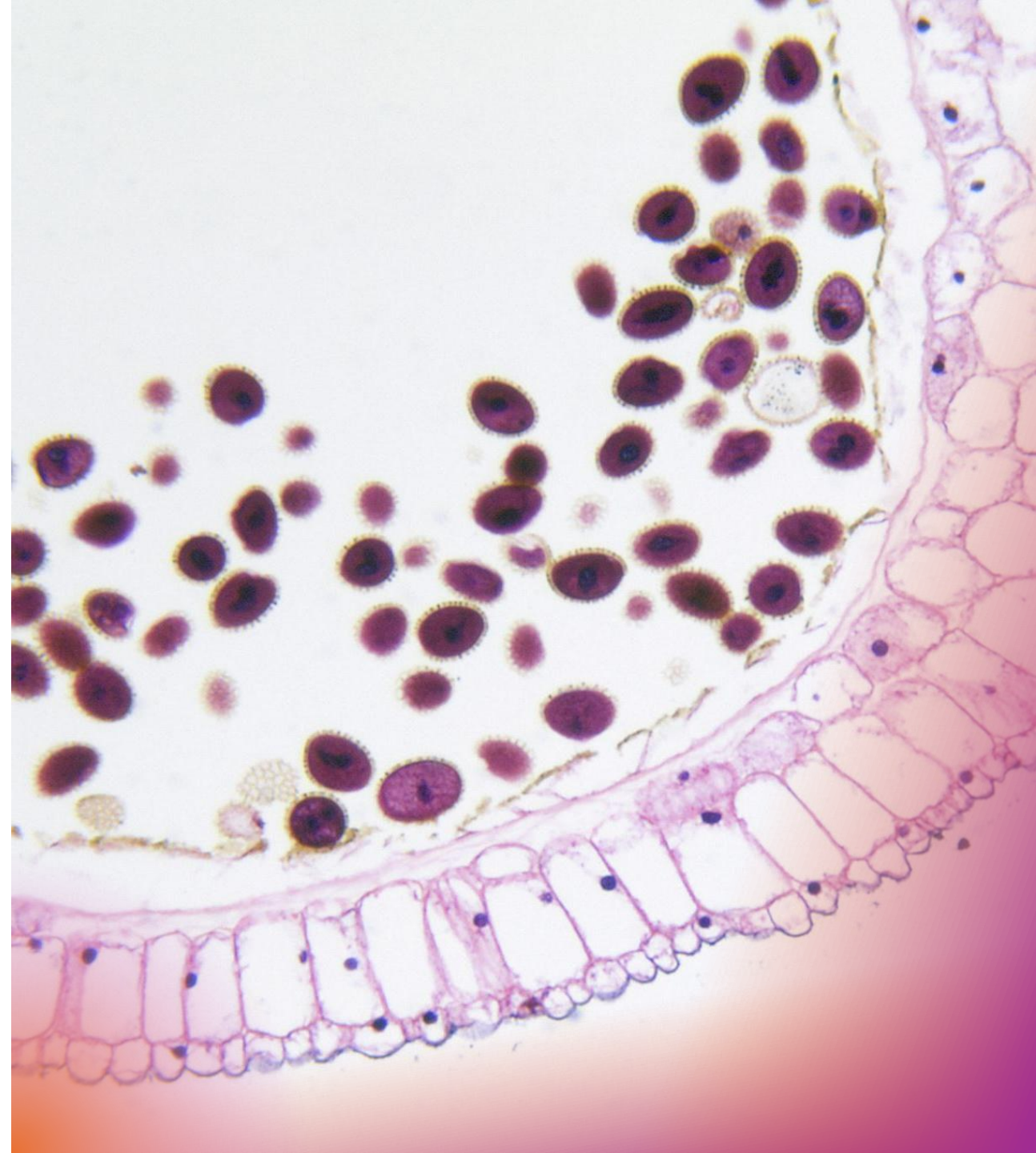
Pathogenesis

- Infection induces **IgE-mediated allergic inflammation**.
- **Mast cells** release **histamine**, increasing **vascular permeability**.
- **Eosinophils** migrate via ECF (Eosinophil Chemotactic Factor) and release **anti-histaminic substances** to regulate inflammation.
- **Humoral (IgG)** and **cell-mediated immunity** (T-cell response to larvae) both play a role.

Parasite	Host	Lesion Type	Key Findings
<i>Ascaris suum</i>	Pig	Interstitial pneumonia	Hypersensitivity lesions
<i>Parascaris equorum</i>	Horse	Bronchopneumonia	Migrating larvae
<i>Toxocara canis</i>	Dog	Granulomatous nodules	Calcification
<i>Strongyloides papillosus</i>	Ruminants	Hemorrhagic pneumonia	Skin → lung → intestine cycle
<i>Echinococcus spp.</i>	Ruminants	Hydatid cysts	Compression, abscess, calcification
<i>Protostrongylus spp.</i>	Sheep, goats	Nodular pneumonia	Pleural yellowish nodules
<i>Muellerius capillaris</i>	Goat, sheep	Granulomatous nodules	Calcified lesions, fibrosis
<i>Cystocaulus ocreatus</i>	Sheep, goats	Cystic nodules	Worm-filled cavities
<i>Metastrongylus spp.</i>	Pig	Bronchitis, emphysema	Earthworm life cycle
<i>Dictyocaulus spp.</i>	Cattle, sheep, horses	Catarrhal, interstitial pneumonia	Allergic and immune-mediated response

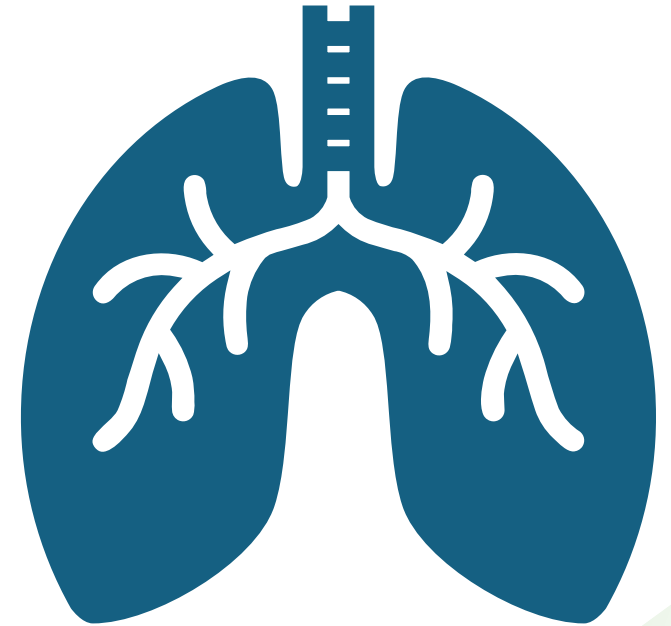
PNEUMOCONIOSIS

(Dust Diseases of
the Lung)



Definition

- Pneumoconiosis is a **lung disease** caused by inhalation and accumulation of dust particles such as **carbon, silica, asbestos, or other minerals**.
It is common in **industrial areas, mining animals, and humans** working in dusty environments.



ANTHRACOSIS (Carbon Dust)

- Caused by inhalation of **charcoal or soot particles**.
- Seen in **polluted cities** and animals near **industrial or mining zones** (cattle, horses, dogs, cats).

Gross findings:

- **Black spots or streaks** scattered throughout the lungs.
- **Lymph nodes** appear **blackish**, especially in the **cortical area**.

Microscopic findings:

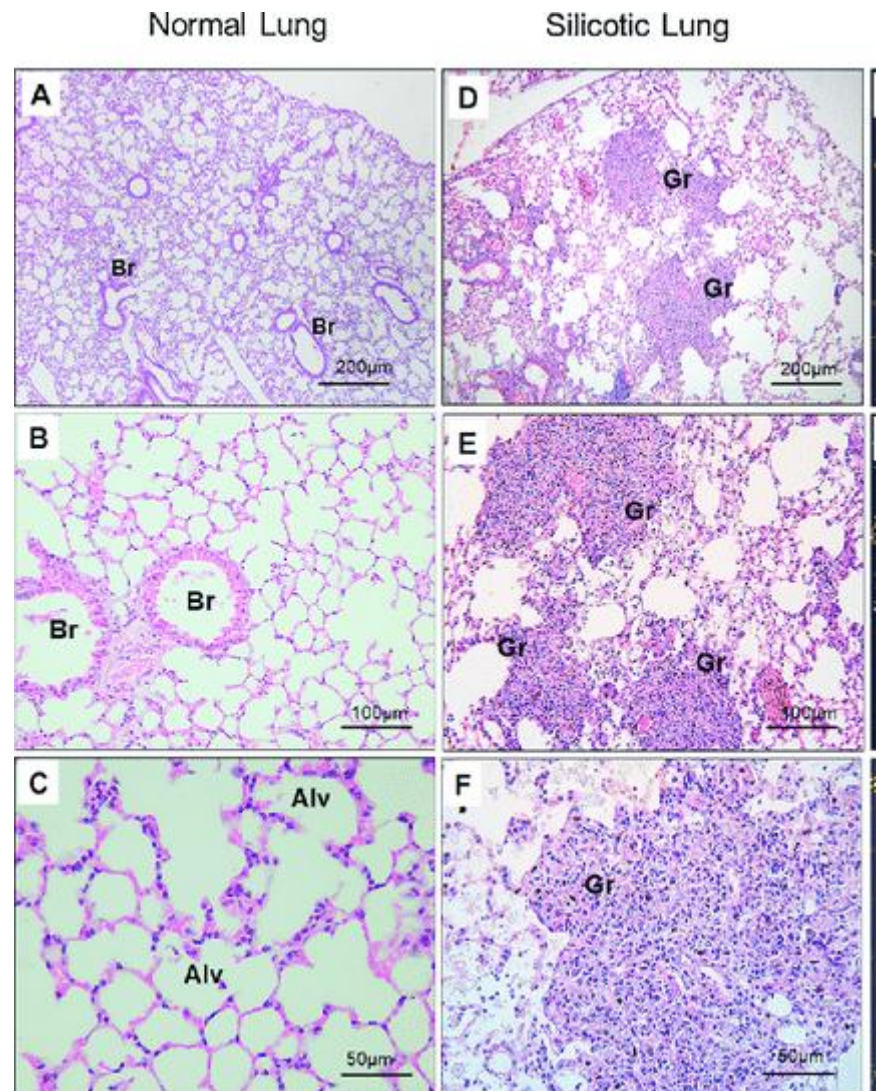
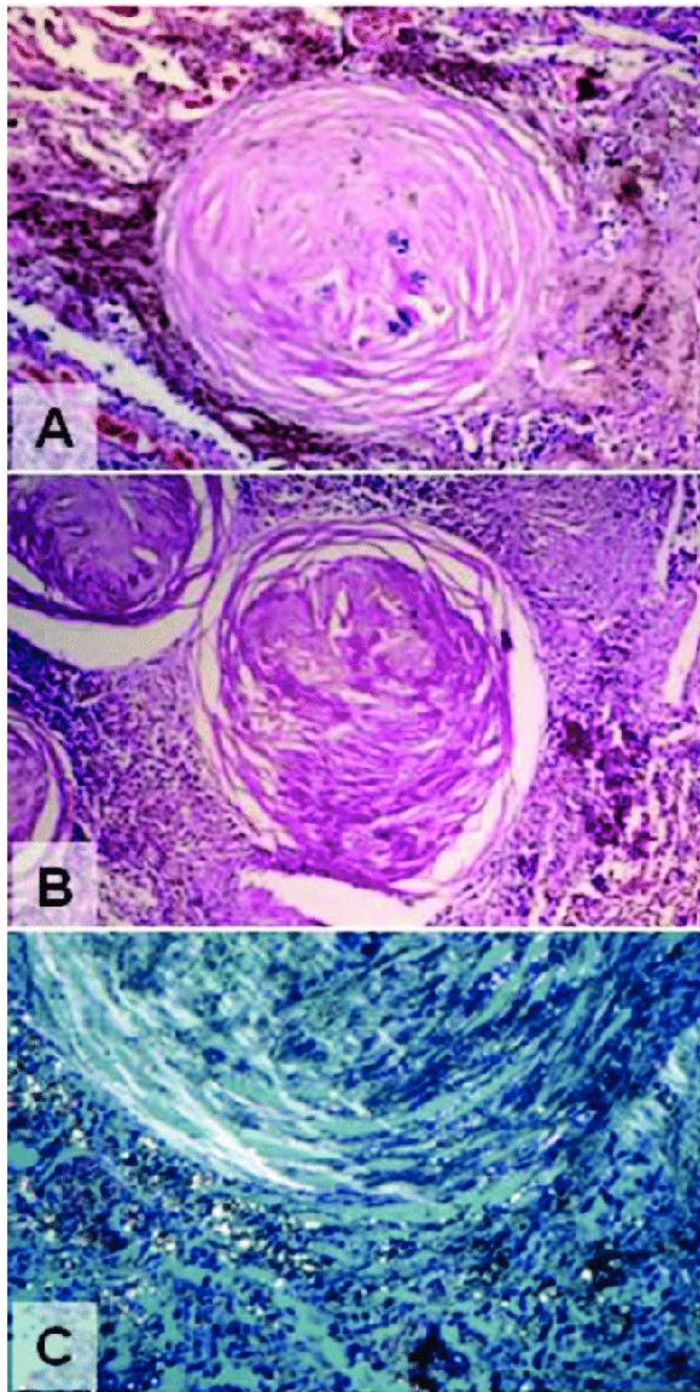
- **Black carbon pigments** within **alveolar macrophages** and around **bronchi and bronchioles**.
- Usually **no significant tissue reaction**, but **mild fibrosis** may occur after long exposure.

SILICOSIS (Quartz Dust)

- Caused by inhalation of **silica (silicic acid, quartz, or silicon dioxide)**.
- In animals it is rare, but in humans it is an **occupational disease**.

Lesions:

- **Granulomatous inflammation,**
- **Fibrosis,** and
- **Chronic emphysema** formation.

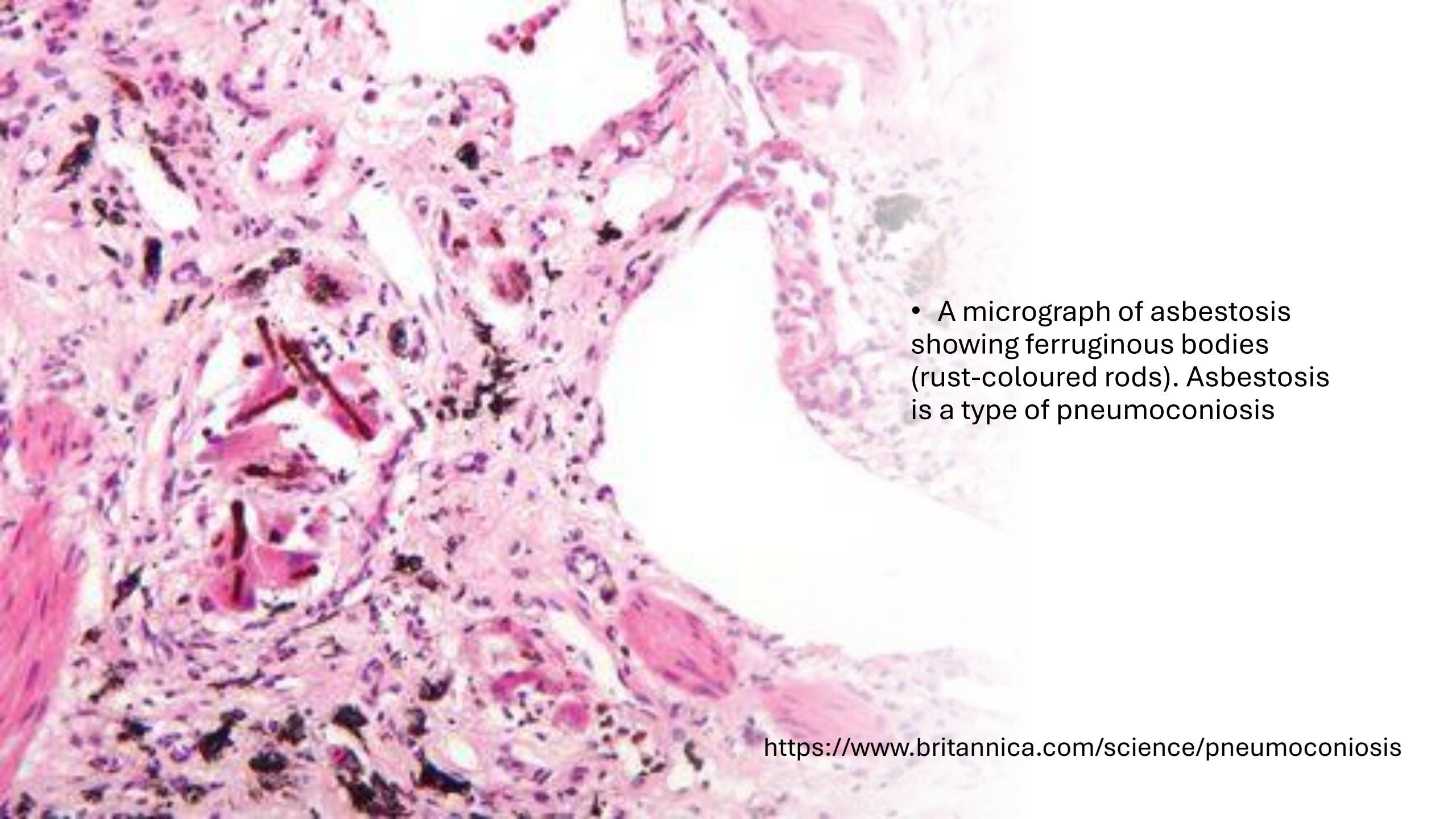


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ASBESTOSIS

- Results from inhalation of **asbestos fibers**.
- Causes **lung fibrosis** and can lead to **mesothelioma** (cancer of the pleura).



- A micrograph of asbestosis showing ferruginous bodies (rust-coloured rods). Asbestosis is a type of pneumoconiosis

ZEOLITE (Erionite) EXPOSURE

- **Most potent carcinogenic mineral** known.
- Found in **Cappadocia (Karain, Tuzköy – Turkey)**.
- Proven by **Prof. Dr. İzzettin Barış**.
- Causes **lung fibrosis** and **mesothelioma**.
- Due to its danger, **Tuzköy village was evacuated (2001)**.



Science and Society | Published: February 2007

A mesothelioma epidemic in Cappadocia: scientific developments and unexpected social outcomes

[Michele Carbone](#) , [Salih Emri](#), [A. Umran Dogan](#), [Ian Steele](#), [Murat Tuncer](#), [Harvey I. Pass](#) & [Y. Izzettin Baris](#)

[Nature Reviews Cancer](#) **7**, 147–154 (2007) | [Cite this article](#)

2053 Accesses | **222** Citations | **23** Altmetric | [Metrics](#)

Abstract

In Cappadocia, Turkey, an unprecedented mesothelioma epidemic causes 50% of all deaths in three small villages. Initially linked solely to the exposure to a fibrous mineral, erionite, recent studies by scientists from Turkey and the United States have shown that erionite causes mesothelioma mostly in families that are genetically predisposed to mineral fibre carcinogenesis. This manuscript reports, through the eyes of one of the researchers, the resulting scientific advances that have come from these studies and the social improvements that were brought about by both the scientists and members of the Turkish Government.

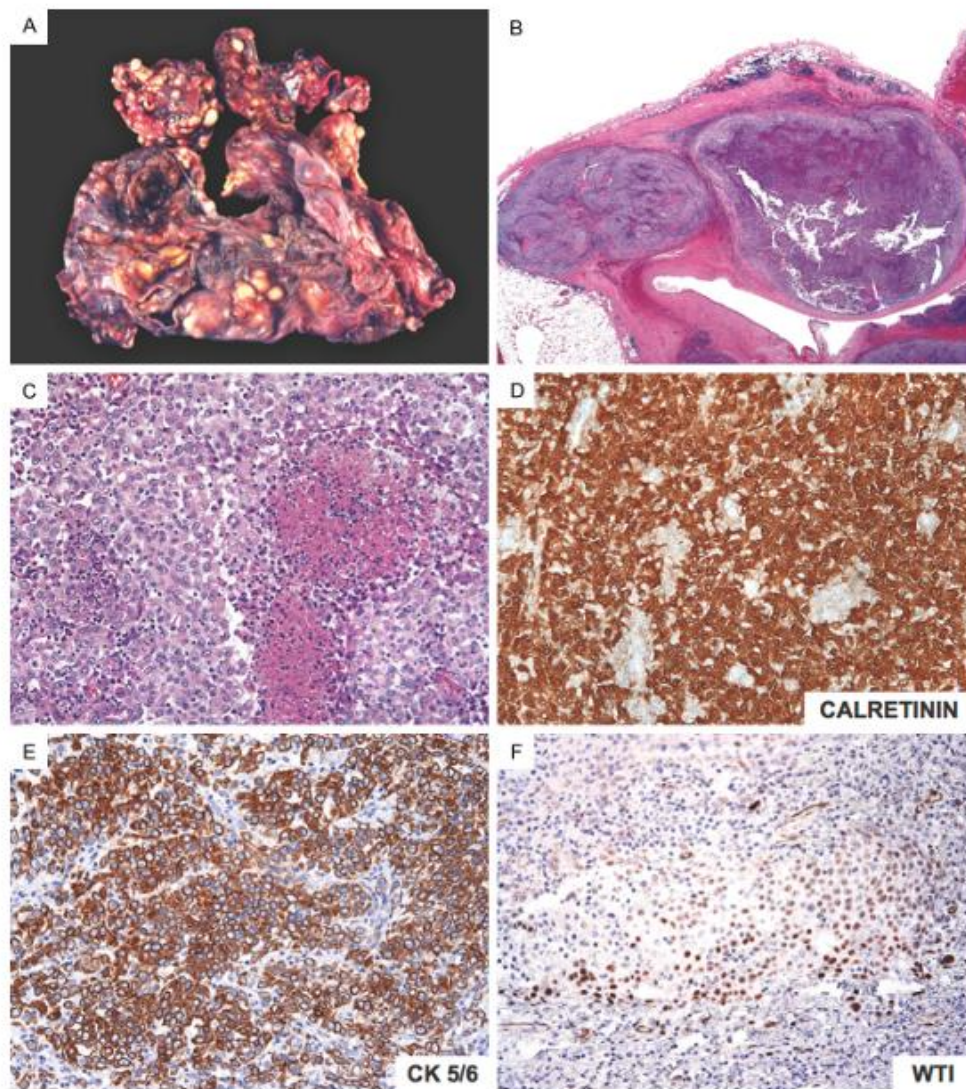


Figure 2. Gross pathology and histological analysis of tumor tissue shows malignant pleural epithelial mesothelioma. A. Pleurectomy specimen showing numerous neoplastic nodules ranging in size from 0.3 cm to 2.5 cm. B. Low power magnification of nodular lesions embedded within the parietal pleura (H&E 6.25 $\times$). C. High power magnification of epithelioid cells admixed with necrosis and scattered chronic inflammatory cells (H&E 200 $\times$). D. Calretinin stain highlighting the neoplastic cells (200 $\times$). E. Strong immunoreactivity against CK5/6 (200 $\times$). F. Patchy nuclear staining with WT1 stain (200 $\times$).

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Case Report

Erionite-associated malignant pleural mesothelioma in Mexico

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Abstract: Malignant mesothelioma is a highly fatal cancer of the visceral and parietal pleura most often caused by asbestos exposure. However, studies over the past thirty-five to forty years have shown that a fibrous zeolite mineral found in the soil, erionite, is a strong causative agent of malignant mesothelioma as well. Cases of erionite-associated pleural mesothelioma have been widely reported in Turkey, but only one case has been documented in North America. Here we report a new North American case of epithelial malignant pleural mesothelioma in a vehicle repairman who was raised on a farm in the Mexican Volcanic Belt region. The complexities of the case highlight the importance of objective lung digestion studies to uncover the causative agents of mesotheliomas. It also highlights a need for increased environmental precautions and medical vigilance for mesotheliomas in erionite-rich regions of the United States and Mexico.

Keywords: Mesothelioma, erionite, zeolite, asbestos

KAOLIN

(China Clay)

- Used in **porcelain and ceramics industry**.
- Chronic exposure causes **gray lungs, fibrosis**, and **nodular lesions** with **kaolin particles** visible microscopically.