

# Asbestos disease

Diseases from asbestos include:

1. **non-cancerous diseases** : asbestosis, pleural hyalinosis, acute pleurisy;
2. **cancer** : bronchogenic carcinoma , malignant mesothelioma of the pleura and peritoneum, also carcinoma of the larynx and ovary.

## Characteristics of noxy

**Asbestos** is a group of minerals (silicates) that occur in two forms - **serpentine** and **amphibole** (serpentine and genitourinary). Their common feature is **a fibrous structure** , where the length exceeds the cross-section many times over. The fibers are **non-flammable** , **resistant** to acids and alkalis;

1. *serpentine fibers* - chrysotile ("white asbestos"),
  - long, flexible, twisted, intertwined (used in textile processing, the only industrially produced - chrysotile),
  - deposits - Canada, Urals, Cyprus, South Africa,
2. *amphibole fibers* - 5 types: crocidolite ("blue asbestos"), amosite, anthophyllite, actinolite, tremolite,
  - shorter, brittle, very resistant to acids.

## Professional exposure

- During mining, during transport (today less so - they are packed in plastic),
- during processing,
- use - asbestos-cement materials, roofing (eternite), pipes, cladding boards, textiles (protective clothing for firefighters, metallurgical workers), friction and braking equipment (previously it was used to make brake pads).

## Asbestosis

Asbestosis is interstitial pulmonary fibrosis caused by long-term exposure to dust containing asbestos .

### Etiopathogenesis

The fibers reach the alveolus, activate macrophages and an inflammatory and fibrotic process develops. The mechanism is not exactly clarified, the shape of the fibers and their "indestructibility" play a role. The fibers are long and therefore cannot be ingested by a single macrophage. One fiber thus activates many cells, resulting in an inflammatory reaction - ROS , cytokines , etc. Fibers longer than 5  $\mu\text{m}$  are especially dangerous. Long latency, progressing for **20 or more years** .

### Pathology

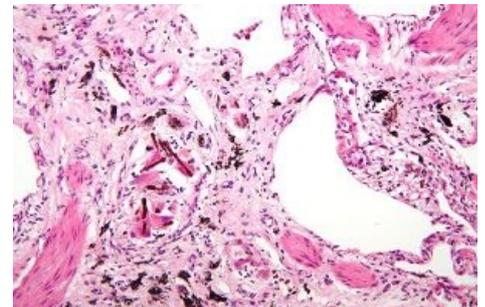
The histology is consistent with other types of interstitial fibrosis. In the advanced stage, a honeycomb-like lung structure is formed. A typical finding is an asbestos body - an axial asbestos fiber covered with mucopolysaccharides, containing hemosiderin (like beads on a thread). They can also be found in healthy individuals (considered evidence of exposure).

### Clinical picture

Initially, there is slight exertional dyspnea , which gradually progresses to rest. A cough with little expectoration is present . It progresses slowly (even after elimination from the risk). The main complication - COPD . Physical examination - crepitus at the lung bases (may not be present). In the advanced stage, hypoxemia , respiratory insufficiency, cor pulmonale occur . With a long latency, there is a high risk of developing mesothelioma .

### Investigation methods

X-ray of the lungs - symmetrical shading of irregular shapes ( *irregular opacities* ) basally (the finding in the upper fields is small). In the upper fields there is often emphysema .



Asbestosis - increased interstitium containing asbestos bodies



Asbestosis - basal shadowing on X-ray

## ILO classification

Fine striations, netting (s), medium coarse (t), coarse, irregular shadows (u) CT , HRCT. Pulmonary function test - restrictive disorder, reduced compliance, diffusion capacity for CO.

## Pleural hyalinosis

Bounded pleural plates, diffuse pleural thickening. Direct local reaction to the presence of asbestos fibers in the pleural cavity. They get there from the alveolus via the lymphatic route, the fibers injure the pleura → inflammation, hemorrhage → organization → adhesions.

- **Pleural plaques** - demarcation of the focus of hyaline fibrosis - especially in the submesothelial layer of the parietal pleura posterolaterally, irregular shape and size, whitish shiny surface, protrude, irregularly calcify and form bizarre shapes (pleuritis calcarea).
- **Diffuse pleural thickening** - affects rather the visceral pleura, has the character of a milky spot, forms adhesions between the pleurae, fibrosis spills into the lung parenchyma and into the interlobar spaces.

## Clinical picture

Bordered sheets are the most common manifestation of asbestos exposure. They are often found as an incidental X-ray finding, they increase in size over time, they tend to calcify, they do not cause problems, Diffuse pleural damage - most often after acute pleurisy with effusion, affects a larger part of the pleura. It usually spreads bilaterally, from apex to base,

Extensive plaques lead to exertional dyspnea, irritating cough, persistent chest pain.

## Diagnostic criteria

Pleural fibrosis at least 50 mm wide, 80 mm vertically, 3 mm thick (according to CT). Around - rounded atelectasis ( *rounded atelectasis* ), the fusion of the lesion into the parenchyma is described on CT as *crow's feet* .

## Investigation methods

- Chest x-ray - bizarre circumscribed shadows,
- diffuse thickening - overall obscuring of the lung pattern,
- CT , HRCT ,
- pulmonary function - restriction.

## Acute pleurisy

Local reaction to the presence of asbestos on the pleura. It is asymptomatic in two thirds of cases, the exudate does not exceed 500 ml and is usually absorbed spontaneously.

Breathing difficulties, cough, weakened breathing, disappeared *fremitus pectoralis* .

## Examination

X-ray, sono, chest puncture.

## Bronchogenic carcinoma

Carcinogenicity depends on the amount, time and length of the fiber (above 5), it is an epigenetic carcinogen (IARC group I). It is involved in the formation of all types of bronchogenic ca - squamous cell, small cell, large cell, adenocarcinoma. The risk of smoking and asbestos is multiplied (exposed smokers - 50-90x higher chances than unexposed non-smokers).

## Malignant mesothelioma of the pleura and peritoneum

There is a **causal relationship** . Mesothelioma practically does not occur without exposure to asbestos, amphiboles pose a 10x greater risk.

## Pathology

They can be localized or diffuse. Localized can expand and fill the entire hemithorax, diffuse - multiple. Gray nodules on the pleura, merge and form tumorous masses. There is usually a hemorrhagic pleural effusion, the tumor overgrows the lungs, grows into the surroundings - chest wall, mediastinum , abdomen...

## Clinical picture

Persistent pain, exertional dyspnea (sometimes the first symptom is marked dyspnea at rest due to the effusion). With an inflammatory effusion, the pain stops when the pleura move away from each other, it usually does not stop here. Weight loss, low fever, symptoms of organ damage by tumor.

Latency – 30-40 years, smoking cigarettes has no effect on the course. Despite treatment, it progresses very quickly, most patients die within a year of diagnosis.

## Examination

- X-ray – thickening of the pleura, extensive effusion, or signs of other asbestos diseases,
- CT, HRCT,
- exudate examination, pleural cytology,
- the professionalism of mesotheliomas is strongly underestimated in our country.

## Prevention

In the Czech Republic, the import, production and distribution of amphibole fibers is currently prohibited and their use is restricted.

## Therapy

There is no causal treatment for these conditions. Oxygen therapy, bronchodilation in COPD.

## Links

### related articles

### Source

- BENEŠ, Jiří. *Study materials* [online]. [feeling. 24/02/2010]. < <http://jirben.wz.cz> >.

### References

- PELCLOVA, Daniela. *Occupational diseases and intoxication*. 2nd edition. Prague: Karolinum, 2006. 207 pp. ISBN 80-246-1183-X .