

## Parasitic lung diseases

Some parasites selectively settle in the lungs (*Pneumocystis*, *Paragonimus*), whereas others are found incidentally (*Echinococcus* and amoebae), passing through the organism during their life cycle (*Ascaris* and filaria etc). They can cause nodules, transient or chronic pulmonary infiltrates, oedema or plural impairment.

### Pneumocystis

This is caused by *Pneumocystis jiroveci* (previously known as *pneumocystis carinii*), a ubiquitous pathogen, which particularly affects immunocompromised subjects. This parasite exists in two forms: trophozoites (2µ) and cysts (4µ). Humans become infected by inhaling cysts. The parasite preferentially affects infants, especially premature babies where it causes polypnoea and a cough with cyanosis and can even lead to respiratory distress. *Pneumocystis* also affects adults, particularly those suffering from AIDS (60% of cases), and causes respiratory distress and fever.

X-rays show opaque areas on the lungs (so called frosted-glass) that extend up to, but not including, the apices of the lungs. Diagnosis relies on identifying vegetative forms and cysts within the bronchial secretions or in a bronchial alveolar lavage sample. Treatment consists of thoprime trimethyl-sulfamethoxazole (Bactrim®) or pentamidine.

(Pentacarinat®) through intramuscular administration. Prophylaxis is used in HIV+ patients with less than 200 CD4/mm<sup>3</sup>, through 1 tablet a day of Bactrim®.

### Pulmonary Hydatid Cysts

*Echinococcus granulosus* or Taenia in dogs is the cause of hydatid cysts in dogs, sheep and humans. It is present in countries breeding livestock (including South America, Australia, New Zealand, North Africa (+++) and in France – in Landes and Corsica). Dog faeces in the grass are ingested by sheep, which in turn die and are consumed by dogs. Humans are contaminated when they eat raw vegetables from gardens contaminated with dog faeces. The parasite develops in humans in the form of larvae in the liver and possibly the lungs as well as other organs creating an abdominal mass, which is for a long time asymptomatic. This is then followed by discomfort in the

chest and a cough and sometimes haemoptysis. The diagnosis is identified through diagnostic imaging and treatment is surgical. If the cysts are complex, numerous and/or inoperable, Zentel® must be prescribed over a period of a few years; treatment stops when the serology test result is negative.

### Ascariasis

*Ascaris lumbricoides* (common roundworm) is a pinkish-white parasite of 10 - 20 cm long, and is an intestinal nematode that can enter into the lungs.

Humans can be infested by eating raw vegetables contaminated with *Ascaris* eggs; these eggs then pass into the stomach, then the larvae pass on to the liver, heart, lungs, pharynx, stomach and the small intestine where they become adult worms.



The cycle lasts 60 days and the passage through the lungs lasts approximately 8 days. Clinically, during the parasite's pass-through the lungs (invasive phase with larval migration) the subject experiences respiratory discomfort with coughing, sputum, and even haemoptysis (Loeffler syndrome) or remains asymptomatic. The static phase induces abdominal pain, nausea, vomiting and diarrhoea.

Diagnosis relies on identifying hypereosinophilia in the full blood count (FBC) and on parasitology investigations of stool samples showing *Ascaris* eggs. Treatment consists of using flubendazole (Fluvermal®) or albendazole (Zentel®), and sometimes surgery.

## Toxocariasis

The larvae of *Toxocara canis* (usual hosts: dogs) or *Toxocara cati* (in cats) can accidentally be ingested by humans when eating raw vegetables contaminated with faeces, contaminated sand (sand pits) or when kissing dogs and cats (especially children). This infection is responsible for visceral *Larva Migrans* accompanied by hepato-splenomegaly, fever and possibly pulmonary disease if the parasite enters the lungs. Diagnosis relies on serology testing and hyper eosinophilia. Treatment is ivermectin (Stromectol®).

## Pulmonary amoebiasis

During intestinal amoebiasis, the parasite can reach the liver or the lungs; nevertheless the intestinal form may have been crude and the diagnosis is often made 3 - 4 months later. In these two forms, serology testing is always highly positive (not necessarily in the intestinal form). Biologically, there is leukocytosis and inflammatory indicators (ESR and CRP) are raised. Treatment consists of tinidazole (Fasigyn® 2g/day for 3 - 5 days) or metronidazole (Flagyl® 1 - 2 g/day for 10 days). Testing is normally slow; the level of antibodies can rise during the first month after treatment before decreasing then disappearing in 12-15 months.

## Paragonimus

*Paragonimus westermani*, *P. africanus* and lung flukes are parasites found in Asia, Africa and South America. Humans are contaminated by eating contaminated shellfish (crabs and crayfish). Clinically, paragonimiasis affects the lungs and causes coughing, sputum production, haemoptysis (resembling tuberculosis but with hypereosinophilia). Diagnosis relies on finding eggs in the sputum sample and especially in stools. Treatment consists of praziquantel (Biltricide®).

## Filarioses

Within the lungs, sometimes we find Guinea worm or lymphatic filaria (such as *Wuchereria bancrofti*, *Brugia malayi*). Guinea worm is endemic in Africa. Humans are contaminated on ingestion of infested copepods found in drinking water.

Clinical diagnosis is made on inspection of a filarial worm when exiting the skin; if the worm does not leave the skin it causes abdominal and pulmonary calcifications.

The "pulmonary eosinophilia" in the lungs is caused by the passage of lymphatic filarial worms transmitted through *Culex* mosquito bites.

Symptoms include coughing (that is sometimes productive) and asthmatic bronchitis. Diagnosis relies on a positive filarial serology result and microfilaria infection at 24 hours. Treatment is ivermectin (Stromectol®).

Sometimes animal filaria or dirofilariosis can be found in humans (through parasitic transfer) from insect bites. These are often discovered by accident (generally in the context of cancer investigation) and are not pathogenic.

## Porocephaliasis

Is caused by *Armillifer (Porocephalus) armillatus*, also known as 'ringed worms', which are 1 cm long and a parasite found in pythons. Porocephalus infection is seen in subjects eating or handling pythons in Africa. Although rare, it is asymptomatic. The diagnosis relies on spotting "crescent shaped calcifications" on lung radiography images.

## Aspergillosis

Caused by *Aspergillosis fumigatus*, *A. flavus*, *A. niger* and *A. nidulans* is frequently found in patients suffering from leukaemia and neutropenia, pulmonary aspergillosis causes fevers, dyspnea and haemoptysis. X-rays show "images of the fool's shell".

The diagnosis relies on positive serology testing and the presence of *Aspergillosis* in biopsies and sputum.

Treatment consists of itraconazole (Sporanox®), voriconazole (Vfend®) or caspofungin (Cancidas®).

## *Penicillium marneffei*

Only the *Penicillium* pathogen, *P. marneffei* is rampant in Asia, especially in Chiang Mai where penicilliosis is the 3<sup>rd</sup> most frequently encountered infection after tuberculosis and cryptococcosis.

Contamination is airborne and the incubation period is 2 - 6 months. Symptoms include fever, weight loss, anaemia, and even cutaneous lesions and a persistent cough.

Diagnosis relies on a positive fungal culture of a bronchial alveolar lavage sample. Treatment is amphotericin B (Ambidome®).

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