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CME ARTICLE

Parasitic lung infection and the paediatric lung

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EDUCATIONAL AIMS

1. To appreciate the clinical presentations of human parasitosis and their pulmonary manifestations.
2. To further understand the management of parasitic lung disease.
3. To learn more about the mechanisms of the main parasitoses that affect the paediatric lung.

KEYWORDS
lung parasitosis;
amoebiasis;
malaria;
pulmonary tropical eosinophilia;
visceral larva migrans;
loeffler syndrome;
schistosomiasis;
paragonimiasis;
hydatidosis

Summary Human parasitosis is still prevalent worldwide and causes significant morbidity and mortality in developing countries. The involvement of the lung is variable depending on the characteristics of the parasites and hosts. In malnourished and immunodeficient children, the consequences of lung parasitosis may result in significant morbidity and mortality.

Throughout modern history, the tropical regions have been affected much more than the rest of the world by infectious diseases, due to both environmental and biological factors interacting dynamically.[1] There has been an increase of such diseases in the developed world due to globalization, which has promoted travel to and from tropical countries.[2–4]

The tropics have particular ecological conditions, typically a hot wet climate producing a large number of potential natural reservoirs and insect vectors of diseases. Most developing countries are in the tropics, which adds further risk factors to the already high risk of tropical infectious diseases together with low socioeconomic conditions, poor sanitation, malnutrition and limited vaccine coverage.

A group of tropical diseases have caught the attention of the World Health Organization (WHO) due to their immense social burden.[3] These are the Neglected Tropical Diseases (NTDs), which include different parasitic infections, such as soil-transmitted helminthiasis, which can promote

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lung diseases (Table 1). There are over 1 billion people suffering from one or more NTD. This explains why, in this region, parasitic diseases surpass even malignancies and heart disease as the major causes of morbidity and mortality.

In this article, we will review pulmonary involvement in some of the most common parasitic tropical diseases where parasites cause an infection directly or where passage through the lung causes damage or symptoms.

EPIDEMIOLOGY

Migration is more commonly responsible for the spread of many diseases between countries. People from developing countries, which have a lower socioeconomic level and low hygiene and sanitation standards, bring their diseases to developed countries.[2,4] More porous international frontiers, the increase in tourism and international trade add to this phenomenon.[4]

The health authorities in Europe and the USA are increasing their epidemiological vigilance in order to control some diseases that are related to migration. Parasites, which affect human beings, are a good example of this problem. In some countries, they are included in special programmes and are termed 'imported diseases', which denotes their significance.[4]

Parasites may cause anaemia, malnutrition, impaired growth and development, permanent organ damage and death. Their economic impact is also important: unemployment, decreased earning ability and low industrial production are among the possible consequences of these diseases. In contrast, some initiatives have made dramatic improvements, for example in terms of a reduction in leprosy, guinea-worm disease, lymphatic filariasis and schistosomiasis. In the Republic of Korea, intestinal helminths have been eliminated.[3]

In order to reduce the impact of these diseases, the WHO has recently highlighted three approaches[3]:

1. broad coverage with rapid-impact initiatives against helminthic infections;
2. stronger vector control;
3. improved surveillance and high-quality health care.

IMMUNOLOGICAL ASPECTS OF PARASITIC LUNG DISEASES

Parasites may elicit respiratory symptoms via three mechanisms[5]:

1. stimulation of hypersensitivity during their life cycle,
2. direct parenchymal or pleural invasion;
3. migration from infected organs.

Any organisms or their antigens reaching the respiratory tract via inhalation or through the bloodstream will face local immunological and non-immunological responses. Lung responses will be related to anatomical barriers and mechanical and immune responses (cellular and

Table 1 Main parasites causing lung disease: clinical features and laboratory findings

Parasite	Clinical picture	Diagnosis
Protozoa		
Entamoeba histolytica	Cough, sputum 'chocolate sauce', haemoptysis, pleuritic pain	Trophozoites in sputum, or in respiratory collections, pleural effusion, lung abscess, ELISA, PCR, MCA, ultrasound
Plasmodium spp.	Chills, fever, haemolysis, sweating	Giemsa-stained thick and thin films, blood smears
Helminths		
Ascaris lumbricoides	Löffler's syndrome, rales and wheezing, mild dyspnoea	Eosinophilia, larvae in respiratory secretions or gastric aspirate, stool test
Toxocara canis	Löffler's syndrome, wheezing, hepatomegaly	Hypereosinophilia, stool test, ELISA, hypergammaglobulinaemia
Strongyloides stercolaris	Löffler's syndrome, cough, wheezing, dyspnoea, acute respiratory distress syndrome	Larvae in sputum or BAL, ELISA, stool test
Necator brasiliensis and *Ancylostoma duodenalis*	Malnutrition, cough, anaemia	Discrete eosinophilia, larvae in sputum
Schistosoma mansoni	Dry cough, dyspnoea, wheezing, 'Katayama fever', hepatosplenomegaly, pulmonary hypertension	Leukocytosis, eosinophilia, serology (acute phase), eggs in stools or urine, lung biopsy, fine nodules on X-ray
Paragonimus westermani	Cough, chest pain, haemoptysis	Eggs, sputum, X-ray, ELISA, BAL, fine-needle biopsy
Echinococcus granulosus	Cough, haemoptysis, thoracic pain, wheezing, urticaria	X-rays, Camelot's sign, hydropneumothorax, ELISA

BAL, bronchoalveolar lavage; ELISA, enzyme-linked immunosorbent assay; PRC, polymerase chain reaction.