Parasitic Lung Diseases

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Pulmonary paragonimiasis has been reported from the following geographical areas (autochthonous cases), except:

A. Southeast Asia

B. China

C. North America

D. Africa

E. This question is tricky because autochthonous cases have been reported from all the above areas

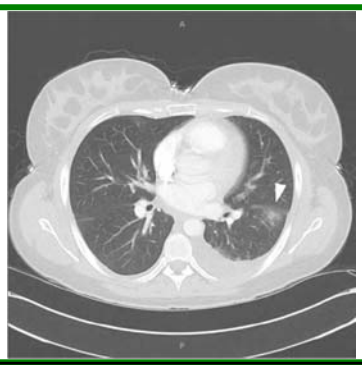
Parasitic Lung Infections Outline

- case presentation
- when to suspect parasitic lung diseases?
- immunocompetent vs. immunocompromised patients
- clinical and radiological presentation of common parasites affecting the lung
- brief mention of treatment and prevention
- parasitic lung infections associated with eosinophilia

A previously healthy 26 yo woman was admitted to her local hospital with the working Dx of community acquired pneumonia

- 2-wk hx of cough, fevers, night sweats, fatigue, malaise, and vomiting
- hospital discharge on levofloxacin
- returned due to persistence of symptoms
- eosinophil count = 2000cells/mm3 (20% of WBC)
- transbronchial biopsy revealed an eosinophilic inflammatory infiltrate
- BAL revealed eosinophilia as well
- BAL cultures for bacteria, TB, and fungi: negative

A previously healthy 26 yo woman with a focal consolidation in the superior segment of the left lower lobe, a left pleural effusion and significant eosinophilia



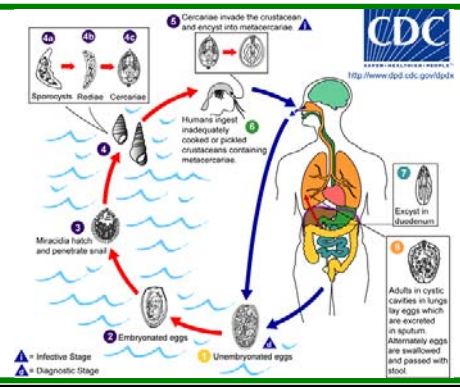
A presumed diagnosis of eosinophilic pneumonia was made and methylprednisolone initiated

- patient's symptoms improved with the use of steroids
- however, her fevers, chills, night sweats, and malaise returned when use of steroids was tapered
- she also developed a 0.5-cm nodular lesion inferior to her left lower lip. A needle biopsy demonstrated an inflammatory infiltrate with conspicuous eosinophils. The lesion grew in size to 1.5 cm and migrated to her left cheek

Patient referred to teaching hospital for pneumonia, significant eosinophilia, and migrating skin lesions

- upon further questioning, the patient revealed that she had been on a "float trip" on a tributary of the Meramec River in south eastern Missouri ~4weeks before the onset of her symptoms
- she also stated that she had eaten 2 uncooked crawfish from the river while intoxicated with alcohol
- two weeks after returning from the float trip, she developed a self-limited diarrheal illness. She later experienced fatigue, malaise, cough, fevers, night sweats, and vomiting.

An ELISA test was positive for Paragonimus species at 1:32



Patient received a diagnosis of pulmonary and cutaneous paragonimiasis and was treated with praziquantel 75mg/kg in 3 divided doses for 2days

- her systemic symptoms resolved within 48 hrs of initiating therapy, and the left cheek mass resolved within 7 days of Rx
- methylprednisolone was tapered and discontinued
- one month after treatment, she denied having fever, night sweats, cough, or malaise
- two other patients received the confirmed or presumed diagnosis of paragonimiasis and also had the hx of ingestion of raw crawfish or crayfish while they (the patients) were intoxicated with alcohol

Lane M. et al. Clinical Infectious Diseases 2009; 49: e55-61

When to suspect parasitic lung diseases?

- born or lived in endemic areas (however, pay attention to possibility of autochthonous cases)
- significant peripheral blood eosinophilia
- unexplained and worsening cases of community acquired pneumonia
- certain radiological presentations (e.g. cystic lesions, fleeting infiltrates)

Table 1 Pulmonary diseases caused by parasitic infections

Diseases	Parasites
I. Protozoa	
1. Pulmonary amoebiasis	*Entamoeba histolytica*
2. Pulmonary leishmaniasis	*Leishmania donovani*
3. Pulmonary malaria	*Plasmodium vivax*
	Plasmodium falciparum
	Plasmodium malariae
	Plasmodium ovale
4. Pulmonary babesiosis	*Babesia microti*
	Babesia divergens
5. Pulmonary toxoplasmosis	*Toxoplasma gondii*
II. Helminths	
a) Cestodes	
1. Pulmonary hydatid disease	*Echinococcus granulosus*
	Echinococcus multilocularis
b) Trematodes	
1. Pulmonary schistosomiasis	*Schistosoma haematobium*
	Schistosoma mansoni
	Schistosoma japonicum
2. Pulmonary paragonimiasis	*Paragonimus westermani*
c) Nematodes	
1. Pulmonary ascariasis	*Ascaris lumbricoides*
2. Pulmonary ancylostomiasis	*Ancylostoma duodenale*
	Necator americanus
3. Pulmonary strongyloidiasis	*Strongyloides stercoralis*
4. Tropical pulmonary eosinophilia (filarial infection)	*Wuchereria bancrofti*
	Brugia malayi
5. Pulmonary dirofilariasis	*Dirofilaria immitis*
	Dirofilaria repens
6. Visceral larva migrans	*Toxocara canis*
	Toxocara catis
7. Pulmonary trichinellosis	*Trichinella spiralis*

Vijayan VK
Current Opinion in Pulmonary Medicine; 2009; 15: 274-82

Table 2 Rare pulmonary protozoal infections in immunocompromised individuals

Diseases	Parasites
1. Pulmonary acanthamoebiasis	*Acanthamoeba castellanii*
	Acanthamoeba polyphaga
2. Pulmonary balamuthiasis	*Balamuthia mandrillaris*
3. Pulmonary naegleriasis	*Naegleria fowleri*
4. Pulmonary trichomoniasis	*Trichomonas vaginalis*
	Trichomonas tenax
	Trichomonas hominis
5. Pulmonary lophomoniasis	*Lophomonas blattarum*
6. Pulmonary trypanosomiasis	*Trypanosoma cruzi*
	Trypanosoma brucei gambiense
	Trypanososma brucei rhodesiense
7. Pulmonary cryptosporidiosis	*Cryptosporidium parvum*
	Cryptosporidium hominis
	Cryptosporidium meleagridis
8. Pulmonary cyclosporidiasis	*Cyclospora cayetanensis*
9. Pulmonary encephalitozoonosis	*Encephalitozoon cuniculi*
	Encephalitozoon hellem
	Encephalitozoon intestinalis
10. Pulmonary entercytozoonosis	*Enterocytozoon bieneusi*
11. Pulmonary balantidiasis	*Balantidium coli*

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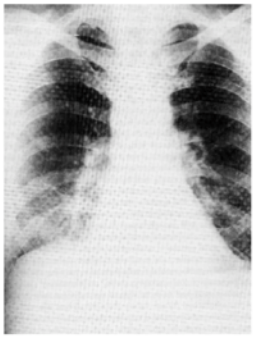
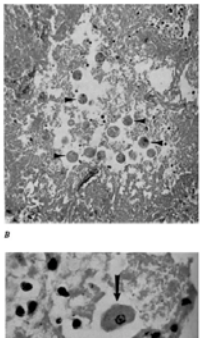
Pulmonary amoebiasis

- trophozoites can cross the intestinal mucosa and through the bloodstream reach liver, brain and lungs
- however, the most common route to the lungs is by extension of a right lobe liver abscess to the pulmonary tissue (through the diaphragm)
- fever, RUQ/chest pain, cough and hemoptysis
- "anchovy sauce-like" pus

Radiological findings pleuro-pulmonary amoebiasis include elevated hemidiaphragm, tender hepatomegaly, pleural effusion and basal pulmonary involvement





Shamsuzzaman SM and Hashiguchi Clin Chest Med 2002; 23: 479-92

Pulmonary amoebiasis can be diagnosed by the presence of trophozoites in the sputum or pleural fluid

stool tests are not confirmatory (*E. dispar or E. moshkvskii)*

serum antigen or antibody detection (IHA) are highly sensitive

real-time PCR is probably the best test but it is still technically challenging

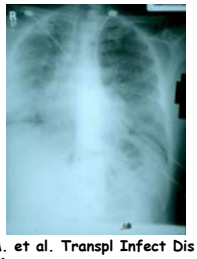
metronidazole or tinidazole (outside the US secnidazole, and ornidazole)

paromomycin or the second-line agent diloxanide furoate to cure luminal infection

Pneumonia is a common manifestation of toxoplasmosis in IC patients and has been reported in immunocompetent patients

in France, before the HAART era, 5% of AIDS patients with a PCP-like CXR had proven pulmonary toxoplasmosis

pneumonia, with or without fever, is also frequently reported as a manifestation of toxoplasmosis in HSCT and liver transplant patients (brain abscesses appear to be less frequently present in non-AIDS patients)



cough, dyspnea, hypoxia, and diffuse bilateral or localized infiltrates

Assi, M. et al. Transpl Infect Dis 2007; 9:132-6
Delhaes L et al. BMT 2009; July 3 Epub ahead of print

Pulmonary toxoplasmosis in a 41yo man who presented to an emergency room with life-threatening pneumonia

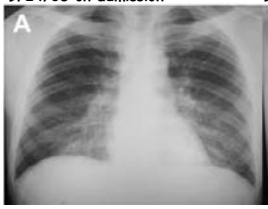
presented to a Brazilian hospital with an 8-day history of fever, myalgia, and headache followed by 4 days of nausea and vomiting (HIV negative)

fever (temperature, 40 C), jaundice, hepatosplenomegaly, and tachycardia (heartrate,115/min) but no lymph node enlargement

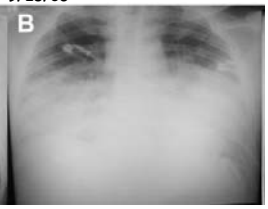
AST: 269; ALT: 312; total bili: 2.32; LDH: 755

thirty-six hours after admission to the hospital, he developed respiratory insufficiency with bilateral pulmonary reticular opacities suggestive of interstitial infiltrates

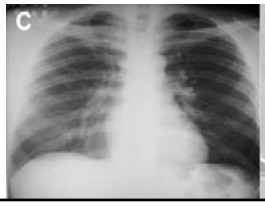
9/24/05 on admission



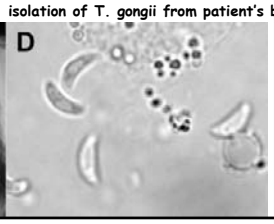
9/28/05



10/26/05 after anti-toxo Rx



isolation of T. gongii from patient's blood



Patient was treated with sulfadiazine, pyrimethamine, corticosteroids, and folinicacid

Serologic testing revealed the presence of *T.gondii*-specific IgM antibodies by ELISA

he exhibited a marked improvement in his clinical, radiological, and laboratory findings after the fourth day of anti-toxoplasma therapy and he was discharged from the hospital 12 days after admission

PCR in CSF and isolation studies in peripheral blood were positive for *Toxoplasma gondii*

Fatal Outbreak of Human Toxoplasmosis along the Maroni River: Epidemiological, Clinical, and Parasitological Aspects

Community outbreak of acute toxoplasmosis in immunocompetent patients

- Unusually severe clinical presentation 11 otherwise normal individuals
- 8 had severe disseminated disease (including pneumonia and hepatitis) that resulted in three deaths -one adult, one newborn and one fetus
- genotype analysis with 8 microsatellite markers revealed that only one strain was responsible for at least 5 of the 11 cases

Demar M et al. Clin Infect Dis 2007;45: e88-95

Laboratory Diagnosis of Pulmonary Toxoplasmosis

Serologies (IgG, IgM*)

PCR in BAL or peripheral blood (or any body fluid as clinically indicated)

histological examination with Wright Giemsa stain of sputum or BAL

isolation of the parasite from any body fluid or tissue

Positive IgM test results should undergo confirmatory testing at a reference laboratory ((e.g., in the United States, at the Palo Alto Medical Foundation Toxoplasma Serology Laboratory [PAMF-TSL]; Palo Alto, CA; http://www.pamf.org/serology/; telephone number (650) 853-4828;e-mail, toxolab@pamf.org).

Treatment of Pulmonary Toxoplasmosis

pyrimethamine/sulfadiazine/folinic acid

trimethoprim/sulfamethoxazole

pyrimethamine/clindamcyin/folinic acid

pyrimethamine/atovaquone/folinic acid

Pulmonary echinococcosis or hydatidosis

Echinococcus granulosus and *E. multilocularis*

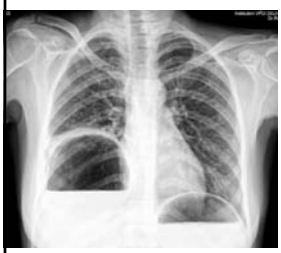
cough, fever, dyspnea, chest pain

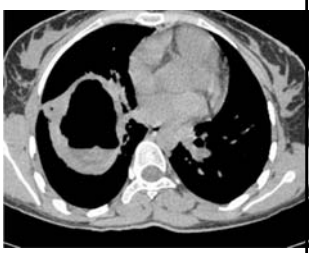
compression of adjacent tissue by the cysts.

rupture of the cysts into a bronchus may result in hemoptysis and expectoration of cystic fluid containing parasite membrane and can cause anaphylactic shock, respiratory distress, asthma-like symptoms, persistent pneumonia and sepsis

rupture into the pleural space results in pneumothorax, pleural effusion and empyema

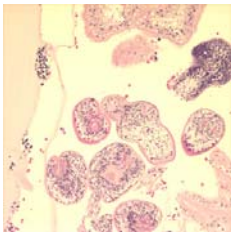
Radiological findings include solitary or multiple round opacities mimicking lung tumors, pnuemothorax, pleural effusion

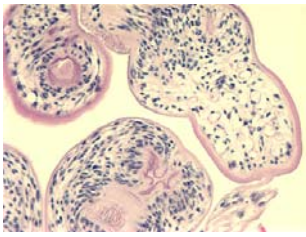




Vijayan VK Current Opinion in Pulmonary Medicine 2009; 15; 274-282

Antibody detection remains as the only supportive diagnostic method. Identification of Protoscoleces in tissue or cystic fluid establishes the diagnosis





treatment is primarily surgical

medical treatment includes albendazole +/-praziquantel

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***Strongyloides stercoralis* has worldwide distribution but more common in South America, South-EastAsia, sub-Saharan Africa and the Appalachian region of the United States**

Strongyloides infection is sustained over time in a given host by a small, stable number of intestinal adult worms

although these die after a finite lifespan, autoinfection ensures the constant production of new worms perpetuating the cycle even in the absence of re-infection

HTLV-infection or corticosteroid use are major risk factors for dissemination and pulmonary involvement

Pulmonary symptoms include cough, shortness of breath, wheezing and hemoptysis

in patients with disseminated strongyloidiasis, Gram negative septicemia, pneumonia, and meningitis can occur

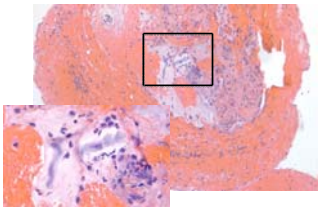
ARDS often develops

eosinophilia is often absent during hyperinfection

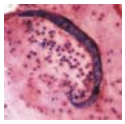
Strongyloides-specific serological tests (CDC)

the parasite can be visualized in respiratory secretions

Respiratory secretions often contain the parasite



Bronchoscopic biopsy in patient with Strongyloides hyperinfection syndrome
Courtesy Chandra Krishnan, MD,
Stanford University Department of Pathology

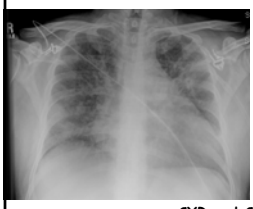


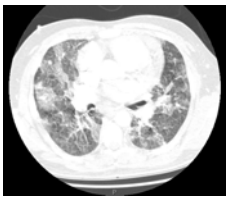
Sputum sample

BAL sample showing filariform larvae

Courtesy Stanford University Microbiology Laboratory

Pneumonitis is common, with cough, respiratory failure, and diffuse interstitial infiltrates or consolidation on radiographs





CXR and CT in Stanford patient with *Strongyloides* hyperinfection syndrome

ivermectin is preferred for hyperinfection/disseminated strongyloidiasis.

it should be administered daily until symptoms have resolved and larvae have not been detected for at least two weeks

Table 1 Infectious causes of pulmonary eosinophilia

1. Parasite-induced eosinophilic lung diseases
   a) Nematodes
      i Pulmonary ascariasis
      ii Pulmonary ancylostomiasis
      iii Pulmonary strongyloidiasis
      iv Tropical pulmonary eosinophilia
      v Visceral larva migrans
      vi Pulmonary trichinellosis
   b) Trematodes
      i Pulmonary schistosomiasis
      ii Pulmonary paragonimiasis
   c) Cestodes
      i Pulmonary hydatid cyst
2. Bacteria-induced eosinophilic lung diseases
   a) Pulmonary tuberculosis
   b) Pulmonary brucellosis
3. Fungus-induced eosinophilic lung diseases
   a) Pulmonary coccidiodomycosis
   b) Pulmonary cryptococcosis
   c) Pulmonary histoplasmosis
   d) Allergic broncho-pulmonary mycoses (ABPM)

Vijayan VK. Current Opinion in Pulmonary Medicine 2007,13: 428–433

Noninfectious causes of pulmonary eosinophilia

- bronchial asthma
- acute eosinophilic pneumonia
- chronic eosinophilic pneumonia
- idiopathic hyper-eosinophilic syndrome
- cryptogenic pulmonary fibrosis
- Wegener's granulomatosis
- lymphomatoid granulomatosis
- eosinophilic granuloma of the lung
- Churg-Strauss syn-drome
- drug hypersensitivity reactions

Tropical Pulmonary Eosinophilia (TPE)

syndrome that results from an immunologic hyper-responsiveness to filarial parasites, *Wuchereria bancrofti* and *Brugia malayi*

characterized by cough, dyspnoea and nocturnal wheezing, diffuse reticulonodular infiltrates and marked peripheral blood eosinophilia

patient travelling from a filarial endemic region presenting with "asthma-like" symptoms

sputum is usually scanty, viscous and mucoid, often shows clumps of eosinophils, Charcot-Leyden crystals are rarely observed

Hallmark of TPE is leucocytosis with an absolute eosinophil count of usually more than 3000 cells/mm3 (may range from 5000 to 80000)

Loffler's syndrome

unilateral or bilateral, transient, migratory, nonsegmental opacities of various sizes in the setting of parasitic infections

usually described in patients with pulmonary Ascaris infection

Leucocytosis, particularly eosinophilia, is an important laboratory finding

larvae can sometimes be demonstrated in respiratory or gastric secretion.

Pulmonary paragonimiasis has been reported from the following geographical areas (autochthonous cases), except:

A. Southeast Asia

B. China

C. North America

D. Africa

E. This question is tricky because autochthonous cases have been reported from all the above areas