Strongyloides:
What you always wanted with breakfast

Global to Local lecture series: Parasitic infections
73 yo Cambodian Male

- Former truck driver
- 15 pack-year h/o smoking; quit 1989
- Hospitalized April 2009
  - COPD exacerbation
- Dx adult onset asthma April 2009
  - FEV1/FVC 59%
  - Marked reactivity
73yo Cambodian Man: Asthma

- ICU June 2009
  - Acute asthma exacerbation at 2:00 AM
  - AMS
  - EMS 62% RA
  - No seasonal allergies, no childhood asthma, no URI
  - Sx, No change in environmental exposures
  - Admitted to ICU with acute asthma exacerbation
  - Persistent cough
  - Tx: Solumderol, oral prednisone, guaifenesin
73yo Cambodian Man: Asthma

- CBC 2/10/2011: Eosinophils 1239
- Stool O&P completed: *Strongyloides stercoralis* Rahbditiform larvae
- *Strongyloides* IgG positive
- ID Consult
  - Ivermectin 200 mcg/kg x 2 days, then repeat in 2 weeks
  - *Strongyloides* antibody serologies pre and post treatment
  - Repeat O&P in 3 months
- Check HLTV-1
- AVOID Steroids
**Strongyloides stercoralis**

- Infects 30-100 million people worldwide (1)
- Tropical and subtropical areas
  - Southeast Asia, South American, sub-Saharan Africa, Southeast US
- Poor sanitation
- Southeast US: 1-4% Appalachia (9, 10)
- Infection in Canadian refugees 1990:
  - Cambodia (76%), Laos (56%), Vietnam (12%) (2)
- 42% Cambodian immigrants to Australia infected (3)
Strongyloides stercoralis

Source: Crompton et al 2003 in WGO Practice Guideline Management of Strongyloides
Strongyloides stercoralis: Life cycle
Strongyloides stercoralis

1. Infective Strongyloides filariform larvae penetrate the skin and travel hematogenously to the lungs.

2. From the alveoli, larvae migrate to the lung tree to the intestine.

8a. Filariform larvae penetrate the large intestine mucosa or pass through the perianal skin and travel hematogenously to the lung.

7a. Some rhabditiform
From the alveolar spaces, filariform larvae migrate through the bronchial tree to the pharynx.

Larvae are swallowed and enter the gastrointestinal tract.

In the small intestine, filariform larvae burrow into the mucosal epithelium and molt twice to become adult worms.
1. Infective *Strongyloides* filariform larvae penetrate the skin and travel hematogenously to the lungs.

2. From the alveolar spaces, filariform larvae migrate through the bronchial tree to the pharynx.

3. Larvae are swallowed and enter the gastrointestinal tract.

4. In the small intestine, filariform larvae burrow into the mucosal epithelium and molt twice to become adult worms.

5. Adult female worms produce eggs through parthenogenesis that embryonate and hatch rhabditiform (non-infectious) larvae.

6. Some rhabditiform larvae mature into filariform larvae.

7a. Some rhabditiform larvae migrate to filariform larvae.

7b. Other rhabditiform larvae are excreted in feces.

8a. Filariform larvae penetrate the large intestine mucosa or pass through the perianal skin and travel hematogenously to the lung.

8b. Excreted rhabditiform larvae enter a free-living cycle in soil that includes maturation of adult worms, reproduction, and release of larvae.

**Diagnostic opportunities:**
- Step 2: Sputum or bronchoalveolar lavage examination for filariform larvae.
- Step 7b: Stool ova and parasite examination for rhabditiform larvae (4 weeks postinfection). Serologic testing may be diagnostic anytime following initial infection.
Strongyloides stercoralis: Auto-infection

- Adult worms burrow into Duodenum and Jejunum
- Adults live 5 years
- Can complete life cycle inside human
- Rhabditiform mature to filariform larvae in GI tract
- Reenter gastrointestinal mucosa or perianal skin
**Strongyloides stercoralis: Auto-infection**

- WWII and Vietnam veterans persistent infections
  - 57 years after initial infection in WWII veteran (4)
- 24% Cambodian immigrants to Australia persistent infections 12 years later (5)
- Larval transformation accelerated by steroid use
Strongyloides stercoralis: Morbidity

- Most Asymptomatic
- Acute asymptomatic to chronic life-threatening (1)
- Sx: puritis, abdominal pain, diarrhea, nausea and weight loss, cough
- Eosinophilia
- Larva Currens: Buttox, inner thighs, occ palms/penis
**Strongyloides stercoralis: Pulmonary**

- Pulmonary symptoms: non-productive cough, throat irritation, dyspnea, wheezing, hemoptysis
- Wheezing presenting symptom
- 10% people infected (10)
- Repeated fever and pneumonitis: Misdiagnosed recurrent PNA
- Asthma: Paradoxically worsens with steroid use
- CXR: Diffuse pneumonitis, hemorrhage, miliary nodularity (6)
- ARDS

Strongyloides stercoralis: Hyperinfection and disseminated disease

- Hyperinfection Syndrome: autoinfection → large parasite burdens (bowel, lungs, peritoneum) (7)
- Disseminated disease: larvae migrate to other organ → end-organ dysfunction, gram-neg sepsis, septic shock, meningitis (7)
- Increased risk with immunosuppression
- +/- eosinophilia
- Short courses steroids (6-17 days): Overwhelming hyperinfection and death
- Mortality 15-87% (8)

Source: http://tmcr.usuhs.mil/tmcr/chapter13/radiological4.htm
Strongyloides stercoralis: HTLV-1

- Retrovirus (12)
- IVDU, sex, contaminated blood, vertical transmission
- Infects CD4 and CD8 T-Cell
- Neoplastic disease, inflammatory syndromes, and opportunistic infections (12)
- IgE, IL4 and IL5 (12)
- Increased risk hyperinfection
- AIDS (less common)

Source: The Lancet (12)
**Strongyloides stercoralis: Malnutrition**

- Malnutrition causes profound disruption intestinal mucosa (1)
- Decreased immune function
- Associated with severe disease
- Severe disease without immune compromise more common in developing countries (1)
Strongyloides stercoralis: Sanitation

- 2.5 Billion people do not have access to improved sanitation (11)
- Access to improved water and sanitation are necessary to decrease the risk of food and waterborne disease.
- Poor access to sanitation increases risk of parasitic infections
- We are not on track to reach MDG for sanitation (11)
Strongyloides stercoralis: Diagnosis

- Notoriously difficult
- Larvae first appear in stool 3-4 weeks after infection
- Larvae only excreted intermittently
- Among immigrants not diagnosed on arrival, mean time to dx is 55mo (10)
Strongyloides stercoralis: Diagnosis

- Stool O&P 51% sensitivity (10)
  - 16% have 3 negative O&P before dx
- Eosinophilia 84% sensitive to predict positive O&P (10)
  - Relative >5%
  - Absolute >400
- Duodenal aspirate/biopsy
- ELISA for IgG antibodies
  - Variable sensitivity by lab, up to 95%
  - False negative in immunocompromised
Strongyloides stercoralis: Treatment

- Ivermectin 200 mcg/kg, repeat in 2 weeks
  - 97% efficacy
  - No Hookworm coverage
- Thiabendazole 25 mg/kg/12 hour x 3 days
  - 78% efficacy
- Albendazole 400mg PO BID x 3-7 days
  - 60% efficacy
- Hyperinfection
  - Unknown
  - Prolong or repeat Ivermectin (daily until Sx resolved and stool negative x2wk)
- Our case
Conclusion

- Neglected disease: Sanitation, malnutrition
- High prevalence *Strongyloides* in immigrants from Southeast Asia
- Consider testing for *Strongyloides* in patients from endemic areas
  - Adult onset asthma
  - ARDS
  - Gram-negative sepsis
- Can trigger fatal hyperinfection and disseminated disease.
- Take extreme caution using steroids in patients with *Stronglyoidiasis*. 
References

References

