



## Chapter 133 – Parasitic Infections

### Episode Overview

#### Key Points:

1. Parasitic disease may manifest with almost any symptom or constellation of signs and symptoms. Accordingly, a travel history should be obtained from all patient with clinically significant signs and symptoms of unclear cause. The combination of presenting signs and symptoms and a history of recent travel to a specific geographical regions can lead to early diagnosis and the initiation of pharmacotherapy, decreasing morbidity and mortality and increasing the probability of eradication of the infection.
2. Parasitic co-infections are particularly common in patients with HIV infections and AIDS. A travel history is essential because the clinical presentation may be atypical, morbidity and mortality more severe, and treatment and eradication of the parasite are often prolonged in these patients.
3. Acute malaria should be suspected in patients with irregular high fevers associated with headache, abdominal pain, or respiratory infection. Falciparum malaria, which has a unique morphology easily identifiable on a peripheral blood smear, is the only species of malaria that causes coma and death. Furthermore, it is the most highly resistant to chemotherapy, demanding close observation and clinical follow-up of patients. Patients who are clinically ill or who are suspected of having falciparum malaria should be hospitalized for evaluation and treatment.
4. Cysticercosis should be considered in the differential diagnosis for new-onset seizures, especially in immigrants from Central and South America
5. Giardiasis should be suspected in patients with diarrhea who have recently been camping or drinking unfiltered mountain spring water. Patients may tolerate several weeks of severe bloating, flatulence, eructation, and weight loss without fever before seeking medical attention

#### Core Questions:

1. Describe the life-cycle of malaria and list 4 common types.
2. Describe clinical features of malarial infection. What is unique to each type?
3. Describe the diagnosis and treatment of acute malarial infection.
4. List 5 complications of malaria
5. What is black-water fever?
6. What is Babesiosis? What is its vector and how does it present?
7. Describe the features of American Trypanosomiasis + African Trypanosoma
8. List 6 common illnesses causing fever in the returning traveler and 5 life threatening infections
9. Other than malaria, list 3 other organisms that cause:
  - a. CNS infection
  - b. Anemia
  - c. Pulmonary Symptoms
10. List the most common organism causing:
  - a. Peripheral edema
  - b. Dermatologic symptoms x2



- c. Visual symptoms
  - d. CV symptoms
11. List 5 common GI parasites and their typical manifestations

### Wise Cracks:

1. Rounds Pimper: quick association of parasite and treatment
2. A 32 year-old male has returned from a BBQ tour of South America. He is now actively seizing.
  - a. What does he have?
  - b. Your CT scanner is down, how else do you confirm the diagnosis?
3. What are kissing bugs?

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### Rosen's in Perspective

This chapter is infamous for THE LARGEST LISTS IN THE WHOLE BOOK. We won't be covering them all. If you feel the need to OCD, go check out the chapter.

**Refer to Box 125.1 in Rosen's 9<sup>th</sup> Edition for the comprehensive table detailing the travel history for evaluation of parasitic disease in the emergency department**

|                                   |   |
|-----------------------------------|---|
| <b>Questions For All Patients</b> | <ul style="list-style-type: none"><li>• What were the exact dates of travel?</li><li>• What countries did the patient visit?</li><li>• How much time did you spend in each country?</li><li>• What was the patient doing in the country, and where was he/she living?</li><li>• Was the patient staying in cities or rural villages?</li><li>• Was the patient sleeping in hotels or tents?</li><li>• Did the patient engage in protected or unprotected sexual intercourse?</li><li>• What did the patient eat or drink?</li><li>• What were the patient's activities?</li><li>• Did the patient receive prophylactic immunizations before travel?</li><li>• Did the patient take malaria chemoprophylaxis and comply with the regimen?</li><li>• Did the patient use mosquito repellent and netting?</li><li>• Does the patient have underlying chronic medical problems?</li><li>• What medications does the patient take?</li><li>• When did symptoms start, and what has been the chronology of symptoms, particularly fever and diarrhea?</li></ul> |
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|  |   |
|--|---|
| <b>Questions for Recent Immigrants</b> | <ul style="list-style-type: none"><li>• When did the patient arrive, and from where?</li><li>• What acute or chronic illnesses did the patient have previously while living in the country of origin?</li><li>• What treatment did they receive there?</li><li>• If the patient is a refugee or immigrant, what countries did the patient pass through, and what were the living conditions?</li><li>• What was the season during the patient's stay or travel in the countries (e.g., monsoon versus dry)?</li><li>• What animal exposure or bites has the patient experience?</li><li>• Has the patient had exposure to fresh water in work or recreational activities?</li></ul> |
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\*\*\*NOTE\*\*\*: Moral of today and this chapter:

1. Don't eat raw meats, fish, or unwashed anything
2. Don't walk around barefoot
3. Don't eat dirt or poop
4. Don't hang around animals
5. Live in a saran-wrap bubble

**Refer to Table 125.1 in Rosen's 9<sup>th</sup> Edition for the comprehensive table detailing the various anti-parasitic agents and their indications/mechanisms of action**

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### **[1] Describe the life-cycle of malaria and list 4 common types**

There are four stages of the life-cycle of the malaria parasite:

**Stage 1 - Mosquito Stage:** Female anopheles takes blood meal and injects parasite into blood

**Stage 2 - Human Liver Stage:** liver cells infected, then rupture

**Stage 3 - Human Blood Stage:** RBCs infected, then rupture

**Stage 4 - Sexual stage:** Female anopheles takes another blood meals and ingests parasite

There are four major types of malaria and one rare type:

- Plasmodium Falciparum (deadly)
  - Plasmodium Malarie
  - Plasmodium Ovale (recurrent)
  - Vivax (recurrent)
  - \*\*\* 5th type\*\*\* plasmodium knowlesi (primates to humans)
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## [2] Describe clinical features of malarial infection. What is unique to each type?

With malarial infection, it is all about the FEVER!

- Early with malaria infection, febrile paroxysms occur at irregular intervals throughout day
- Later in infection febrile paroxysms become regular
  - When you see febrile paroxysms every other day, think about the following types of malaria:
    - ☐ P. vivax
    - ☐ P. ovale,
    - ☐ P. falciparum
  - If the fevers occur every third day, think:
    - ☐ P. malariae.
- If an individual experiences seizures as a result of their infection, they are likely to be infected with P. falciparum
  - Seizures may herald CEREBRAL MALARIA
- Watch for in febrile seizures in pediatric patients infected with any of the species
- Non-immune patients can have temps above 40°C leading to tachycardia complicated by febrile delirium

There are two major forms of malarial infection: uncomplicated and severe. \

### Uncomplicated Malaria:

- The patient will have symptoms of malaria
- The patient will have positive parasitological test
- The patient will NOT have signs of severe malaria

### Severe Malaria (Think Falciparum >>>> Vivax):

- **Risk factors:**
  - Non-immune individuals
  - Immunocompromised patients (including asplenic individuals)
  - Children 6 to 36 months of age
  - Pregnant women
- **Features:**
  - CNS: Altered consciousness, (+/- meningismus) seizures, focal deficits (cerebral malaria)
  - GI: Vomiting, jaundice
  - RESP: Respiratory distress +/- ARDS
  - RENAL: AKI
  - CVS: Shock
  - HAEM: Severe hemolytic anemia with jaundice, coagulopathies and spontaneous hemorrhage
  - METABOLIC: acidosis and hypoglycemia
  - HIGH PARASITE LOAD: >2% RBCs infected or >100,000 parasites/mm<sup>3</sup>

For an excellent summary of malaria, its pathophysiology, and its treatment, check out the LITFL post: <https://lifeinthefastlane.com/cc/malaria/>



Remember, the pathophysiology of malarial infection is the result of CYTOADHERENCE:

- AKA: parasitized (and non-parasitized) red cells adhering to small vessels causing infarcts, capillary leakage, and organ dysfunction

This process of cytoadherence and tissue damage results in the following complications:

#### **Cerebral Malaria:**

- **Presentation:**
  - Encephalopathy with impaired consciousness
  - Delirium
  - Seizures
- **Risk Factors:**
  - Children and older adults
  - Pregnancy
  - Poor nutritional status
  - HIV infection
  - Host genetic susceptibility
  - History of splenectomy

Always remember the differential diagnosis for malaria:

#### **Differential Diagnosis for Malaria:**

- Leptospirosis
- Pneumonia
- Typhoid fever
- Hemorrhagic fever
- Sepsis due to bacteremia
- Dengue fever
- Chikungunya
- Meningitis

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### **[3] Describe the diagnosis and treatment of acute malarial infection**

#### **Diagnosis of Acute Malarial Infections:**

There are two tests that we use for the diagnosis of acute malarial infections:

1. Thick & thin films for microscopy (1-3 Q12hrs Gold standard)
2. Malaria rapid Antigen (sample in febrile stage) test

\*\*\*NOTE\*\*\*: If slides are negative on your first attempt, repeat testing every 24 hours for 3 days



## Treatment of Acute Malarial Infections:

### Uncomplicated:

- PO quinine + doxycycline
- PO chloroquine (watch for resistance)

\*\*\*NOTE\*\*\*: Chloroquine -sensitive regions: Central America & Middle East

### Complicated:

- IV artesunate OR
  - IV quinine + doxycycline
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## [4] List 7 complications of malaria

There are a number of complications related to malarial infection. There are seven of the most important listed below:

### Complications of Malarial Infections:

- Cerebral Malaria
  - Hypoglycemia
  - Metabolic Acidosis
  - ATN
  - ARDS
  - DIC
  - Blackwater fever
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## [5] What is black-water fever?

### Black-water Fever:

- Black-water Fever is a result of the hemolytic anemia caused by malarial infection. AS red cells burst, hemoglobinuria occurs, causing the urine to take on a dark appearance.
- This is often accompanied by the typical fevers, chills, and rigors of malarial infection, but is also accompanied by jaundice, profound fast-onset anemia, and vomiting.

\*\*\*NOTE\*\*\*: Black-water fever is not to be confused with the nephrotic syndrome caused by P. malariae infection. These are two completely different processes.

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## [6] What is Ba'be'siosis? What is its vector and how does it present?

### Ba'be'siosis:

- **Definition:**
    - Ba'be'siosis is a tickborne disease that is like malaria, that is characterized by acute febrile illness tickborne
  - **Causative Agent:**
    - Ba'be'siosis is caused by an intraerythrocytic protozoal parasites of the genus Babesia
  - **Vector:**
    - The vector for ba'be'siosis is the Ixodes tick, largely found on deer and mice, cattle.
  - **Clinical presentation :**
    - Incubation period of 1 to 4 weeks after tick exposure, followed by non-specific influenza-like illness, with fever, chills, headache, fatigue, and anorexia,
    - Unlike Lyme disease, rash is not a major feature; however, if you see erythema figuratum , consider septic ba'be'siosis.
    - Asplenic patients can get hypotension, severe hemolytic anemia, hemoglobinuria, jaundice, renal insufficiency, ARDS, DIC
    - Think about this in endemic areas as cause of post-transfusion infection
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## [7] Describe the features of American Trypanosomiasis and African Trypanosoma

### American Trypanosomiasis (Chagas Disease):

- **Causative Agent:**
  - Trypanosomiasis Cruzi
- **Endemic Region:**
  - South America
- **Vector:**
  - Reduviidae bug (Assassin/Kissing Bug)
- **Clinical Presentation:**
  - Romaña sign - swelling of the ipsilateral eye and eyelid to the bite from inadvertent spreading of infected bug feces into the eye
- **Complications:**
  - Myocarditis
  - Dilated Cardiomyopathy
  - Meningo-Encephalitis (can be chronic)
- **Treatment:**
  - Nifurtimox / Benznidazole

### African Trypanosoma (African Sleeping Sickness):

- **Causative Agent**
  - Trypanosomiasis Brucei
- **Endemic Region:**



- Africa
  - **Vector:**
    - TseTse fly
  - **Clinical Presentation:**
    - Extreme sleepiness + coma
  - **Treatment:**
    - Suramin
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## **[8] List 6 common illnesses causing fever in the returning traveler and 5 life threatening infections**

Remember, this list will change depending on where the traveler is returning from! That detailed history is crucial. Who, what, when, where, why, how?

### **Common illnesses:**

- Dengue fever
- Chikungunya
- Meningitis
- Pneumonia
- Sepsis due to bacteremia
- Typhoid fever
- Leptospirosis
- Viral hemorrhagic fever

### **Life threatening infections:**

- Secondary bacterial infection / sepsis
  - Emerging viral illness - e.g. Ebola, MERS CoV,
  - HIV
  - Cerebral malaria
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## **[9] Other than malaria, list 3 other organisms that cause the following:**

### **CNS infection:**

- Neurocysticercosis
- Echinococcus (hydatid cysts)
- African Trypanosomiasis (sleeping sickness)
- Trichinella spiralis

### **Anemia:**

- Helminthic infections (with concomitant eosinophilia)
- Ba'be'siosis





- Whipworm
- Hookworm
- Tapeworms / flatworm / fluke

**Pulmonary Symptoms:**

- *E. histolytica* (pleural effusions)
  - PCP aka PJP (think HIV)
  - Löffler's syndrome (round worm / hook worm / thread worm) pneumonia w/ eosinophilia
  - *Strongyloides* (think lung infections with Aortitis)
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**[10] List the most common organism causing the following:**

**Peripheral edema:**

- Elephantiasis

**Dermatologic symptoms:**

- Leishmaniasis

**Visual symptoms:**

- Onchocerciasis river blindness

**CV symptoms:**

- Chagas Disease aka *Trypanosoma cruzi* causing myocarditis
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**[11] List 5 common GI parasites and their typical manifestations**

**Diarrhea:**

- *Cryptosporidium* and *Cyclospora*
- *E. histolytica*
- *Giardia*
- *Schistosomiasis*

**Abdominal pain:**

- Tropical appendicitis: ITS A THING! Think = enterobiasis, amebiasis, ascariasis, trichuriasis, and taeniasis
- *A. lumbricoides* (roundworm)
- *Strongyloides*
- *E. histolytica* (can mimic viral hepatitis)



## WiseCracks:

### [1] Classic rounds pimper: quick association of parasite to treatment

| Parasite:             | Treatment:                |
|-----------------------|---------------------------|
| Entamoeba Histolytica | Flagyl                    |
| Giardia               | Flagyl                    |
| Leishmaniasis         | Amphotericin B            |
| Schistosomiasis       | Praziquantel              |
| Trypanosoma Cruzi     | Nifurtimax / Benznidazole |
| Neurocysticercosis    | Albenazole                |
| Pinworm               | Albenadzole / mebendazole |

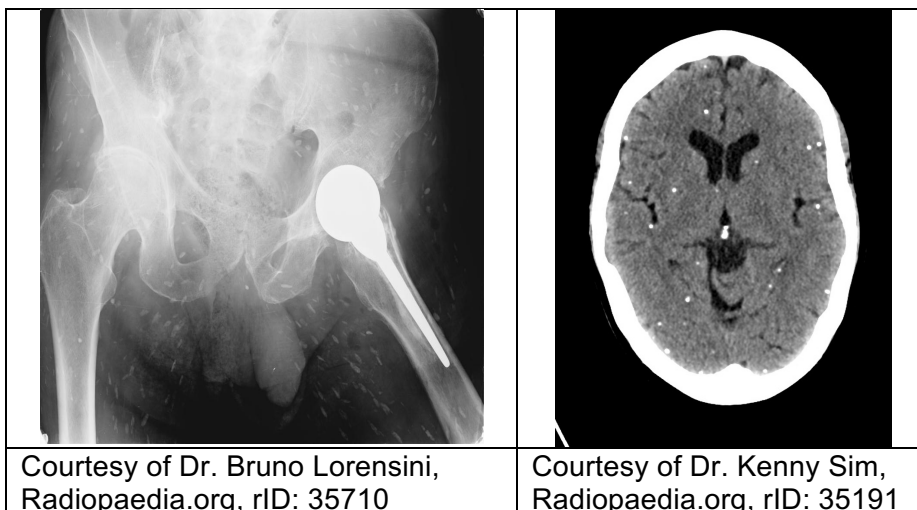
### [2] A 32 year-old male has returned from a BBQ tour of South America. He is now actively seizing. What does he have and how can we diagnose it without a CT scanner?

#### Diagnosis:

- Neurocysticercosis
- Think about it in patients exposed to undercooked pork and seizures

#### Diagnostic Modality:

- Obviously, you CT scan is the gold standard for diagnosis of neurocysticercosis, however, you can use a soft tissue radiograph looking for typical soft tissue calcifications





### **[3] What are kissing bugs?**

Whenever you hear the term “kissing bugs”, think Chagas Disease. The kissing bug or Reduviid bug is the vector for Chagas disease. Its bite is the cause of the Romaña’s sign (painless unilateral periorbital edema). If you see Romaña’s Sign, it is pathognomonic for Chagas Disease.