

Schistosomiasis

WRAIR- GEIS 'Operational Clinical Infectious Disease' Course

WRAIR

Walter Reed Army
Institute of Research

Soldier Health • World Health



Lecture Objectives

Increase knowledge of:

Epidemiology

Prevention

Treatment

Introduction

Schistosomiasis

Caused by parasitic trematode (fluke) in the
Genus Schistosoma

2nd most common parasitic disease behind
Malaria

More than 40 million people were treated in 2013



Military Relevance

Historically a medical problem from the age of the Napoleonic conquests

Several hundred British and Australian troops infected in Egypt during World War I

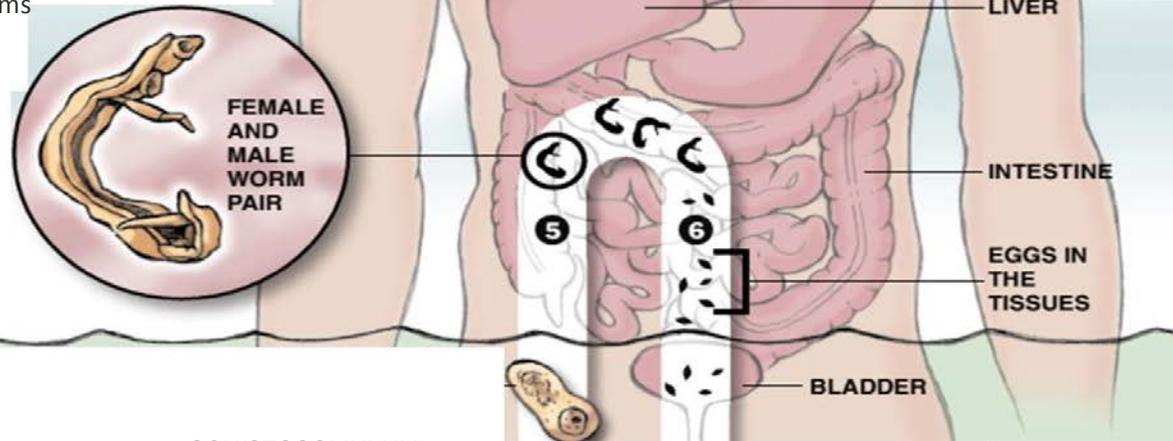
During World War II, over 1,500 British and African troops became infected in Nigeria

During the invasion of Leyte hundreds of US service members became infected

During World War II, many Puerto Rican nationals applying for enlistment with the US Army were turned away based on positive stool samples

The Life Cycle of Schistosomiasis

Schistosomiasis affects more than 200 million people worldwide. The parasitic larvae live in fresh water and can penetrate human skin, placing people at risk through everyday activities such as washing laundry or fetching water. Inside the victim's body, adult female worms lay thousands of eggs that cause significant damage to internal organs, most commonly from scarring the intestines, bladder, kidneys, liver, or lungs. Children suffer the most from schistosomiasis, which causes poor growth and impaired cognitive function. The disease is completely preventable and can be controlled through an annual inexpensive drug treatment, health education, and access to safe water and sanitation.



Contaminated Fresh Water

SCHISTOSOMULUM

MIRACIDA

1 Parasitic eggs in fresh water.

2 Larvae called miracidiae hatch from the eggs then seek out certain species of snails.

3 Infecting the snails, the miracidiae multiply, producing larvae called cercariae.

4 Released into the water, the cercariae penetrate human skin, transforming into larvae called schistosomulae.

5 The schistosomulae mature into worms in the blood supply of the liver, intestines, and bladder.

6 The worms lay thousands of eggs that cause damage as they work through tissues.

7 The eggs, released into the water in urine or feces, restart the cycle.

The Carter Center / Graphic by Al Granberg



Hatching of a Schistosoma Mansoni Miracidium

<https://www.youtube.com/watch?v=eQXBhHXY5hM>

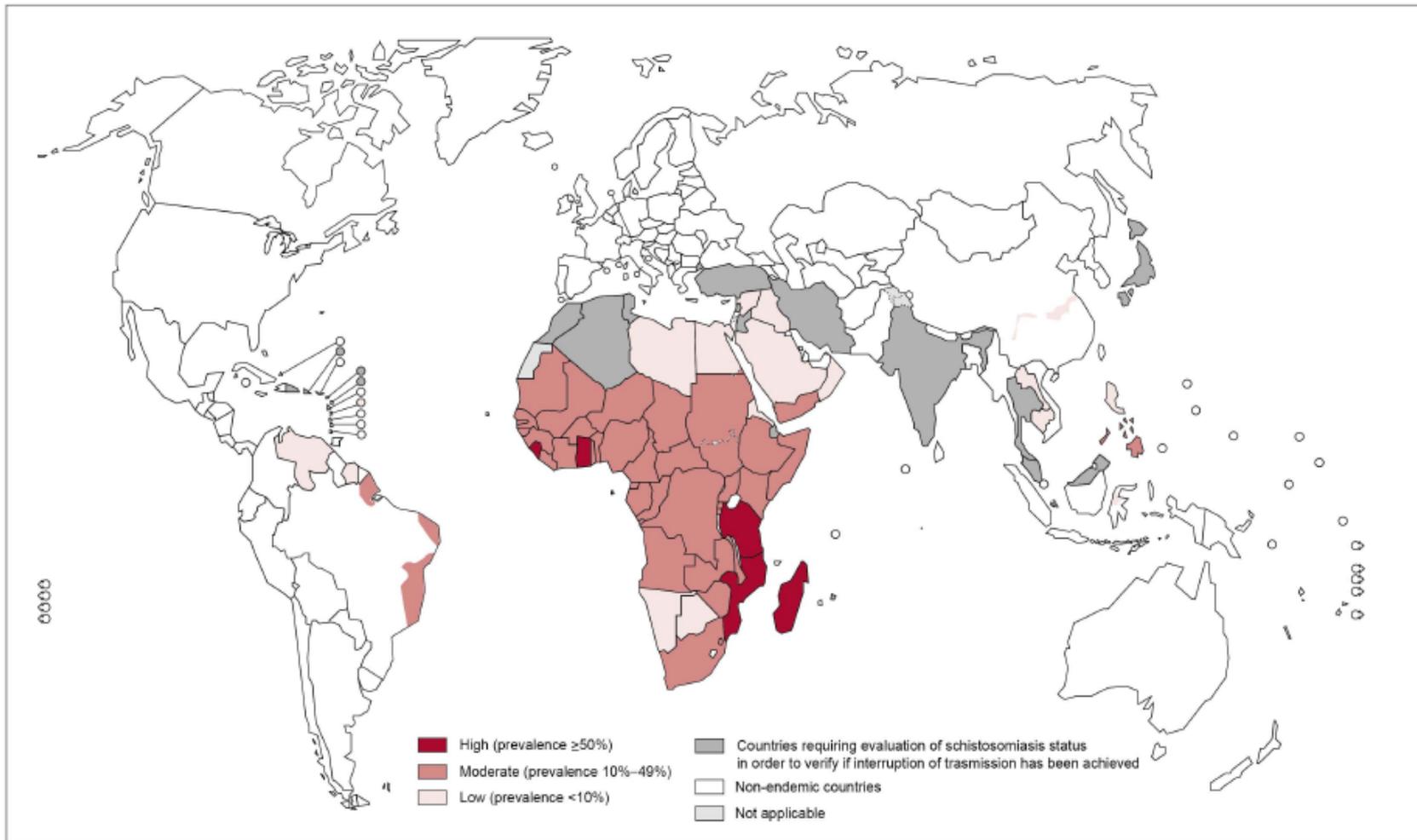


Schistosoma Mansoni Cercariae

<https://www.youtube.com/watch?v=hQUJ-FpgimA>

Type of infection	Parasite species	Definitive host	Snail vector	Geographic location
<i>Urogenital schistosomiasis</i>	<i>S. haematobium</i>	humans, non human primates	<i>Bulinus</i>	AFRICOM, CENTCOM
<i>Intestinal schistosomiasis</i>	<i>S. intercalatum</i>	humans, rodents, cattle	<i>Bulinus, Physopsis</i>	AFRICOM
	<i>S. japonicum</i>	humans, ruminants carnivores	<i>Oncomelania</i>	PACOM (China, Indonesia, the Phillipines)
	<i>S. mansoni</i>	humans, rodents	<i>Biomphalaria</i>	AFRICOM, SOUTHCOM
	<i>S mekongi</i>	humans, dogs, cats	<i>Oncomelania</i>	PACOM (Laos and Cambodia)

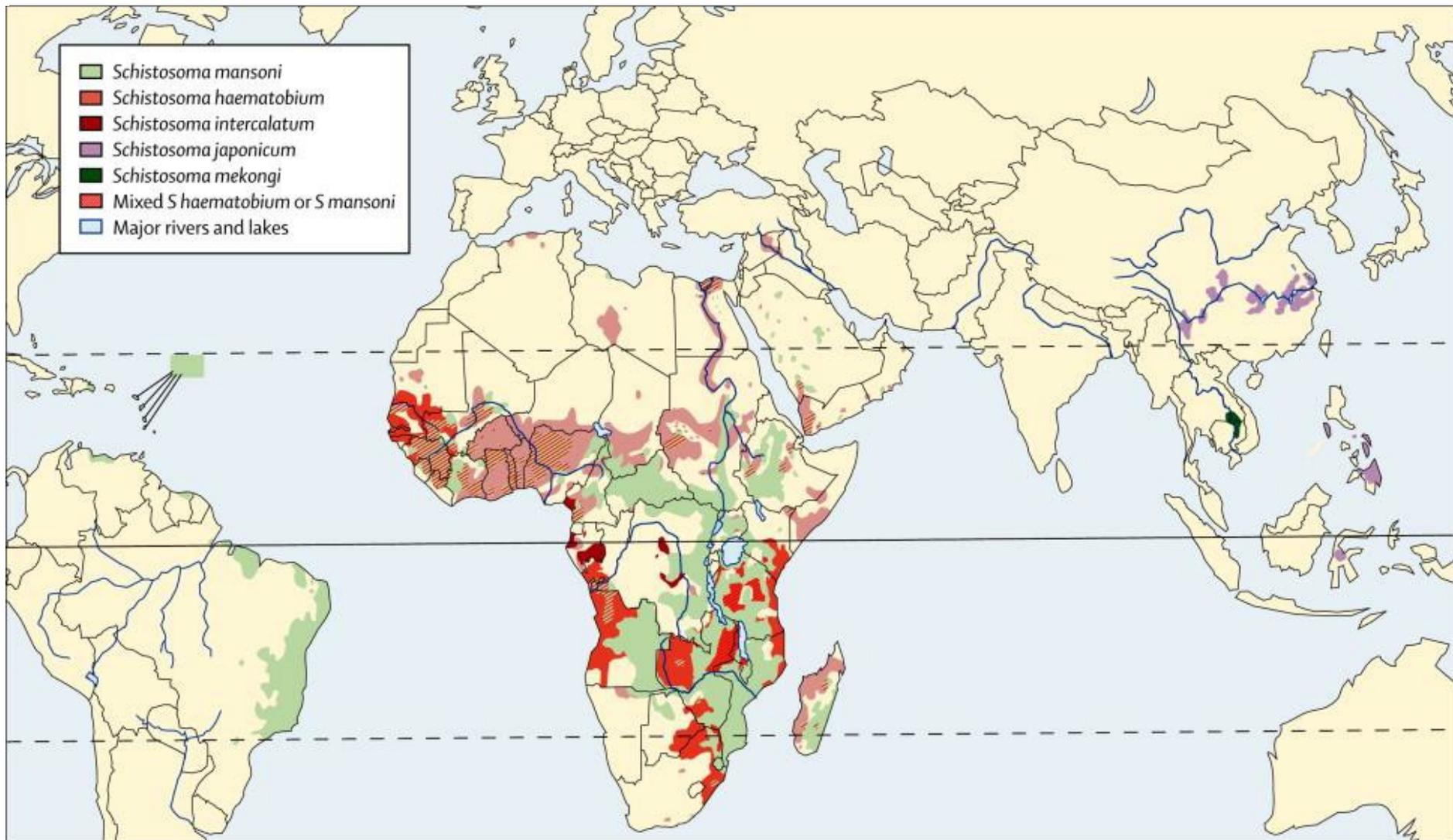
Distribution of schistosomiasis, worldwide, 2011



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. © WHO 2012. All rights reserved

Data Source: World Health Organization
 Map Production: Control of Neglected
 Tropical Diseases (NTD)
 World Health Organization





Colley, Daniel G., et al. "Human schistosomiasis." *The Lancet* 383.9936 (2014): 2253-2264

Clinical Signs and Symptoms

Incubation can range from 14-84 days

Many people are asymptomatic with subclinical disease

Acute infection can present as Katayama syndrome

Rash, fever, headache, myalgia, respiratory symptoms, diarrhea (with or without blood)

Eosinophilia, hepato- and/or splenomegaly

Clinical Signs and Symptoms

Symptoms

Fever Chills

Sweating

Headache

Cough

Diarrhea (50 %)

Weight Loss

Signs

- Lymphadenopathy
- Hepatomegaly (50 %)
- Splenomegaly (10%)

Clinical Presentation

Itchy rash at the site of parasite penetration

Abrupt onset of fever (approximately 4-8 weeks post exposure)

Fever may be accompanied by abdominal pain, bloody stool/urine, cough, lymphadenopathy, and hepatosplenomegaly.

Gastrointestinal symptoms appear 6-12 weeks post exposure

Maculopapular Rash



Gray, Darren J., et al. "Diagnosis and management of schistosomiasis." *BMJ* 342 (2011).

Hematuria



In Nasarawa North in Nigeria, 12-year-old Dauda Usman holds a sample of his urine, which is red with blood, a sign of schistosomiasis.

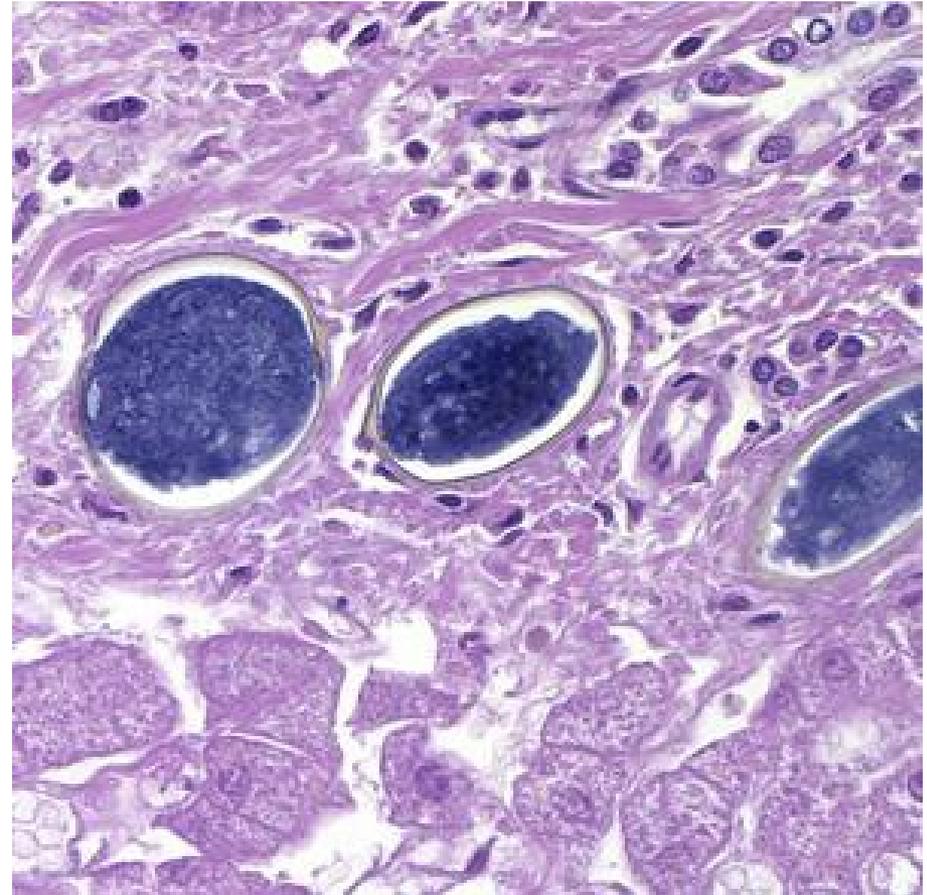
Carter Center Photo: Emily Staub

Hepato and Splenomegaly

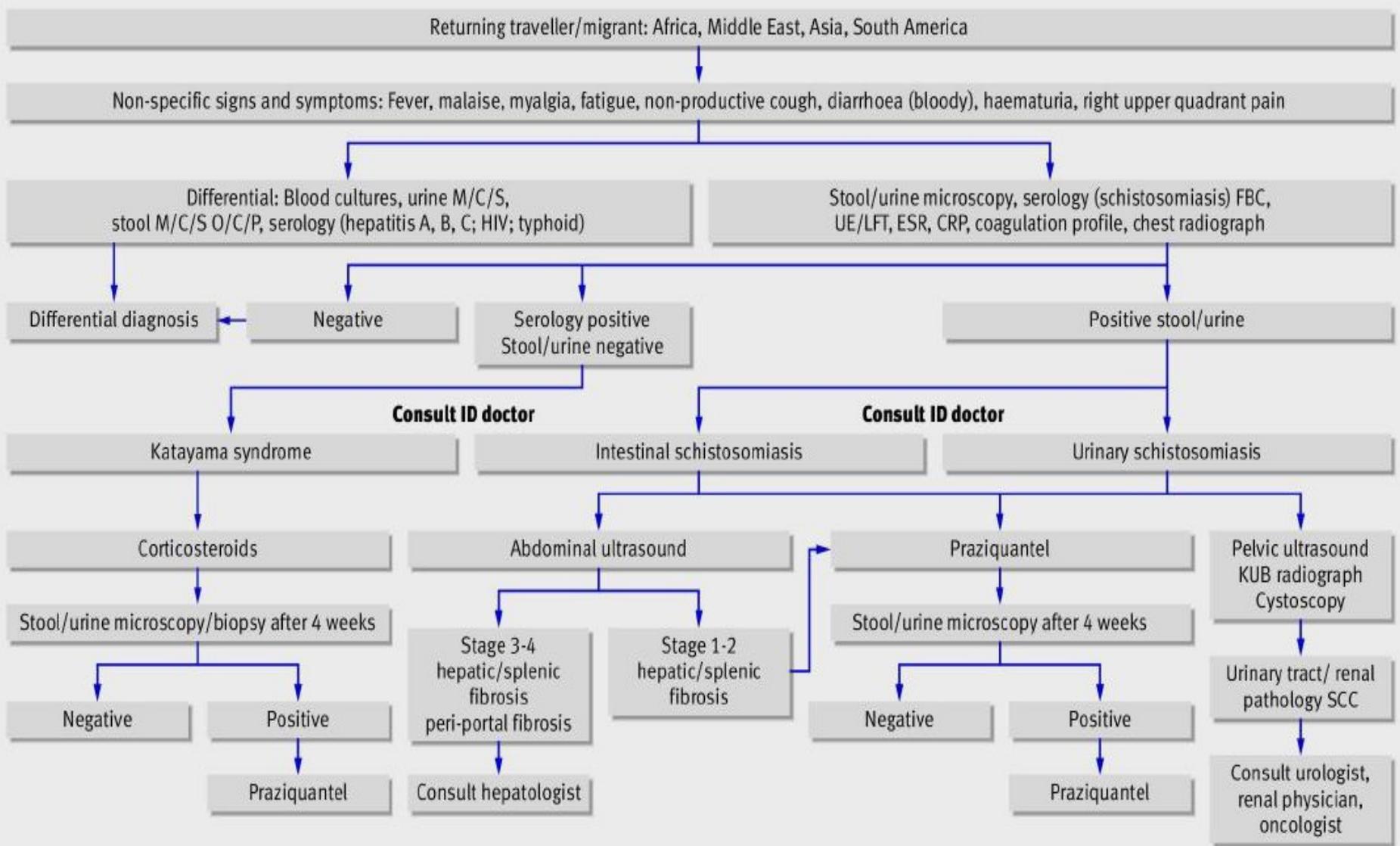


Child with schistosomiasis; credit; Project Crevette

TissueStains

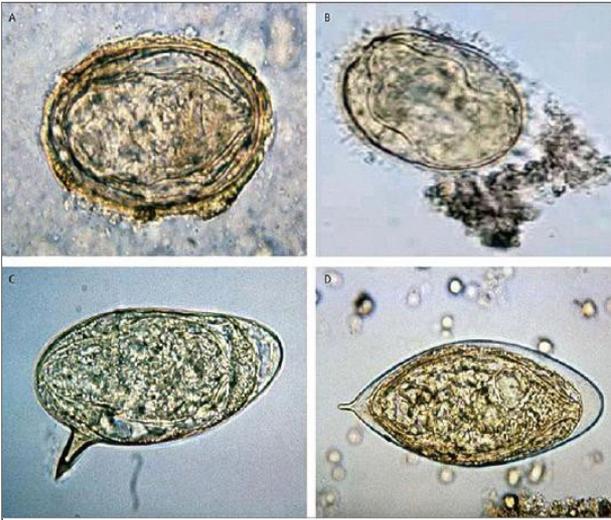


Courtesy of CDC image library



Gray, Darren J., et al. "Diagnosis and management of schistosomiasis." *BMJ* 342 (2011).

Diagnosis



Courtesy of CDC image library

Hematology

Eosinophilia (>500 cell/mm³)

Microbiology

Eggs in stool or urine sample 2-6 weeks

Serology

Immunofluorescent antibody test (IFA)

Indirect hemagglutination assays (IHA)

Enzyme-linked immunosorbent assay (ELISA)

Not useful in acute schistosomiasis or for people living in endemic areas

Need to get a complete travel history

Treatment

Treatment should be 6-8 weeks after last exposure to potentially contaminated water

Praziquantel

2 doses of 20 mg/kg for one day

S. mansoni, S. haematobium, S. intercalatum

3 doses of 20 mg/kg for one day

S. japonicum, S. mekongi

Repeated treatment may be needed after 2-4 weeks

Follow up positive pre-treatment stool/urine exam 1 to 2 months post treatment

Prevention

Avoidance of fresh water sources

Vigorous towel drying for brief accidental contact

When using water from fresh water sources,
boil for at least 1 minute

When water contact cannot be avoided, use
preventive chemotherapy

PPE where appropriate (rubber waders, boots)

Control

MASS DRUG ADMINISTRATION PROGRAMS

SNAIL CONTROL

CHEMICAL CONTROL THROUGH MOLLUSCIDES

BIOLOGICAL CONTROL THROUGH SNAIL NATURAL ENEMY
INTRODUCTION

ENVIRONMENTAL MODIFICATION

HEALTH EDUCATION

IMPROVED SANITATION

Questions?



MY UNCLE HAS A PARASITE IN HIS WALL.