Neglected tropical diseases (NTDs) are a group of parasitic, viral and bacterial infections with unusual names such as chagas, leishmaniasis and dengue. Many are chronic, debilitating infections that leave their victims malnourished, disabled and disfigured, which limits their ability to work or attend school. Most people associate NTDs with developing countries because they mainly impact people living in extreme poverty, on less than $2 per person per day — in the United States this includes an estimated 1.6 million households. Despite the fact that NTDs negatively affect public health and local economies in United States, there is very little public awareness of their impact and how to prevent them.

In this document, we lay out a school lesson plan for a role-playing game, ideally for sixth-grade students, to help explain several NTDs, their symptoms, and how they can be prevented. This activity document includes disease fact sheets, patient cases, and general instructions with answers. The goal is to increase awareness of NTDs in vulnerable youth populations to encourage early detection, treatment and prevention of these diseases.

These materials were based on an entry by Jennifer Nguyen and Emmy Sun for the Baker Institute Center for Health and Biosciences’ 2015 NTD Challenge “Children’s Outreach Concept” Competition.

Visit www.bakerinstitute.org/NTDs-classroom to download PDFs of this lesson plan in English and Spanish. For more information about the competition, visit www.bakerinstitute.org/ntdchallenges-usa.

COMBATING NEGLECTED TROPICAL DISEASES THROUGH EARLY EDUCATION, DETECTION AND PREVENTION

Neglected tropical diseases (NTDs) affect over 1 billion people worldwide and have a significant impact on the Americas, including at least 12 million people in the U.S.
Sixth-grade lesson plan for a role-playing game to facilitate understanding of NTDs

- Total activity time is approximately 60 minutes.
- Students are placed in groups of eight. In each group, four students will be the “doctors” and four students will be the “patients.”
- Each patient will be given one of four NTD “patient case sheets” featuring the external symptoms and how the patient acquired the NTD.
- Each doctor group will have a “master package” of symptoms, risk factors and transmission prevention methods of all four NTDs.
- The four patients will each present their case to the doctor group, and members of the doctor group will attempt to “diagnose” the patient. The doctor group will then inform the patient of available treatments, risk factors and transmission prevention methods for that NTD.
- Students will have eight minutes for each NTD case presentation and diagnosis.
- Next, the patient group and doctor group will swap sheets and rotate to their right within the classroom — so the patient becomes the doctor for the next round, and vice versa.
- The instructor has an answer key listing the correct NTD diagnosis for each patient. At the end of the activity, the instructor will review the answers with the entire class.

REFERENCES


CHAGAS DISEASE
(American Trypanosomiasis)

GENERAL INFO

Chagas disease affects 6–8 million people worldwide and about 12,000 people die each year due to disease complications. It is caused by a single-celled parasite (T. cruzi) that is usually transmitted by an insect known as a triatomine or kissing bug. The disease can also be spread during pregnancy from mother to child and by organ transplants or blood transfusions.

SYMPTOMS

Acute (two months after infection):
Less than 50% of those infected will experience the following symptoms:
• Skin lesions and swelling around infected area; and
• Flu-like symptoms (including fever, headache, swollen lymph nodes, etc.).

Chronic (up to a decade after infection):
• 30% of patients will develop cardiac disorders.
• 10% suffer from digestive alterations such as enlargement of the esophagus or colon.

RISK FACTORS

• Kissing bugs are commonly found in tropical areas of the Americas.
• Cracks in the walls of houses increase risk by allowing bugs to enter inside.
• Accidentally eating food contaminated with the parasite can result in infection.

PREVENTION

• Improve housing to avoid triatomine bug infestation.
• Spray houses and surrounding areas with insecticides.
• Use a bed net to prevent bug bites at night.
• Properly prepare, store and transport food.

TREATMENT

• Two drugs (benznidazole and nifurtimox) are efficacious if administered during the acute phase.
• Early detection during the acute phase is key to treatment; difficult to treat during chronic phase.
• Treating cardiac symptoms during the chronic phase may delay disease progression.
LEISHMANIASIS  
(Cutaneous)

GENERAL INFO

Each year between 700,000 and 1.3 million people acquire cutaneous leishmaniasis from the bite of a female sandfly that is infected with a single-celled *Leishmania* parasite.

SYMPTOMS

Cutaneous Form:
- Results in skin lesions, ulcers, life-long scars and serious disability.
- This form is most prevalent in the Americas, Middle East, Central Asia and the Mediterranean.

Mucocutaneous Form:
- Results in partial-to-total destruction of mucous membranes in the nose, mouth and throat.
- This form is most prevalent in the Americas, but only a small fraction of those infected with Leishmaniasis will develop the mucocutaneous form.

RISK FACTORS

- Sandflies are most active after dusk and before dawn.
- Crowded living conditions increase risk because sandflies are attracted to body heat.
- Those with poor nutrition are more likely to develop an infection after a sandfly bite.
- Destruction of sandfly habitat such as deforestation and urbanization increases sandfly contact with people.

PREVENTION

- Spray houses and surrounding areas with insecticides.
- Use a bed net to prevent bug bites at night.
- Cover as much skin as possible and use insect repellent when outdoors.

TREATMENT

There are multiple approaches including oral medication or topical treatment.
DENGUE FEVER

GENERAL INFO

- 2.35 million cases of dengue were reported in the Americas in 2013. 37,687 of these cases were severe dengue. Dengue fever is caused by a virus that is transmitted through the bite of infected mosquitoes.

SYMPTOMS

- Dengue causes high fever (40°C / 104°F), severe headache, pain behind the eyes, muscle and joint pains, nausea, vomiting, swollen glands or rash.
- Symptoms begin 4–10 days after initial infection and last for 2–7 days.
- Signs of severe dengue include plasma leakage (when the liquid portion of blood leaks out of the blood vessels), fluid accumulation, trouble breathing, persistent vomiting, severe bleeding and organ failure.
- Warning signs of severe dengue occur 3–7 days after first signs of symptoms.

RISK FACTORS

- Poor populations lacking basic health services due to increased urbanization are at risk.
- Climate change that leads to higher temperatures and rainfall creates a breeding ground for mosquitoes.

PREVENTION

- Spray houses and surrounding areas with insecticides.
- Use a bed net to prevent bug bites at night.
- Cover as much skin as possible and use insect repellent when outdoors.

TREATMENT

- No specific drugs or vaccines are yet available.
- Rehydration is critical.
- The 24–48 hours after warning signs of severe dengue are crucial; the patient runs the risk of serious complications or death if symptoms are not treated by doctors and nurses.
SOIL-TRANSMITTED HELMINTHS

GENERAL INFO

About 2 billion people worldwide are infected with soil-transmitted helminths (STH) such as hookworm, roundworm and whipworm. These diseases can be acquired by the accidental ingestion of microscopic STH eggs or direct contact with hookworm larvae that can actively penetrate skin.

SYMPTOMS

- With early infection, there may be no symptoms.
- A localized rash may occur when hookworm larvae penetrate the skin.
- Symptoms of chronic infection include fatigue, weight loss, anemia, diarrhea and abdominal pain.
- Impairment of cognitive and physical development in children may result from long-term infection.

RISK FACTORS

- Preschool/school-age children and pregnant women are the most at-risk.
- Walking barefoot, eating contaminated produce, poor hygiene and inadequate sanitation lead to increased exposure to STHs.
- STHs are commonly found in warm and moist climates.

PREVENTION

- Avoid walking barefoot in areas where hookworm is endemic.
- Practice good hygiene (e.g., washing hands often and washing hands before eating).
- Cook, wash or peel all raw produce in STH–endemic areas.
- Take deworming drugs in STH endemic areas.

TREATMENT

Deworming drugs, such as albendazole and mebendazole, can be used for treatment and prevention.
CAROLINE SMITH  
Age 35 • Houston, Texas

I am a working mother of two children. My house has been falling apart and I have yet to save enough money to get it fixed. There are cracks in the wall, leaks in the ceiling and bug infestation. In addition the Texas weather is hot and humid, which further escalates my health condition.

• Recently I have had increased difficulty breathing.
• I also have frequent headaches, fevers and swollen lymph nodes.
• One of my eyes also started getting puffy and red recently, but I think it might be seasonal allergies.

WHAT’S WRONG WITH MY EYE?

RENE SOSA  
Age 11 • Dallas, Texas

I’m 11 years old and I love playing with the dogs outside of our public housing projects. My mom tells me to watch out for fleas and other bugs but I don’t care.

• A few weeks ago I started getting a weird sore on my face. It looks like a blister but doesn’t hurt.
• My family has been a bit tight on money lately, so my mom started buying more canned beans. I don’t like beans though, so I just refused to eat.
• Then the sore on my face started getting worse.

IS IT BECAUSE I HAVEN’T BEEN EATING THE BEANS?
JERRY LEE
Age 29 • San Antonio, Texas

I work in the construction industry to support my wife, three children and dog. I’ve been working as hard as I can, working long hours outdoors, trying to provide for my family.

- I’ve had flu-like symptoms for a couple of days.
- Today the fever has gone down to 100°F but I started to experience persistent vomiting. In addition, I noticed that I have a rash.
- I am really frustrated because my ability to work is heavily affected.

IS THERE ANY MEDICINE I CAN TAKE?

SOPHIA GARCIA
Age 10 • El Paso, Texas

I’m 10 and I like to play football with my older brother after school every day. My mom always tells me to wear shoes when we play outside but I think I play better with my bare feet.

- My feet started getting itchy a few weeks ago and I had to stop playing football for a while.
- I’ve been having stomach aches and I get tired very quickly.
- My mom tried feeding me more food but I keep getting runny poop.

WHY DOES MY TUMMY FEEL WEIRD?
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