

Date \_\_\_\_\_

Name \_\_\_\_\_

Teacher \_\_\_\_\_

## **Introduction**

Malaria is a serious disease in many parts of the world. Scientists work to explain the causes of Malaria and explore how to stop it. You will do both of these kinds of work.

## **Task**

1. Read the texts on the following pages and make notes in the margins about your reading, thinking and problem solving processes.
2. Use the information in the texts to create a scientific model (using visuals and words) that explains how malaria causes hundreds of thousands of deaths each year in Africa.
3. Explain why the scientific model you constructed is a good model.
4. Based on your model and information from the text, explain what measures (methods, means, courses of action, or solutions) could be implemented to stop the hundreds of thousands of deaths each year in Africa and explain why these measures might work.

SPACE WILL BE PROVIDED AT THE END FOR YOU TO COMPLETE YOUR RESPONSES.

## TEXT ONE

### Introduction: The Malaria Problem

Malaria causes fever, joint pain, vomiting, and seizures and can lead to brain damage and death, especially in children. On World Malaria Day in 2009, former President Clinton explained that “malaria was eliminated in the United States over a half a century ago, yet more than 1 million people around the world still die from the disease each year, making it one of the most pressing health challenges the world faces today.”<sup>1</sup> According to the World Health Organization’s 2011 report, there were 216 million cases of malaria and an estimated 655,000 deaths in 2010.<sup>2</sup> Most deaths occur among children living in Africa where a child dies every minute of malaria and the disease accounts for approximately 22% of all childhood deaths. The Clinton Foundation states, “despite ... attention from the global community in recent years, the majority of African families are not benefitting from the tools necessary to stop malaria, such as bed nets and effective medicines, because of a lack of access or efficient use.”<sup>3</sup>

#### *Sources*

1. April 24, 2009 | New York, Address given by Bill Clinton on World Malaria Day,
2. [http://www.who.int/malaria/world\\_malaria\\_report\\_2011/en/](http://www.who.int/malaria/world_malaria_report_2011/en/)
3. 2. <http://www.clintonfoundation.org/what-we-do/clinton-health-access-initiative/our-approach/access-programs/malaria>

## TEXT TWO

### How is malaria spread?

Malaria is caused by *Plasmodium* bacterium. These parasites infect successively two different hosts: humans and female *Anopheles* mosquitoes.

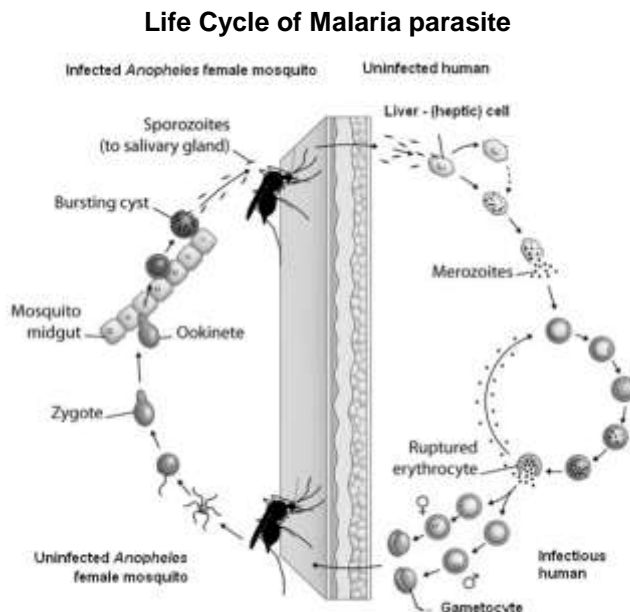
The parasites are transmitted to people who are bitten by infected female *Anopheles* mosquitoes.

In humans, *Plasmodium* multiplies in the liver and then invades the red blood cells. Successive generations of parasites grow inside the red cells and destroy them,

releasing daughter parasites that continue the cycle by invading other red blood cells. These blood-stage parasites, called “gametocytes” (G. gamete + kytos, cell) cause the symptoms of malaria, which begin 6-10 days after infection.

When a female *Anopheles* mosquito bites an infected human, she takes the person’s infected blood for a meal. During this meal, if gametocytes are picked up by the female mosquito, they may start another, different cycle of growth in the mosquito’s gut. After 10-18 days, the parasites develop the infectious stage, called “sporozoites” (G. *sporos*, seed + *zōon*, animal), which reproduce in the mosquito's salivary glands.

When this infected *Anopheles* mosquito bites another human, the sporozoites are injected into the human’s blood along with the mosquito's saliva. Thus the mosquito acts as a vector, transmitting the disease-causing parasite from one human to another.



Adapted from <http://www.cdc.gov/malaria/about/biology/index.html> and <http://www.who.int/mediacentre/factsheets/fs094/en/>  
Life cycle of malaria parasite from: <http://ocw.jhsph.edu>

## TEXT THREE

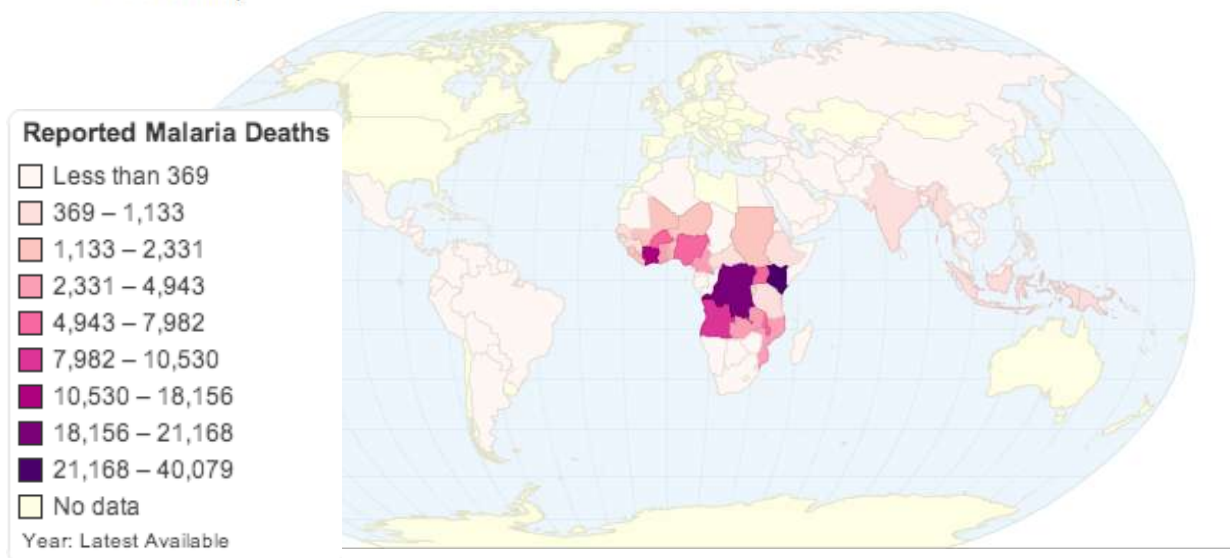
### Ecology of Malaria

For malaria transmission to occur, three conditions must exist:

- Female Anopheles mosquitoes must be present, which are in contact with humans, and in which the parasites can complete half of their life cycle
- Humans must be present, who are in contact with the Anopheles mosquitoes, and in whom the malaria parasites can complete half of their life cycle
- Malaria parasites must be present.

Climate, therefore, plays a major role in the spread of malaria, as certain weather conditions allow for increased reproduction rates in mosquitoes. Warm areas with occasional to moderate rainfall tend to harbor more mosquitoes than drier areas, as the insects lay their eggs in stagnant waters. Countries that experience monsoon rains may also see mosquito population growth in between wet seasons, when accumulated rainfall is allowed to sit still over an extended period of time. The highest transmission is found in Africa South of the Sahara.

Malaria Map



Adapted from:

<http://www.malaria.com/overview/malaria-countries-map> and

<http://www.wisegeek.com/what-factors-affect-the-spread-of-malaria.htm>

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