Life Cycle of Malaria for Junior Secondary Schools

This lesson provides the teacher with material to teach the life cycle of malaria on the JSS level.

Topic: Life Cycle of Malaria Parasites

Malaria is one of the most important infectious diseases in the tropics, causing one to two million deaths a year worldwide. Unlike other infectious diseases as tuberculosis and AIDS, malaria can be cured easily, if treated in time. Teaching the life cycle of malaria is one way of rising awareness towards this disease and can, if properly understood, help to prevent unnecessary suffering among the affected population.

Instructional Objectives:

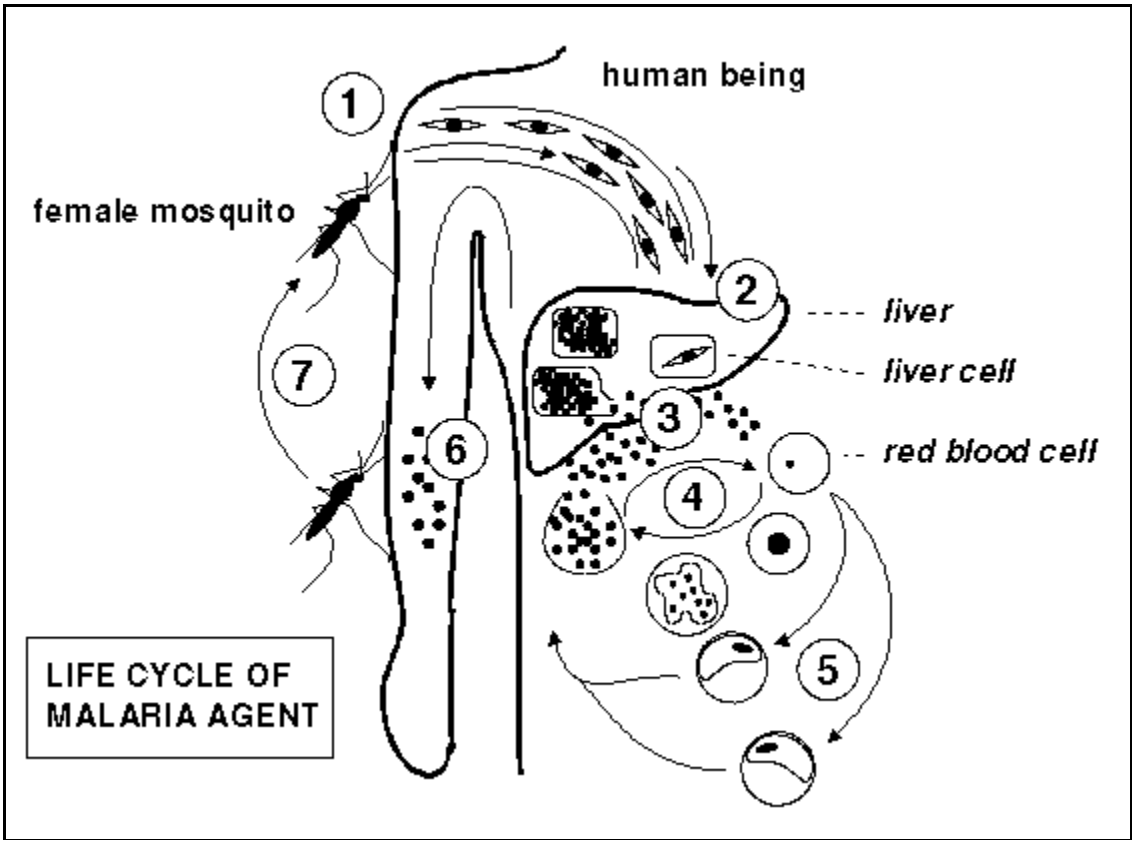
1. life cycle of the malaria agents
2. importance of anopheline mosquito
3. importance of prompt treatment

Reference Books:

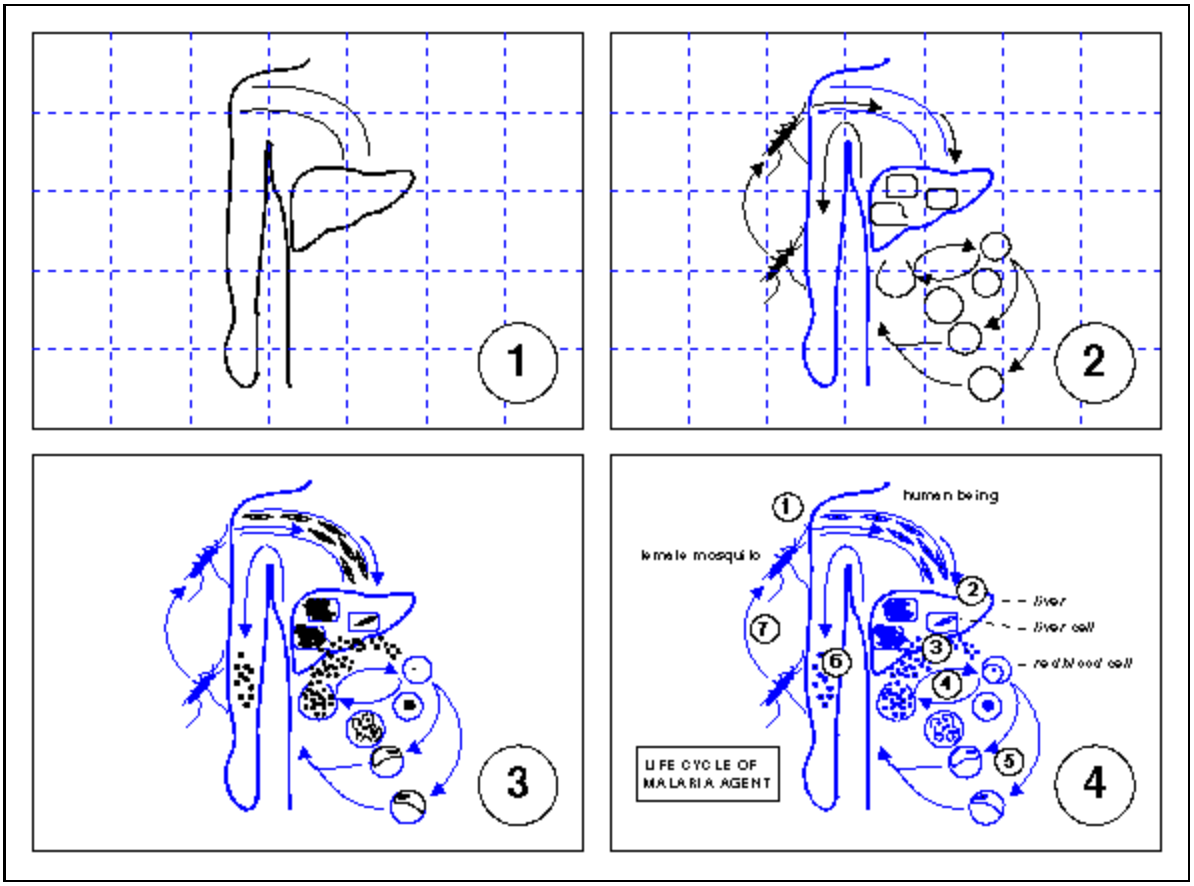
WHO, 1996: "Malaria: A manual for community health workers"; World Health Organization, Geneva 1996
WHO/CTD, 1998-1: "Malaria Control - The Disease"; WHO Division of Tropical Disease; http://www.who.int/ctd/html/malariadis.htm

Teaching and Learning Aids to Be Used:

For this lesson you need the following drawing of the malaria life cycle:



As the drawing is rather complex, drawing instructions should be given to the students if they are to copy it. The following steps should therefore be taken:



1. Start with the basic body outline, as an additional help a grid may be constructed.
2. Draw the cell elements, the arrows and the female mosquitoes.
3. Draw the different parasite forms.
4. Label the drawing.

If you have different colours those could be used to differentiate between man, mosquito and parasite.

Text "Malaria Life Cycle"

Malaria is caused by a group of four different single-cell parasite species. Transmission from one person to another is mediated by female anopheline mosquitoes. As with other mosquitoes, the male anophelines do not transmit the disease as they only suck plant juices. If a female anopheline mosquito bites a person a few malaria parasites may enter the human body. (1) The parasites which can only be seen by a microscope travel to the liver first. (2) In the liver they grow inside a liver cell. After some time the liver forms of the parasites release thousands of new parasites. (3) They enter the bloodstream and infect the red blood cells. Inside the red blood cells the parasite grows und splits itself into 6 - 36 new parasites. Those parasites leave the red blood cell by destroing it and invade new red blood cells. (4) After a few days the activity of the parasite leads to the destruction of many red blood cells at the same time.

At this point a person may realise that she or he is having malaria. As the parasites multiply every time they infect new red blood cells, treatment should be searched before the parasites' activity weakens the body to much. The most dangerous of the four parasites can change the red blood in an alarming way: The affected cells stick to the walls of the capillaries, the smallest blood vessels, and thus, block the flow of blood. The cells around the blockage don't get enough oxygen any more and die. If too many cells are affected, death is the result.

Apart from the parasite forms infecting red blood cells after some time other forms of the parasite develop which can be distinguished as females or males. (5) These parasite forms can infect a mosquito if it sucks blood on a person who is suffering from malaria or has recently suffered from it. (6) Inside the mosquito's gut the female and the male parasites mate and produce thousands of off-spring which invade the mosquito's salivary gland after about two weeks. (7) The next time the mosquito sucks blood on a human being, putting some saliva into the wound, the parasite may enter the human body and another cylce of malaria infection starts. (1) ‘

Students Previous Knowledge:

Students should understand the basic concepts of the cell, the blood circulatory system and know what microorganisms are.

Presentation of Lesson or Methodology:

Content/Breakdown	Teacher Activity	Student Activity	Time
a) Introduction	Tell the students the topic of the lesson: the malaria cycle. Let them prepare for drawing and writing activities.	Prepare for drawing and writing activity.	00'1
b) Development of periods in steps	Put the drawing "Life cycle of malaria agent" on the blackboard, drawing it step by step as shown in "Teaching and learning aids to be used". Don't hesitate to comment on what you are drawing and how to best copy it, as this would help your students to accurately copy the drawing and to understand what they are drawing. Finally add the labels and make sure your students understand what an anopheline mosquito is. (See background information on anopheline mosquito)	Copy the drawing into their books.	05'
	Once the students have finished copying explain the malaria life cycle to them, by following the text provided. If you have enough time you can ask some specific questions about the cycle, such as "Which species of mosquito transmit malaria?" or "Where does the parasite multiply first?" and others. Also emphasize the importance of the anopheline mosquito and make sure your students understand why prompt treatment of malaria is important. To show them you may provide an example by suggesting that every time the parasites goes through a red blood cell cycle it numbers multiply by ten. Starting with an infected number of 50'000 red blood cells out of 5 million in	Listen to the explanations. Answer to questions. Show some aspect in front of the class. Do the calculations.	35'

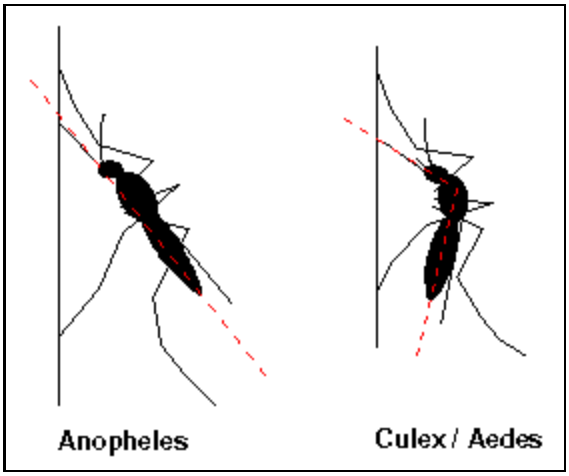
Content/Breakdown	Teacher Activity	Student Activity	Time
	one µl (mm3) blood, let the students calculate the percentage of infected red blood cells after a multiple of 48 hours, the time most parasites need for a full blood cycle. People with more than 20% of their red blood cells parasited normally die even if good treatment in hospital is provided.		
	Start writing the text "Malaria Life Cycle" on the blackboard.	Copy the text from the blackboard.	45'
	After the text has been copied by the students, let the class read the text aloud. Check whether the students have understood vocabulary by asking them about the meanings of some words, such as "parasite", "microscope", "liver", "red blood cell", "capillaries", "salivary gland" and others. If you still have some time left, let the students repeat the malaria life cycle in pairs. €	Try to answer the teacher's question. Repeat the life malaria life cycle in pairs.	70'
c) Assignment	"Repeat the life cycle at home so that you know the seven basic steps indicated in the drawing."		
d) Conclusion	1. Only anopheline mosquitoes transmit malaria. 2. Malaria is the result of massiv red blood cell distruction and in some cases the blockage of capillaries. 3. Prompt treatment is important as the parasite can multiply very fast.		

1 The numbers indicate the starting time of an activity, e.g. 35' indicates that a certain activity should be started 35 minutes after the lesson has begun. To cover the topic well two lessons are needed. If you can't teach them in one block, you should split the lesson were you feel it to be appropriate. Also, you can exchange, shorten or stretch some of the suggested activities.

Remarks

You migh shorten or stretch the lesson according to how well your class is progressing.

Background Information: Anopheline mosquitoes
Anopheline mosquitoes can be distinguished from other mosquito geni by their body position. If they sit on a wall or suck blood their head and the whole body are lined on one axis pointing towards the surface. Also the most important anopheline species have dotted wings, whereas this is not the case for many other mosquito species. More difficult to see, the palps of anopheline mosquitoes are nearly as long as their proboscis, whereas in other species they are considerabely shorter.



Background: Information Malaria Parasite
Malaria parasites are small single-cell beings, which invade the red blood cells in humans and animals. There are four different types infecting humans of which so-called Plasmodium falciparum is not only the most common but also the most dangerous as it can cause deathly attacks of severe malaria. Unfortunately some strains of Plasmodium falciparum are resistant against common drugs such as chloroquine. Whereas grown-ups in endemic regions (places where malaria is common) normally develop some resistance against the disease, this is not the case in small children and pregnant women. Plasmodium vivax seems to be rare in West Africa due to widespread resistance in the population. Plasmodium malariae and Plasmodium ovale are also less common and can normally be treated without too many difficulties.

Background Information: Malaria Symptoms
The most important feature of malaria are fever attacks which normally start with shivering and end in profuse sweating. Headache and pains in the back, joints or all over the body are common. Loss of appetite, vomiting and diarrhoea may also occur. In between the attacks the patient may feel better, but the repeated attacks will slowly weaken him or her more and more. Especially young children can become very ill and die within a few days, displaying convulsions or even loosing consciousness. In this case, urgent treatment in a hospital is needed to save the child's life.

Comments, suggestions or corrections, especially from Ghanaians, people from the teaching field or in malaria research to mattgig@crosswinds.net are most welcome.

Matthias Giger, 2001