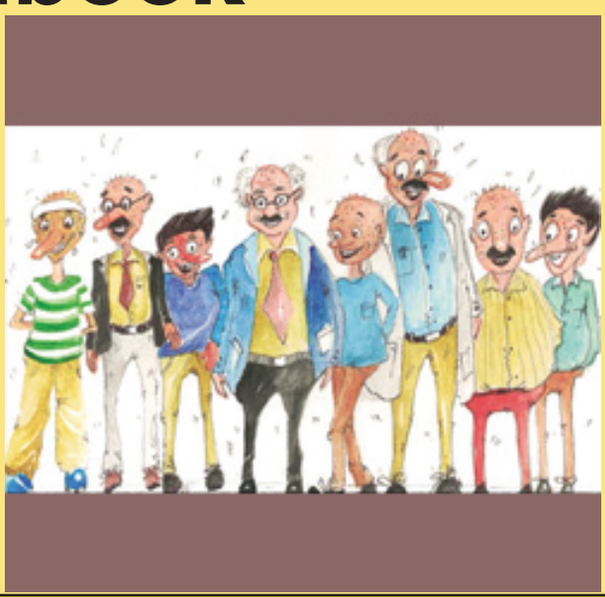
Science

HEALTH AND DISEASE

Student Handbook



CONNECTED LEARNING INITIATIVE

An initiative seeded by

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TISS

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CLIx (2018)

TISS/CEI&AR/CLIx/SHb/S/E/e/06Apr'18/02

The **Connected Learning Initiative (CLIx)** is a technology enabled initiative at scale for high school students. The initiative was seeded by Tata Trusts, Mumbai and is led by Tata Institute of Social Sciences, Mumbai and Massachusetts Institute of Technology, Cambridge, MA USA. CLIx offers a scalable and sustainable model of open education, to meet the educational needs of students and teachers. The initiative has won UNESCO's prestigious 2017 King Hamad Bin Isa Al-Khalifa Prize, for the Use of Information and Communication Technology (ICT) in the field of Education.

CLIx incorporates thoughtful pedagogical design and leverages contemporary technology and online capabilities. Resources for students are in the areas of Mathematics, Sciences, Communicative English and Digital Literacy, designed to be interactive, foster collaboration and integrate values and 21st century skills. These are being offered to students of government secondary schools in Chhattisgarh, Mizoram, Rajasthan and Telangana in their regional languages and also released as Open Educational Resources (OERs).

Teacher Professional Development is available through professional communities of practice and the blended Post Graduate Certificate in Reflective Teaching with ICT. Through research and collaborations, CLIx seeks to nurture a vibrant ecosystem of partnerships and innovation to improve schooling for underserved communities.

Collaborators:
Centre for Education Research & Practice – Jaipur, Department of Education, Mizoram University – Aizawl, Eklavya – Bhopal, Homi Bhabha Centre for Science Education, TIFR – Mumbai, National Institute of Advanced Studies – Bengaluru, State Council of Educational Research and Training (SCERT) of Telangana – Hyderabad, Tata Class Edge – Mumbai, Inter-University Centre for Astronomy and Astrophysics – Pune, Govt. of Chhattisgarh, Govt. of Mizoram, Govt. of Rajasthan and Govt. of Telangana.

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HEALTH AND DISEASE

Through Scientific Lens

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We would like to sincerely acknowledge all the resources that we have referred to for the development of our modules.

CLIx/Eklavya Team
Version 2017-PE01

Approach Note:

Students know about various aspects of health through personal experiences or through experiences of others. There are also awareness campaigns and health programs at the school level which contribute to students' information about health. The module encourages students to reflect on their existing knowledge and ask questions about things that they would like to know about. This module is designed for students to explore the concept of health and a few diseases through short independent projects which will include surveys within their community and some hands-on experiments.

The module consists of:

1. Student driven project work
2. Case study
3. Hands-on experiments by collecting samples from their surroundings
4. Thought experiments
5. Digital interactives

Through this process, students will have the opportunity to make observations, investigate hypotheses and present their learnings to the class.

We have four units in the module:

1. The concept of health

2. History of malaria through scientific lens

3. Let's investigate!

4. What does data tell us? (Only on CLIx platform)

In first unit, we will talk about students' perception of social, physical and mental well-being.

In the first unit, we will talk about students' perception of social, physical and mental well-being.

This is a survey conducted by students within their community to gain a better understanding of the overlap of the three aspects of health.

In next unit, we will talk about the discovery of malaria. This will be a scientific narrative with thought experiments and hands-on experiments. This can be considered as a template for investigations to be carried out for the students in the last unit.

In the third unit, the students will work on one of the four investigative projects suggested in the module. The project work will be done in groups.

At the end of this unit, the students will have to present their project work to their entire class. . The project work will be done in group.

Our last unit of this module talks about the importance of data in public health. It is essential to look at the data and try to see patterns in order to predict and prevent hazardous outcomes. Students will try to observe the need to take a large sample of the population to conclude anything about the data with confidence.

We imagine role of the teachers to be that of facilitators in the process of scientific investigations that the students will do. Encouraging students to ask questions, helping

them formulate strategies to answer questions, facilitating discussions and guiding students to present their work in the class would be key responsibilities of the teachers.

The expected outcome of the module is that it will help students to think about health, causation, cure and prevention of disease as a scientific process and not mere things that happen to someone. The module also encourages students to apply the process of scientific inquiry in real world problems related to health and well-being. Although the module discusses only a few diseases, the expected outcome would be is that for the students will apply the same process to think about other prevalent diseases and newly emerging diseases.

Content

The Concept of Health

1.1.What is health?

'Health' is a familiar word to all of us. things we watch on the television which We hear about healthy habits from our also tell us about what is good for our parents and teachers. Books give us tips health and what is not.

on how to stay healthy. There are so many

Activity 1: Health and its various aspects

Classroom activity

Requirement: Student workbook

What are the things that come to your Use the space below to write all the things mind when you think about a healthy that you would associate with a healthy person? person:

_____

_____

_____

Now you have a list of things that indicate that a person is healthy. We can call these "our health indicators".

An organization named WHO (World Health Organization) also came up with pointers to define health. After studying various situations, they defined health as:

"A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."

In simpler words, it means that health is not only the absence of any disease.

It is the state where our body is able to do the day to day work properly (physical health), we are able to understand our strengths, we can cope with the normal tensions of life (mental health), our surroundings are clean and hygienic, we have friendly interactions with family, friends and neighbors and we have concern for other people around us (social health).

Can you use the indicators that you have listed and classify them as indicators for Physcal health, Mental health and Social Health?

Mental	Physical	Social
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1.2. Overlap of the three aspects of health

We studied three aspects of health. But are they related to each other? Does one health aspect affect the other aspects of health or are they independent of one another?

Activity 2 : Are the three aspects of health mutually dependent or independent of each other?

Group Activity : (Groups of 3)

Requirement: Computer lab

Watch the story of Chanda on CLIx platform

Based on the story, answer the following questions:

1. How did moving to a new place affect Chanda's life?

2. What according to you was the reason for Chanda falling ill?

3. Can you think of physical problems that make you feel sad?

4. Can you give an example where your mood affects how you talk to others?

In this story, you saw that mental health can mental and social health.

affect the social and physical health. We can be truly healthy only when we are

Similarly, physical health can also affect physically, mentally and socially healthy

1.3. Overlap of the three aspects of health

Activity 3: Let's talk!

Not a classroom activity (field activity)

Requirement: Go out and interact with people

Talk to at least one person around you. Write the story of her/his health.

While talking to anyone about her/his health, remember to –

1. *Be polite.*
2. *Listen to the person and make notes*
3. *Do not ask questions that can be hurtful.*
4. *4. If they don't want their name to be used in your story, you can change it in your notes to protect the identity of that person.*

Here are a few sample questions to help you-

- *Have you ever been unwell for many days or had to stay in bed because of some illness or accident?*

- *How did this affect you?*
- *Did you feel sad because of it?*
- *Were you able to meet your friends during that time?*
- *Have you ever been tense for many days for any reason? For example, have you been worried about family, school or office work?*
- *Did you interact normally with people around you during that time?*
- *Did you have any other problem like headache or stomach problem during that time?*
- *Did you eat or sleep properly during such time?*
- *Did you feel excessively tired during that time?*
- *Have you ever felt isolated or lonely in school or home or in your community? For example, were you ever unable to interact with your friends and family?*
- *Did you feel upset about it? Did you eat properly during that time?*
- *Has it ever happened to you that feeling healthy in one way made you feel healthy in other aspects also? For example: being with friends and family or in neat and clean surroundings made you forget your worries.*
- *---------- (you can add more questions after classroom discussion)*

Use space below to write the story of health of the person you talked to

Title of your story :

_____

_____

_____

Discuss in the classroom

Q1. Did you see that three aspects of health overlap in the person's life?

Q2. Did you come across any example where a person made efforts to become healthy in one way either physical, mental or social, and that affected other ways too?

1.4 From health to disease

Sometimes our health gets affected because of things that happen around us and we suffer from diseases.

Diseases can be classified in different ways. They can be classified based on - What causes them, what they do inside the body, their symptoms and many other things.

Some diseases are caused by organisms which enter our body (infectious diseases), many others due to environment (Asthma due to air pollution or inhaling smoke from stove while cooking food). Some others are caused by our lifestyles (tension ridden lifestyle tend to cause high blood pressure). Some diseases are caused by deficiencies of important nutrients (one such example is anaemia). The cause of some diseases are not known – eg, cancer

Here we will talk about diseases that are caused by external agents.

1.5 How do disease reach us?

First let's think, how do these external agents reach us? Do all external agents enter our body through the same route or do they take different routes?

To understand various routes of disease let's do a small activity.

Activity 4: How do diseases that are caused by external agents reach us?

ClassroomActivity

Requirement: Student workbook

Make a list of diseases that are mentioned in your textbook. Now, think about how these diseases reach us?

Use the body outline given below to write the names of the diseases next the part through which they reach us.

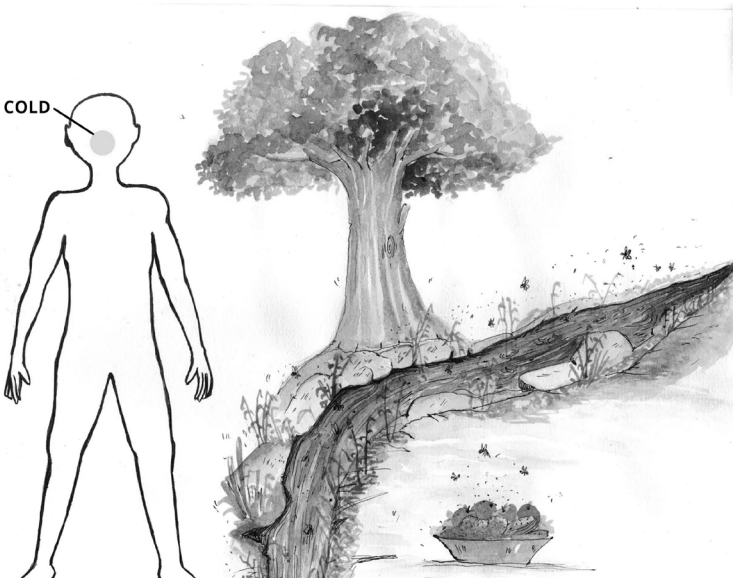
Let's take 'cold' as an example. Through which body part does it reach your body?

We can get cold if someone sneezes or coughs near our nose or mouth. Hence we can say that it reaches us through our nose or mouth.

Similarly think of routes of all the diseases in your list. You can use your textbook for help.

Are there some diseases that you have not been able to mark on the body outline?

Discuss in groups to find out how we get these diseases.



1.6. Preventing ourselves from diseases

Some diseases are mild and very common like cold, so we either do not have to take special measures to protect ourselves from them or sometimes need to take very simple measures to protect ourselves. Others like measles can kill a baby, so we protect the baby by vaccinating it.

Let's try to think of ways to protect ourselves from diseases.

Activity 5 (optional): Think about it! Classroom activity

Classroom activity

Requirement: Student workbook

How can we prevent ourselves from getting these diseases?

Let's suggest a way based on the route of the disease.

Let's take nose (route) as an example. To prevent getting a disease through our nose e can wear mask.

In this unit we looked at health in an overall manner not just the physical health. We also saw ways in which we can protect ourselves from getting some diseases. To effectively protect ourselves from diseases

In the next unit we will look at the story of discovery of the organism that causes malaria.

The Story of Malaria

2.1 Malaria Discovery

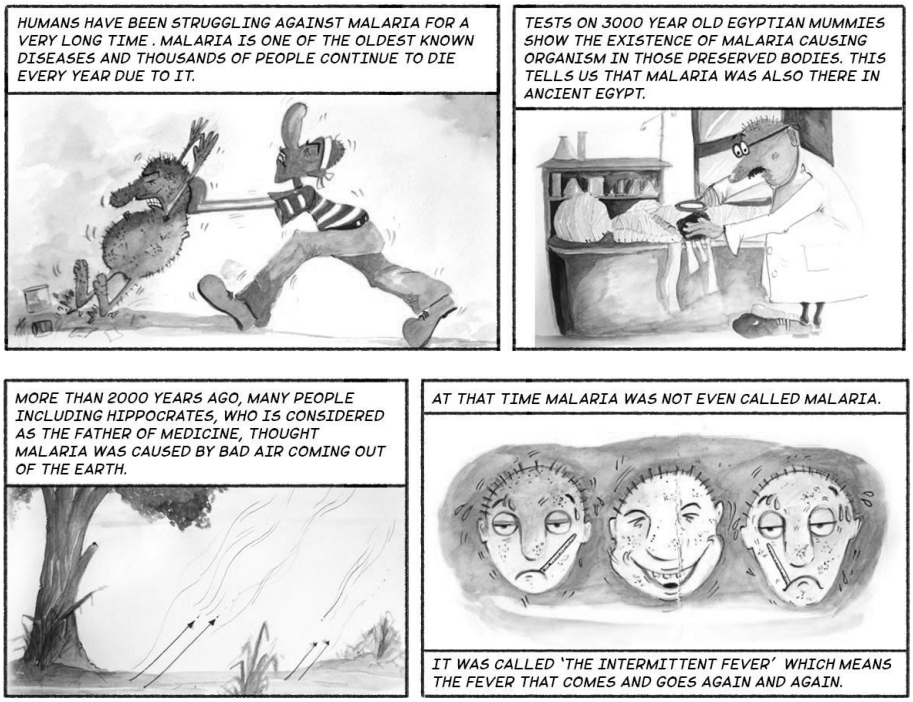
In the previous unit we looked at health in an overall manner not just the physical health. We also saw ways in which we can protect ourselves from getting some diseases. To effectively protect ourselves from diseases it is sometimes important to understand what causes the disease.

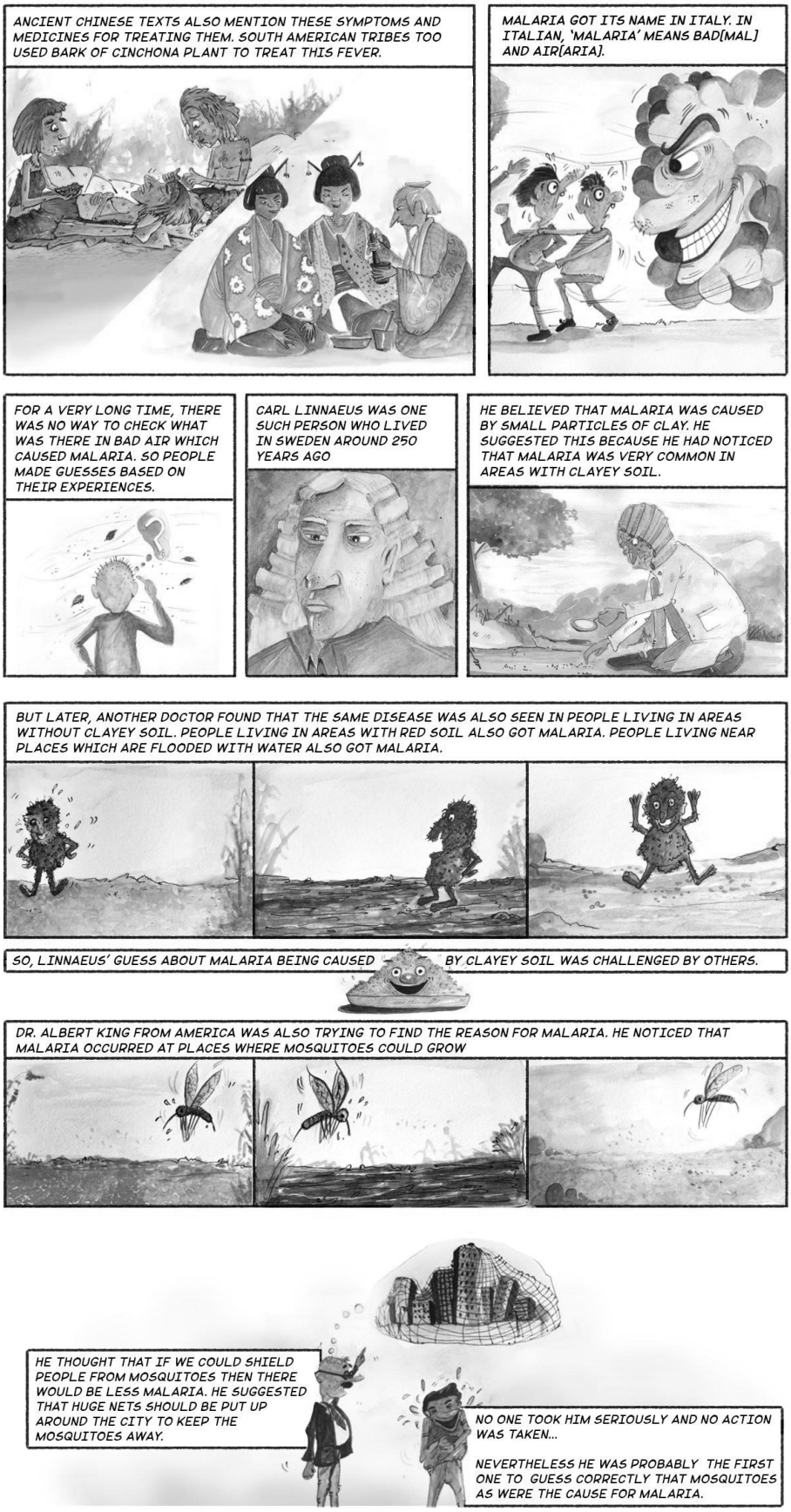
In this unit we will look at the story of discovery of the organism that causes malaria.

Malaria is one of the deadliest diseases in the world today. Every year many people die from this disease in our country.

When a person suffers from Malaria he/she gets high fever after every 48 hours. This rise in fever on alternate days weakens the patient. We now know that female anopheles mosquitoes can carry the organisms which cause malaria. But it took humans many years to identify what causes malaria. People all over the world contributed to what we know today.

This is the story of discovery of malaria…





Activity 1

Can you guess places in your school and its surroundings where mosquitoes can be found?

Mark the places where you think you will find mosquitoes.

(Tip: Do not worry about drawing everything exactly. Use squares, circles to mark the places where you think you will find mosquitoes.) Go around the school campus and check whether you really find mosquitoes there. Observe the kind of places they prefer. Based on you notes, **can you say what are the places they prefer?**

Activity 2

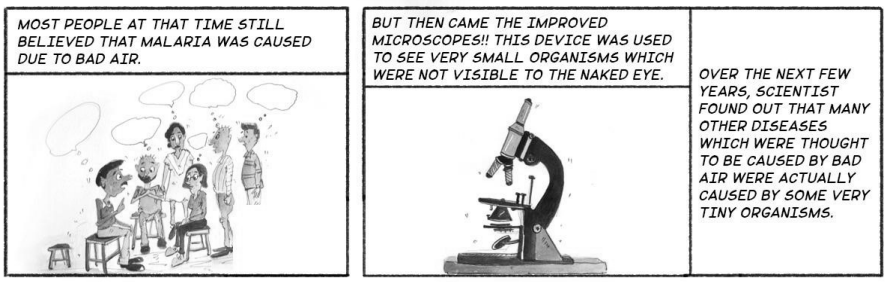
Mosquitoes lay eggs which become mosquito larvae and then grow into adult mosquitoes. But where do these larvae live?

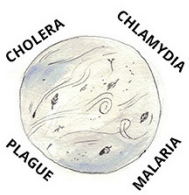
Draw a sketch map of your school and mark the places on your map where you find larvae.

What are the similarities in the places where larvae are found?

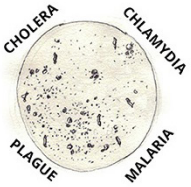
You can use a transparent cup to collect the larvae along with the water from the place you found them. Cover the mouth of the cup with a piece of cloth or a sieve to let air pass through.

Observe them for the next 15 days.

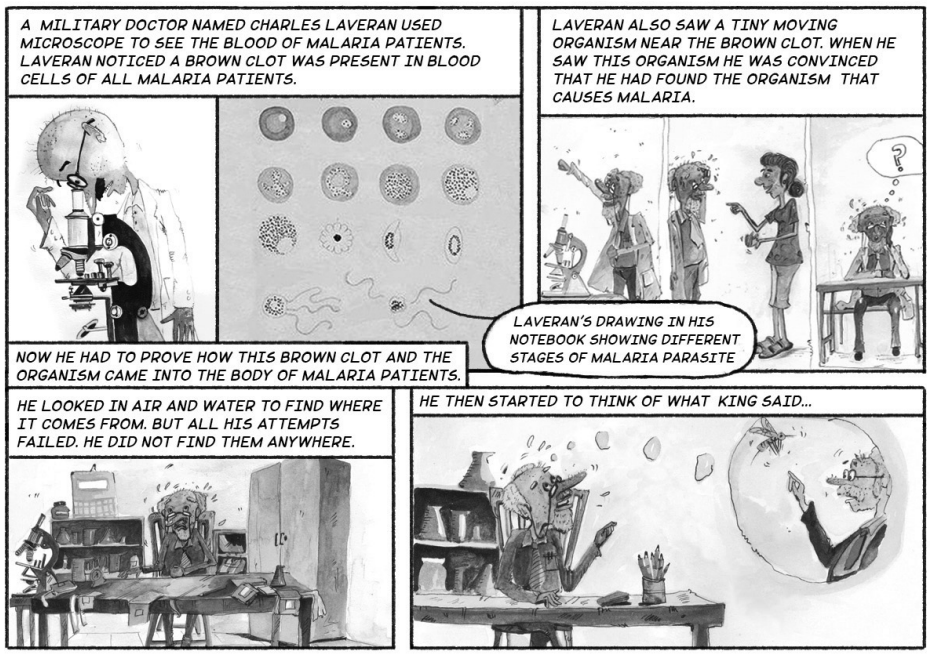


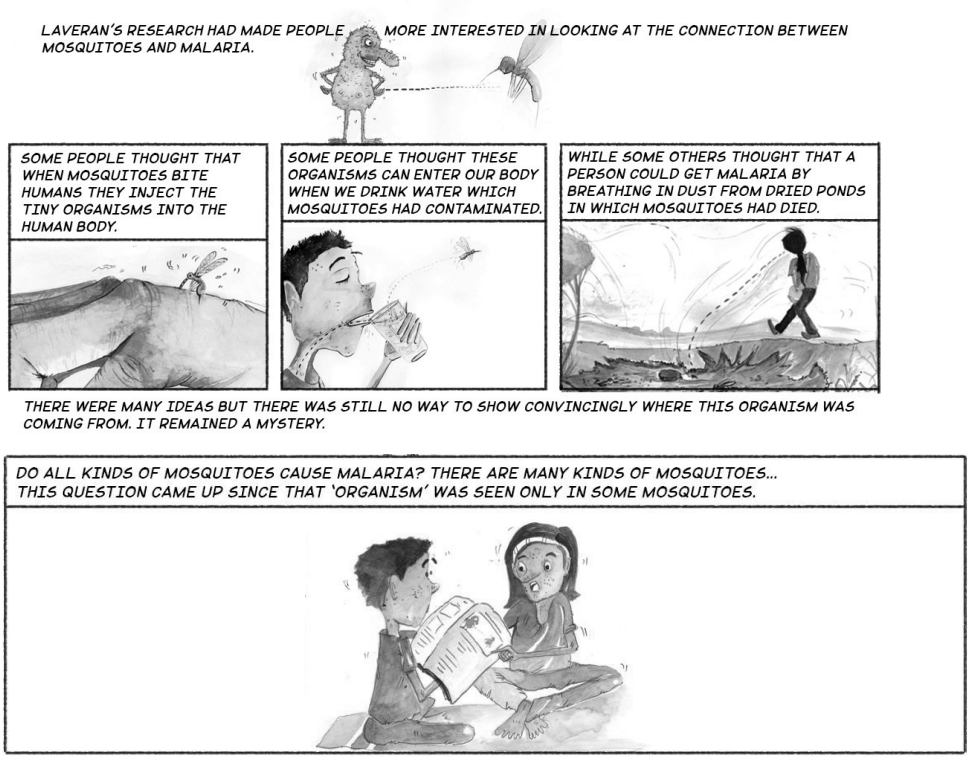


Bad Air



Microorganism





Observe them for next 15 days.

Activity 3

Discuss in your groups and guess how they would have found out which mosquito causes malaria.

Activity 4

Work in groups to collect some mosquitoes from your school or home.

You can kill them if you are not able to collect live mosquitoes.

Keep the mosquitoes on a white background and look at them carefully Observe the mosquitoes

complete the following table using as many mosquitoes as you can catch.

Q1. What time of the day did you catch it (night/daytime)?

Q2. Is it completely black or does it have stripes or spots on it?

Q3. Where did you find it?

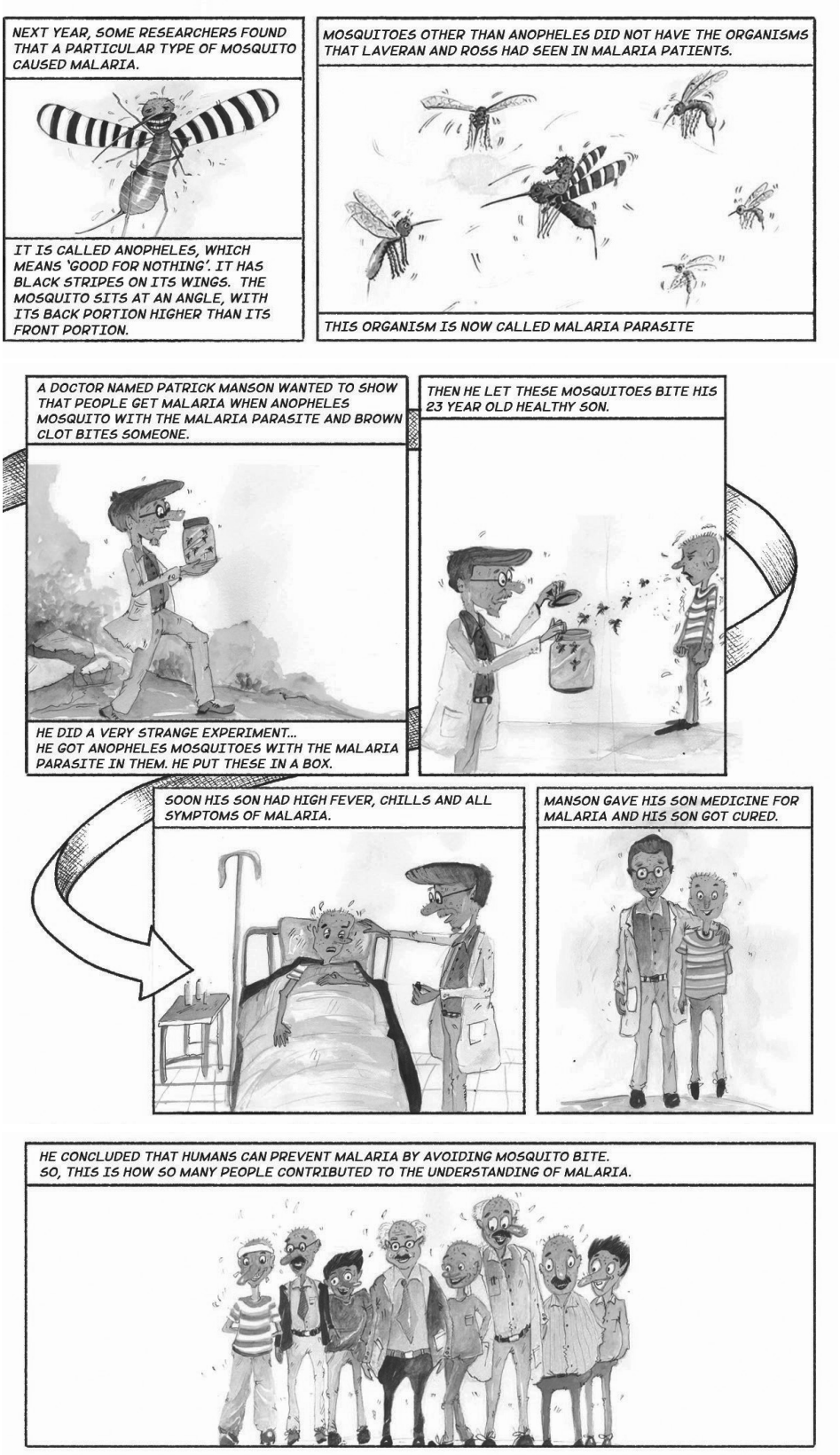
You can make a table like the one given below to note your observations

Serial number	***Time (Night or Day)***	***Black completely (yes/no)***	***Stripes on wings***		
(yes/no)	*Spots on legs*	*Location*			
1.					
2.					
3.					

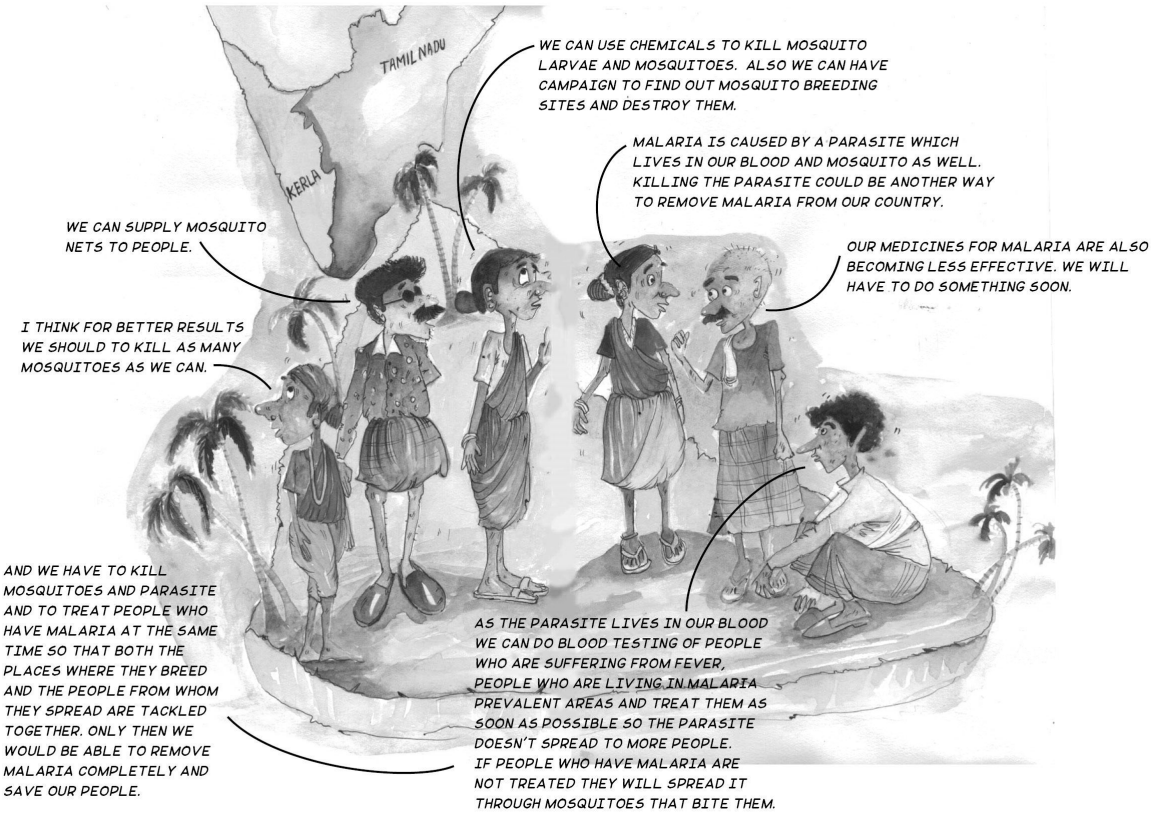
Compare your tables with other groups.

There are 3 main types of mosquitoes that you will find in your neighbourhood. The ones that are completely black are called Culex. The ones which have stripes on wings are called Anopheles.

Anopheles mosquitoes are also usually smaller than the other types. These are the ones that can carry malaria. The ones which have black and white spots are called Aedes. Aedes mosquitoes can carry the dengue just like anopheles can carry malaria.



The fight against malaria has come a long way since that time. Some countries using the knowledge we have today have been able to completely remove malaria from their region. Let us see how one such country – Sri Lanka did this



Let's Investigate

3.0 Finding answers to some questions

In the previous unit saw that many people were trying to answer the question " how is malaria caused? ". many people had different ideas and suggestions about how malaria is caused. The scientists and doctors had to do some experiments to prove to everyone else that what they were saying was not wrong.

In this unit, you are will be investigating some questions yourself. There are 3 parts in this unit - High blood pressure, Smoking and Anaemia. Each of them discusses one health issue. You can select any one of them.

You have to work in groups to complete these investigations. After completing the activities, you will also have to tell your friends about what you did and what you find.

3.1. High Blood Pressure

Blood pressure of a person depends upon various factors. Blood flow through the pipes is one of the factors. When blood flows through the pipes in our bodies, they exert pressure on the walls of the pipes. The ease with which blood flows is indicated by our 'blood pressure'. The flow gets affected by the diameter of blood pipe and any obstruction in them. Our food habits, stress level and exercise also affect our blood pressure in complex way Blood pressure is also influenced by hereditary factors. If both or either of the parents have high blood pressure then the chances of their son/daughter having high blood pressure increases.

3.1.1. What causes high BP?

Let's read a story about hypertension or high blood pressure

Sunita's mother had not been feeling well for a few days. She had cough and cold. Sunita convinced her to see a doctor and they went to Doctor Mahi. Sunita's mother informed Dr. Mahi that she had been having cold and cough for the last couple of days. She was also getting tired easily. The doctor examined her and said that she should take rest and drink warm water to soothe her throat. She assured her that the cold and cough would go away soon.

While the doctor was examining her mother, Sunita saw the doctor open a box-like instrument. The inner side of the lid had a scale next to a tube containing some liquid

substance, and it was linked to a rubber bag with a cuff and a pump lying in the box. Mahi kept talking to Sunita's mother while winding the cuff tight around her arm. She also used a stethoscope. She asked her, "What is your age?" She also enquired about food habits and stress. She then said that the blood pressure was is currently higher than normal and would need to be checked regularly. "Blood pressure? What is that?" Sunita asked.

Doctor Mahi told her, "Blood pressure or BP of most people varies within a certain range during most of the day". The doctor continued, "That range is considered normal. Sometimes, for a person, blood pressure becomes constantly higher than the normal range and this can be dangerous for our body."

Sunita's mother's BP was higher than normal. Dr. Mahi prescribed some medicines and asked her to come in after one week. She advised Sunita's mother to reduce salt and oil in her food and told her to get her BP checked from time to time.

You may know some people around you who suffer from high BP. High BP is not only a problem among the elderly, it is a common problem among most adults. It is now recommended that people above the age of 30 should get their blood pressure checked regularly.

Blood pressure is affected by many factors: your family history,your diet, whether your weight is normal or excessive, your personality someone who gets anxious and annoyed soon, or someone relaxed, whether you are under some stress. It also varies during the day, depending on what you are doing and feeling, and on the balance of many things in your body.

Question: What will reduce flow of blood through blood pipes?

Let's make a guess

3.1.2. Effect on the blood flow- How to check it?

Suppose our hypothesis is - "Pipe with a narrow diameter will reduce the blood flow"

How can we test this?

One way to check this is following -

For this you will require

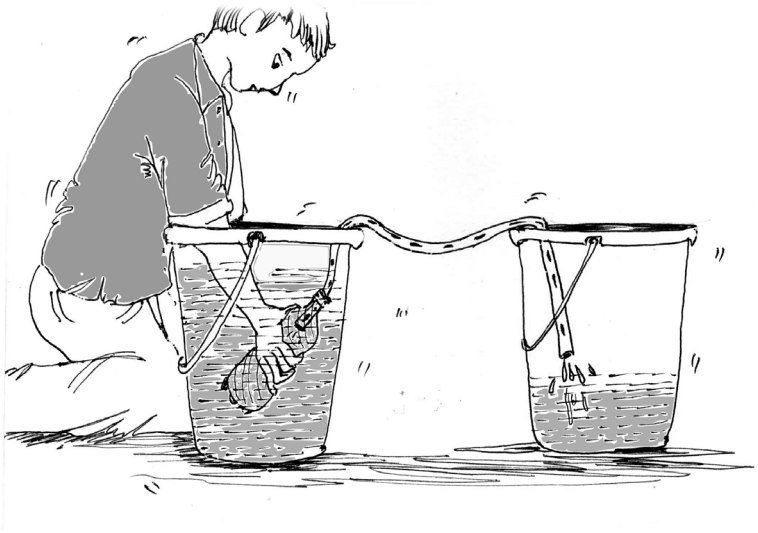
- 2 buckets
- An old plastic bottle like a cold drink bottle, water bottle etc that can be easily pressed.
- Two pipes about 2 meters with different diameters

1. Fill one of the buckets with water. There should be enough water in the bucket to submerge the plastic bottle.
2. Take the pipe and the plastic bottle and put one end of the pipe inside the bottle.
3. Now put the plastic bottle and the pipe inside the bucket filled with water.
4. Keep an empty bucket nearby.
5. Take the free end of the pipe and hang it in the empty bucket.
6. Now hold the plastic bottle with one hand. Make sure the bottle is inside the water.
7. Squeeze the bottle repeatedly. You will see that water will start flowing from the pipe into the empty bucket.

This is how heart pumps blood into blood pipes which then carry the blood to different organs.

8. Measure the water that flowed into the empty bucket in 1 minute.
9. Repeat the procedure for second pipe with different diameter
10. Measure water that flowed into the empty bucket.

3.1.3 Effect on the blood flow- Observations



Was the quantity of water pumped out more when you used the pipe with -

- smaller diameter
- larger diameter

Did your initial guess match with the result of our activity? What does it say about the effect of diameter of pipe on the flow of blood? Write it down in your notebook.

What are the conditions that can make the pipe narrow? Write down your ideas.

For further investigation we can take these two factors

- Narrowing of pipe at specific position using clothespin
- Obstruction in the pipe

Can you think of way to check the effect of obstruction in the pipe?

(You can introduce an obstruction in your experimental pipe using chewing gum or dough.)

Write down what changes you made in the initial setup and your observations in notebook.

What is the effect on the flow of water?

Suppose bottle is pumping same amount of water in 2 pipes - one with large diameter and one with small diameter. As the pipe with smaller diameter gives lesser space for water to flow the pressure in the pipe is more.

In this activity we have seen that flow of water is affected by the diameter of the pipes. Similarly, blood flow in the blood pipes of our body get affected by their diameter. This in turn affects our blood pressure.

Depending on various factors like the above, blood pressure can be low or high. Both low blood pressure and high blood pressure are not good for our health. Often high blood pressure does

not show any specific symptoms in a person. Hence it is advised to check it regularly after age of 30. Regular check-ups would be able to detect if the range is not normal. Keeping the blood pressure in normal range is very important to avoid complications like heart attack and stroke.

3.1.4. Your question, Your investigation! - Blood Pressure

Do you have any other questions related to blood pressure that you would like to investigate into or find about?

Do you have any idea how you can find out the answer?

3.2. Smoking

Smoking and tobacco chewing are harmful habits that many teenagers start because of influence of either their friends or people around them. These habits are also very hard to break. Many people who once start either smoking or tobacco chewing are not able to leave the habit. It is addictive and requires effort to give up.

Tobacco use can have very adverse effects on health. Smoking has harmful effects not only for the people who smoke but also for their family members who inhale the smoke. The latter called passive smoking.

3.2.1. Lungs of people who smoke

Let's read a story about smoking and investigate how it can affect the health of people who inhale tobacco smoke.

I am 30 years old. I have been smoking since I was 16 years old. Most of my friends at school smoked. I tried my first cigarette with Kamal bhaiyya. He was my neighbour. I looked upto him for everything. He was good at sports and in studies too. He even played for our school hockey team.

For the first few years I smoked 4-5 cigarettes every day. I never smoked at home. While coming back from school I would stop at the bus stand before my house and smoke with my friends.

I started smoking more when I moved to city for work. It became a part of my life, a habit just like eating food and sleeping.

When my mother found out that I smoked she told me that I would get addicted. She tried to convince me to leave smoking. I knew that some people tried to quit smoking but were not able to. But I never thought that smoking was a problem for me. I thought that I would be able to leave the habit whenever I wanted.

Last evening I took my 5 year old daughter to the doctor. She has had difficulty in breathing and bad cough for many days. Doctor told us that she has asthma, possibly because of inhaling smoke. On the way back home. I decided that I would never touch a cigarette again. It is proving harder than I imagined. I never thought that my habit of smoking would cost so much to my daughter's health. Maybe I was wrong, smoking is a problem for me.

The writer's daughter in this story had difficulty in breathing and would cough regularly. Inhaling smoke can often cause people to have breathing problems. You might have noticed that smokers usually start panting (getting breathless) after even a little bit of exercise. **Do the lungs of smokers function as well as the lungs of nonsmokers?**

<u>Let's try to answer this question through an experiment.</u>

To answer this question first let's make a guess.

Write your guess in your notebook

3.2.2. Lung Capacity of smokers and non-smokers

Suppose our guess is

" the lungs of smokers do not function as well as the lungs of nonsmokers."

Now we will have to test if our guess is right or wrong.

To test the functioning of lungs in smokers and non-smoker we can do a test.

For this test you will require

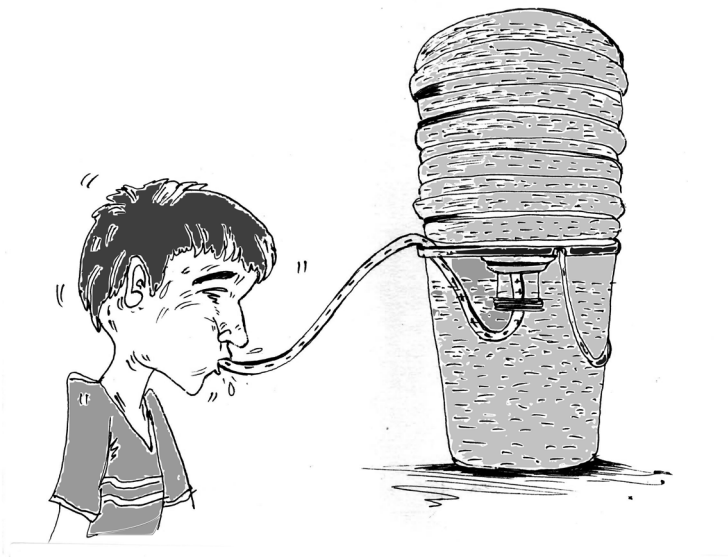
1. *water*
2. *One large (5 litre) plastic bottle or container,*
3. *A bucket in which the plastic bottle can comfortably fit.*
4. *Rubber or plastic pipe of about 2 metre*
5. *250 ml cylinder or beaker (to measure)*
6. *Small strips of paper*
7. *Tape*

To do this test

1. *Take the 5 litre bottle and the measuring cylinder. Fill up the measuring cylinder with 250 ml water. Pour the water into the plastic bottle. Mark the water level with a marker and write 250 ml near it. If you don't have a marker you can write 250ml on a small piece of paper and stick it on the bottle near the water level. You can use tape to stick the paper on the plastic bottle.*
2. *Use the measuring cylinder to add 250 ml water again, and mark the new water level just like you had done previously. Write 500 ml near the water level.*
3. *Continue adding water and marking the water level in the same manner till you fill up 5 litres of water (5000ml)*
4. *Fill a bucket with water. Keep in mind that it must have enough room left to accommodate the added water from your plastic bottle*
5. *Hold your hand tightly over the mouth of the bottle and turn it upside down in the bucket. Remove your hand when the mouth of the bottle is below the water. Note that the plastic bottle should be completely filled when you put it in the bucket. If some water goes out of the bottle when you are putting it inside the bucket, tilt the plastic bottle a little so that water can go inside it.*
6. *Place one end of the plastic tubing into the mouth of the bottle*
7. *Clean the free end of the tube.*
8. *Now to test how much air can your lungs hold, take a deep breath- as deep as you can and hold your nose closed, and exhale as much as you can into the tube in one go.*
9. *As you start exhaling in the pipe, you will see that the air goes into the plastic bottle.*
10. *After exhaling note the mark to which air is filled in the plastic bottle.*
11. *The value near the mark will represent the your lung capacity.*
12. *You can ask some people who smokes to take this test and note their lung capacities. Then*

you can some people who do not smoke to do take the test and you can note their lung capacities also.

Note your observations here. You can make a table to note your results.



3.2.3. Lung Capacity of smokers and non-smokers (contd.)

Based on your observations try to answer the following questions.

Was there a difference between lung capacities of people who smoke and who do not smoke?

Was the lung capacity same for all people who smoke?

Was the lung capacity same for all people who do not smoke?

Based on your observations can you say that our guess was right?

You can also use this test to find out the difference in lung capacity of people who exercise regularly with people who don't exercise regularly.

The air we inhale goes through our nose or mouth into our lungs. Lungs have small balloon like sacs were exchange of gases takes place. Every time we breathe these small balloons in our lungs inflate. When a person smokes, the inhaled smoke goes through mouth or nose and enters the lungs. The particles of smoke can get deposited in the lungs. These particles can cause damage to the balloon like sacs. Sometimes mucus can also be filled in these sacs. So when a person with damaged or mucus filled sacs breathes in sacs do not inflate completely.

3.2.4. Your question, Your investigation! - Smoking

Do you have any other questions related to smoking that you would like to investigate into or find about?

Discuss and decide questions with your group. Write down the questions in your notebook.

Now, make a guess about the answer.

Remember the guess doesn't have to be correct. You can make any guess that seems reasonable to you!

Now, think of an experiment to test whether your guess is right or wrong.

What did your experiment tell you?

Can you say whether your guess was right or not?

3.3. Anaemia

Not getting enough to eat is a major reason why many people in our country suffer from a deficiency of blood in their bodies, especially girls, women and children. Another reason is the absence of those kinds of items in the diet that help the body in making blood. Let us see what is meant by deficiency of blood.

Red blood cells found in blood help in delivering oxygen to different parts of our bodies. When these red blood cells are not sufficient, our blood will not be able to deliver properly oxygen to different organs; then we start feeling weak, and get tired quite easily. This condition is called‘anaemia’.

Iron-deficiency anaemia is a major health problem in India especially among children, adolescent girls and women.

3.3.1 Iron-deficiency can cause Anaemia

Let us read a story about anaemia and try to find out how it affects us.

Sowmya is 13 years old, and lives in Pipaliya village. She studies in the 7th standard in the village’s middle school. Her parents work as farm labourers. She takes care of a number of household chores before going to school – filling water, dusting, washing utensils, etc. When it’s time to go to the school she eats a roti or just drinks a cup of tea and runs to the school. She is good in sports and often comes first in running. But for a few weeks she has been getting tired easily. She doesn’t feel hungry too. She doesn’t feel like doing any work after waking up in the morning. She has also not been able to concentrate on her studies in the class. Her head started to spin while playing one day and everything became black in front of the eyes. She couldn’t play any longer and sat down. One of her friends fetched some water and another went to call the teacher. Sushila madam checked the colour of her eyelids and tongue. They looked really pale. The teacher suspected that Sowmya has anaemia.

Sushila madam arranged for a discussion on anaemia after a few days. She checked the eyelids and tongue of every student in the class. Nearly 12 of the 30 students in the class had a pale colouration on their eyelids and tongues. These could be signs of blood deficiency.

Afterwards the teacher described other signs of blood deficiency. Several students shared their experiences. Najnin said that her waist and shins ache in the morning. Ajay said that her mother works a lot and eats less, thus she is weak.

The teacher said that these are all signs of blood deficiency. Protein and iron are necessary in our diets for our body to make blood. The students gave quick replies to the question of where we can get protein from – pulses, legumes, milk, meat, eggs, fish, etc. But they didn’t know which food items contain iron.

Then the teacher asked the students to bring some raw food items on the next day, whose list is given below. They would do an experiment to find out which of these contain iron.

Guess: Make a guess as to which of these items will contain more iron.

Serial number	Name of the edible item and its quantity	Observation after the experiment
1.	Jaggery 5 grams	.....
2.	Spinach juice	
3.	Iron tablet	
4.	Lemon juice	
5.	Salt	
6.	Distilled water	
7.	Tamarind	
8.	Beetroot	
9.		
10.		

Note:

1. If you can't get a complete solution for an item, then you can grind it and then dissolve it in water or get its juice out and then do the experiment.
2. You can find filter paper in a store selling laboratory ingredients or in your school laboratory.
3. If there is no distilled water then you can store rain water in a clean vessel.

3.3.2. Food sources of iron

Experiment:

1. *Add 3 to 4 spoons of tea leaves in one litre of water and boil it.*
2. *Filter this tea water and store the water in a container.*
3. *Take one cup of this tea water for the first experiment.*
4. *Make a separate solution of the item whose iron content is to be tested, and then filter it using a strainer so that there is no solid part in it. For example, mix 5 grams of jaggery in 10 ml of water and then filter it.*
5. *Mix this solution with one cup of tea water.*
6. *Keep it aside for 40 to 45 minutes. Is there any change visible in the tea water solution?*
7. *After 45 minutes strain this mixture through a filter paper (Whatman number 1) after fitting it in either a funnel or a plastic tea strainer.*
8. *It may take 30 minutes or more to strain this mixture. Let the filter paper dry completely once the process is complete.*

What did you see on the filter paper?

If there is any black residue on the filter paper, then it indicates the presence of iron.

Note:

1. If the substance does not dissolve easily, then you can grind it and then dissolve it in water or extract its juice out and then do the experiment.
2. You can find filter paper in a store selling laboratory ingredient or in your school laboratory.

3. If there is no distilled water, then you can store rain water in a clean vessel

3.3.3. Food sources of Iron

Which items contain larger amount of iron? How did you decide whether the amount was more or less?

Which items contain larger amount of iron? How did you decide whether the amount was more or less?

You can do this with water collected from different sources like wells, hand-pumps, tap water, just like you did with distilled water Write down your observations.

From this experiment, we can only discover whether an edible item contains iron or not. But this does not end the discussion on anaemia, because it is not necessary that our bodies can digest or absorb iron from all types of sources. Absorption of iron in our bodies requires helping elements like vitamin C. It is more difficult to absorb iron from a vegetarian diet. Hence, vegetarians must eat foods containing vitamin C. absorption it can be said that Iron is more easily absorbed from a non-vegetarian diet. Vitamin C and other absorbing elements are added to iron tablets in any case to ensure its proper absorption in our bodies. So it is certainly beneficial to consume them. Including more iron-containing items in food in addition to that can help in reducing anaemia.

3.3.4. Your question, your investigation! - Anaemia

Other than physical signs, what other reliable methods are there to determine whether someone has anaemia or not? Discuss and find out

Questions for the future:

If we drink tea while eating, then what difficulties can be there for our bodies to absorb the iron contained in the food items? Write you thoughts on the basis of the results of the experiments done above.

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