2.2 Lesson 2: Water contamination

Teacher's information – Lesson 2: Water contamination

The lesson starts by explaining the term safe water and goes on with an activity related to the local water sources. Key part of the lesson is a broad exercise about water contamination at the source, during transport and through inaccurate storage. A practical activity with water and faeces illustrates the invisible nature of dangerous microorganisms.

Objectives – Knowledge
- Know the difference between safe and unsafe water
- Know the potential water contamination stages

Objectives – Attitude
- Willing to learn how to prevent water contamination
- Reject the use of unsafe water

Objectives – Skills
- Capable of evaluating the quality of different water sources

Time
- 50 minutes

Materials – School
- 1 transparent glass
- 0.2 litre of safe water
- 1 twig
- Drawing material

Materials – Toolkit
- Images: Lesson 2

Key messages of the lesson

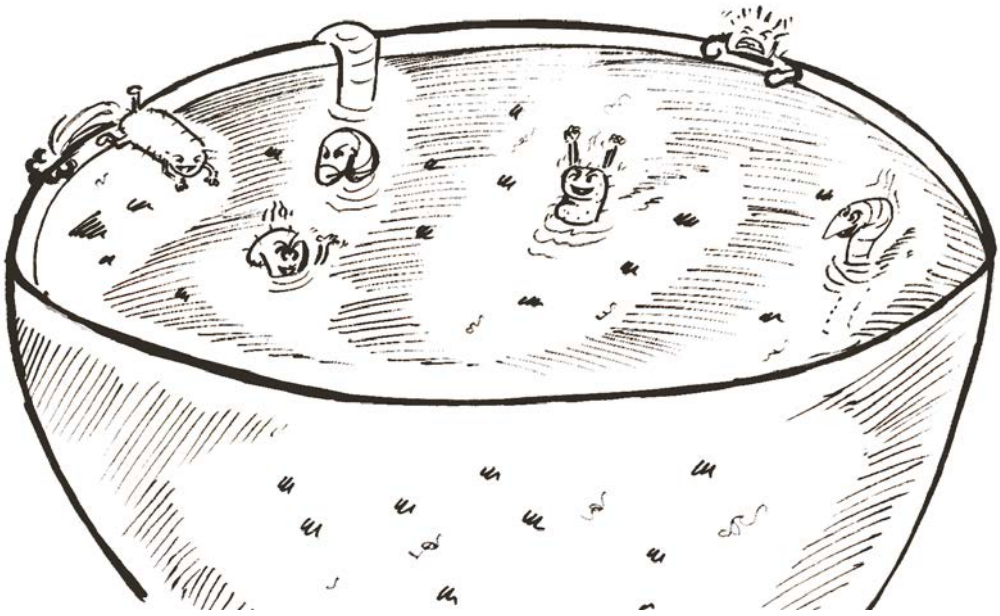
- **Water contamination can occur at the source, during transport or through inaccurate storage.**
- **Improvement of the water quality is one barrier for disease transmission.**
- **Turbid water is normally unsafe, but also clear water can be contaminated.**

Safe water

Materials: Drawing material
Image: A look into water

1. Explain the differences between safe and unsafe water.
   - Water contains very small organisms like bacteria and viruses that are invisible to the human eye. Some of the small organisms pose a severe threat to human health as they cause different diseases with the following symptoms: vomiting, stomach pain or diarrhoea.
   - Turbid water is normally unsafe, but also clear water can be contaminated.
   - Safe water is free from disease-causing organisms and harmful chemical substances.

2. Let the children draw their vision of the small organisms contaminating the water. Show them the image “A look into water” as an example.



A look into water

Water quality at the source

Images: Water sources

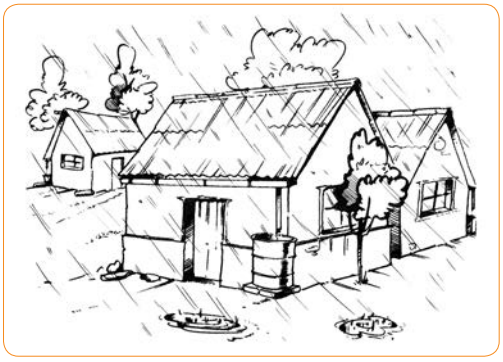
1. Ask the children what kind of water source they use.
   - From which water source does the water you use at home and in school come from?
   - Do you know other water sources?

2. Hang up the images “Water sources”. Discuss the quality of the different water sources and explain how to protect them.
   - Rainwater harvested from sheet or tile roofs is relatively pure.
   - The risk of surface water contamination is very high.
   - Groundwater is usually much purer than surface water but may also be contaminated.

River

Pond

Protected well



Rain

Water contamination

Images: Water contamination

1. Divide the children into three groups and distribute to each group a series of the images “Water contamination”. Let the groups discuss the images and arrange them in the correct order.

Unsafe water storage

Drinking contaminated water

Diarrhoea

Illness

2. Ask one child of each group to hang up the series of images and to present the story of water contamination.

3. Inform the children that water can get contaminated at the source, during transport or through inaccurate handling and storage. Start a discussion about the different stories.
   - Are the stories similar?
   - At which stage did the people commit mistakes?
   - What could they improve?

4. Repeat the message about disease transmission of the first lesson.
   - Water contamination with faeces is especially dangerous.
   - Drinking safe water reduces the risk of becoming ill.

Do not drink contaminated water

Materials: 1 transparent glass, 0.2 litre of safe water, 1 twig

1. Fill the glass with safe water and ask if anyone is willing to drink it. Let him/her take some sips.

2. Walk through the school or the community and find some open faeces. Take a piece of grass or twig, touch the faeces and dip it into the water.

3. Ask if anyone is willing to drink the water now. Normally nobody wants to drink it. Ask why they refuse to drink it. Emphasise the fact that water can also be contaminated if it is clear. If some children want to drink the water, do not let them. Repeat the message about the dangerous faeces.

Water and faeces

What did we learn today?

- Why is some water not safe for drinking?
- What are the potential water contamination stages?
- Do you think the water you drink at home is safe?
- What are the local water sources and what is their quality?
- Would you drink water contaminated with faeces?

Home-bringing message

- Contaminated water is a threat to our health.
- Water can be contaminated at the source, during transport or through inaccurate storage.

Homework

- Ask your parents: Do we have access to safe water at home? Do we apply a water treatment method? Which one?
- Bring to the next lesson the water treatment tools used at home, such as bottles, chlorine solution, filters.

2.2.1 Background information – Water contamination

Safe Water

Safe water is free from disease-causing organisms and does not contain harmful chemicals. Drinking water acceptable in appearance, taste and odour is important, however, it is not a criteria for safe water.[9]

Microbial water quality can vary rapidly and over a wide range. The greatest microbial risks are associated with human or animal faeces. Faeces can be a source of pathogenic bacteria, viruses, protozoa, and helminths.

- **Bacteria:** Though the vast majority of bacteria is harmless or even beneficial to humans, a few can cause diseases, like diarrhoea, cholera and typhoid.

- **Viruses:** They can only grow and reproduce within a living host cell. They can cause for example diarrhoea or hepatitis A and E.

- **Protozoa:** Protozoa are larger than bacteria or viruses. They need a living host to survive. Amoebic dysentery is the most common illness caused by protozoa.

- **Helminths:** Helminths are parasitic worms. They live in hosts before being passed on to people through the skin. Many types of worms can live for several years in human bodies. Roundworms, hookworms or guinea worms are helminths that cause illnesses.

Drinking water may contain numerous, mostly harmless chemicals. However, high concentrations of a few naturally occurring (e.g. fluoride, arsenic, uranium, and selenium) and man-made (e.g. fertilisers, pesticides) chemicals are of immediate health concern.

- **Naturally occurring chemicals:** Arsenic is an important drinking water contaminant, as it is one of the few substances known to cause cancer in humans through consumption of drinking water. Ingestion of excess fluoride can cause fluorosis that affects the teeth and bones.

- **Man-made chemicals:** Causes of man-made chemical contamination are agricultural and industrial activities, as well as waste disposal, urban runoff and fuel leakage from human settlements.

[9] WHO: Guidelines for drinking-water quality. 2011.

Water contamination at the source

Water can already be contaminated at the source. Especially in surface waters the risk of water contamination is very high. Groundwater is usually much purer than surface water but may be contaminated by natural chemicals or by anthropogenic activities. Rainwater harvested from sheet or tile roofs is relatively pure, particularly if the first water after a dry period is discarded or allowed to run off to waste.

Improved drinking water sources are defined in terms of the type of technology and level of service most likely to provide safe water than unimproved technologies. Improved water sources include household connections, public standpipes, boreholes, protected dug wells, protected springs, and rainwater collection. Unimproved water sources are unprotected wells or springs.

Actions to protect water sources:

- regularly cleaning of the area around the water source
- moving latrines away from and downstream of water sources (30 m)
- building fences to prevent animals from getting into open water sources
- lining wells to prevent surface water from contaminating the groundwater
- building proper drainage for wastewater around taps and wells[10]

Woman taking unsafe water from a river

[10] CAWST: An introduction to household water treatment and safe storage. 2009.

Water contamination during transport

Contamination occurs for example due to substandard water distribution systems, intermittent water pressure, illegal connections to the distribution system or during transport in buckets or other containers.

Unsafe water transport in an open vessel

Water contamination through inaccurate storage

The risk of recontamination through handling at household level should be minimised by using containers with narrow openings and dispensing devices, such as taps or spigots. Improved containers protect stored household water from microbial contaminants via contact with hands, dippers and other objects contaminated by faeces.

More detailed information on the appropriate vessels and correct handling of the stored water is listed in the chapter “Safe water station” (see page 90).

Unsafe water storage containers