WEEK TEN

SUBJECT: BIOLOGY

CLASS: SS1

TOPIC: CONTROL OF HARMFUL MICRO-ORGANISMS

Specific Objectives: By the end of the lesson, students should be able to:

1. Outline the ways of controlling the effects of harmful micro-organisms
2. Define vectors
3. State the various ways of controlling vectors, example houseflies and mosquito
4. State the importance of personal health to the community
5. Explain the methods involved in disposing refuse and sewage
6. Explain the methods involved in both large scale and small scale purification of water
7. Outline the processes involved in protection of food during storage, preparation and serving
8. Explain health organizations
9. Give examples of health organizations
10. State the functions of each of the organizations

The effect of harmful (pathogenic) micro-organisms can be controlled in the following ways:

1. Use of antiseptics: These are chemicals that kill or inhibit the growth of pathogenic micro-organisms. These chemicals include iodine tincture, alcohol (70%), boric acid, Dettol, Milton, chlorine water, medicated soap etc.
2. Use of disinfectants: These are stronger antiseptics that also kill or inhibit the growth of pathogens e.g Lysol, izal (carbolic acid).
3. Salting (high salinity): When salt is applied to fresh food items example fish or meat, the micro-organisms are destroyed. The bacterial cells are plasmolysed due to the movement of water from the cells of bacteria.
4. Heating to high temperature: This kills pathogenic microbes. Heating may involve:
   a. Dry air, hot air oven, infra-red radiation
   b. Moist heat: Pasteurization
5. Freezing at low temperature: at low temperature the activities of micro-organisms are reduced to barest minimum.
6. Use of antibiotics to kill microbes. Examples include: ampiclox, penicillin, streptomycin, erythromycin, ampicillin and others.
7. Covering of food to prevent vectors like houseflies, cockroaches and rats from coming in contact with the food.

8. Isolation of infected persons. Individuals suffering from infectious diseases like tuberculosis must be isolated to prevent other members of the community from contacting the disease.
9. Maintenance of good personal hygiene and body cleanliness.

Vectors

A vector is any animal or a living agent that carries and transmits pathogenic organisms. Examples include mosquito, housefly etc.

Ways of Controlling Vectors

A. Control of mosquito

- Mosquito is the vector of *Plasmodium* that cause malaria in order to control mosquito properly we have to know the life cycle of mosquito.
- Mosquito passes its life history in stagnant water. Its eggs, larvae and pupae develop in stagnant water.
- The adult mosquito lives on land/terrestrial habitat
- The adult can be killed by the use of insecticide/DDT/shell-tox.
- Can also be killed by physical attack
- Killed or expelled with mosquito repellant or coils
- By use of netting/screens to prevent contact with infected adult/prevent mosquito from biting man
- Using medicines to kill micro-organisms in human body before they develop to be harmful
- Clearing bushes/eliminating breeding/hiding places
- Pouring oil on the surface of stagnant water to suffocate/kill the eggs, larvae and pupae
- Putting fish and ducks in ponds to eat up the larvae/pupae
- Burying tins and cans to prevent them from collecting water and serving as breeding places
- Release of sterile male mosquito into the environment. When they mate with normal female mosquito, the later doesn't lay any egg. With this genetic method, the mosquito will eventually die out.

NOTE: Sterile male mosquitoes are obtained by exposing the normal males to certain chemicals and irradiation in the industry.

B. Control of houseflies

- They are mainly terrestrial and so live on decaying organic matter
- Burning and burying all garbage
- Improving sewage disposal facilities
- Toilets should be well covered to prevent houseflies coming in contact with faeces/prevent them from laying eggs.

- Physical killing of flies to control/reduce their population
- Use of insecticides to kill maggot/adult flies
- Use of fly baits/traps to catch and kill flies
- Keeping food where flies will not get in contact with them and thereby starving them to death.

STUDENT'S HEALTH: MAINTENANCE OF GOOD HEALTH

A student can control the spread of infectious diseases by maintaining good personal hygiene habits.

The World Health Organization defines good health as "a state of physical, mental and social well-being and not merely the absence of disease or infirmity". Good physical and mental health can be maintained by:

1. Eating a balanced diet.
2. Involving in regular exercise to keep the body parts in healthy condition.
3. Engaging in recreational activities and sleep (about 6-8 hours for adult, more for growing children).
4. Doing work suited for our mental and physical ability
5. Cleanliness and care of the body.

Social well-being of an individual can be achieved through a well a well-balanced family and community life.

- Avoid bad habits like excessive smoking, drinking of alcohol and drug addiction which are harmful to a person's health
- Take preventive measures to ensure good health by being vaccinated against diseases like poliomyelitis, diphtheria, measles, tetanus and tuberculosis.

How human body fights against diseases

a. Through a healthy skin and mucous membrane which prevent entry of pathogenic micro-organisms into the body.
b. Salts and fatty acids found in sweat and sebaceous glands kill bacteria. Also some enzymes (lysozymes) found in tears destroy the bacterial cell walls.
c. The natural micro-flora of the body prevents pathogens from colonizing the body.
d. White blood cells eat up/ingest invading microbes.
e. The body produces antibodies that react with the invading pathogenic micro-organisms and prevent them or their toxins from harming the body.
f. Immunity: this is the ability of the body to resist infections of parasitic organisms

IMPORTANCE OF PERSONAL HEALTH TO COMMUNITY

An individual must safeguard, maintain and improve his health. If a person takes all the necessary measures to promote his health, he is directly contributing to the health of the community. A person who neglects his health and also his surroundings may be responsible for

the spread of infectious diseases to others in the community. Such a person becomes a problem to the community.

WAYS IN WHICH COMMUNITY DISPOSE REFUSE

Refuse is the dry or wet solid waste from homes, markets, hospitals, offices and factories. Examples include waste papers, corn cobs, yam and cassava peelings.

Methods of Disposal of Refuse

1. Dumping anyhow to the nearest convenient place.
2. Burning in incinerators. Dust bins are usually used to collect refuse from homes and offices.
3. Burying in pits and trenches far away from living surroundings.
4. Emptying into the sea.

SEWAGE DISPOSAL

Sewage comprise of wastes from the following:

1. Faeces and urine
2. Bath water
3. Waste water from houses and streets
4. Waste from factories
5. Agricultural wastes

Sewage contains about 99% water while the remaining 1% contains impurities and micro-organisms. Disposal of sewage is very vital to avoid an outbreak and spread of diseases within the community.

Methods of Sewage Disposal

1. **Bucket latrine:** The faeces and urine are passed into buckets and emptied by night soil men into a dug trench of about a half kilometer away from town. The buckets containing faeces and urine are carried to the trench. This method should highly be discouraged because it is unhygienic and unsatisfactory.

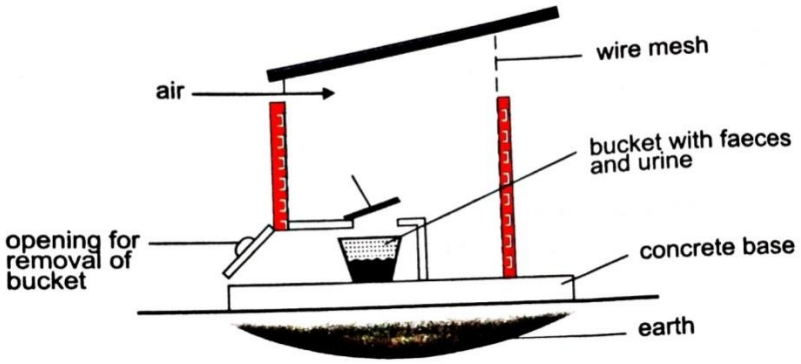

Figure 1: A bucket latrine

2. **Pit latrine:** This involves digging a pit or hole of about 240cm deep. The hole is covered with lid to reduce odour and keep away flies.

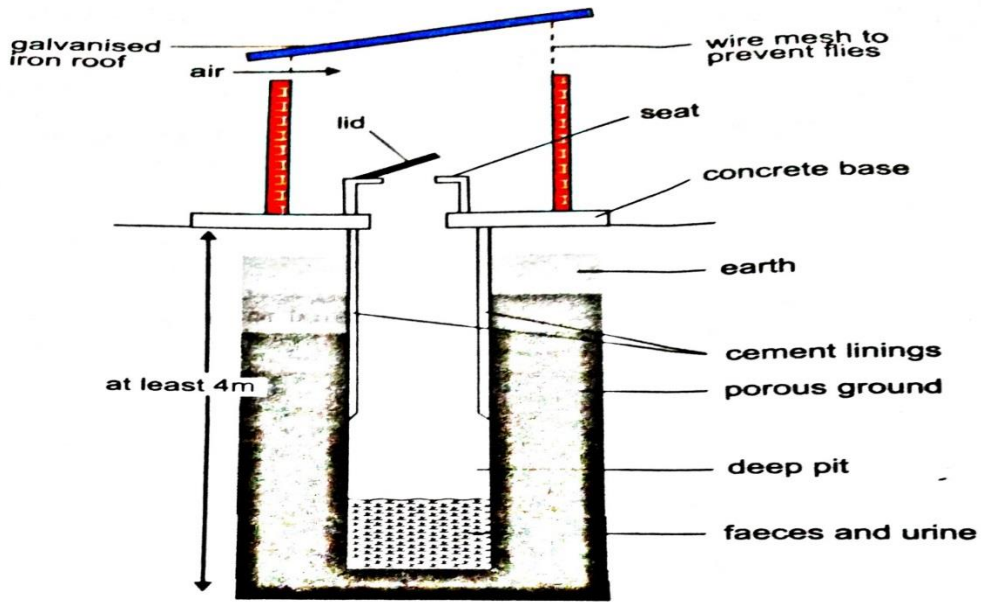

Figure 2: A pit latrine

3. **Septic tank latrine (water-borne system):** In this method, pies are constructed from the house to a large tank sunk about 16metres from the house. Faeces and urine are passed into ceramic bowl containing water; the waste is then flushed into an underground septic tank where the sewage is decomposed by anaerobic bacteria.
   Some diseases associated with sewage are: **Cholera, Typhoid, Dysentery, Bilharziasis also called schistosomiasis**

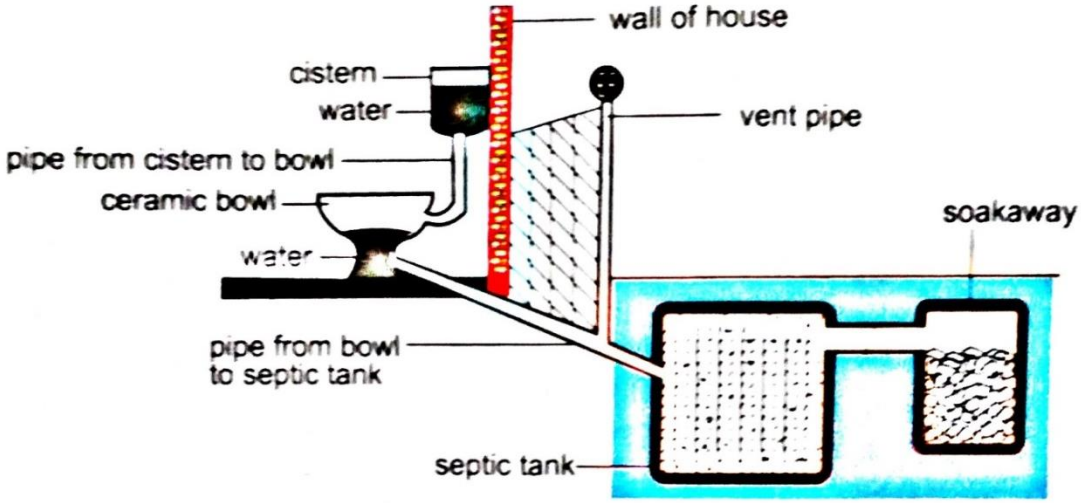

Figure 3: A septic tank latrine

PROTECTION OF WATER

Water is used in our communities for drinking, cooking, bathing and other cleaning purposes. The water obtained from various sources like wells, rivers, streams, reservoirs and rainfall are usually contaminated with germs. A clean fresh water must be supplied for use to avoid spread of water-borne diseases.

Purification of Water

Large scale purification of water: This involves removal of suspended solid matter and bacteria from water. The three main processes involved in treating water supplied to towns and communities include: **sedimentation, filtration and sterilization**.

- Sedimentation by adding alum: the water pumped into a large tank is allowed to stay for several days, to allow heavy particles like salt to settle at the bottom of the tank. Alum is added to aid in this process of sedimentation.
- Filtration: Water is passed through filtration tank containing layers of algae (or aluminium silicate for pressure filtration), fine sand, coarse sand and large stones.
- Sterilization with chemicals like chlorine gas to kill any germ present in the water. After this, water is then distributed to houses and industries.

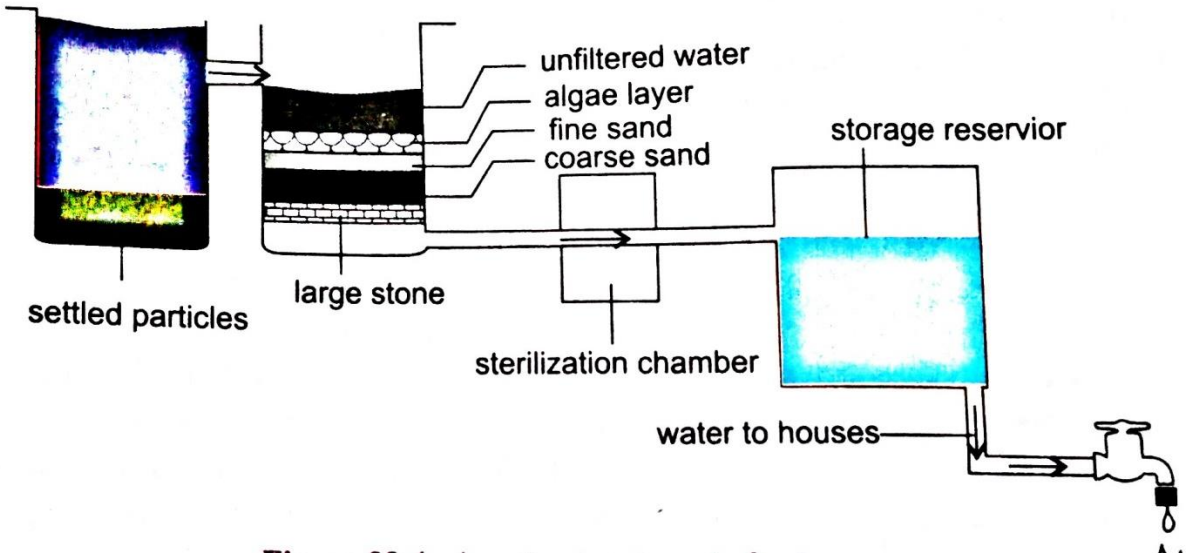

Figure 4: A water treatment plant

Small scale purification of water

a. **Boiling** which should continue vigorously for 5minutes
b. **Addition of iodine**: Add 20 drops to 4 litres of clean water and 40 drops for cloudy water. Mix and allow to stand for 30 minutes before use.
c. **Filtering:** This is done with commercial filter, and then add alum and followed by chlorine or iodine.

d. **Distillation:** Heat the impure water and the steam produced is passed througha glass tube and allowed to condense into water which is collected as distilled water.
e. **Bleaching powder:** This is added in small amount into water and allowed to stand for 30 minutes to one hour. The substance kills all the microbes present in the water.

PROTECTION OF FOOD

Balance diet promotes good health and so food must be protected from germs at all times. The kitchen where food is prepared must be kept clean always, well lighted so that insects and dirts are easily seen. Food must be protected during **storage, preparation and serving.**

Storage of food: Fresh foods like meat, fresh fish should be stored in refrigerators, while dry foods should be stored in clean oven, cupboards or big tins with lids to prevent vectors from reaching the food.

Protection during food preparation

- Hands must be properly washed to avoid introducing dirts from hand and finger nails to foods.
- Food items must be properly washed before cooking.
- Cooking utensils must be properly washed with soap and clean water to remove all possible dirts.
- All food items must be properly covered to prevent flies from touching the food.
- Foods must be properly cooked to destroy all germs.

Protection during serving of food

- Food should be served in clean plates. Spoons, forks, table knife and tables must be kept dry and clean.
- Table manners such not sneezing, laughing and blowing nose when eating should be observed, because bad manners can spread diseases.

CONTROL OF DISEASES

In the country there are three main divisions of the Ministry of Health that are responsible for controlling of diseases. They are the **protective division, sanitary division and medical division**.

The Protective division: some of their responsibilities include.

a. Maintain high standard of food hygiene.
b. To supply clean water for drinking and also prevent pollution of public water supply.
c. To prevent carriers of infectious diseases from foreign countries from entering the country at airports, seaports and boarders.
d. To organize vaccination and screening programmes.

e. To alert the public of any outbreak of infectious diseases and precautions on how to control its spread.
f. To keep all public places such as markets, public latrines and drains clean and free from disease causing organisms.

Sanitary Division

a. Ensures the removal and proper disposal of sewage
b. To ensure that refuse are collected and are properly disposed.
c. To keep public burial grounds and cemeteries clean and hygienic.

Medical Division

Some responsibilities include:

a. Setting up and supervising general hospitals and health centers.
b. Provide school health services, school dental services and welfare services.
c. Employing doctors, nurses and other medical practitioners for the above establishment.
d. Filing of medical records and compilation of health statistics.
e. Organizing seminar and workshops for medical and paramedical staff, to update them.

HEALTH ORGANIZATIONS

These are organizations established to maintain good health both at the national and international levels. They include:

1. **World Health Organization (WHO):** This was established in 1948 with its headquarters in Geneva, Switzerland. Its functions include:
   - Raising standard of health in member countries
   - Eradicating of disease in member country
   - Training of medical and paramedical personnel
   - Standardization of medical, pharmaceutical and biological products
   - Making sure that certain food reach/meet acceptable standard
   - Give out information on biological/health research findings to the whole world.
   - Supply medicine to member countries.
   - Give advice in improvement of maternal and child care, nutrition, nursing, public health services and education
2. **Red Cross:** Established 1864.

   Functions

   a. In time of peace:
      - Improves first aid programme.
      - Prevention of accidents
      - Maintaining child welfare clinics and blood banks (campaigns for blood donation for those in need of blood)

- Giving aids and relief materials during natural disaster

b. In time of war:
    - Help in caring for injured persons
    - Provision of emergency aid to war affected areas
    - Evacuation of refugees
    - Welfare of war prisoners, presents gifts to make them happy

3. **The United Nations International Children's Emergency Fund (UNICEF):**
   This is an international organization set up to improve the health and welfare of children. It collaborates closely with WHO in many projects. Its main functions include the following:
   - Improves the nutrition of needy children by providing dried milk, vitamins and other protein rich foods
   - Supply equipment, drugs and transport to eliminate major diseases like malaria and tuberculosis which often attack children and mothers
   - Sends scientific materials, books etc to different countries to assist education of children
   - Gives out a small portion of its fund for emergency relief
   - Trainings to the local communities on the various methods of improving their nutrition, those of children and how best to make use of locally available foods

4. **Food and Agricultural Organization (FAO):** This is established in 1945, with headquarters in Rome, Italy. Its responsibilities include:
   - To raise living standard and improve production of Agricultural products
   - Collects, analyzes and compile information related to Agriculture, food and nutrition
   - Discuss ways of improving efficiency of the production and distribution of Agricultural products and food

5. **The Public Health Authority:** This body is responsible for the health of the community. Functions:
   - Ensures proper sewage disposal
   - Ensures that public places such as markets, play grounds and food manufacturing places are clean
   - Provides maternity clinics
   - Registers births and deaths
   - Administers vaccination to prevent and control infectious diseases
   - Provides ambulance services
   - Provides quarantine services
   - Gives health certificates to travelers

- Informs WHO of outbreaks of infectious diseases
- Supervises clinics, hospitals and welfare centres

Evaluation

1. Outline 4 ways you can control the effect of harmful micro-organisms
2. What is a vector?
3. State 5 major way you can control mosquito vector in your environment
4. Outline the ways of disposing refuse in your community
5. Mention the 3 major ways of sewage disposal
6. List 3 major steps involved in large scale purification of water
7. Mention any 3 ways you can protect your food during storage and serving
8. What are health organizations?
9. State 3 functions each of the following health organizations
   a. WHO
   b. Red Cross
   c. UNICEF

Assignment

1. Outline 2 major ways you can prevent the mosquito larva stage from emerging to adult mosquito.
2. Having studied control of harmful micro-organisms, outline the methods you can apply in your home to control black rat (*Ratus ratus*) which is a rodent vector; under the following headings
   a. Environmental control
   b. Chemical control
   c. Biological control