

## LABORATORY NO. 6

## 6.1. ESTABLISHING THE WATER BACTERIOLOGICAL PROPERTIES

## 6.1.1. GENERALITIES

In water we find two types of microbial flora:

- Microbial flora proper for water, that consists of microbes that develop at the temperatures between 10 and 22°C. They have an important role in water self purification.
- Pollution microbial flora, that consists of microbes with best developing temperature between 35 and 45°C. This flora pollutes the water. It may be: saprophyte, conditional pathogenic and pathogenic.

For a hidric infectious diseases appearance there may be necessary the least three conditions:

1. the presence of certain sources of germs (ill persons or healthy carriers, ill animals);
2. the possible survival of germs responsive in water for enough time to cause diseases;
3. the existence of a responsive population.

The survival of germs in water is variable depending on:

- water temperature;
- nutritive substances;
- sun radiation (ultraviolet radiation);
- the degree of water aeration;
- pH.

The main water infection diseases are:

- **MICROBIAL DISEASES:** typhoid fever and paratyphoid infections, cholera, bacillary dysentery, leptospirosis and rearly brucellosis.
- **VIRAL DISEASES:** enterovirosis (Coxsackie, ECHO), adenovirosis, reovirosis, A hepatitis.
- **PARASITICAL DISEASES:** amoebian dysentery, giardiasis, ascaridiosis, trichocephaliasis, bothriocephaliasis, schistosomiasis, trichomoniasis.

The infectious diseases transmitted through water have three forms which are:

- **EPIDEMIC FORM:** a great number of persons become ill in a short period of time.
- **ENDEMIC FORM:** a small number of cazualties appears, but which is permanently found in a certain area.
- **SPORADIC FORM:** isolated cases of illnesses appear.

### 6.1.2. THE BACTERIOLOGIC SANITARY INDICATORS OF WATER MICROBIAL CONTAMINATION

#### 6.1.2.1. THE GLOBAL CONTAMINATION INDICATOR

It is represented by the total number of germs which develop at  $37^{\circ}\text{C}/\text{cm}^3$  of water. They indicate a human or animal water pollution.

#### 6.1.2.2. THE FAECAL CONTAMINATION INDICATORS

The mostly used indicators in practical establishing are:

##### > THE PROBABLE NUMBER OF COLIFORMS/ $100\text{ cm}^3$ WATER.

They can ferment lactosa and produce gas and acidity in 24-48 hours. *Escherichia Coli* is alone from species *Escherichia*, *Citrobacter* and *Klebsiella*. It is of faecal origin, 90% have been present in human intestine.

##### > THE PROBABLE NUMBER OF FAECAL STREPTOCOCCUS

They are more rarely found in faeces than *E. Coli*. Their presence in faeces shows a recent faecal water pollution.

##### > THE PROBABLE NUMBER OF SULPHYTO-REDUCER GERMS/ $100\text{ cm}^3$ WATER

These germs are sporulated, anaerobical, and they are found in human intestine in smaller proportion than coliforms. They are represented by *Chlostridium perfringens*. They resist in water much longer than *E. coli*, and show an old water pollution.

##### > THE ENTERIC BACTERIOPHAGES/ $100\text{ cm}^3$ WATER

They are viruses present in environment together with the germs with which they live in symbiosis. They are; Bacteriophages Antityphi, anticoli/ $100\text{ cm}^3$  water. These phages are more resistant to water chlorination than coliphorms and enterococcs.

#### 6.1.3. NORMAL VALUES:

In water are not permitted to exist pathogenic germs.

Saprophyte germs are accepted within certain limits depending on the water source type.

In Romania we respect, the following values:

Types of indicators Types of water sources	The total numbers of germs which develop at $37^{\circ}\text{C}/1\text{ cm}^3$ water	The probable number of coliforms/ $100\text{ cm}^3$ water	The probable number of <i>E. coli</i> / $100\text{ cm}^3$ water	The number of Streptococcus faecal/ $100\text{ cm}^3$ water
Central sources of water supply with disinfected water	< 20	0	0	0
Central sources of water supply with undisinfected water	<100	<3	0	0

Local sources of water supply (wells) with undisinfected water	<300	<10	<2	<2
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## 6.2. ESTABLISHING WATER BIOLOGICAL PROPERTIES

### 6.2.1. GENERALITIES

Biological analysis shows the water quality for a long period of time, and it is a simple method.

In water we find:

- plankton (bioseston) that represents the total of the viable organisms in water.
- tryptone (abioseston) that represents the total of the abiotic elements in water.
- seston = plankton + tryptone

We establish the sestonic volume (through water filtration and centrifugation).

### 6.2.2. NORMAL VALUES

- The seston volume is:
  - maximum  $1 \text{ cm}^3/\text{m}^3$  of water for central sources of water supply (tap water);
  - maximum  $10 \text{ cm}^3/\text{m}^3$  of water for local sources of water supply (wells);
- The maximum number of microscopic animal organisms is  $20/\text{dm}^3$  of water;
- The animal, vegetal organisms and eye visible particles must be absent in water;
- The pollution tryptone - absent;
- The geohelminth eggs, Giardia cysts - absent.