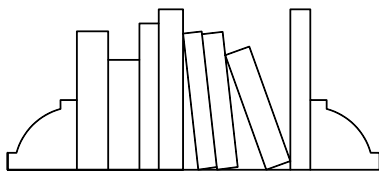


Water

Lecture Outline:

15. WATER QUALITY — DRINKING WATER
- A. History of Drinking Water
 1. Ancient Period
 2. Progressive Period
 3. Contradictive Period
 - B. Safe Drinking Water Act
 1. Goals of SDWA of 1974
 2. Important Definitions
 - C. Primary Drinking Water Standards
 1. Organic Chemicals
 2. Inorganic Chemicals
 3. Microorganisms
 4. Turbidity
 5. Radionuclides
 - D. Secondary Drinking Water Standards
 - E. Bottled Water



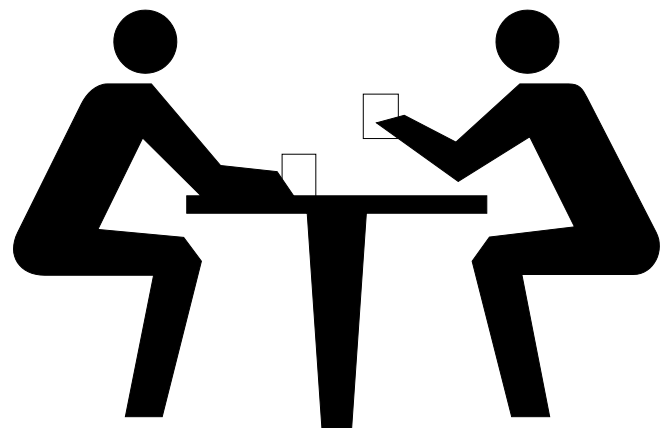
Learning Objectives:

When you are finished with this unit you should be able to:

1. Describe the history and progress of drinking water quality from ancient times through modern times.
2. List and understand the basic goals of the Safe Drinking Water Act of 1974.
3. Define important terminology associated with safe drinking water.
4. List and describe the different categories of drinking water contaminants.
5. Describe and understand primary and secondary drinking water standards.

Terms You Should Know:

- ❖ Ancient Period
- ❖ Coliform bacteria
- ❖ Community Water System (CWS)
- ❖ Contradictive Period
- ❖ Cryptosporidium
- ❖ Drinking water
- ❖ Giardia
- ❖ Maximum contaminant level (mcl)
- ❖ Primary Drinking Water Standard
- ❖ Progressive Period
- ❖ Safe Drinking Water Act
- ❖ Secondary Drinking Water Standard
- ❖ Turbidity



Reading Assignment:

Brennan and Withgott:
General reading throughout Chapter 15.

15. WATER QUALITY – DRINKING WATER

DRINKING WATER:

defined as: water delivered to the consumer that can be used safely for:

-
-
-

A. HISTORY OF DRINKING WATER

3 DISTINCT PERIODS

-
-
-

1. Ancient Period (pre-1880)

- From ancient times drinking water has been treated by at least one of the following processes:

-
-
-
-

Ancient Period — History:

MESOPOTAMIA —

- Public sanitation laws (200 BC – 400 AD)

-

- 25 meter minimum distance between wells and

✓

✓

✓

ROME —

- Diligence in seeking and choosing water sources for Rome

—

- Created reservoirs

ROME →



DARK AGES

—

—

—

2. Progressive Period (1880-1960)

2 MAJOR DEVELOPMENTS —

-

-

- Characterized by:
 - rapid improvement in drinking water quality
 -

 - control of bacterial diseases
 -

 -

PROGRESSIVE PERIOD:

human → waste →

-

- By 1900 → for the first time in 2,000 years, Europe enjoyed decent drinking water quality
- 1887 Lawrence, MA
 - 1st water filtration system (sand)
 - ✓

 - ✓

3. Contradictive Period (1960 – present)

- Concerned with specific organic and inorganic chemicals
-

B. SAFE DRINKING WATER ACT

- SDWA of 1974

–

–

- major amendments in 1986 and 1996

1. Goals of SDWA of 1974

-
- Set up government oversight of both surface and groundwater sources of drinking water
-
- Provides funding for state water systems
-

2. Important Definitions

Community Water System — a public water system that serves:

- at least 15 service connections used by year round residences

OR

–

✓

✓

MAXIMUM CONTAMINANT LEVELS (mcl) — the maximum allowable concentration of a contaminant in drinking water

Primary mcl —

Secondary mcl —

Drinking Water Standards

- If you get your drinking water from a CWS
 -
- If you get your water from a private well
 -
 -
- EPA regulations are sub-divided into 2 categories
 - 1.
 - 2.

C. PRIMARY DRINKING WATER STANDARDS

- Specific mcl (maximum contaminant levels) based on health criteria
- There are specific standards for many contaminants

CATEGORIES

1. Organic chemicals
 - 2.
 - 3.
 4. Turbidity
 - 5.
1. Organic Chemicals
 - Synthetic Organic Chemicals (SOCs)

-
-

EXAMPLES:

SOCs — Aldicarb, Chlordane, Carbon tetrachloride

VOCs — Benzene, Trichloroethylene (TCE), Vinyl chloride

THMs —

2. Inorganic Chemicals

- Huge number of chemicals
-
- Sources can be result of:
 - natural processes
 -
 - human activity

EXAMPLES:

- Nitrate
- Arsenic
-
-
- Asbestos
- Cadmium

Example: Nitrate-N

- EPA has an established mcl of 10 ppm $\text{NO}_3\text{-N}$
-

- Water containing $>10\text{ppm NO}_3\text{-N}$ should not be used for regular drinking
-
-
- The standard is for infants, as levels up to 60 ppm have no negative short term impacts on adults

3. Microorganisms

- Many waterborne diseases are caused by microbes:
 -
 -
 -
- Bacteria are the most common water contaminants (test for coliforms!)
-
- Other microbial problems
 - - ✓ Giardia
 - ✓
 -

4. Turbidity

Turbidity — measure of fine suspended matter in water

Caused by:

- clay
-
- organic particulates

-
- some microscopic organisms
- Measured in nephelometric turbidity units (NTUs)
 - a measurement of the amount of light scattered or reflected from the water
 -

5. Radionuclides

- Serious problem
-
- Natural sources:
 -
 - geologic formations

NATURAL RADIONUCLIDES

- Uranium
- Radium
-

HUMAN-MADE RADIONUCLIDES

- More than 200 known
- Sources:
 -
 - nuclear weapons facilities
 -
 - docks for nuclear-powered ships

D. SECONDARY DRINKING WATER STANDARDS

- Pertain to aesthetic preferences public has on drinking water
-
- Range of concentrations is established — but no known impact on public health

SECONDARY STANDARDS

- Water pH
-
-
- Taste
- Odor

E. BOTTLED WATER

- Bottled water is much more expensive than tap water!
- Bottled water is not necessarily better for you than tap water
-
- Bottled water is regulated by the FDA
-

Common Bottled Water Terms

-
-
-
-
- water from an underground aquifer which may or may not be treated

- DISTILLED WATER

–

- MINERAL WATER

–

FIJI vs Cleveland Water

- FIJI's ad slammed Cleveland city tap water

–

–

–

- Cleveland NewsChannel 5 did a blind taste test

–

- Laboratory tests

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