WATER QUALITY STANDARDS

Dr. M. Siva Durgaprasad Nayak, MD, PhD

Assistant Professor,

Department of Community Medicine

CONTENTS

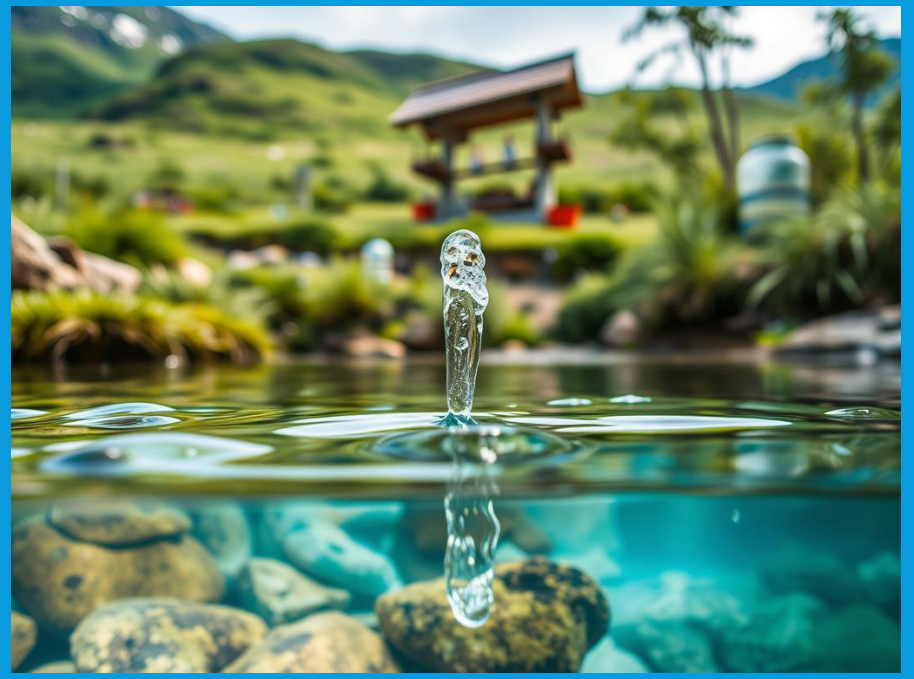
- Safe water
- Water quality standards
  - Acceptability aspects
  - Microbiological aspects
  - Chemical aspects
  - Radiological aspects
- Water testing and Water surveillance

WHAT IS SAFE WATER

- Safe water is water that is free from harmful contaminants, making it suitable for drinking, cooking, and other domestic uses.
- It should meet specific physical, chemical, biological, and radiological standards to ensure human health and safety.
- Safe water should be clear, free from visible particles, have no harmful chemicals, and be free of disease-causing microorganisms.

EXAMPLES OF SAFE WATER FROM NATURAL SOURCES

- **Springs:** Naturally filtered groundwater emerging from the earth.
- **Artesian Wells:** Deep wells accessing confined aquifers.
- **Glacial Meltwater:** Pure water from melting glaciers.
- **Rainwater (Properly Collected and Stored):** Free from contaminants if harvested correctly.
- **Deep Groundwater:** Water stored in deep underground aquifers.



ARE WE DRINKING SAFE WATER?

- The safety of drinking water varies across different regions.
- In developed nations, municipal water supplies undergo strict treatment processes to ensure safety.
- However, in many developing countries and rural areas, water sources may be contaminated with bacteria, viruses, heavy metals, and other pollutants, leading to waterborne diseases.

WHAT WILL HAPPEN IF WE DRINK UNSAFE WATER?

- **Gastrointestinal Diseases:** Diarrhea, dysentery, cholera.
- **Parasitic Infections:** Giardia, cryptosporidiosis.
- **Heavy Metal Poisoning:** Lead and arsenic toxicity.
- **Chemical Toxicity:** Pesticides, industrial chemicals affecting the nervous and endocrine systems.
- **Long-term Health Issues:** Kidney damage, cancer, and developmental problems in children.

WHO AND WHEN DECIDED QUALITY STANDARDS FOR WATER?

- **World Health Organization (WHO):** Provides international guidelines for drinking water quality (first published in 1958 and regularly updated).
- **United States Environmental Protection Agency (EPA):** Established the Safe Drinking Water Act (SDWA) in 1974.
- **Bureau of Indian Standards (BIS):** Developed national standards in India.
- **European Union (EU):** Set regulations for drinking water quality.
- **Local Governments:** Implement and enforce these standards regionally.

WHAT ARE QUALITY STANDARDS FOR WATER?

- Water quality standards classify water based on its
  - Acceptability aspects,
  - Microbiological aspects,
  - Chemical aspects, and
  - Radiological aspects

ACCEPTABILITY ASPECTS - PHYSICAL STANDARDS

- **Color:** Should be clear. Less than 15 TCU
- **Taste and Odor:** Should be pleasant and free from chlorine or metal taste.
- **Turbidity:** Less than 1 NTU (Nephelometric Turbidity Units). Greater than 4 NTU, turbidity visible to naked eye.
- **Temperature:** Preferably between 10-15°C for palatability. Cool water more palatable.

ACCEPTABILITY ASPECTS – INORGANIC CONSTITUENTS

- **pH:** Should be between 6.5 - 8.5.
- **Chlorides:** 250mg/ lit
- **Copper:** 1mg/ lit
- **Sodium:** 200 mg/ lit
- **Sulphate:** 200 mg/ lt
- **Zinc:** 4mg/ lit
- **Total Dissolved Solids (TDS):** Should be less than 1000 mg/L.

MICROBIOLOGICAL ASPECTS

- **Bacteriological Indicators:**
  - **Coliform Bacteria:** Should be absent in 100 mL of water.
  - **E. coli or Thermotolerant coliform bacteria** Should be absent.
- **Viruses and Parasites:** Should not be present.
- ***Disinfection with 0.5mg/lit of free chlorine residual after contact period of 30 minutes to one hour at pH of 8 is sufficient to inactivate viruses***
- ***Slow sand filter and rapid sand filters can effectively remove pathogenic parasites.***

CHMICAL ASPECTS

- **Fluoride:** 0.7 - 1.2 mg/L.
- **Nitrate:** Less than 10 mg/L.
- **Heavy Metals:** Lead (below 0.01 mg/L), Arsenic (below 0.01 mg/L), Mercury (below 0.001 mg/L).
- **Pesticides & Industrial Chemicals:** Should be absent or within permissible limits.

CHMICAL ASPECTS

- The average daily per capita consumption of drinking water is usually around
  - 2 lit per day for 60 kg weight person,
  - 1 lit per day for 10 kg child
  - 0.75 lit per day for 5 kg infant

- Some times drinking more water may be toxic if chemical composition of water is not up to standards

RADIOLOGICAL STANDARDS

- **The effects may be somatic or hereditary**

- **Alpha Emitters:** Below 0.5 Bq/L.
- **Beta Emitters:** Below 1 Bq/L.
- **Radon:** Below 100 Bq/L.

WHO WILL MONITOR THESE STANDARDS?

Several organizations monitor water quality:

- **Regional Public Health Laboratories:** Test and analyze water quality at a local level.
- **Environmental Protection Agencies:** Oversee water safety compliance.
- **Water Utility Companies:** Regularly test municipal water supplies.
- **Non-Governmental Organizations (NGOs):** Conduct independent testing and advocacy.

WHEN TO TEST WATER?

Water should be tested:

- **Regularly (Annually):** For households with private wells.
- **After Natural Disasters:** Floods, earthquakes, or hurricanes.
- **When Water Changes Appearance or Taste:** Cloudy, smelly, or odd-tasting water.
- **After Repairs to Plumbing or Well Systems:** To check for contamination.
- **If Health Issues Arise:** Recurrent gastrointestinal diseases in the community.

PROCEDURE OF WATER TESTING: SAMPLE COLLECTION AND SENDING TO THE LAB

1. **Obtain a Sterile Container:** From the testing lab or health department.
2. **Choose the Sample Point:** Tap or well, avoiding contamination.
3. **Flush the System:** Run water for 2-3 minutes before collecting.
4. **Collect the Sample:** Fill the container without touching the inside.
5. **Seal and Label the Sample:** Include date, time, and location.
6. **Transport Quickly:** Deliver within 24 hours, keeping it cool if needed.

WHEN WILL THEY GIVE THE REPORT?

- **Basic Bacteriological Test:** 24-48 hours.
- **Chemical Analysis:** 1-2 weeks.
- **Radiological Testing:** 2-4 weeks.
- **Comprehensive Report:** Usually within 2-3 weeks, depending on the complexity of testing.

SURVEILLANCE OF DRINKING WATER QUALITY

- Approval of new sources
- Watershed protection
- Approval of construction and operating procedures of waterworks
  - Periodic maintenance, flushing, monitoring chemical substances using in plants
- Sanitary surveys
- Monitoring and provision f regional labs
- Development of codes for practice of well construction
- Inspection of quality control in bottled water and ice manufacturing operations

"Bacteriological surveillance and Chemical surveillance"

CONCLUSION

- Safe water is essential for health and well-being.
- While global and national standards exist, ensuring their enforcement requires cooperation between governments, laboratories, and the public.
- Regular testing and adherence to standards can prevent waterborne diseases and ensure clean drinking water for all.

- Thank You..