STERIS UNIVERSITY

Water. The Life's Blood Of Sterile Processing

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Disclosures

- **Successful completion:** Participants must complete the entire program and submit required documentation. No partial credit will be given.
- **Conflict of interest:** Employee of STERIS.
- **Commercial company support:** Fees are underwritten by education funding provided by STERIS.
- **Non-commercial company support:** None.
- **Alternative/Complementary therapy:** None.

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- STERIS Corporation is an approved provider of continuing education by California Board of Nursing (provider # CEP 11681) and the Board of Ambulatory Surgery Certification (provider # 1417).
- This program is approved for:
  - **0** hour(s) of GI specific content credit by American Board of Certification for Gastroenterology Nurses (ABCGN)
  - **1** AEU(s) & **1** IPCH(s) by BASC
  - **1** contact hour(s) of continuing education credit
    - HSPA
    - CBSPD
    - CBRN

Continuing Education

CCI® The Leader in Perioperative Certification

Through a partnership with CCI®, it also meets CNOR® and CSSM® recertification requirements for perioperative nurses.

Learning Objectives

- List the properties of pure water
- Describe the impact water impurities have on sterile processing activities
- List methods of water testing for impurities of concern

Water Is Powerful

Where Is Water Used


Point Of Use Treatment


Initial Rinse


Manual Cleaning


Washer / Cart Washer


Ultrasonic Cleaner


High Level Disinfection


Liquid Chemical Sterilization


Terminal Sterilization

Water

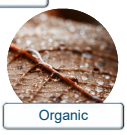

Microorganisms


Dissolved Gas


Minerals


Inorganic


Debris


Organic

Effect Of Water

- Instrument damage
- Equipment damage and inefficiencies
- Interfere with high-level disinfection and sterilization
- Instrument contamination

Water Impurities And Their Tests

Properties Of Water

- Tasteless
- Odorless
- Blue tint
- "Universal Solvent"
- Nonconductive
- pH of 7

What Impurities Do

- Add odor and taste
- Add color
- Increase conductivity
- Raise and lower pH

Observation

Observation

Water

- Visual - Tint / Cloudiness
- Odor - Musty / Fishy / Oily / Chemical/ etc.

Faucet / Sink

- Visual - Discoloration / Slime / Powder

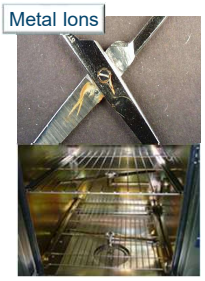
Total Dissolved Solids

What Are Dissolved Solids?

Organic	Inorganic
• Tannins	• Calcium Salts
• Fertilizer	• Magnesium salts
• Pesticides	• Metal Ions
• Biofilm	• Chlorides

Dissolved Solids SPD Issues

Metal Ions



Calcium

Chloride

Toxicity

Weight Test

- Dry water sample over night
- Determine the weight of what's left
- Report as mg/L

Considerations

- Takes 24-48 hours
- Specialized equipment
- Not specific

Conductivity Test

- Measures conductivity
- Portable TDS conductivity meter
- Reports
  - mg/L (milligrams per liter)
  - PPM (parts per million)

Mg/L
Weight in milligrams of dissolved solid in 1 liter of water

PPM
= Weight of Dissolved solid / Weight of Solution

Conductivity Test Considerations

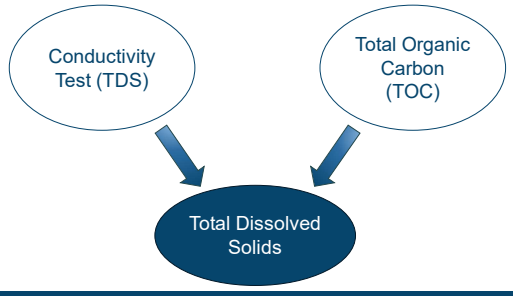
- Fast and easy
- Affordable specialized equipment
- Limitations
  - "False read" from water softening
  - Dissolved solid must be ionic

Total Organic Carbon Test

- All organic compounds
  - Pesticides
  - Endotoxins
- Specialized test equipment
- Reports
  - mg/L
  - PPM

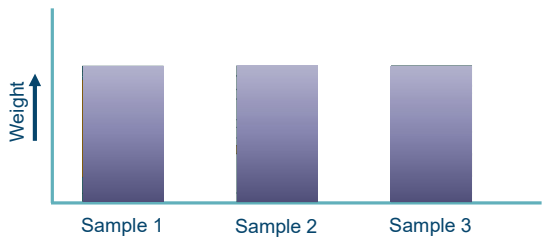
Considerations
- Laboratory test
- Does not measure inorganic dissolved solids

A Complete Picture Of Total Dissolved Solids



Elements Of Special Concern

Hiding Problems



Hard Water

- Calcium and magnesium salts
- Test Strips
- Results
  - PPM
  - GPG (Grains Per Gallon)

PPM
= Weight of Dissolved solid / Weight of Solution

GPG
Weight in grains of calcium carbonate per gallon

1 grain = 17.1 ppm

Metals

Laboratory Tests

- Aluminum
- Report in mg/L

Test Strips

- Copper, iron, manganese, zinc
- Reported in mg/L or PPM
- Considerations:
  - Accuracy
  - Range

Nonmetals

Laboratory

- Sulfate, silicates
- Report in mg/L

Test Solutions or Test Strips

- Phosphate, Chloride, Nitrate
- Reported in mg/L or PPM
- Considerations:
  - Accuracy
  - Range

Dissolved Gasses

Dissolve Gas SPD Issues

Non-condensable Gas

Carbonic Acid

Dissolved Gasses

- Naturally occurring gasses
- Imbalanced water treatment
- Liquid Water
  - Static headspace gas chromatography assay
  - Specific gas meter (Oxygen, Carbon Dioxide, etc.)
- Steam
  - Condensation and gas capture

Testing Steam

- Personal protective equipment
- Feed Water and Steam Condensate
- Consider a test condenser unit port

Potential Of Hydrogen (pH)

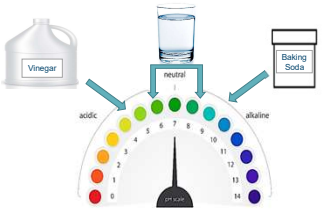
pH SPD Issues

Low pH

High pH

pH

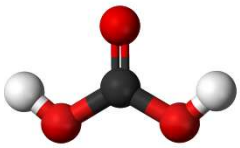
- Concentration of hydrogen ions
- Pure water is 7.0 pH
- Strips or pH meter



Total Alkalinity

Total Alkalinity SPD Issues

Increased scale formation



Carbonic acid in steam condensate

Total Alkalinity – Buffering Power

- Amount of acid added to reach ≥4.0 pH
- Titration or test strip
- Reports
  - mg CaCO3/L
  - ppm CaCO3

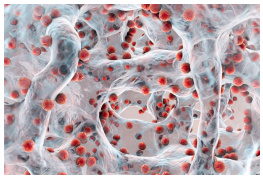
Considerations
- Accuracy
- Range

Two Definitions Of Alkalinity

- Alkalinity – solution pH greater than 7
  - Alkalinity or acidity
- Alkalinity - buffering power
  - Total alkalinity
  - Neutral pH can have a high total alkalinity

Microorganisms

Microorganism SPD Issues



Biofilm Formation

Recontamination of high-level disinfected devices

Toxic Anterior Segment Syndrome (TASS)

Bacteria Testing

- Heterotrophic plate count
- Plate Sample
- Incubate at in a humid 30-35°C environment for ≥48 hours
- Reports CFU/ml

Filter Membrane

Spread Plate

Pour Plate

Endotoxin Testing

- In-Vitro Tests
  - Limulus Amebocyte Lysate (LAL)
  - Recombinant Factor C Assay (rFC)
- Coagulation reaction
- Reports
  - EU/ml
  - Pass / Fail

Considerations
- Threshold for fail result
- Accuracy

Important Difference

Bacteria Testing	Endotoxin Testing
• Must be alive	• Living bacteria NOT necessary
• Population spikes	• Steady increase
• Cause infections	• Seasonal spikes
	• Causes fevers / inflammations

Should I be using pure water for all my sterile processing applications?

Pure Water Challenges


Leaching


Absorbs Gas


Leaching


Unnecessary Cost

ANSI/AAMI ST108

American National Standard

ANSI/AAMI ST108:2023

AAMI

- Defines water quality by application
- Describes routine testing
- Considerations for water treatment

Action Items

- Explore your water treatment process.
- Read ANSI/AAMI ST108

References

- Association for the Advancement of Medical Instrumentation. (2020). ANSI/AAMI ST79: 2017 & 2020 Amendments A1, A2, A3, A4 (Consolidated Text) Comprehensive guide to steam sterilization and sterility assurance in health care facilities. Arlington, VA: Author.
- Association for the Advancement of Medical Instrumentation. (2023). ANSI/AAMI ST108:2023 Water for processing of medical devices. Arlington, VA: Author.