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

Continuing Education

- STERIS Corporation is an approved provider of continuing nursing education by **CBRN** – provider # CEP 11681 and an approved Administrator Education Unit (AEU) and Infection Prevention Control (IPCH) provider by **BASC** – provider # 1417.
- This program is approved for:
 - **0** hour(s) of GI Specific content credit by **ABCGN** (American Board of Certification for Gastroenterology Nurses),
 - **1** AEU(s) & **1** IPCH(s) by **BASC** (Board of Ambulatory Surgery Certification), and
 - **1** contact hour(s) of continuing education credit
 - **CBRN** (California Board of Registered Nursing);
 - **CBSPD** (Certified Board for Sterile Processing and Distribution); and
 - **HSPA** (Healthcare Sterile Processing Association).

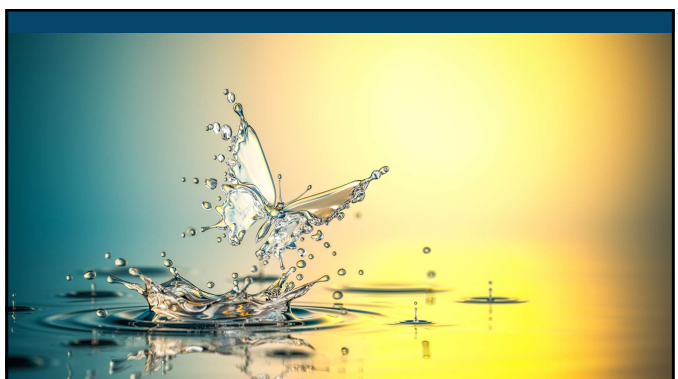
Continuing Education

**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



Water



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

- Tannins
- Fertilizer
- Pesticides
- Biofilm

Inorganic

- Calcium Salts
- Magnesium salts
- Metal Ions
- 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
= $\frac{\text{Weight of Dissolved solid}}{\text{Weight of Solution}}$

Conductivity Test Considerations

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

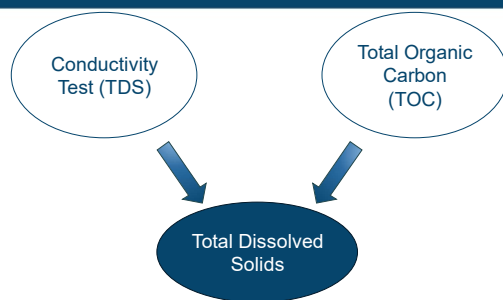
Total Organic Carbon Test

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

Considerations

- Laboratory test
- Does not measure inorganic dissolved solids

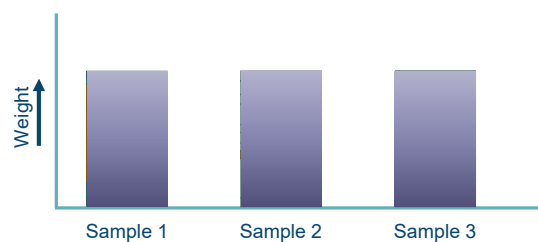
A Complete Picture Of Total Dissolved Solids



Elements Of Special Concern



Hiding Problems



Hard Water

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

$$\text{PPM} = \frac{\text{Weight of Dissolved solid}}{\text{Weight of Solution}}$$

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



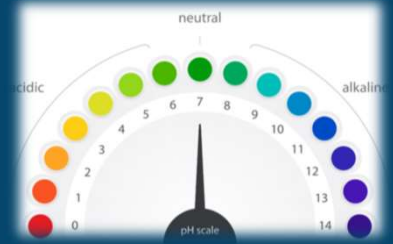
Dissolved Gasses

- 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

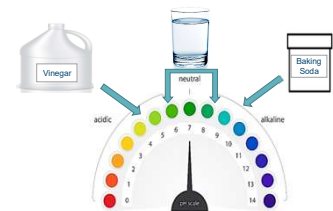


High pH



pH

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



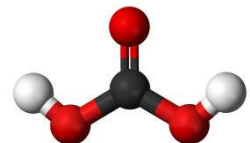
Total Alkalinity



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 CaCO_3/L
 - ppm CaCO_3

Considerations

- Accuracy
- Range

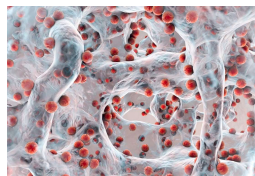
Two Definitions Of Alkalinity

- 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

- Must be alive
- Population spikes
- Cause infections

Endotoxin Testing

- Living bacteria NOT necessary
- Steady increase
- 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



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

Action Items

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

References

- APA format. See: <https://owl.english.purdue.edu/owl/resource/560/1/>
- 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.

Questions?



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