Water: The Life's Blood of Sterile Processing

Friday, August 15, 2025, 10 AM

Water is one of the most overlooked—yet essential—elements in the reprocessing of medical devices. Join us for an in-depth and engaging session that uncovers the critical impact of water quality on the safety, performance, and longevity of medical instrumentation and equipment. Discover the properties of water and how impurities impact the reprocessing cycle from initial cleaning and rinsing to high-level disinfection and steam sterilization. Learn about testing methods for water quality and current limitations. Learn about the risks of poor water quality and discover resources that can help your team make informed, compliant decisions that support safe, high-quality care. Whether you're a technician, manager, or clinical leader, this session will provide valuable insights into optimizing water quality in your reprocessing workflow.

Learning Objectives:

- Identify the key characteristics of pure water and why they matter in medical device reprocessing
- Recognize how various water impurities can compromise sterile processing outcomes and equipment integrity
- Learn how to apply appropriate water testing methods to detect and address impurities that pose a risk to safe and effective reprocess

Presenter: Angela Ritchey, Clinical Education Specialist, STERIS

Executive Summary:

- Angela Ritchey presented on the critical role of water quality in medical device reprocessing, emphasizing how water impurities can affect every step of the process and potentially compromise patient safety.
- The session covered various types of water impurities (dissolved solids, dissolved gases, pH/alkalinity, microorganisms/endotoxins), their effects on sterile processing, and methods for testing these impurities.
- Ritchey stressed the importance of appropriate water quality management based on specific applications and recommended referring to the AAMI ST108 standard for guidance on water quality requirements in sterile processing.

Meeting Notes:

Importance of Water in Sterile Processing

- Water is used throughout the device processing cycle:

    - Point of use care: Sterile water for removing debris
    - Transport: Moistening lint-free towels
    - Initial processing: Cold water rinse
    - Manual and automated cleaning: Creating cleaning solutions and rinsing
    - High-level disinfection: Rinsing devices
    - Sterilization: Steam for steam sterilization, humidification for ethylene oxide
- Poor water quality can affect every step of processing, jeopardizing process integrity and patient safety

Properties of Pure Water

- Tasteless and odorless
- Appears colorless in small quantities, blue tint in large quantities
- Universal solvent - can dissolve more substances than any other known solvent
- Insulative - does not conduct electricity
- Neutral pH of 7

Types of Water Impurities

Dissolved Solids

- Definition: Solids that become part of the water solution
- Examples:
    - Organic: Tannins, fertilizers, polychlorinated biphenyls (PCBs)
    - Inorganic: Calcium and magnesium salts, metal ions, chlorides
- Effects on sterile processing:
    - Discoloration, rusting, hard water deposits, pitting
    - Can be toxic for patients
    - May create protective spaces for microorganisms

Dissolved Gases

- Main gases of concern: Carbon dioxide, nitrogen, and oxygen
- Issues in steam sterilization:
    - Non-condensable gases can interfere with sterilization by blocking steam penetration
    - Carbon dioxide can form carbonic acid condensate, leading to pipe corrosion

pH and Alkalinity

- pH: Measure of acidity or alkalinity

    - Extreme pH can cause pitting, corrosion, loss of surface finishes, and discoloration
    - Can negatively affect sealants and adhesives
- Total Alkalinity: Measure of water's ability to buffer pH changes
    - High alkalinity can lead to scale formation and increased carbon dioxide in steam

Microorganisms and Endotoxins

- Microorganisms:
    - Can form biofilms, impeding equipment function
    - May recontaminate devices after high-level disinfection
- Endotoxins:
    - Created when microorganisms die and degrade
    - Can cause fevers and local site reactions in patients

Testing Methods for Water Impurities

Total Dissolved Solids Testing

- Weight test:
    - Pros: Captures all dissolved solids
    - Cons: Time-consuming (24-48 hours), requires specialized equipment
- Conductivity test:
    - Pros: Fast, easy, affordable equipment
    - Cons: Limitations with water softening, only measures ionic solutions
- Total organic carbon test:
    - Pros: Measures all organic dissolved substances
    - Cons: Requires specialized lab equipment, specific to organic compounds

Specific Dissolved Solids Testing

- Hard water: Test strips for calcium carbonate
- Metals: Test strips for copper, iron, manganese, and zinc; lab testing for aluminum
- Other dissolved solids: Lab testing for sulfates and silicates; test strips for phosphates, chlorides, and nitrates

Dissolved Gas Testing

- Liquid water:
    - Static headspace gas chromatography assay (lab test)
    - Specific gas sensors for oxygen and carbon dioxide
- Steam:

    - Condensing steam and capturing non-condensable gases
    - Results reported as percentage of non-condensable gases in steam supply

pH and Alkalinity Testing

- pH: Test strips or pH meter (more accurate)
- Total Alkalinity: Titration method or test strips

Microorganism and Endotoxin Testing

- Microorganism testing:
    - Heterotrophic plate count using filtration, spread plate, or pour plate methods
    - Results reported as colony-forming units (CFUs) per milliliter
- Endotoxin testing:
    - Chemical tests using limulus amebocyte lysate or recombinant factor C
    - Results reported as endotoxin units per milliliter or pass/fail

Regulatory Standards and Guidelines

- AAMI ST108 standard:
    - Defines water quality requirements for sterile processing applications
    - Provides guidance on water treatment options and validation

Practical Considerations for Water Quality Management

- Pure water is not always necessary or practical for all sterile processing applications:
    - Can cause problems in water lines and equipment due to its solvent properties
    - Difficult to maintain purity due to gas absorption
    - Unnecessary cost for most applications
- Importance of appropriate water quality management based on specific applications and impurity concentrations

Summary and Key Takeaways

- Water impurities have a significant impact on medical device processing
- Facilities should explore their water treatment processes and learn how impurities are managed
- Angela Ritchey recommends obtaining and reading the AAMI ST108 standard for more information on managing water impurities and appropriate water types for each processing step