Quiz 23-02-2026 water quality

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Question 1

- In hemodialysis water distribution systems, disinfectant selection must consider material compatibility to avoid corrosion, leaching, and dialysate contamination. **Which of the following disinfectant–material pairs is NOT compatible?**
- **A. Peracetic acid – Polyethylene (PE) piping**
  B. Formaldehyde – Stainless steel (SS) piping
  C. Ozone – Polypropylene (PP) piping
  D. Hot water disinfection – Stainless steel (SS) piping

Answer --**Ozone – Polypropylene (PP) piping**

- **Ozone – Polypropylene (PP)**
  - Ozone is a strong oxidizing disinfectant
  - Causes oxidative degradation of PP and ABS plastics
  - Leads to microfissures → biofilm risk, leaching, and system failure
- **Peracetic acid – Polyethylene (PE)**
  - Broad-spectrum oxidizing disinfectant
  - Compatible with most dialysis piping materials

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- **Formaldehyde – Stainless steel (SS)**
  - SS generally resistant to formaldehyde
  - Main incompatibility is with ABS plastics
- **Hot water – Stainless steel (SS)**
  - Thermal disinfection safe for SS loops
  - Problems mainly with PVC, CPVC, PE, and ABS polymers

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Question 2

A dialysis unit is validating its protocol for endotoxin monitoring in RO water and ultrapure dialysate as per international dialysis water quality standards.

Which of the following methods is **acceptable and validated for quantitative endotoxin estimation** in dialysis water systems?

A. Heterotrophic plate count (HPC) using R2A agar incubated at 20–28°C for 7 days

B. Recombinant Factor C (rFC)-based fluorometric assay

C. Gram staining with semi-quantitative microscopy scoring

D. Total organic carbon (TOC) measurement

Answer -- Recombinant Factor C (rFC)-based fluorometric assay

- **Recombinant Factor C (rFC) assay**
  - Synthetic alternative to traditional LAL assay
  - Specifically detects endotoxin via Factor C activation
  - Quantitative
  - Avoids variability of horseshoe crab-derived reagents
  - Increasingly accepted under modern pharmacopeial and dialysis standards

Limulus Amebocyte Lysate (LAL) Assay — Classical Gold Standard

- Derived from **horseshoe crab (Limulus polyphemus) amebocytes**
- Based on activation of a coagulation cascade triggered by endotoxin (lipopolysaccharide)
- Available formats:
  - **Gel clot method:** qualitative/semiquantitative, simplest
  - **Chromogenic assay:** color change proportional to endotoxin concentration
  - **Turbidimetric assay:** optical density increase with endotoxin activity
- Expressed as **Endotoxin Units (EU/mL)**
- Widely used in dialysis water testing due to sensitivity and validation in standards.

- **Heterotrophic Plate Count (HPC):**
  - Measures viable bacterial colonies only
  - Endotoxin may persist despite sterile cultures.
- **Total Organic Carbon (TOC):**
  - Nonspecific indicator of organic contamination
  - Cannot identify endotoxin specifically.
- **Gram Staining:**
  - Detects bacterial morphology only
  - No quantitative endotoxin assessment.

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Thank you