



Tackling the Dental Instrument Cleaning Challenge in High-Volume Practices with Pre-Treatment Fluids

Effective cleaning and disinfection of dental instruments is a foundational component of infection prevention. However, high-volume dental practices often face logistical barriers to timely instrument processing. When contaminated instruments are left unprocessed—whether due to back-to-back appointments, limited staffing, or workflow bottlenecks—residual bioburden such as blood, saliva, and tissue can dry and harden on surfaces. This significantly complicates cleaning, raises safety risks, and may impair sterilization efficacy.

This article explores how pre-treatment fluids—formulated with enzymatic and anti-corrosion agents—can support clinical best practices by improving instrument cleaning efficiency, reducing manual scrubbing, and helping maintain instrument integrity in dental settings.

The Clinical Problem: Delays in Instrument Reprocessing

Dental instruments should be cleaned as soon as possible after use to prevent drying of organic material. However, immediate processing is not always feasible. According to the Centers for Disease Control and Prevention (CDC), delays can result in dried debris that is difficult to remove, potentially compromising sterilization.

In practice, dental assistants may need to prioritize chair turnover and patient support over immediate cleaning. This leads to temporary holding of contaminated instruments in stabilization trays or bins, often without moisture retention. When cleaning is eventually performed—sometimes hours later—dried soils may resist removal, requiring extended manual scrubbing or repeated ultrasonic cycles.

This delay poses several risks:

- **Increased mechanical abrasion** of delicate instruments, especially those with fine working ends.
- **Risk of staff injury** from sharps during aggressive cleaning.
- **Potential cross-contamination** from incomplete soil removal.
- **Corrosion or pitting** of metal surfaces due to residual organic acids or prolonged exposure to moisture without corrosion inhibitors.

Pre-Treatment Fluids: Function and Composition

Pre-treatment fluids (also called pre-cleaning or holding solutions) are applied at the point of use to begin breaking down bioburden on instruments immediately after a procedure. These fluids typically contain:

- **Proteolytic enzymes** (e.g., proteases) that catalyze the hydrolysis of peptide bonds in proteins like blood and tissue.
- **Surfactants** to reduce surface tension and aid in soil dispersion.
- **Anti-corrosion agents** (e.g., passivating compounds) to protect metal surfaces during the holding phase.
- **Humectants or moisture-retaining agents** to prevent drying of contaminants.

These formulations maintain a moist environment on contaminated instruments and initiate the cleaning process before mechanical or ultrasonic cleaning occurs.

Technical Benefits in Dental Workflows

1. Enzymatic Soil Breakdown at Point of Use

Enzymes in pre-treatment fluids begin cleaving proteinaceous soils on contact. Unlike disinfectants, which are not cleaning agents and may fix proteins onto surfaces, enzymatic pre-treatment softens and loosens contaminants without denaturing them. This results in significantly reduced manual cleaning effort, especially on instruments with serrations, hinges, or internal lumens.

2. Moisture Retention for Extended Periods

Validated formulations can maintain moisture and enzymatic activity for up to 72 hours, although most guidelines recommend cleaning as soon as possible. This extended window is particularly useful in practices where instrument processing may be delayed due to staffing limitations, after-hours procedures, or transport to off-site reprocessing areas.

3. Corrosion Inhibition for Stainless Steel Instruments

Corrosion can occur when instruments remain in contact with organic acids or chloride ions. Pre-treatment fluids formulated with corrosion inhibitors create a protective barrier during the holding period. This is essential for high-carbon stainless steels used in periodontal, surgical, and endodontic tools, which are susceptible to pitting under certain conditions.

4. Reduction in Mechanical Scrubbing and Ergonomic Risk

Manual scrubbing of dried contaminants is a recognized risk factor for sharps injuries in clinical environments. By minimizing soil adhesion, pre-treatment fluids lower the need for forceful brushing and manual effort. This supports a safer environment

and contributes to staff retention by reducing repetitive strain and exposure risk.

5. Improved Cleaning Outcomes in Ultrasonic and Automated Washers

Instruments pre-treated with enzymatic fluids enter the ultrasonic or automated washer with softened soils, allowing cavitation or spray action to remove residues more effectively. This reduces the need for repeat cycles and ensures that sterilization devices are processing instruments that are genuinely clean—an essential requirement for validated sterilization.

Clinical Integration and Compatibility

Pre-treatment fluids can be integrated seamlessly into existing workflows. A common implementation includes keeping a spray bottle or gel dispenser in the operatory or stabilization area. After a procedure, contaminated instruments are lightly coated before transport to the central sterilization area.

Compatibility is a key consideration. Dental practices should select fluids that are:

- **pH-neutral or mildly alkaline** (typically between pH 7–9) to avoid material degradation.
- **Free from aldehydes and harsh solvents**, which may pose safety risks or interact with other reprocessing chemicals.
- **Validated for use on stainless steel, aluminum, and polymer components.**

Staff training is critical to ensure consistent application and to clarify that pre-treatment is not a substitute for cleaning or sterilization, but an adjunct step that enhances overall efficacy.

Regulatory and Standards Alignment

Use of pre-treatment fluids aligns with best practices recommended by:

- **CDC Guidelines for Infection Control in Dental Health-Care Settings (2003)**, which emphasize the importance of preventing drying of bioburden.
- **ANSI/AAMI ST79** and **AAMI ST79 for dental** instrument processing, which support the use of holding solutions for delayed reprocessing.
- **OSAP and ADA** educational materials that highlight cleaning as a distinct and essential phase prior to sterilization.

Conclusion

Instrument cleaning delays in dental practices are a persistent challenge, especially in high-throughput environments. The consequences of dried bioburden extend beyond inconvenience—they can impact infection control, staff safety, and instrument integrity.

Pre-treatment fluids offer a scientifically grounded, workflow-compatible method to improve instrument readiness for cleaning. By leveraging enzymatic activity, moisture retention, and

corrosion inhibition, these fluids enhance cleaning outcomes while supporting regulatory compliance and patient safety.

While not a replacement for mechanical cleaning or sterilization, pre-treatment fluids represent a valuable step in the broader infection prevention strategy—ensuring that even the busiest practices can maintain consistent, high-quality reprocessing standards.

Author Information

Ross Gustafson, Senior Chemist, MicroCare Medical

With over 30 years of experience in product formulation across diverse industries, Ross Gustafson leads product development and quality control efforts at MicroCare Medical. He holds an M.S. in Chemistry from the University of Colorado – Boulder and is known for creating safer, high-performance cleaning solutions. Ross is named on four patents and is recognized for his collaborative, innovation-driven approach to critical cleaning chemistry.

For more information, visit www.microcare.com.