

# PRE-CLEANING: THE FOUNDATION FOR EFFECTIVE INSTRUMENT REPROCESSING



Pre-cleaning is the beginning of the journey of reprocessing, and arguably the part that attracts the least attention, despite its importance. Appropriate pre-cleaning steps that are undertaken at the chair side can dramatically reduce the amount of adherent material (including blood, salivary proteins, cements and bonding agents) on instrument surfaces. The 2024 Australian Dental Association Infection Prevention and Control Guidelines highlight the importance of pre-cleaning steps, from those that occur during treatment and at the chair side, through to those that are undertaken prior to mechanical cleaning, once items have left the area where patient treatment is being undertaken.

Pre-cleaning using a multi-enzyme approach has been a part of the protocol for reprocessing rotary nickel-titanium endodontic files for over 20 years. As a result, many dental practices have become more familiar with the use of multi-enzyme products for the pre-treatment of instruments before the cleaning process is commenced.

Cleaning solutions with multiple enzymes are specifically designed to handle a variety of organic and inorganic substances that stick to dental instruments. These solutions usually contain a mix of enzymes, such as proteases, lipases, amylases, and other types of carbohydrases. Proteases will break down proteins present in blood and saliva, while lipases focus on fats and lipids, and carbohydrases break down carbohydrates and organic substrates such as those in dental cements and bonding agents. This multi-enzyme strategy guarantees a thorough disintegration of bioburden, thereby enhancing the efficiency and effectiveness of the cleaning procedures that follow.

There are several advantages of employing a multi-enzyme treatment for dental instruments. They enhance the efficacy of the cleaning process by decomposing organic substances at a molecular level.

This aids in preventing the creation of biofilms during the time the instruments are soaking. Biofilms are difficult to eliminate and can harbor harmful pathogens. An effective cleaning solution can also extend the lifespan of instruments by preventing corrosion using corrosion inhibitors.

Several factors play a crucial role in determining the activity and effectiveness of multi-enzyme solutions. Firstly, temperature is a significant factor, since enzymes are sensitive to temperature changes. Most multi-enzyme solutions are designed to function at room temperature, which is typically 20-25°C. However, increasing the temperature to 40°C can considerably enhance enzyme activity, and accelerate the breakdown of contaminants. It is important to stay within the recommended temperature range, as excessively high temperatures will denature the enzymes, making them ineffective. Secondly, the duration of exposure to the multi-enzyme solution is critical. A soaking time of 10-20 minutes can be sufficient for the enzymes to act on the bioburden. Extended soaking can enhance cleaning efficiency, but it is essential to adhere to the manufacturer's guidelines to prevent potential damage to the instruments. Thirdly, some multi-enzyme products are designed to be used during ultrasonic cleaning. The agitation effects gained from cavitation significantly boost the effectiveness of the agent, since ultrasound waves create jet streams on the rigid surface of items when the microscopic bubbles created by cavitation collapse. This aids in dislodging debris, giving more effective cleaning, and reducing the time needed.

Fourthly, mild agitation, either manually or through mechanical means, can increase the extent of contact between the enzymes in solution and contaminants on instrument surfaces, thereby improving the breakdown process. Agitation helps distribute the enzymes evenly through the solution and across the instrument surfaces, ensuring comprehensive cleaning.

The concentration of the enzyme solution is another critical factor. Manufacturers provide specific dilution instructions to achieve the optimal concentration for effective cleaning. Using the solution at the correct concentration ensures that there is sufficient enzyme activity to break down bioburden efficiently. In addition to these factors, the pH of the solution, the hardness of the water used, and the presence of inhibitors or activators can also influence the effectiveness of multi-enzyme solutions. The influence of these variables was seen in a comprehensive analysis that we undertook of commercially available cleaning solutions for dental instruments, when we evaluated the various parameters that influenced their efficiency.

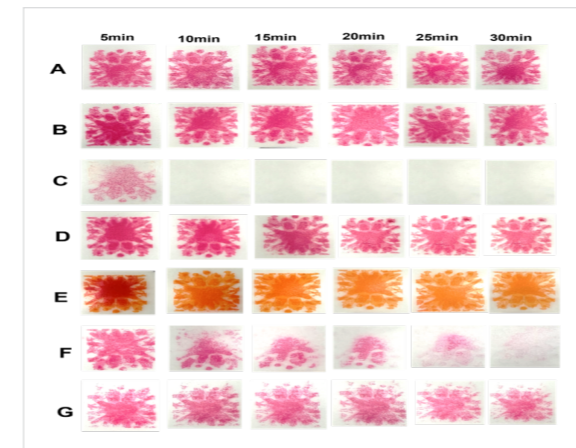


Figure 1. Effective cleaning of STF Browne Load Check® Indicators by ultrasonic cleaning over a period of 30-min with various commercial detergents at their manufacturer-designated concentrations at a temperature of 40°C. Row C is Optizyme Ultra D 6 ml/L, which shows the fastest removal of soil at 10 mins.

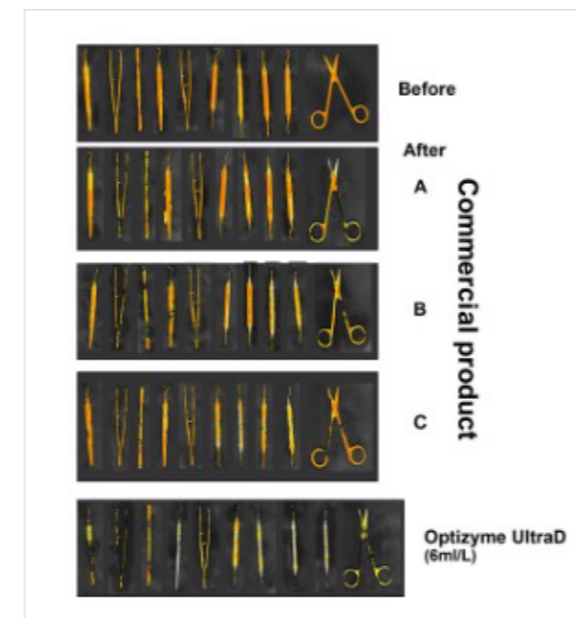


Figure 2. Cleaning of artificially soiled dental instruments by ultrasonic cleaning, analyzed using PROReveal for efficacy evaluation in short wash cycle (10-min cycle) with various commercial detergents at designated concentrations

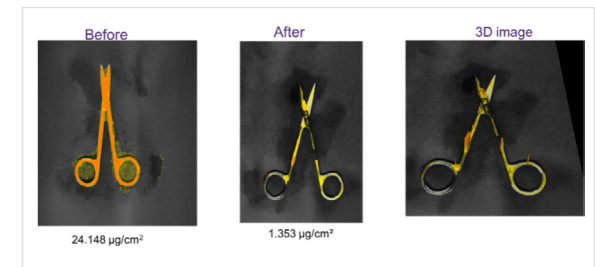


Figure 3. Efficacy of Optizyme Ultra D.

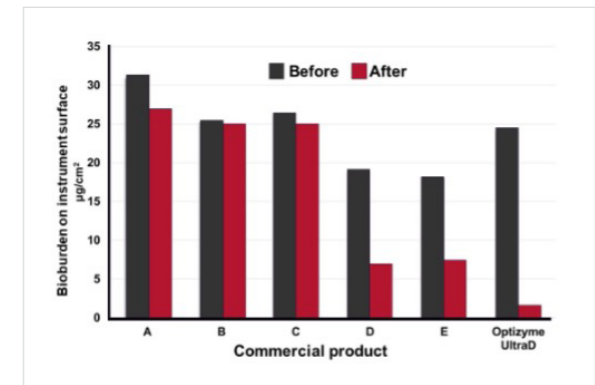


Figure 4. Comparative analysis of enzyme-based and non-enzyme-based detergents

Therefore, it is important to optimise all these factors when using multi-enzyme cleaning solutions for cleaning dental instruments.

Based on the foregoing results it can be concluded that multi-enzyme cleaners are highly effective in removing biofilms, blood residues, and microbial contaminants from dental instruments. Multi-enzyme cleaners that include disinfectants also reduce the overgrowth of bacteria that otherwise occurs during a prolonged holding period when items are submerged, and thereby enhances environmental hygiene in the reprocessing area. Their actions are superior to simply leaving instruments immersed in tap water, or in tap water to which ordinary detergents or chlorine compounds have been added.

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# OPTIZYME ULTRA D

## AN ADVANCED TOOL FOR DENTISTRY



Novapharm has been a research leader in the use of enzyme detergent medical instrument reprocessing for 3 decades. The last 15 years has seen an almost total replacement of the old style alkaline detergents by near neutral enzyme detergent formulations which have proven to be safer, more efficacious, more cost effective and more instrument compatible.

Recently it became clear that the challenges in reprocessing dental instruments are somewhat different from medical requirements and therefore a research project focussed on developing an enzymatic cleaner specifically to meet this dental challenge was undertaken five years ago.

The result is Optizyme Ultra D - an aqueous, multi-enzyme detergent concentrate developed specifically for dental instrument reprocessing. This formulation has proven to offer superior cleaning efficacy and is applicable to all dental instruments and cleaning modalities i.e. sinks, ultrasound baths and automated washers.

The unique features of the product focussed on satisfying the currently unmet dental requirements are:

- Clear, low foaming solution, fully compatible with manual washing, ultrasound baths and automated washers
- The ability to clean both organic and inorganic soils (bone, pulp, amalgam, ionomer as well as all human secretions).
- Digests and removes biofilm
- Contains rust and corrosion inhibitor
- The inclusion of a disinfecting system which ensures that the cleaning sink or ultrasound bath does not become a source of cross-infection after being in continuous use with a multiplicity of soiled instruments for many hours. (N.B. the product is not an instrument disinfectant)

Optizyme Ultra D is easily used in exactly the same way as other currently available instrument cleaners. It is simply added to the bath water or automated washer at the rate stated on the label.



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