

Cleaning

A crucial step in the reprocessing
workflow of medical devices and instruments

Although cleaning might be considered the first step in reprocessing, it is vital to remember that the first step in the decontamination cycle is acquisition of the instrument or device. This means that BEFORE you buy any new dental equipment you MUST check that the re-processing of your instrument or device described in the IFU is compatible with the processes in your dental office. If they are then you can proceed ...

Whether performed mechanically or manually, the cleaning of used medical instruments is a critical step in the process. The general principle of cleaning, was summarized by Herbert Sinner in 1959 in a simplified way in the so-called Sinner Circle.

The concept of Sinner's Circle is that all the critical components must be optimised for effective and efficient cleaning. Being an employee of Henkel, Herbert Sinner's principles were based on the different factors to improve the cleaning of clothes. The same is true for the cleaning of dental instruments, but optimised to remove micro-organisms, blood, saliva and other contaminants. It is important to remember that even an optimised Sinner's circle will not remove dental cement or liners that have set on dental instruments, these must be removed at chair side. Since any residual material left on instruments after dental use may reduce the probability of achieving sterilization conditions. Also, contamination remaining after cleaning can substantially affect the lifespan of instruments. Examples of this are blocked spray channels in handpieces, or instrument gear parts that are hard or impossible to operate due to dried on contamination. It is helpful to visualise the adverse effect of heating (in the sterilizer after incomplete cleaning) any remaining tissue or body fluids that remain will act like old-fashioned glue on or in instruments.

Automated cleaning using **AWD's** is the most efficient and staff safest method for instrument cleaning.

If these machines are unavailable then practice staff must exercise particular caution here; the risk of contamination is high, particularly in the event of heavy contamination with blood. It is essential that appropriate protective clothing, gloves and masks be worn and that staff have documented training and competency assessments in this task.

How clean is clean?

The answer to this question is still debated by subject-matter experts, and they have defined a number of chemical or biochemical tests to help inform this decision. These can be found in the **standard ISO EN 15883-5**. Examples of some suggested criteria include:

Protein assay criteria:

Just to give an example on assay criteria: The maximum permitted protein content on a clean instrument must be $\leq 6.4 \mu\text{g}/\text{cm}^2$ on every product test site. These tests are not currently designed to be routinely undertaken in dental practice. At present the practical definition for determining clean instruments in general dental practice is by visual examination of instruments under illuminated magnification.

Manufacturer recommendations indicate the appropriate cleaning process for the instrument in question and should always be followed. The preferred method of cleaning is using an automated washer disinfectant that has been validated.

Validation is a documented process for the retrieval, recording and interpretation of required results. This ensures the consistent performance result of a product that complies with prescribed specifications. Thermal washer disinfectors (or automated washer disinfectors or AWD) are validated by means of a series of specific testing schedules.



If an **AWD** is unavailable, then a combination of cleaning with ultrasonic baths and manual cleaning may be an alternative process, but is impossible to validate.

Before using an ultrasonic cleaner, please refer to the manufacturer manual of your device/instrument. Ultrasonic cleaners are an inexpensive and effective means of cleaning instruments in preparation for sterilization. The mechanism of an ultrasonic is that sound waves create small bubbles that are densely distributed in the ultrasonic solution. When the bubbles implode, they create cavitation within the chamber and this activity dislodges debris from the instruments (1). A variety of solutions are available for use in ultrasonic cleaners. Plain water alone is not as effective in the cleaning of instruments as the use of a cleaning agent (1). Failure to change the ultrasonic bath water frequently (follow the manufacturers' instruction of use) allows the formation of contaminants. This will increase detectable protein residues on instruments. Instruments should be rinsed after the ultrasonic bath to remove possible contaminants.

Protein residues before and after cleaning on various types of dental instruments:

The summary by M. Vassey et al (2) on the calculation of protein residues before and after cleaning contains very interesting results. This summary looks at processing by means of manual, ultrasonic-based and automated cleaning methods.

Before each cleaning method, different protein loads were found on various types of dental instruments:

The average quantity of protein residues found on non-cleaned instruments ranged from 0.4 µg (bur made from stainless steel) to 462 µg (extraction forceps).

In terms of cleaning performance, i.e. the reduction of the respective protein load of the different instruments, the thermal washer disinfecter achieved the largest reductions. The cleaning performance recorded for the contaminated instruments yielded a protein load of at least 0.4 µg and no more than 50 µg. These results provide evidence that both manual and mechanical cleaning substantially reduces the protein load of instruments contaminated to different extents. Please refer to the publication by M. Vassey et al, which provides detailed data on different instruments, from steel burs through to extraction forceps.

Important with regard to the reprocessing of surgical instruments:

To avoid stubborn surface-drying of protein residues, these instruments can be kept damp in preparation for forthcoming cleaning. In the event of contamination with blood, instruments should not be cleaned with alcohol because this fixes protein residues more firmly in place and makes cleaning more difficult.

The soaking of instruments contaminated in this way also results in protein residues bonding more strongly to the instrument, thereby rendering the subsequent cleaning more difficult. (3)

Bibliography:

- (1) Bettner MD, Beiswanger MA, Miller CH, et al. Effect of ultrasonic cleaning on microorganisms. Am J Dent. 1998;11(4): 185-188.
- (2) M. Vassey. A quantitative assessment of residual protein levels on dental instruments reprocessed by manual, ultrasonic and automated cleaning methods. British dental journal official journal of the British Dental Association: BDJ online · March 2011
- (3) Costa DM, Lopes LKO, Hu H, Tipple AFV, Vickery K. Alcohol fixation of bacteria to surgical instruments increases cleaning difficulty and may contribute to sterilization inefficacy. Am J Infect Control. 2017 Aug 1;45(8):e81-e86.