Mastering the Three "S's" for Successful Surgical Instrument Decontamination: Skill, Solutions, and Supplies

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The Power of "Clean"

What does the word "Clean" mean to you? Everyone always strives for clean drinking water, clean air, or clean fuel.. On the other hand, we may long for a clean bill of health, a clean getaway, a clean life, a clean joke, and even a clean voting record. The meaning of the word "clean" can take on many different meanings but in healthcare, the meaning of "clean" has much more of an impact because the consequences can be life threatening. If a surgical device is unclean, then sterilization and high-level disinfection can be rendered ineffective, bloodborne pathogens can be transmitted, and the healthcare team is at a higher risk for disease transmission. Therefore, healthcare professionals must properly clean and decontaminate instrumentation every time and without compromising good practices. The secret to successful decontamination is directly related to the **skill** of the healthcare professional, the type of **solutions** used, and the **supplies** needed to provide adequate cleaning.

The healthcare professional must thoroughly understand the reprocessing steps needed when surgical instruments are being prepared for reuse. This process involves:

1. Decontamination
    - A. Cleaning during the procedure
    - B. Preparation for decontamination
    - C. Containment and transportation
    - D. Cleaning Process
    - E. Rinsing (drying, if needed)
2. High-level disinfection, or
3. Sterilization

Healthcare professionals are often confronted with reprocessing challenges such as compliance with standards, complex instrument designs, virulent organisms, varying reprocessing solutions and supplies, and meeting the staff member's educational needs. Since decontamination is the most critical phase of reprocessing, this study guide will focus on the importance of the proper cleaning of surgical instruments while highlighting skill, solutions, and supplies.

Decontamination

Decontamination is referred to in the healthcare arena as the elimination of harmful substances (such as bloodborne pathogens) to minimize or prevent disease

transmission. Decontamination is a process which leaves an area, device, or surface clean or free from dirt, stain, or impurities. Decontamination as defined by the Association for the Advancement of Medical Instrumentation (AAMI) ST35 document is the "use of physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal." (AAMI, 2003) In other words, decontamination is a chemical and/or physical process that renders the contaminated item safe for further handling.

Skill

The healthcare team must be committed to providing proper and thorough decontamination of surgical instruments. Research-based standards of care and practices that address decontamination must be incorporated into the facility's policies and procedures. AORN Recommended Practices are voluntary but are usually interpreted as being the standard of care. The *Recommended Practices for Cleaning and Caring for Surgical Instruments and Powered Equipment* highlight the importance of proper cleaning practices as described below: (AORN, 2006)

Recommended Practice I: "Surgical instruments and powered equipment should be cleaned, handled, and used according to manufacturers' instructions."

This recommended practice (RP) states that the manufacturer is responsible for providing direction for the proper cleaning of surgical instruments and reminds the healthcare professional that proper care and cleaning helps preserve the instrument's function and effectiveness.

Recommended Practice II: "Instruments should be kept free of gross soil during surgical procedures."

This RP describes that instruments should be continually wiped with water-moistened sponges to prevent blood and debris from drying on the surfaces. Lumened instruments should be flushed with sterile water. Saline should not be used because it can cause deterioration of the instrument surfaces.

Recommended Practice III: "Effective and timely decontamination of instruments should be performed in a manner that minimizes risk to those performing the task."

This RP explains that:

*All instruments that are on the sterile field require decontamination.

*Healthcare professionals must wear personal protective attire to prevent blood and body fluids from contaminating them. This attire is worn to protect the skin, mucous membranes, and eyes from exposure to blood, body fluids, and other infectious materials.

*For cleaning, instruments should be taken apart and lock boxes should be opened. The instruments should be arranged in an orderly manner and placed on mesh-bottom trays so that the automated cleaning equipment action can reach all instrument surfaces. Heavy instruments are positioned on the bottom of the load or on another tray. More delicate instruments (i.e., scissors) are placed on the top of loads.

*Sharp instruments should be separated from general instruments.

*During transportation, the contaminated instruments should be covered with a damp towel (at a minimum) to prevent drying of debris on the instruments. Enzymatic soak solutions, sprays, gels, or foam, may be used to prevent debris from drying on the instruments. If debris is allowed to dry on the instruments or within lumens, corrosion, pitting, rusting, or occlusion can occur. Enzymatics are very effective on the hard-to-clean instruments.

*Various methods (manual or automated) can be used to clean contaminated instruments including:

-Manual methods (automated methods are preferred though)

-Washer/sterilizer

-Ultrasonic cleaner (bubbles are created to implode the soil off of the instrument surfaces)

-Washer/decontaminator

*Instruments should be submerged when being manually cleaned to prevent aerosolization and splashing of contaminants.

*Manufacturers' instructions that accompany the instruments should be followed for reprocessing practices, detergent selection, and proper use of the instruments. For example, abrasives can damage some of the instrument protective surfaces which can contribute to corrosion.

Recommended Practice IV: "Surgical instruments should be checked for function after cleaning. Those with moving parts may require lubrication according to manufacturers' instructions."

This RP notes that water-soluble lubricants should be used for instruments that have moving parts or require regular lubrication. Water-soluble lubricants allow steam to penetrate during steam sterilization. On the other hand, oil-based lubricants cannot be penetrated. Instruments should always be clean before a lubricant is applied. Ultrasonic cleaning will remove lubrication so attention must be paid to ensure lubrication is reapplied as needed.

Recommended Practice VI: "Surgical instruments should be inspected and prepared for storage and/or sterilization after decontamination."

This RP outlines what to look for during the inspection phase of reprocessing, including cleanliness, proper alignment and functioning, sharpness, presence of defects, chipping, nicks, cracks, or corrosion. Instruments that need repair should be labeled and taken out of service. Instruments to be stored after decontamination should be thoroughly dried. Instruments with removable parts should be disassembled for sterilization.

Another AORN reference that should be used when developing policies and procedures for instrument decontamination is the *Recommended Practice for Product Selection in Perioperative Practice Settings*: (AORN, 2006)

Recommended Practice I: "A mechanism for product and medical device standardization and evaluation should be implemented."

This RP states that implementing product standardization and value analysis processes will lead to the selection of safe and cost-effective products that promote

quality care. A multidisciplinary product evaluation and selection approach helps to ensure representation by many different healthcare professionals and departments. The manufacturer or distributor can provide valuable information along with clinical and technical data for evaluation and reference during product trials.

Recommended Practice II: "Product and medical device evaluations should be based on objective criteria specific to an item's function and use."

This RP lists criteria that can be used when evaluating and comparing products during a trial. Some of the criteria may include safety, performance, improved efficiency, ease of use, efficacy, cost/value analysis, ease of use, standardization, environmental impact, etc.

Recommended Practice III: "A clinical evaluation should be initiated based on an identified need or opportunity."

This RP addresses the importance of evaluations during product or medical device trials. Everyone's input should be acknowledged and received in a timely manner. Products should be demonstrated or instructions given to ensure safe and appropriate clinical use.

Recommended Practice IV: "Evaluation data should be analyzed to determine product recommendations."

When evaluating the data from the trial, the clinical performance should be compared to predetermined standards. As part of the evaluation and selection process, a value analysis may be performed. After a specific product or device has been selected, a comprehensive plan to introduce it into practice should be created. A plan for the use and evaluation of the product should also be developed and implemented. User satisfaction should be documented at planned intervals to ensure that the expected performance criteria continue to be met.

These are just some of the many recommended practices and guidelines that are available to educate the healthcare professional on the safe and appropriate process of decontamination and proper solution/supply decisions. If an unskilled or incompetent worker were to be given the responsibility of decontaminating surgical instruments, the consequences could be disastrous. Patient and healthcare worker infections could rise, instrumentation could be damaged, and surgical procedures could result in unexpected complications or outcomes.

When decontaminating surgical instruments, the healthcare professional must wear personal protective attire since disease-producing microorganisms on contaminated instruments can invade workers through skin cuts and abrasions or enter through mucous membranes of the eyes, mouth, or nose. The staff must use standard precautions when handling items that are contaminated. Federal law requires that gloves, gowns, masks, and eye protection must be available. Sometimes shortcuts are taken when reprocessing is hurried and proper attire is not worn. Staff members must understand the risks, consequences, and ramifications of not following mandates and facility protocols when decontaminating instrumentation.

Healthcare personnel responsible for reprocessing devices also must understand the complexity of the surgical instrumentation. They must read and comprehend the directions provided by the manufacturers on the care and handling of the instruments, how to disassemble them, how to reassemble them, and how the instruments are used for a procedure.

Many times the personnel responsible for reprocessing surgical instrumentation are invited to observe how the instruments are used during surgery so they realize the impact of contaminated or malfunctioning devices. The staff members also must understand the instructions for use of the cleaning solutions and supplies so that decontamination can be performed properly.

The skill level of the reprocessing staff members should be evaluated on a regular basis with competency checks and skills labs. Inservices on new devices, new processes, or new practices based on research should be continually conducted and documented. Open communication between the surgical team members and the reprocessing staff members should be fostered so that problems can be immediately addressed and quickly resolved. Maintaining a highly skilled team is paramount to effective and successful reprocessing.

Solutions – Chemicals that work

The decontamination of surgical instruments actually begins during the surgery. Any debris or blood on an instrument should be wiped off using a sponge or gauze soaked with sterile water. Any bioburden within a lumen should be flushed away with sterile water. Saline should not be used to wipe, flush, or soak instruments as the salt within saline can harm the instrument surfaces.

Some unique environmental conditions, such as those experienced during laparoscopy, may complicate the cleaning process if lumens are not kept free from debris. Laparoscopic instruments are used within a pressurized abdomen. This pressurization can drive debris up into the lumens and channels of instruments making them more difficult to clean. Throughout the procedure, these instruments should be flushed with water to remove debris before it dries and adheres to the internal lumens. (Ball, 1997)

At the end of the procedure, debris must be prevented from drying on all of the instruments. Blood and tissue contain chemicals that can break down the protective chromium oxide layer on the instrument surface. Three different presoaking methods are listed below that can be used: (listed in order of increasing efficiency)

*Place the contaminated instruments in water. The blood and bioburden will be prevented from drying and sticking but water alone will not suspend or loosen the soil, especially in crevices or lumens.

*Place the contaminated instruments in a water/detergent solution. The water will keep the bioburden moist while the detergent will provide a little surfactant activity to loosen the soil.

*Place the contaminated instruments in a water/detergent/enzyme solution or coat the instruments with an enzymatic gel or foam. The enzymatic activity will lead to a breakdown of blood and fats and almost float them away. An enzyme detergent will work on deposits in the lumens and will penetrate tight areas so less manual cleaning will be necessary.

By beginning the decontamination process immediately after surgery with an enzymatic soak, the number of microorganisms will be reduced and organic matter will be inactivated. By making this bioburden essentially harmless, the risk of infection to the reprocessing staff is reduced. Removing debris will also reduce the nutrient material that might support pathogenic growth. If not removed, the presence of dried organic debris can protect microorganisms during sterilization and disinfection, thus increasing the risk of nosocomial infections. When the process to remove bioburden begins immediately after surgery, the need to vigorously clean a device to remove encrusted debris is significantly reduced.

An effective and innovative product for preliminary soaking to prevent dried on bioburden is **Prepzyme®**. This spray is very effective in surgery or endoscopy suites where instrument and scope cleaning is not immediately available or when transportation to another department is needed. No water is needed for soaking; therefore, splashing during transportation is not a problem. **Prepzyme®** keeps soiled instruments, scopes, and biopsy forceps moist while the multi-tiered enzymatic foaming spray begins breaking down blood, fat, protein, and carbohydrates, thus helping to reduce the time needed for cleaning. This foam spray has a neutral pH, is non-abrasive and 100% biodegradable, and is safe for all instrument and scope surfaces..

Another effective spray for instrument and scope soaking is **Prepzyme®. X.F.eXtreme Foam** which provides a thick, long lasting foam to keep the instruments moist and begin breaking down blood, fat, carbohydrates, starches, and protein prior to decontamination. An applicator spray tip is designed for reaching into cannulas and lumens. The chemical formulation of this spray is a great alternative to water-based solutions that may cause rust after prolonged soaking times. Just like **Prepzyme®** this long lasting foam is safe for all instrument and endoscope surfaces.

If contaminated devices are soaked in a solution immediately after surgery, the solution needs to be discarded before transporting the devices to the reprocessing area so that splashing doesn't occur. If the items must be transported in the soaking solution, then the container lid must be secured tightly so that spills and splashes cannot occur. These transport containers should be durable and able to be effectively decontaminated. They also must be designed so they do not roll around or fall from the transport cart.

The **Instru-Bin®** is a multi-purpose, reusable high quality container with a durable snap down lid that prevents splashing and messy spills. The thick but transparent walls allow for visualization of the contents while the entire container system is light-weight but sturdy. The integrated handles provide easy lifting and carrying. A mesh basket is also included.

After the contaminated surgical instruments or endoscopes are received in the reprocessing area, they are removed from the transportation container and rinsed. Rinsing should not be performed under running water so that splashing is prevented. Instead, rinsing should be accomplished by immersing the instruments under the water level in a sink or basin.

Instruments with more than one part are disassembled so that all surfaces can be exposed to the cleaning process. Any small parts are kept together to provide easy and quick reassembly. Instruments with several parts should remain disassembled throughout reprocessing.

The actual cleaning process to remove the blood, body fluids, and other organic materials is now performed. The proper cleaning solutions are mandatory to provide successful removal of the bioburden. Surgical instruments are delicate tools that can easily be damaged when standard household detergents or industrial cleaners are used to clean them; therefore, appropriate cleaning solutions must be used.

The cleaning process can be performed either manually or in an automated system designed specifically for instrument cleaning. Whichever method is chosen, the proper cleaning solutions must be selected. Cleaning solutions have continued to evolve over the years with research validating the importance of adding enzymes to the cleaning detergents. Since a variety of bioburdens may be present on surgical instruments (depending on the surgery site), different enzymes must be used because of their specific actions:

*Protease will break apart protein
*Lipase will break apart fats
*Amylase will break apart starches
*Carbohydrase will break apart carbohydrates

Today's cleaning solutions are just as complex and specialized as the surgical instruments themselves with different formulations for different bioburdens and soils. For example, **Endozime SLR®** is the only enzymatic cleaner specifically designed to molecularly displace synthetic lipids, allowing them to be rinsed off while dissolving blood, fat, starches, carbohydrates and protein at the same time. Synthetic lipids are now being used as a substitute in fat-free foods and in weight loss medications. When ingested by an endoscopy patient prior to a procedure, these lipids form an orange oily substance that coats the insertion tube and internal channels of a scope. This oil does not break down during cleaning but redeposits itself, becoming impossible to remove. **Endozime SLR®** is used as preventive maintenance or as needed by stopping synthetic lipid residues from accumulating on the outer sheath and inner channels of a scope and on biopsy forceps.

One significant and valuable characteristic of an enzymatic cleaning solution is the pH which is the indication of alkalinity or acidity using a scale of 1 to 14. The definition of pH is the "potential of hydrogen" which is a measure of the hydrogen ion ratio of H+ (hydrogen) to OH- (hydroxyl). Neutral pH registers at 7 in which equal H+ and OH- ions are present. The lower the pH (less than 7), the more acidity is experienced with more H+ ions present. As the pH becomes higher than 7, more OH- ions are present making the solution alkaline. The pH often indicates the cleaning solution's cleaning power. Sometimes cleaning cannot be accomplished with a neutral pH so acid or alkaline boosters are used to accomplish a particular cleaning challenge. Cleaning solutions that have an acid pH are most effective in removing inorganic substances, such as mineral deposits. Cleaning solutions with an alkaline pH are more effective with organic

substances, such as blood or tissue. The appropriate strength of the cleaning solution must be achieved so that chemical trauma will not damage the instrument. For example, excessive alkalinity over 2% in cleaning solutions is not recommended. Washer/decontaminators may use highly alkaline solutions but the instruments must be rinsed immediately with an acid or water to bring the instrument surface pH back down to a neutral pH balance.

One popular neutral pH cleaning enzymatic solution is **Endozime® AW Plus**. The unique formulation and proprietary synergistic mixture of enzymes and buffers will remove blood, fat, carbohydrates, starches, and protein from instruments and endoscopes in approximately 2 minutes. Instruments that are difficult to clean, such as orthopedic instruments or laparoscopic instruments, along with delicate microsurgical instruments can easily and safely be cleaned with this low-sudsing solution. When used in automatic washers, ultrasonics, or even during manual cleaning, the dilution rate of a half ounce per gallon of water has proven **Endozime® AW Plus** to be a highly concentrated and cost effective cleaning solution.

A multi-tiered enzymatic detergent with advanced proteolytic action along with rust inhibitors called **Endozime® AW Triple Plus with APA** (advanced proteolytic action) is also very popular for effectively cleaning surgical instruments and endoscopes. The synergistic mixture of the enzymes protease, lipase, carbohydrase, and amylase removes all soil. Since bioburden is composed of different elements such as protein, fats, starches, and carbohydrates, it's essential to have specific enzymes that will remove each contaminant, otherwise it will be impossible to effectively clean the device. **Endozime® AW Triple Plus** helps solve facility standardization concerns since it can be used on all instruments and endoscopes, no matter how difficult to clean or how delicate. This neutral pH and free rinsing solution also reduces film build-up left by some non-glutaraldehyde high-level disinfectants. The APA increases the protein enzyme activity which provides better cleaning capabilities and penetration into the hard to reach areas on some of the more complex instrumentation.

If an instrument is manually cleaned, a three-sink setup is recommended. In the first sink, the instruments are cleaned using a low foaming, low sudsing solution so that visibility is not obscured; thus decreasing the risk of injuries from sharp instruments. The second sink is used to rinse the devices. Again instruments are submerged in the rinse water and not rinsed under the running water to prevent splatters. The third sink is often used for a final rinse with distilled or de-ionized water to prevent mineral buildup on the instrument surfaces. Even though workers are careful, instrument trauma may be greater when manual cleaning is involved.

Ultrasonic cleaning requires manual pre-cleaning first to remove the gross bioburden. During the ultrasonic process, tiny bubbles are created on the surface of the instrument that implode the debris from the surface (cavitation). Since the role of the detergent is not as important as the mechanical process of cavitation, a neutral pH detergent should be used. More alkaline pH solutions can cause corrosion thus shortening the instrument life. When placing the instruments in the ultrasonic chamber, the instruments should be fully open. Different metals should not be mixed in the same basket so corrosion is prevented. Fiberoptics (light cables, flexible endoscopes) should not be placed in an ultrasonic unit as the vibratory movements can damage the fragile fiberoptics.

Many different solutions can be used in ultrasonic cleaners. **Liquiclean-H®** is an effective solution for removing organic soils with manual cleaning or for use in an ultrasonic or washer sterilizer. The powerful sequestering and emulsifying action of **Liquiclean-H®** assures complete cleaning and free rinsing on all surgical instruments. The solution is biodegradable and does not contain phosphates. **Liquiclean-H®** is extremely fast wetting and is very effective in hard, soft, cold, or hot water.

Other formulations have been developed by Ruhof Corporation to handle specific customer needs for instrument decontamination. For example,

Orthozime® is designed for cleaning orthopedic and arthroscopic surgical instruments. This solution is a powerful formulation of enzymes, buffers, and non-ionic detergents that safely dissolves and removes all blood, fat, and protein from reamers, hip replacement sets, cannulas, and liposuction equipment. The neutral pH, non-sudsing solution is safe for use in all washers, ultrasonics, and for manual cleaning.

Kartzime® is a multi-tiered enzymatic alkaline detergent specifically designed for use in washer-disinfectors, tunnel washers, and cart washers to remove all blood, fat, carbohydrates, starches, protein, scale, and mineral deposits left from hard water in the units. Its powerful sequestering and emulsifying agents assure complete cleanliness and free rinsing of all surgical carts, trays, plastics, aluminum, glassware, and rubber tubing.

Many reprocessing departments today routinely use washer/decontaminator systems instead of employing manual cleaning.

Automatic instrument washers use water, pressure, and detergent for effective cleaning. Washers can have a single chamber, multiple chambers, or pass-through designs. They offer different user-control programs along with a wide range of cycle options. Usually a washer will require an alkaline or enzyme cleaner during the first wash to remove a majority of the residues. This cycle is then followed by a rinse. The second wash uses a neutral detergent that provides additional cleaning, if needed, and then will rinse away any remaining alkalinity from the first wash.

Lukewarm water is used for instrument cleaning (45^{O} C. or 110^{O} F) so that the debris, such as protein, can be easily removed while the water is not hot enough to cause protein coagulation.

The next cycle often involves a water-soluble instrument lubricant that's applied during the final rinse cycle. **Surgislip®** is a popular concentrated instrument lubricant for use in washers. Clinical tests have demonstrated that it is thoroughly steam penetrable, steam sterilizable, and ETO (ethylene oxide) sterilizable. **Surgislip®** provides a non-sticky, non-toxic, silicone free and water soluble mineral oil lubricant that can withstand the high temperatures of autoclaving without becoming gummy. This lubricant forms a protective barrier on the instrument surface that prevents rusting, staining, and spotting. The lubricant protective barrier prolongs the life of the instrument and greatly reduces repair and replacement costs.

When manual application of a lubricant is needed, **Premixslip®** can be used. This pre-mixed instrument lubricant and rust inhibitor has been clinically tested to be compatible with steam and ETO sterilization. The application of **Premixslip®** also prevents damage due to misuse of stiff or grinding instruments.

Proper instrument lubrication will prolong the life of the instrument and ensure proper working of any moving parts. Proper protective attire should be worn even when manual instrument lubrication is being performed.

Supplies

Just as important as the solutions used to clean contaminated surgical instrumentation, the supplies are of utmost importance too. Ports, lumens, serrations, fulcrums, box locks, and crevices can be very difficult to clean. Many times soft-bristle brushes are used to cleanse these areas.

When cleaning lumened devices, the size of a brush must be appropriate for the diameter of the lumen or port to be cleaned. A brush that is too large may damage the internal channel. On the other hand, a brush that is too small for the lumen cannot adequately remove the bioburden. The bristles of the brush may not always contact the entire surface of the internal lumen if cleaning is not performed properly.

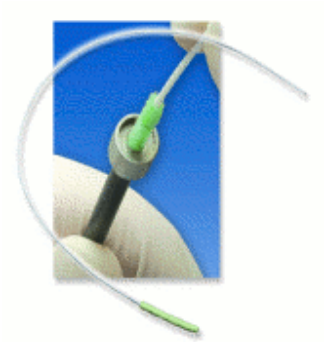
Because of brush designs, splattering is always a problem. To avoid aerosolization and risks to the healthcare worker, lumens are brushed while the device is under the surface of the water. Port irrigator systems along with suction devices can be used to flush these lumens too.

Recent advancements have introduced a very popular and unique lumen sponge called the **Endozine® InstruSponge™.** This cleaning device provides continual surface contact with the internal lumen so that thorough cleaning can be easily and quickly achieved. Since the lumen sponge lacks the pointed bristles of a brush, the risk of lumen or port trauma is eliminated. The **Endozine® InstruSponge™** is specifically designed to clean the internal channels of endoscopes, flexible fiberoptics, cannulated and take-apart laparoscopic instruments. The sponge at the end of the flexible plastic wand is impregnated with **Endozime® AW Triple Plus® with APA** (Advanced Proteolitic Action). The wand is easily maneuvered through complex internal channels, lumens, and cannulas to loosen and expel gross contaminants while instantly and actively digesting bioburden upon contact. Before insertion, the foam tip is dipped in water which activates the enzymes. Unlike bristles on a brush, the InstruSponge® will not spatter when coming out of the channel. This cleaning device is designed for single use so that the risk of cross contamination is decreased. Currently 3mm, 4mm, and 5mm diameters are available on a 240cm (8') length of flexible plastic wand.

The **Endozine® InstruSponge™** is also available for rigid and take-apart instruments. The **InstruSponge** is 60 cm (2') in length and is available in diameters of 3mm, 5mm, 7mm, and 10mm to address the different lumen sizes. This unique cleaning device can be used on lumens within rigid endoscopes, cystoscope sheath ports, and other

cannulated hand-held instruments. The directions for use for both of these cleaning sponges include:

1. Dip the foam tip in water to activate the enzymes.
2. Insert the foam end into the channel and run the length of the channel. Use a scrubbing action to remove debris from the walls of the channel. A back and forth action will help dislodge any debris without harming the channel as compared to a bristled brush.
3. After each passage, rinse the foam tip to remove any visible debris before retracting and reinserting it.
4. Continue scrubbing the channel until there is no debris visible on the foam tip.
5. Discard the **InstruSponge™** after each use.



Another exciting advancement in cleaning supplies is the introduction of the **Endozime®Sponge** which provides a safe and easy way to remove gross debris from the surfaces of flexible and rigid endoscopes. The sponge is highly saturated in **Endozime®** which begins to work as soon as it contacts the surface of the endoscope. The sponge is designed to contour with the outside sheath of the scope to remove gross contaminants before the scope is placed in the enzymatic presoak. Removing the gross contaminants immediately after use prevents bioburden from drying on the surface of the endoscope thus reducing the cleaning time needed. The special enzymatic non-abrasive solution within the sponge has a neutral pH and will not harm the surfaces of even the most delicate rigid or flexible endoscope. The solution is also free rinsing and 100% biodegradable.

The **Endozime® SLR Sponge** is custom made to contour with the outside sheath of an endoscope to remove synthetic lipids and gross contaminants prior to the enzymatic presoak. The sponge is saturated with the multi-tiered **Endozime® SLR** that removes synthetic lipids, such as those found in prescription weight loss medications and fat-free foods, as well as silicone, petroleum jellies, and other oily substances used in healthcare

facilities. When the sponge is placed on the endoscope surface, cleaning begins immediately on contact thus preventing biofilm from drying on the scope surface. The **Endozime® SLR Sponge** is individually packaged for single use thus eliminating the risk of cross contamination. This sponge is nonabrasive, has a neutral pH, is free rinsing, and will not harm metal, plastic, or rubber.

Summary

Thorough cleaning removes 99% of the bioburden (Hanson, 1990) but there are no accurate validation methods that exist today to prove this practice repeatedly. Sloppy techniques can lead to debris being left on or within instruments. When the device is then sterilized, this "sterile dirt" can act as a foreign body if transmitted to the next patient. This deposit can also increase adhesion formation, cause an immune response reaction, and even delay healing.

Inadequate cleaning can be identified by inspecting the instruments or endoscopes at the end of the cleaning process. The following list describes ineffective practices and the resulting problems:

Poor cleaning: Soil residues left on the instrument can lead to staining and corrosion if allowed to dry on the instrument surface. Staining can also result from the misuse of cleaning solutions or from malfunctioning cleaning equipment. Debris left on an instrument, especially in lock boxes and other hard to reach areas, may appear yellow-brown to dark brown in color. Protein soil can be identified by adding a few drops of hydrogen peroxide. If the solution bubbles, then protein soil is present.

Poor rinsing: Water spots on the instrument may be the result of hard water. Mineral deposits or cleaning solution or compound residues may appear as white spots or may dull the surface of the instrument. Usually these deposits are present when there is a rinse cycle malfunction, clogged spray jets, or when tap water is used as the final rinse.

Metal plating problems: When different metals come in contact with each other during reprocessing, metallic stains can occur which appear as rust or brown stains on the instruments. For example, gold or copper ions can plate onto stainless steel surgical instruments.

Instrument misuse and abuse: When strong acids or other caustics come in contact with instrument surfaces, the instrument's protective chromium oxide layer can be destroyed

which can lead to etching and corrosion. Stress cracking can occur from instrument wear and tear or abuse. If debris is allowed to accumulate in the cracks, then corrosion will occur. Rust can appear on the surfaces, cracks, or juncture sites and may be transferred to other instruments. Pitting occurs when bleach, saline, iodine tinctures, cleaning agents, or protein residues are not immediately removed from an instrument's surface.

Improperly cleaned textiles: If laundry residues remain in reusable cloth towels or wraps, instrument staining may occur.

Inadequate drying: If instruments are not thoroughly dried after cleaning and before wrapping for sterilization or before storage, this moisture can lead to corrosion after a period of time.

The importance of a systematic and meticulous decontamination process cannot be overrstated. The practice of proper decontamination requires a team effort and continual attention to the advancements in complex instrumentation, cleaning solutions, and cleaning equipment. Proper reprocessing practices ensure patient and staff safety, instrument integrity, and the control of pathogens and microorganisms. Decontamination is the foundation of all surgical instrument care and must never be taken lightly. Successful decontamination will always require a high level of **skill** by the healthcare professionals combined with using the most effective **solutions** and cleaning **supplies**.

References:

Association for the Advancement of Medical Instrumentation (2003), "Safe handling and biological decontamination of reusable medical devices in health care facilities and in non-clinical settings, ANSI/AAMI ST:35:2003, Arlington, VA, AAMI.

Association of periOperative Registered Nurses, Standards, Recommended Practices, and Guidelines (2006), Denver, CO, AORN.

Ball K (1997), Endoscopic Surgery, St. Louis, CV Mosby, p. 87.

Hanson PJV, Gor D, Jeffries DJ, et al. (1990) "Elimination of high titre HIV from fiberoptic endoscopes," Gut 31:657-659.