

Precautions About the Use of Chemicals for Instrument Sterilization

Chemicals not to be used for stainless steel instruments and T/C steel instruments:

Aqua Regia, Ferric Chloride, Sulfuric Acid, Hydrochloric Acid, Sodium Hypochlorite, Tartaric Acid, Aluminium Chloride, Barium Chloride, Bichloride of Mercury, Calcium Chloride, Carbollic Acid, Chlorinated Lime, Citric Acid, Dakin's Solution, Ferrous Chloride, Lysol, Mercuric Chloride, Mercury Salts, Phenol, Potassium Permanganate, Stannous Chloride

Do not mix T/C steel instruments with stainless steel instruments during the cleaning and sterilization, which could cause cross-corrosion on the stainless instruments.

Resin Instruments are to be sterilized with ultrasonic or automated cleaning and steaming. It is not recommended to sterilize it with dry heat or rapid dry heat transfer.

Anodized Aluminum is well maintained with autoclave, chemiclave or dry heat, but in ultrasonic units.

Recommended Method of Instrument Sterilization

Sterilization Method	Recommended Temperature	Expected Advantage
Steam Autoclave	121°C for 20 minutes	Time Efficient Good Penetration Sterilize water-based liquid
Dry Heat	160°C for 60 to 120 minutes	No Corrosion Large capacity per cost Items are dry after cycle
Chemical Vapor	132°C for 20 minutes	Time Efficient No Corrosion Items dry quickly after cycle

INSTRUMENT CLEANING AND STERILIZATION

Cleaning	All instruments need to be cleaned and thoroughly dried before they are sterilized. They should be washed with a non-corrosive, low suds, neutral detergent. Instrument cleaning can be accomplished by ultrasonic or automated cleaning, which is preferred to minimize the opportunity of sharps injuries due to hand scrubbing. Dental USA, does not suggest the use of any abrasive brushes or materials to clean instruments.
Sterilization	Sterilization is a process that kills microorganisms. There are three common methods of heat sterilization used in the dental office that can be verified by spore testing (steam autoclave, dry heat, and chemical vapor).

COMPARISON OF CLEANING METHODS

Method	Advantages	Disadvantages
Hand scrubbing	<ul style="list-style-type: none"> * Effective if performed properly 	<ul style="list-style-type: none"> * Increases chances for operator injury * Increases spread of Contamination through splatter * Labor-intensive * Need proper care of scrub brush
Ultrasonic cleaning	<ul style="list-style-type: none"> * Safer than hand scrubbing * Effectively cleans all instruments * Reduces chances for spread of contaminants through splatter * Allows for more efficient use of staff time 	<ul style="list-style-type: none"> * Microorganisms may accumulate in cleaning solution * Ultrasonic cleaning will not remove hardened Permanent cement. (Solution: remove cement while it is still soft.)
Automated washer	<ul style="list-style-type: none"> * Safer than hand scrubbing * Reduces chances for spread of contaminants of contaminants through splatter and aerosols * Allows for more efficient use of staff time * Effectively cleans instruments 	<ul style="list-style-type: none"> * Not all instruments are compatible with automated washers. Please see manufacturer's instructions for detailed requirements.

COMPARISON OF HEAT STERILIZATION METHODS

(These conditions do not include warm-up time and they may vary depending on the nature and volume of the load)

Method	Sterilization Conditions	Advantages	Precautions
Steam autoclave	20 minutes at 250°F/121°C (15 psi)	<ul style="list-style-type: none"> * Time efficient * Good penetration * Sterilize water-based liquid 	<ul style="list-style-type: none"> * Do not use closed containers * May damage plastic and rubber items * Non-stainless steel metal Items corrode * Use of hard water may leave deposits * Dry instruments
Unsaturated chemical vapor	20 minutes at 270°F/132°C (20–40 psi)	<ul style="list-style-type: none"> * Time efficient * No corrosion * Items dry quickly after cycle 	<ul style="list-style-type: none"> * Do not use closed containers * May damage plastic and rubber items * Must use special solution * Dry instruments or dip in special solution * Provide adequate ventilation * Cannot sterilize liquids
Dry Heat Dry heat oven	60–120 minutes at 320°F/160°C	<ul style="list-style-type: none"> * No corrosion * Can use closed containers * Large capacity per cost * Items are dry after cycle 	<ul style="list-style-type: none"> * Longer sterilization time * Cannot sterilize liquids * May damage plastic and rubber items * Do not open door before end of cycle * Dry instruments
Rapid dry heat transfer	12 minutes at 350°F/177°C (wrapped items) 6 minutes at 350°F/177°C (unwrapped items)	<ul style="list-style-type: none"> * No corrosion * Short cycle * Items are dry after cycle 	<ul style="list-style-type: none"> * Cannot sterilize liquids * May damage plastic and rubber items * Do not open door before end of cycle * Small capacity per cost * Dry instruments * Unwrapped items become contaminated after cycle

INSTRUMENT CARE

Material	Suggested Care
Stainless Steel Instruments	While stainless steel has superior corrosion resistance, it will discolor and corrode when exposed to higher than recommended chemical concentrations or certain chemicals. Stainless steel should not be exposed to the following chemicals: Sodium Hypochlorite (household bleach), Tartaric Acid (stain and tartar remover), Aluminum Chloride, Barium, Chloride, Bichloride of Mercury, Calcium Chloride, Carbolic Acid, Chlorinated Lime, Citric Acid, Dakin's Solution, Ferrous Chloride, Lysol, Mercuric Chloride, Mercury Salts, Phenol, Potassium Permanganate, Potassium Thiocyanate or Stannous Chloride. The following chemicals should NEVER be used with stainless steel: Aqua Regia, Ferric Chloride, Sulfuric Acid, Hydrochloric Acid or Iodine.
Carbon Steel Instruments	Carbon steel instruments are more sensitive to chemicals than stainless steel and require special handling. Carbon steel should NOT be exposed to any of the previously listed chemicals for stainless steel. Separate carbon steel instruments from stainless steel instruments throughout the cleaning and sterilization process. If processed together, the carbon steel instruments will likely create cross-corrosion on the stainless instruments. Carbon steel instruments should be thoroughly dried prior to sterilization to prevent rusting and/or corrosion. Use a protective rust-inhibitor before sterilization.
Hinged Instruments	All hinged instruments—forceps, rongeurs, scissors, pliers, hemostats, orthodontic pliers, etc.—should be kept lubricated. Regular use of proper lubricants, like Instrument Lubricant Spray (ILS), will prevent rust, corrosion and stiff joints and will ensure smooth operation. (Household lubricants and handpiece lubricants are NOT recommended.) All hinged instruments should be sterilized in the open position.
Anodized Aluminum	Special care needs to be exercised in cleaning and sterilizing these coated aluminum instruments. Do not clean in an ultrasonic unit. Clean by hand or in an automated washer. Check processing product labels for caution about use with aluminum. Sterilize in autoclave, chemiclave or dry heat under 350°F (177°C) according to manufacturer's instructions. Note: Anodized aluminum instruments, when sterilized with stainless steel instruments, may cause an adverse chemical reaction.
Ultrasonic Inserts	To clean, rinse thoroughly or, if you choose, fully immerse in a mild ultrasonic cleaning solution (pH 7-10.5). Daily Clean or Place in Ultrasonic unit for 7 to 10 minutes or 16-20 minutes if the inserts are in a cassette. Thoroughly rinse the insert or cassette with water (de-mineralized water is ideal) and dry completely prior to sterilization.

PROBLEM SOLVING FOR INSTRUMENTS

Problem	Reason	Prevention
Spotting	<ul style="list-style-type: none"> * Insufficient rinsing after ultrasonic cleaning * Insufficient drying after ultrasonic cleaning * Not changing ultrasonic solution * Sterilizer has not been cleaned 	<ul style="list-style-type: none"> * Rinse thoroughly under steady stream of water for 30 seconds * Rinse with hot water * Optional: Dip cassettes in alcohol after rinsing * Solution should be changed at least once a day * Sterilizers should be cleaned weekly * Use only distilled water for reservoir
Rust	<ul style="list-style-type: none"> * Corrosion from carbon instruments spreads to stainless steel instruments 	<ul style="list-style-type: none"> * Separate stainless and carbon instruments * For carbon steel instruments: Dip in pre-sterilized rust-inhibiting solution as suggested by sterilizer manufacturer
Pitting	<ul style="list-style-type: none"> * Chemical attack on instruments 	<ul style="list-style-type: none"> * Rinse and dry instruments thoroughly * Use approved cleaning, sterilization solutions only. * Never use household bleach or stain and tartar remover

*** PROBLEM SOLVING FOR CASSETTES***

Problem	Reason	Prevention
Staining	* Amalgam left in carrier	<ul style="list-style-type: none"> * Thoroughly empty amalgam carrier before returning to cassette * If carrier is plugged, sterilize separately and unplug while carrier is warm
	* Chrome breakdown of instruments	* Inspect instruments and replace those with cracked handles or peeling plating
	* Sterilizer has not been cleaned	<ul style="list-style-type: none"> * Change reservoir water once a week * Regularly clean chamber and filters
	* Normal use discoloration	* Every 6 months soak cassettes (without instruments and not in the ultrasonic) in 100% bleach for 5-30 minutes
Broken Hinges	* Overloading/ improperly placed instruments	<ul style="list-style-type: none"> * Instruments should not protrude from cassette * Only light force is needed to close cassette
	* Improperly placed rails	* Do not reposition cassette rails
Wet Packs	* Insufficient drying either before or during sterilization	<ul style="list-style-type: none"> * Thoroughly dry cassettes after cleaning, before wrapping * Crack open autoclave sterilizer door during dry cycle * Optional: After sterilization cycle, leave cassettes in warm sterilizer for 10 minutes
	* Improper loading of cassettes in sterilizer	<ul style="list-style-type: none"> * Do not over pack sterilizer * Keep cassettes slightly separated within the chamber * Always use sterilizer's cassette rack