Abstract

Knowledge of the full array of available dentistry tools, along with their maintenance, helps the veterinary nurse contribute to patient care by preventing equipment damage, increasing efficiency of the tools, and avoiding cross-contamination between patients. The purpose of this article is to review the most commonly used dentistry tools and important sanitation and maintenance considerations for each to maintain optimal performance and safety.
Dentistry Instruments and Equipment: Uses and Maintenance

Benita Altier, LVT, VTS (Dentistry)
Pawsitive Dental Education LLC, Glendale, Ariz.

Veterinary dental procedures require both power equipment and hand instruments. Unfortunately, these items often go into disrepair and become ineffective or useless. Reasons include a lack of understanding regarding how to set up, maintain, disinfect, sharpen, sterilize, or routinely replace instruments or equipment parts. To continue to work at peak capacity, dental delivery units and their working parts (e.g., air compressors, water and compressed-air lines, handpieces, air/water syringe, suction, ultrasonic scalers) require care before and after use as well as at other periodic intervals. Instruments that come in contact with a patient’s saliva or other body fluids must be cleaned (to be entirely free of biological materials), disinfected, and, whenever possible, steam autoclaved.¹

Staff education on adequately maintaining and using this equipment as well as written and carefully followed protocols are necessary to prevent dental delivery unit, instrument, or equipment breakdowns or failures. Protocols must be established for maintenance and use for each piece of equipment and instrument in the dental armamentarium. In addition, careful organization of all hand instruments into CORE (comprehensive oral and radiology evaluation) dental packs (BOX 1) and oral surgery packs (BOX 2) helps prevent instrument damage and loss and increases procedural efficiency. CORE is the foundational procedure that involves evaluating oral structures, bone, teeth, and soft tissues through full-mouth dental radiographs and clinical evaluation to probe and chart all pathology found. The CORE dental procedure also involves...

Take-Home Points

- Maintain all handpieces, dental delivery units, and other dentistry-associated equipment after each patient use, as directed by the manufacturer’s instructions and best practice guidelines.
- Cleaning, disinfecting, and sterilizing dental equipment will help prevent patient-to-patient cross-contamination.
- Daily sharpening after an instrument has been used maintains the active edges so that the instruments can perform the job at maximum efficiency.
cleaning, polishing, and irrigating tooth structures above and below the gingival margin.

THE DENTAL OPERATORY
A well-planned room or space used for dental procedures must contain several pieces of large equipment, such as a dental delivery unit, dental table (adjustable height), dental radiology equipment, and anesthesia equipment (FIGURE 1). Organization of the dental operatory is key to ensuring efficiency. Surrounding the dental table should be the anesthesia machine, patient monitoring equipment, warming devices, IV fluid pumps, and dental instrument trays. These items should be within easy reach of the operators. Storage should be available for general supplies (e.g., IV catheters, syringes, needles, gauze, bandaging).

Full-mouth direct digital or computed dental radiology is an essential part of dental procedures; the x-ray generator should be wall- or floor-mounted or can be hand held if permitted by your state (fd.gov/media/73890/download). Viewing monitors and
computers should be easily accessible to doctors and technical staff.

**POWER EQUIPMENT**

Power equipment is essential for providing safe, efficient, and effective dental care to veterinary patients. Dental delivery units are the mainstay of equipment in the veterinary dental operatory. However, if these machines and their working parts, such as the handpieces, are not well cared for, they may fail when they are needed.

Dental delivery units include a compressor (air- or oil-cooled), ultrasonic scaler, air-driven handpieces (high- and low-speed), air/water syringe, assorted burs, water supply, and optional suction devices (FIGURE 2).

Compressors (Air-Cooled or Oil-Cooled)

**Use:** Dental air compressors pressurize the air for use with handpieces, drills, and other types of units that need clean, compressed air to function (FIGURE 3).

**Maintenance:** Consult the manufacturer’s instructions on how to care for and maintain the compressor regularly (daily, weekly, and annually).1 For oil-cooled compressors, be sure to have the correct oil available and know how to change it after a certain number of hours used, per the manufacturer’s recommendations.

Air-cooled compressors do not require oil or oil changes but may have other specific maintenance requirements per the manufacturer, such as changing out air-inlet and regulator filters. Be sure that air-inlet ducts are free from hair and debris.

To check the compressor for air leaks, fully pressurize the tank, check the PSI level, and turn the compressor switch off. After 10 minutes with the lines under full pressure, check the PSI gauge; it should not lose more than 10% of ideal pressure. If the system fails pressure testing, air leaking can cause the compressor to engage more frequently, overworking the motor and potentially shortening the motor’s lifespan.

All compressors need to have the air and water discharged out of the tank at least nightly, and the compressor should be turned off and free of compressed air/moisture in the tank on days when not used.1 Equipment manuals can be found on the manufacturer’s website or at manualslib.com.

**Ultrasonic Scalers**

**Use:** Ultrasonic scalers use electrical power to convert sound waves into mechanical vibrations, which remove debris from tooth surfaces.1 A liquid (usually distilled water) is required to create the cavitation effect.

![FIGURE 3. Compressor and handpieces.](image)

![FIGURE 4. Piezoelectric ultrasonic scaler with periodontal tip and adjustment knobs (for water and frequency).](image)
necessary to disrupt the biofilm on tooth surfaces and remove tartar buildup. Cavitation is formation of microbubbles in the water emitted from the scaler tip. Implosion of those bubbles near biofilm disturbs the bacterial cell membranes within 2 to 3 mm of the collapsing bubbles.\textsuperscript{2}

There are 2 categories of commonly used ultrasonic scalers: piezoelectric, in which mechanical stress activates crystals in a linear fashion (\textbf{FIGURE 4}), and magnetostrictive, in which elliptical strokes of metal rods or sheets are converted to vibrations (\textbf{FIGURE 5}).

Ultrasonic tips (piezoelectric) or inserts (magnetostrictive) are for use above the gingival margin (supragingival) or below the margin (subgingival) for periodontal debridement and root surface cleaning in pockets where bone and attachment loss has occurred.\textsuperscript{3} Broader and more robust tips are available for gross removal of tartar from crown surfaces; these tips vary in design from manufacturer to manufacturer. A wide stroke tip will enable the operator to quickly and aggressively remove the largest deposits or clean larger surfaces more efficiently; however, increased water flow is required to cool these tips. The more moderate width of universal tips makes them most useful on smaller surfaces and areas with less calculus (e.g., in cats or more petite dogs).\textsuperscript{1} The only tips safe for subgingival use are periodontal tips in which the tip is thin and water flows to the tip; lower water flow and frequencies are required for these tips.\textsuperscript{1,3,4}

Maintenance: Have several sets of all 3 essential tips or inserts (broad stroke, universal, and periodontal) and autoclave them in your CORE packs, which should also contain hand scalers, a probe/explorer, a mirror, and curettes.

- **Measuring scaler tips:** Use the manufacturer’s tip card, which should have been included with the scaler or can be obtained from the manufacturer (\textbf{FIGURE 6}). Before every use on every patient, check the length and replace tips when wear is below the 2- to 3-mm mark on the tip guide.\textsuperscript{1}

- **Tightening the tips:** Use the proper tip wrench to secure the tip; never overtighten the tip. Ideally, you would have a wrench that prevents overtightening by reducing the torque.

- **Using the tips:** Read the instructions for safely using your ultrasonic scaler on tooth surfaces. Angle the tip to the tooth parallel to the long axis of the tooth with the tip apically oriented to avoid damaging the tooth surfaces.\textsuperscript{4} Angle the tip to the tooth without adding pressure; pushing down with the tip to the tooth limits the tip’s ability to move correctly.\textsuperscript{4}

**Air-Driven Handpieces**

Maintaining low-speed and high-speed handpieces requires keeping each handpiece in good working order, cleaned, lubricated, and sterilized between patient procedures. After every use and before autoclaving, high-speed and low-speed handpieces should be oiled or sprayed with a special cleaning/conditioning spray.\textsuperscript{1}
Product recommendations vary according to the manufacturer. If you have a choice, consider environmentally friendly, nontoxic, and nonallergenic products. Never submerge the handpiece in water, chemicals, or an ultrasonic bath. Many autoclaves have a “handpiece” setting for ease of autoclaving high- and low-speed handpieces. Autoclaving a dirty handpiece can “bake” the blood and saliva into the head of the handpiece and the turbine, thereby decreasing the turbine’s lifespan. Remove the bur as autoclaving with a bur in place can cause corrosion as a result of the different metals in the bur shank and the turbine. Keep the handpiece sterile until ready to use by not opening the sterilization pouch.

High-Speed

Use: High-speed handpieces run at top speeds of 300,000 to 400,000 rpm and should never run at partial speed or without a dental bur (or a blank) in the turbine. Always have a bur or blank in the turbine if the handpiece is installed on your dental unit in case the foot pedal is accidentally engaged.

Maintenance (FIGURE 7): High-speed handpieces become highly contaminated during patient procedures and are very sensitive to poor use or maintenance; therefore, they must be cleaned, conditioned, oiled, and autoclaved between patients (TABLE 1). Having more than 1 high-speed handpiece in your practice will allow you to clean the inside and outside of the

![FIGURE 7. High-speed handpiece. (A) With water on; (B) tightening swivel coupler with wrench; (C) spraying cleaner/conditioner; (D) a turbine; (E) changing the turbine.](image-url)
handpiece properly and sterilize it before its use on another patient. However, if your hospital has only 1 high-speed handpiece and you cannot autoclave it before the next use, it must be thoroughly cleaned according to the manufacturer’s recommendations by using handpiece oil or cleaning/conditioning spray, run for several seconds in the dental unit, and then flushed with water to remove as many contaminants as possible before use on the next patient. For optimal function and longevity of the turbine and other moving parts, specific maintenance protocols are required for every handpiece. Thus, hospital staff should carefully follow the directions for daily maintenance and autoclaving.

Turbines will need to be replaced, so keep a spare new turbine for your high-speed handpiece. Know the signs of turbine failure; the turbine should firmly hold the shank of the bur without wobble or expulsion. The bearings in the turbine are susceptible to poorly made dental burs or stress brought on by the use of dull burs. Bearings can fail in the presence of increased heat or pressure, debris buildup, or if the bur is not fully seated into the turbine. Learn how to change out a failed turbine in your high-speed handpiece.¹

### TABLE 1 High-Speed Handpiece Care

<table>
<thead>
<tr>
<th>STEP</th>
<th>FREQUENCY</th>
<th>CARE PROTOCOLS</th>
</tr>
</thead>
</table>
| Lubricating or cleaning/ conditioning | After every patient use and before autoclaving | - Spray lubricant or 2–3 drops of handpiece oil into the smaller (drive air-shaft) of the 2 larger holes in the bottom of the handpiece and run at full speed without water flow for 45–60 seconds with a bur shank fully seated in the head (turbine) of the handpiece.  
- Remove the bur, spray the lubricant or oil into the hole where the bur was, replace the bur, and run for a few more seconds.  
- Use a soft brush to clean the outside surfaces of the handpiece as needed under running water. Never submerge the handpiece in water or disinfectants.  
- Use a cotton tip applicator soaked in isopropyl alcohol to clean off the fiberoptic lighting surface. |
| Autoclaving (i.e., steam sterilization) | Between every patient | - Remove the bur for autoclaving.  
- Place the handpiece inside the autoclave pouch with at least 1 paper side and 1 plastic side for moisture ventilation.  
- Follow the manufacturer’s recommendations for time and temperature, but do not exceed 135 °C (275 °F).  
- Let the handpiece fully cool before use at room temperature; never force cooling by running it under cool water. |

### TABLE 2 Low-Speed Handpiece Care

<table>
<thead>
<tr>
<th>STEP</th>
<th>FREQUENCY</th>
<th>CARE PROTOCOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disinfecting</td>
<td>After each patient</td>
<td>- Wipe the outside of the handpiece with a cloth and noncorrosive disinfectant.</td>
</tr>
</tbody>
</table>
| Lubricating or cleaning/ conditioning | At the end of each day | - Take the handpiece off the dental delivery unit tubing by unscrewing it at the connection to the tubing.  
- Spray the cleaning/conditioning spray into the smaller of the 2 larger holes.  
- Place the handpiece back on the tubing and run it for 30 seconds.  
- Be sure the gasket at the bottom is still in place and is in good condition. |
| Weekly                      |                                  | - Ream out the plastic post hole with a hypodermic needle (e.g., 20 g or 18 g × 1 inch) to remove plastic debris that gets shaved off the disposable plastic prophy angle and deposited into this area. Turn the handpiece upside down and tap to remove debris. |
| Autoclaving                 | Daily or at minimum weekly       | - Separate the swivel connector from the motor portion when autoclaving.  
- Package in an autoclave pouch with at least 1 paper and 1 plastic side for proper ventilation.  
- Follow the manufacturer’s recommendations for time and temperature, but do not exceed 135 °C (275 °F).  
- Let the handpiece fully cool before use. |
Low-Speed

Use: Low-speed handpieces run at about 20,000 rpm. However, tooth polishing should be performed at less than 5000 rpm; speed is controlled by the rheostat or foot pedal. Heat buildup can be minimized by using ample prophy paste. Low-speed handpieces are primarily used for polishing with a disposable or metal prophy angle. Prophy angles either spin or oscillate the polishing cup. Oscillating prophy angles are excellent for patients with longer facial hair to avoid inadvertently pulling out the hair. Disposable prophy angles are not meant to be reused; the cup material cannot hold up to multiple uses. Metal prophy angles are available; however, they require disinfection and maintenance, which can be time-consuming.

Maintenance (FIGURE 8): Between patients, clean the outside thoroughly with a soft brush under flowing tap water at the sink; a mild detergent may be used if thoroughly rinsed. Never submerge the low-speed handpiece in water; moisture on the inside can lead to corrosion over time. Disinfecting, cleaning/conditioning, and autoclaving care can be found in TABLE 2.

Before use on each patient, fit a new disposable prophy angle on the low-speed handpiece. Many low-speed handpieces have a locking ring adjustment to open and close the chuck, allowing the friction grip hold on the post of the disposable prophy angle to engage or disengage. First, ensure that the locking ring at the top of the handpiece (if equipped with one) is released before placing the prophy angle post inside the handpiece. Next, lock on the prophy angle by turning

Turbines will need to be replaced, so keep a spare new turbine for your high-speed handpiece. Know the signs of turbine failure; the turbine should firmly hold the shank of the bur without wobble or expulsion.
the locking ring in the opposite direction toward the installed prophy angle.

Many low-speed handpieces have a rotational control (forward, neutral, and reverse); note where this is on your handpiece. Rotation direction is not critical for polishing; however, the handpiece will not operate with this control in a neutral position.

Air/Water Syringe

**Use:** The air/water syringe is used to irrigate or dry tooth surfaces. To avoid subcutaneous emphysema or air embolism, never project air into an open surgical site.

**Maintenance:** Some water spouts are disposable; for those that are not, remove the spout and clean it thoroughly in an ultrasonic bath. Disinfect or autoclave it. To be sure the controls are not getting sluggish or obstructed with prophy paste or other debris, use alcohol on gauze to thoroughly clean under the air and water flow buttons.

Carbide Dental Burs

Carbide bur shanks come in 2 lengths: 19 mm is standard and 25 mm is considered a surgical length for use when deep reach is necessary. Carbide burs come in different configurations: round (used for bone removal), cross-cut taper fissure (used for sectioning teeth down to single root sections), and specialized (e.g., pear- or cone-shaped) (FIGURE 9). Even though tungsten carbide dental burs are 3 times stronger than steel, their cutting edges can become dull quickly when used to drill bone or tooth substances. Therefore, these burs should be used for only 1 procedure and then properly discarded (e.g., into a sharps container).

If used when dull, the bur shank will apply force to the turbine, significantly shortening the turbine’s lifespan (leading to premature failure) and potentially extending surgical times due to ineffective and worn-out burs (increasing the time needed to section teeth or remove bone). Thus, do not reuse carbide burs; new burs are less expensive than new turbines.

Diamond Dental Burs

Diamond burs consist of a stainless steel base (head, neck, and shank) with the head bonded over with a diamond powder. The advantage of a diamond bur is that its durable coating can grind away hard tissues, such as enamel and bone. Diamond burs are meant for grinding, not cutting.

In veterinary dentistry, diamond burs are often used to smooth the alveolar crest after a tooth extraction and prevent bony spicules from leaving a rough edge before suturing. Diamond burs are also used for crown preparations when prosthodontic procedures are performed after root canal procedures.

Water Supply

Follow the manufacturer’s recommendations on decontaminating the water lines and tubing, which may involve bleaching or in-line water filters. Distilled or mineral-free water prevents minerals from clogging or corroding water lines and handpieces. Store the unit...
as dry as possible when not in use. Drying the water tubing of your dental unit involves depressing the rheostat pedal and blowing the water out of the lines when air pressure is still in the compressor tank. Last, remove the water bottles and dump all the water out; let the bottles dry overnight or over a weekend when not in use.

Suction
If the unit has a suction attachment and tips, be sure that they are cleaned and disinfected after every procedure, especially the collecting bottles and tubing. Disposable suction tips are convenient and help prevent patient-to-patient cross-contamination.

Additional Cleaning and Maintenance
The outer housing of the dental delivery unit, the rheostat (foot pedal), and the air filters should be checked, cleaned, replaced, and maintained to be clean, free of hair and other debris, and in good working order.

After you have obtained the official instructions for your unit online, write up a simple use and maintenance protocol or log. A log sheet can ensure that the maintenance is done on time and at exact intervals. Train all staff who will be using this equipment on its proper use and maintenance.

HAND INSTRUMENTS
Hand instruments for veterinary dentistry are essential and complementary to ultrasonic scalers and low- and high-speed handpieces. Hand instruments for dentistry can be divided into 2 main groups: those used for diagnostics and periodontal therapy (which can be placed in a CORE dental pack [FIGURE 10]) and those used for oral surgery, extractions, and dental procedures other than cleaning of tooth crowns or root structures (which can be placed in an oral surgery pack [FIGURE 11] or other procedure packs).

Dental instruments for procedures such as diagnostics, tooth crown scaling, and subgingival cleaning (including root planing and subgingival curettage) should be cleaned thoroughly, sharpened, inspected, and steam sterilized in packs for use on each patient.

Surgical instruments commonly used to perform oral surgery include winged elevators, straight elevators, luxators, periosteal elevators, and a bur block (BOX 2). Instruments used to create and close surgical flaps (e.g., blade handle, scissors, needle drivers, thumb forceps) must be selected, sharpened, packaged, sterilized, and kept in good working order between procedures.

The organization of hand instruments is critical for maintaining efficient use, cleaning, sharpening, and sterilization. Organization tools that can be easily found include colorful trays, tray holders, instrument marking tape, bands, or colored stick-on dots. To avoid cleaning and autoclaving unused instruments, individually package rarely used instruments and autoclave them separately rather than in the primary dental packs.

SHARPENING DENTAL INSTRUMENTS
Most hand-held instruments for dentistry require a sharp edge to perform the desired task. Instruments
such as dental elevators, luxators, periosteal elevators, scissors, hand scalers, and curettes must continually maintain sharp edges. Thus, sharpening dental instruments is essential for their effective and safe use. Instruments become dull with just a few uses, so it is crucial to sharpen them after every use before autoclaving. Any dental instruments worn beyond usefulness due to sharpening and use on tooth surfaces should be discarded or recycled.

The goal of instrument sharpening is to restore a sharp edge or edges while maintaining the original design of the instrument. Therefore, all dental instruments must be inspected for damage under magnification before and during the sharpening process. In addition, a sharpening test stick should be used to test instrument edges for sharpness.

It is crucial to preserve the original design and shape of the working end of the instrument. Incorrect sharpening techniques can alter the design and weaken the instrument, resulting in an instrument that does not adapt to tooth surfaces correctly and is prone to breaking. Instrument sharpening must be learned and practiced, becoming part of the routine process of cleaning and autoclaving hand instruments used for veterinary dentistry. The most helpful way to learn how to sharpen instruments is by taking a class on techniques and practicing under supervision.

To sharpen dental instruments, use a fine-grit stone (e.g., a natural Arkansas stone) with honing oil applied or a synthetic stone (e.g., a ceramic stone) with water applied (Figure 12). Instrument sharpening videos are available at pawsitivedental.com. TVN

References

Benita Altier
Benita is a licensed veterinary technician and a Veterinary Technician Specialist (VTS) in Dentistry. She began her career in veterinary technology in 1988 and has worked in small animal general medicine, ophthalmology, equine and llama neonatal care, canine reproduction, and dentistry. Benita is the president of the Academy of Veterinary Dental Technicians and a member-at-large of the Arizona Veterinary Technician Association. She has co-authored 2 textbooks on veterinary dentistry for veterinary nurses and published several articles on the subject in professional journals. Through her business, Pawsitive Dental Education LLC, she provides professional dental instruction and consultation to veterinary hospitals and conferences. She is passionate about giving back to the profession and helping veterinary nurses grow their careers in ways they never thought possible.

**FIGURE 12.** Instrument sharpening supplies: Arkansas fine-grit stones (flat and conical), medium-grit India stone for reshaping or sharpening of excessively dull instruments (top left), honing oil, magnifier, and plastic instrument sharpness testing stick.