

Enhanced Safety Protocols Using High and Low Volume Evacuation

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In today's COVID-19 environment, oral health professionals are understandably concerned about the risks they face at their practice and with their patients. And with new findings being released almost daily, it can be hard for professionals to keep up with the latest recommendations.

We asked a few key questions of, Leann Keefer, RDH, MSM — the director of clinical services for Crosstex International, now a proud member of HuFriedyGroup, about what offices should consider as they work to mitigate aerosols and create a safe dental environment.

Q: What are the differences between spray, splatter, and aerosol in the dental environment, and what risks do they pose?

Leann Keefer: It's simply a matter of size. As defined by Micik and colleagues, splatter (also called "spatter") are airborne particles larger than 50 micrometers (μm) in diameter, while aerosols are particles less than 50 μm in diameter. The particles also behave differently in the environment. Spatter and droplets will fall until they contact another surface, like a countertop, a floor, an instrument tray, a patient, or a clinician.

Aerosols are light enough to float with a range of 3 to 6 feet and can remain airborne for up to 30 minutes. Most dental aerosols are less than 5 μm in diameter, allowing them to penetrate and stay within the lung and potentially cause respiratory or other health problems. In fact, inhaling contaminated aerosols and splatters is the most likely mode of disease transmission in dentistry.¹

Both splatter and aerosols can host a large variety of micro-organisms and viruses that can be infectious to susceptible individuals.² According to studies, the most contaminated area on the clinician's face during treatment is around the nose and the inner corner of the eyes.³

Q: As offices are coming back into full utilization, what are the best practices for evacuation systems to help control aerosols?

Leann Keefer: There is no single transmission-based precaution to provide complete protection from the risk of cross-contamination due to procedural aerosols, but implementing a layered approach is highly recommended to minimize the dissemination of droplets, splatter and aerosols.

There are at least three potential sources of airborne contamination during dental treatment: dental instrumentation, saliva and respiratory sources, and the operative site.¹

Water is required to cool dental equipment, to irrigate and flush the tooth surfaces, and to reduce frictional heat to avoid pulpal damage.⁴ As a result, dental procedures that require dynamic instruments — such as high-speed handpieces, ultrasonic scalers, air polishers, and even the basic air/water syringe — can generate bioaerosols and splatter.

Practices should take a combination of protective measures, including the appropriate choice and use of such personal protective equipment as N95 respirators, ASTM Level 3 facemasks with a full-face shield, and eyewear (goggles or glasses with a side shield). It is also recommended to adhere to the U.S. Centers for Disease Control and Prevention guidelines for infection control in dental settings, which indicate that high-velocity air evacuation be used during dental treatment.⁵ Efficient use of the high-volume evacuator (HVE) has been shown to reduce aerosols by as much as 90%.⁶

Additional layering measures may include patient pre-procedural rinsing and manual toothbrushing, proper patient positioning, and awareness of a room's airflow pattern and exchange rate (target 6-8 times per hour).



Q: For evacuation systems, what's the difference between HVE and low-volume evacuation (LVE)?

Leann Keefer: There are two types of oral evacuators (tools used to remove excess fluid and debris from the mouth) most often used during dental procedures. The first is the HVE tip used with the HVE hose, and the other is the saliva ejector with the LVE hose.

The HVE single-use/disposable tip used by the clinician has a large diameter/bore of 8-10 mm that allows for the removal of excess water or air/aerosols. The saliva ejector is a small straw-shaped tube that either the patient can hold for repeated clearance of the mouth to remove fluids or can be bent/shaped to be retained over the mandible.

The bore of the saliva ejector is too small to remove aerosols effectively. Studies have reported that backflow in low-volume suction lines can occur and micro-organisms can be present in the lines retracted into the patient's mouth when a seal around the saliva ejector is created (e.g., by a patient closing their lips around the tip of the ejector, creating a partial vacuum).⁷

Another study conducted with isolation devices and saliva ejectors demonstrated that neither effectively reduced aerosols and spatter during ultrasonic scaling, therefore indicating that additional measures should be taken to minimize the distribution of splatter and aerosols.⁵

Q: How can an office determine the current efficiency of its evacuation system?

Leann Keefer: The best practice is to schedule an annual maintenance appointment with a service tech for the vacuum system. They will check and replace all lines, filters (average every 3 - 6 months), and belts and will oil/lubricate as needed. Staff should also review the owner's manual or instructions for use to ensure they are performing all the required tasks and using the appropriate cleaning products (with a pH of 6 - 8) to keep the lines and motor clean.

Staff can also improve efficiency by measuring the amount of liquid evacuated per minute of an HVE. Do this by filling a one-liter bottle with tap water, placing the activated tip of the HVE to the bottom of the bottle, and timing how long it takes to evacuate all the water. If the HVE is set appropriately, it should evacuate the water in one minute (a rate of 100 cubic feet per minute). The suction pump also has adjustable controls to set the evacuation rate, and the ideal suction level is between 11-12 bars.

Q: What are the recommendations for HVE and saliva ejector/LVE use for a solo practitioner?

Leann Keefer: Best practices for the use of the HVE include paying attention to three features of the technology: performance, mobility, and ergonomics.⁸ The clinician needs to know the vacuum performance of the HVE system, including power and airflow volume. To control aerosols efficiently, HVE devices must be held approximately 6 - 15 mm away from the active tip of the dynamic instrument.

During dental hygiene care, most clinicians are using a two-handed technique, and mobility of the HVE can be an issue. A shorter HVE tip provides better dexterity and control than the traditional long shape of the standard HVE tip. The bulkiness and weight of a normal HVE hose is approximately 1 pound and can be both awkward to handle and a concern ergonomically.

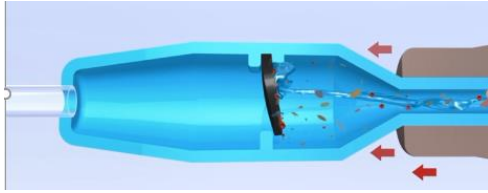
The Palmero HVESolo™ is uniquely designed for clinicians performing power instrumentation (air polishing/ultrasonic) procedures with an assistant. When a clinician is single-handedly performing evacuation, the HVESolo™ offers ease of use with a short (2.5" length), lightweight shaft in the non-dominant hand. The reduced (50%) shaft length lessens tension/drag from the hose and allows a more neutral wrist posting to improve clinician comfort and ergonomics. The unique three-vent design and the tip's smooth, round edges allow for gentle retraction to enhance visibility and prevent occlusion with soft tissues — maximizing patient comfort and collecting aerosols efficiently.



Studies have demonstrated that gravity pulls fluid back toward the patient's mouth when a length of the suction tubing holding the tip is positioned above the patient's mouth or during simultaneous use of other HVE equipment. Research indicates that backflow, or the movement of fluid in the opposite direction from which it was originally moving, may occur more than 20% of the time.

This means if you treat 10 patients daily, at least two of them risk contamination from backflow. Although no adverse health effects associated with the saliva ejector have been reported, 25 years of research show there is the potential risk of cross-contamination.⁷

SAFE-FLO® saliva ejectors and SAFE-FLO® one-way valves provide backflow protection to keep patients safe from evacuation line cross-contamination. Adaptor products contain an internal one-way seated valve, allowing the evacuation of fluids from the patient's mouth. When the vacuum pressure changes, such as when the patient closes their mouth around the tip, the valve snaps into a closed position and creates a barrier to prevent the backflow of saliva and other potentially infectious materials into the patient's mouth.



This product is adaptable and can be used in both LVE and HVE lines and is a low-cost, disposable solution that lets clinicians evacuate patients' mouths without the worry of cross-contamination — effectively limiting the spread of harmful bacteria and pathogens.

By adhering to tried-and-true procedures and adopting new recommendations, providers can implement the safety measures that will keep their patients and staff safe and healthy — both in a COVID-19 environment and beyond

We want to thank Leann Keefer for answering our questions, and we invite you to evaluate our safety and infection prevention products. For more information, visit palmerohealth.com, call 800-344-6424 or email customerservice@palmerohealth.com.

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With over 20 years of academic and directorial experience, Leann Keefer has gained a reputation as a trailblazer and international speaker in the arena of infection prevention. In her role as Director of Clinical Services for HuFriedyGroup, Ms. Keefer proactively identifies trends in the fields of healthcare and infection prevention, developing and implementing the company's long-term strategies relating to education and professional relations. Leann received her degree in Dental Hygiene as well as her Bachelors of Science Degree in Education from Indiana University; she was awarded her Master's Degree in Business Management from Indiana Wesleyan University. Leann was appointed to the OSAP Association Board of Directors in 2012 and serves on various foundation and publication boards in the USA and Canada; she was a site visitor for the ADA Commission on Dental Accreditation. Most recently, Leann was honored by Dimensions of Dental Hygiene as one of the 6 Dental Hygienists You Want to Know in 2017.



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Karen Leigh Neiner, RDH BSDH MBA, has been with Hu-Friedy Manufacturing Co. LLC for over 30 years. She is currently serving as Vice President of Corporate Development and Professional Relations, where she has increased sales through acquisition and new category introductions. In addition, she is currently President of Palmero Healthcare, Hu-Friedy's most recent acquisition. She developed Hu-Friedy's new product stage gate process and created the 45,000-member Friends of Hu-Friedy social media program to provide the dental community with continuing education and professional development support.