

DENTSPLY Sponsored by Dentsply, leaders in preventive dentistry
– makers of Cavitron technology.

Dental Hygiene

FOCUS: Ultrasonics - Revolutionizing Periodontal Therapy



Maximizing Biofilm Disruption with Ultrasonics: Concepts Have Changed...Have You?

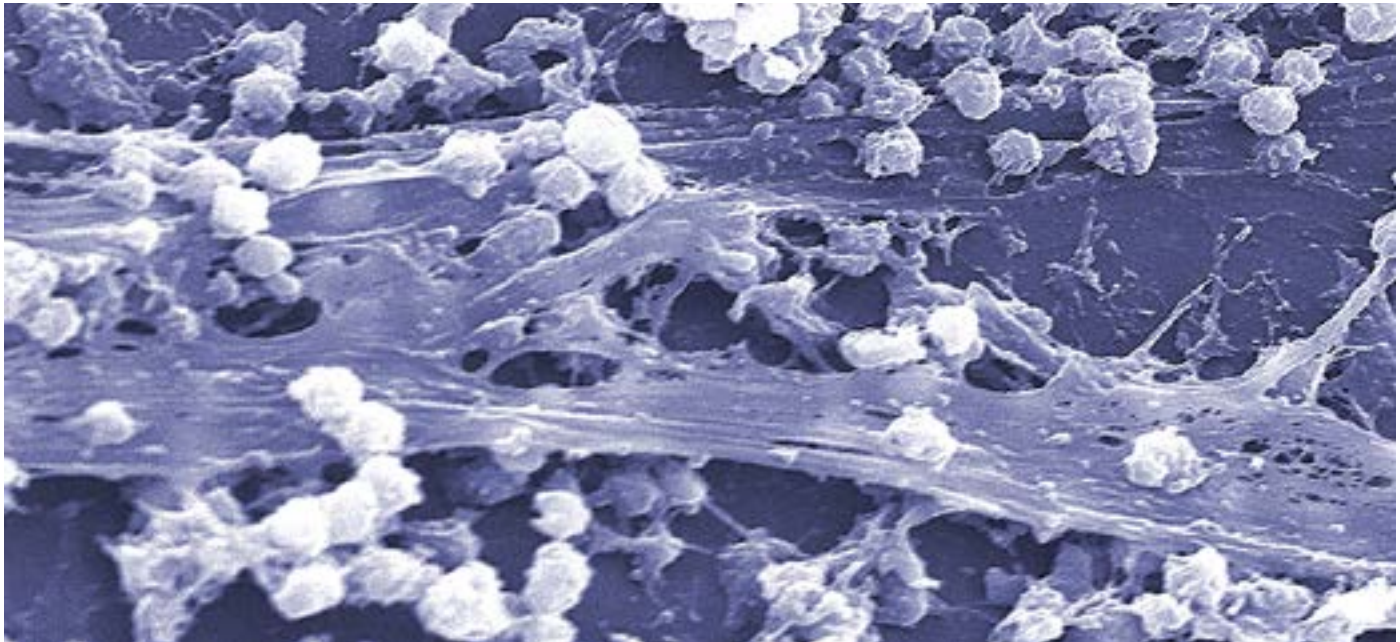
by Lisa Shoemaker, BA, RDH, RRDH • lisa.shoemaker@dentsply.com

My roles in education and sales give me the opportunity to talk to a number of dental professionals on a regular basis. Recently, I had one RDH tell me that she only likes to use ultrasonics when she has a difficult client “when I can see the deposit and I need to get the bulk of it off.” She then uses her hand instruments after that. Another RDH wrote to me asking for confirmation to use ultrasonics from start to finish. Based on her findings, she uses the technology for calculus and biofilm removal due to its benefits far beyond mechanical disruption, but her colleagues are critical of this approach. These contrasting views are very common; as a profession we are so divided in our approach and our implementation of this technology, which surprises me because ultrasonics are not just for calculus removal anymore. With the proper equipment and technique, ultrasonics have the potential to disrupt biofilm beyond traditional methods of periodontal debridement.

When I graduated from dental hygiene in 1992, biofilm reduction was not among the rationales for ultrasonic technology. The rationale for ultrasonic use included only supragingival calculus removal, soft tissue curettage in periodontal surgery, removal of orthodontic cement, and overhanging margins. However, the evidence since I have graduated has grown and, because of it, I have over the past 10 years become extremely passionate about the multifaceted assault that this technology can provide in areas where inflammation management is essential. Biofilm bacteria and their by-products are responsible for initiating the host immune response and the primary factor linking oral and systemic inflammation.¹

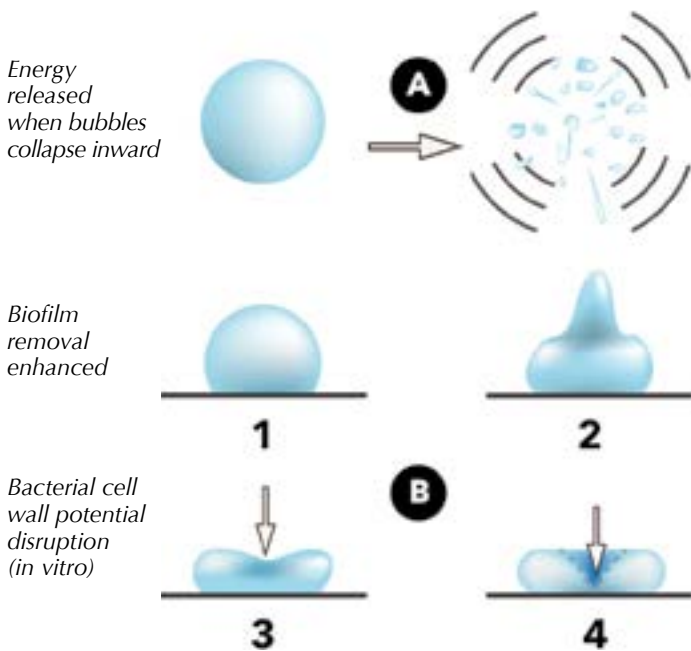
Sam Low, DDS, MS, MEd, a periodontist, professor at the University of Florida, and researcher in periodontal therapy, says that “Biofilms are a stimulus...a stimulus only – nothing mystical.”² While perhaps not mystical, biofilms are intelligent and difficult to penetrate. We know that Quorum Sensing allows a biofilm matrix and pathogens within to be more communicative. Quorum Sensing enables the bacteria to monitor and modulate gene expression which will contribute to the cell density, allowing pathogens in a matrix to be compatible for continued survival.³ If left undisrupted, the reduction of this matrix becomes more challenging, which is why I am a grand proponent of using the entire arsenal at our disposal. Why let a matrix start to take hold, even if you can’t see it?

William Costerton has been called the “Father of Biofilm.” With a PhD in microbiology, Dr. Costerton was involved in 40 years of biofilm research and paradigm shifting contributions to medical and environmental sciences before his death in 2012. He maintained that biofilms “do not like ultrasonics.”⁴ His discussion, in an interview for a film entitled “Why am I still sick?” clearly identifies ultrasonic technology as a necessary arsenal in the fight against biofilm.⁴ While Dr. Costerton was not in dentistry, his work makes reference to research where bacteria seen on teeth are the “scuff.” The “scuff” is plaque, and he mentions that we know that “plaque is a biofilm.” The resulting irritation is inflammation, and these findings can be linked to biofilm and periodontal debridement as explored by researchers Damien Walmsley and WRE Laird from the University of Birmingham. Their findings show that ultrasonics will disrupt biofilm, reducing the load because we have



therapeutic lavage. The cavitation is likened by many to a Jacuzzi where the bubbles implode and create heat in the fluid (Figure 1).⁵ This results in the lysing of the pathogenic cell wall. Sonification (sound waves) is responsible for reducing the matrix with the targeted impact on gram negative pathogens. These two important outcomes are not attainable when using hand instruments solely.

Ultrasonics offer a wide range of inserts in various diameters. Each insert is designed for a specific purpose and provides options for greater access. Walmsley and Laird have discussed the use of thin inserts on low power with a droplet water pattern as the ideal way to maximize the ultrasonic effects (Figure 2).⁶ They also note that thin inserts are kinder to the root surface and don't perpetuate over-instrumentation. Isn't it interesting that we use a fine, small instrument like an explorer to find the deposit but we insist on bringing in an instrument more than double in size like a curette to remove what we found? Sam Low has said that nothing larger than 1 mm should enter into the sulcus.²



▲ Figure 2

Tim Donley, author of the textbook *Ultrasonic Periodontal Debridement: Theory and Technique*, has written that "Mechanical disruption of the biofilm remains to be the foundational approach for the resolution of inflammatory periodontal diseases. Although similar clinical outcomes can be achieved with hand curettes and ultrasonic

▲ Figure 1

Focus: Ultrasonics - Revolutionizing Periodontal Therapy

Maximizing Biofilm Disruption...cont'd

instrumentation, operator variability makes achieving therapeutic root debridement more **predictable** with ultrasonic Instrumentation."⁷

Clinicians love consistency, predictability, effectiveness, efficiency, and safety. Over the last 15 years there has been a growth of compelling evidence to support the benefits that ultrasonic technology can provide given the right equipment and proper technique. Given the contrasting views that currently exist among dental professionals in the area of ultrasonics and calculus versus biofilm, it's time to take a closer look at what maximum assault can mean for the end result and for consistent inflammation management of our clients.

References

1. Asadoorian J. *Therapeutic oral rinsing: Why it's not just brushing and flossing anymore!* Webinar presentation, originally delivered 25 Sept 2013. Ottawa: Canadian Dental Hygienists Association; 2014.
2. Low S. *Ultrasonic literature review [lecture]*. York, PA: Ultrasonic Scaling and Teaching Institute; August 2014.
3. Gurenlian JR. *The role of dental plaque biofilm in oral health*. *J Dent Hyg*. 2007(special supplement):4-11.
4. Costerton W. *Interview by Richard Longland for medical film "Why am I still sick?"* Philadelphia: Arthroplasty Patient Foundation; 23 Feb 2012.
5. Laird WRE, Walmsley AD. *Ultrasound in dentistry. Part 1—biophysical interactions*. *J Dent*. 1991;19:14-17.
6. Walmsley AD, Laird WR, Williams AR. *Dental plaque removal by cavitation activity during ultrasonic scaling*. *J Clin Periodontol*. 1988;15(9):539-43.
7. Donley T. *Instrumentation for the treatment of periodontal disease*. PennWell continuing education course. Tulsa: Academy of Dental Therapeutics and Stomatology (a division of PennWell); 2011. pp 1-8.