

The Art of Furcation Navigation with Ultrasonic Instrumentation

COURSE DESCRIPTION

This course will discuss the current evidence surrounding ultrasonic instrumentation and biofilm disruption in the periodontal patient with emphasis on the need for a methodical approach. A review of proper ultrasonic technique including adaptation, angulation and adaptation will be covered recognizing the differentiating features of magnetostrictive and piezo electric technologies. These fundamental principles will then be applied to advanced instrumentation in the periodontal patient with focus on furcation involvement and areas of challenging anatomical access. A review of furcation anatomy, accurate assessment of furcation involvement and recognizing the need for ultrasonic inserts that properly adapt will be emphasized. The importance of ultrasonic insert maintenance and the ramifications of using inserts that are worn down will be quantified in terms of the relationship to clinical outcomes and efficiency.

OBJECTIVES

- ✓ Apply the Evidence-Based Decision Making (EBDM) process to periodontal instrumentation choices.
- ✓ Recognize the role ultrasonic instrumentation has in biofilm reduction in periodontally involved patients.
- ✓ Review furcation anatomy and accurate assessment of furcation involvement.
- ✓ Examine the need for proper furcation navigation incorporating techniques to access anatomically challenging areas utilizing a variety of ultrasonic inserts/tips.
- ✓ Examine the differences and similarities in various ultrasonic technologies.
- ✓ Recognize the need for inserts to be maintained and replaced when they are no longer providing effective, efficient and comfortable patient experiences.
- ✓ Recognize the need for effective aerosol reduction and optimum ergonomic practices

Impact of Biofilm and Inflammation on Overall Health

Dental Biofilm

- ✓ More than 700 different bacterial species have been detected in the oral cavity of humans.
- ✓ The composition of the developing biofilm is determined by local ecological factors at the site of colonization and varies considerably at different surfaces, even at the same tooth.
- ✓ Dental Biofilms...What We Know
- ✓ Eventually, **if left undisturbed**, a very **diverse** biofilm is established

- ✓ This results in the formation of an **extracellular matrix** that contributes to the **co-adherence** of the bacteria on the tooth surface and offers protection of the **biofilm bacteria**

1. Research/Science/Evidence surrounding Biofilm and Ultrasonics

Several evidence-based studies support the concept of ultrasonic instrumentation being superior to hand in the area of biofilm destruction and increased access in areas of furcation involvement.

- A. **Cavitation**- This burst of energy has the potential to disrupt the cell walls of bacteria. Once the cell wall is disrupted, the bacteria are destroyed (Felver et al., 2009; Baehni et al., 1992). Most pathogenic bacteria, spirochete and motile rods, can be reduced to a presence of 0.1% (from an initial concentration of 50% in the study population) after ultrasonic scaling
- B. **Acoustic Microstreaming**- Characterized by the generation of shear forces around the probe immersed in water. Both the cavitation and streaming forces will result in an acoustic turbulence that not only removes the attached deposits but also will break up the biofilm.
- C. Ultrasonic tips under investigations lead to bacterial detachment, but the action mode as well as the tip configuration and adaptation appeared to be influenced by the biofilm removal effectiveness.
- D. The ultrasonic scaler does possess the ability to disrupt the biofilm not only from tip contact but also via the effects of cavitation and microstreaming.
- E. The purpose of any instrumentation is to disrupt this biofilm thus allowing the host to repair.
- F. ***Biofilm removal remains a main goal of ultrasonic debridement.***
- G. To ensure sufficient biofilm removal, the tip does not necessarily require contact to the surface, but an application parallel to the surface on the side is recommend
- H. Biofilm removal by means of ultrasonic debridement remains a crucial aspect in the treatment of periodontal disease.

2. Patients' Needs and Preferences- Do Patients Ever Say, "I don't want that buzzing thing"!

[Patient Preference for Ultrasonic or Hand Instruments in Periodontal Maintenance](#)

Lloyd K. Croft, Martha E. Nunn, Lana C. Crawford, Thomas E. Holbrook, Michael K. McGuire, Mary M. Kerger, Gloria A. Zacek

The purpose of this study was to determine if patients prefer ultrasonic or hand instruments for periodontal maintenance. A questionnaire of 13 items was answered by 469 patients in three periodontal offices. The results showed a strong preference (74%) for ultrasonic instruments. The possibility of increased compliance because of this preference is discussed.

<https://www.dentistryiq.com/articles/2012/10/dental-professionals-comment-on-patient-influence-on-hygiene-instrumentation.html>

Perhaps the clinicians Clinical Expertise needs to be looked at...

<https://www.todaysrdh.com/quiz-test-your-smart-scaling-knowledge/>

3. **Clinical Expertise** – We must take a hard look at our own skills

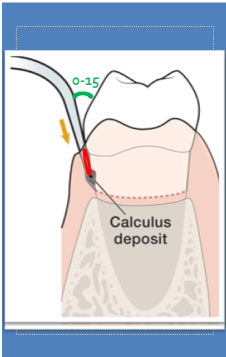
<https://www.todaysrdh.com/ds-video-why-do-you-prefer-ultrasonic-scaling-over-hand-scaling/>

Do you consider yourself and expert in ultrasonic instrumentation?

If not, start here: <https://www.todaysrdh.com/ds-smart-scaling-for-a-better-patient-experience/>

8. **Technique and Fundamentals of Ultrasonic Instrumentation – The 3 A’s**

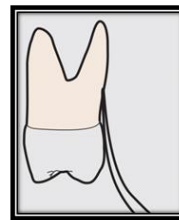
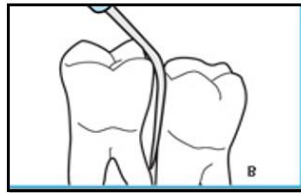
Ultrasonic Technique – Fundamentals



From Dimensions of Dental Hygiene, October 2017;15(10):38,39

- Adaptation 2-3 mm of insert/tip against the tooth structure
- Angulation – 0-15 degrees angulation Max
- Activation – Short 1-2 mm overlapping strokes in either a horizontal, vertical or oblique adaptation

Incorrect Adaptation – Posterior Teeth



Five Most Common Errors When Using Ultrasonic Inserts – Donna Stach RDH MEd
From Dimensions of Dental Hygiene, July 2010; 8(7): 46, 48, 50.

Stroke Patterns

- ✓ Use feather-light touch
- ✓ **Methodical strokes**

Sweeping motion used on:

- ✓ Light deposits & deplaquing
- ✓ Stroke length 2-3 mm

Tip may be used with:

*Tapping stroke against calculus deposit – then a sweeping/shading stroke/exploratory stroke – to **ASSESS** for remaining deposit*



Full Video of ALL Inserts in Use	<p>Standard Diameter</p> <p>Power – Low to High</p>	<p>Slim Diameter</p> <p>Power – Low to Medium</p>	<p>Curved Specialty Design</p> <p>“Area Specific”</p>
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[Area Specific – Curved Inserts](#)

Allows adaptation

- ✓ Posterior root surfaces
- ✓ Concavities
- ✓ Furcations

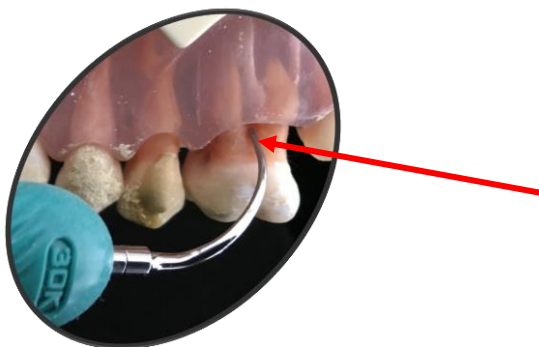


Curve Against the Tooth Surface – Vertical Orientation



Correct Approach for Effective Adaptation-

DO NOT use like a furcation probe!
*If it looks right, it's wrong! (Note tip is adapted **less than 1mm**)*



Keep in Mind, you can still have the correct insert and the **INCORRECT** Adaptation!





Transverse Approach

Tooth 30 B

Top picture –
Perio/Vertical
Adaptation “R” Insert

Bottom pic –
Transverse Supra
Adaptation “L” Insert

Left insert used in *vertical* adaptation for **subgingival/peri** involved areas

RIGHT insert used in transverse adaptation for **supragingival &** contact area

Piezo Design/Application

Ref. F00366 H1

Anterior tooth root planing, diamond-coated tip 30 µm

- Diamond-coated mini-tip recommended for simple cases in the cervical area.
- Also effective for the withdrawal of granulation tissue.

The H1 tip should be used without pressure and above the epithelial attachment because it is abrasive.

Ref. F00367 H2L

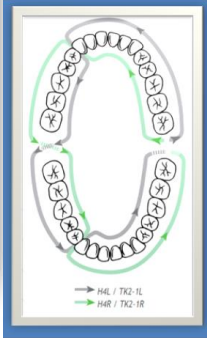
Root planing of the premolar and molar sectors, left-oriented, diamond-coated tip 30 µm

Diamond-coated micro-probe recommended for the treatment of furcations and narrow spaces.

Ref. F00368 H2R

Root planing of the premolar and molar sectors, right-oriented, diamond-coated tip 30 µm

Diamond-coated micro-probe recommended for the treatment of furcations and narrow spaces.



→ H1 / TK2-1L
→ H2R / TK2-1R

Ref. F02162 TK2-1L

Maintenance of the premolar and molar sectors, left-oriented

Recommended for the maintenance of moderate to deep pockets and furcations. Equivalent to the Nabers probe.

Ref. F02161 TK2-1R

Maintenance of the premolar and molar sectors, right-oriented

It is complementary to the TK2-1L tip and is recommended for the maintenance of moderate to deep pockets and furcations. Equivalent to the Nabers probe.

Biofilm disruption

Ref. F01001 TK1-1S

Short probe

Graduated every 3mm, the TK1-1S tip is recommended for examining shallow and medium pockets (< 4mm) and for the maintenance of simple cases.

Ref. F01004 TK1-1L

Long probe

Recommended for examining and maintenance of medium to deep pockets (> 4mm). It is a diagnosis aid during the debridement and irrigation of pockets.

The TK1 probe tips are used without pressure following the contour of the pockets and skimming over the root surface.

Ref. F00091 P2R

Debridement of the premolar and molar sectors, right-oriented

Second instrument in the sequence, it follows the use of the P2L tip.

The double bend makes it possible to treat areas that are difficult to access (inter-radicular spaces, deep pockets).

- **Maxillary:** buccal and mesial surfaces of sector 2, pivots at 13, then buccal and distal surfaces of sector 1.
- **Mandibular:** lingual and mesial surfaces of sector 4, pivots at 43, then buccal and distal surfaces of sector 3.

9. Insert Wear is Critical - You are only as good as what is in your hands –

- Worn tips can cause the use of excessive pressure while scaling, which results in discomfort for both the clinician and patient

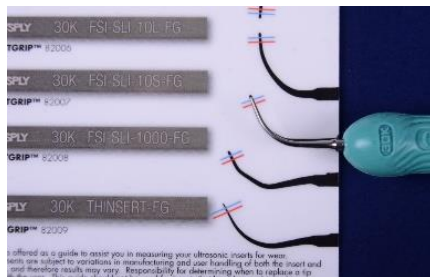


OPTIMAL SCALING AREA
Ultrasonic inserts move from a fixed point.



REDUCED SCALING AREA
Using worn tips reduces the area being scaled.

- ✓ Ethically responsible to keep your equipment in shape according to quality of care
- ✓ Burrs wear down...so do inserts
- ✓ Create an insert replacement **rotating schedule – measure for pleasure!**



10. If your hand piece is removable from the unit – CDC recommendations – should be autoclaved (start video at 2:15 time)

Considered a semi critical item Be in compliance – **Own it!**

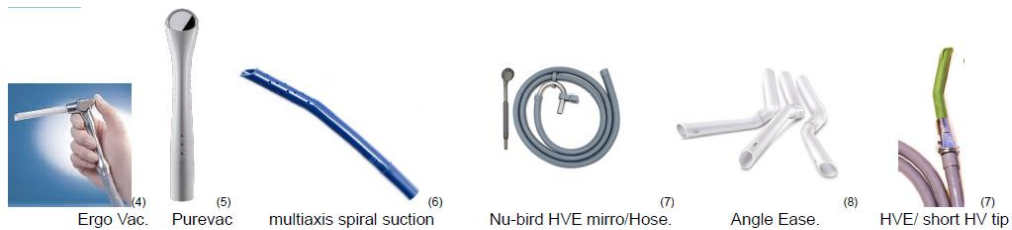
11. Aerosol Control – Begin looking at various HVAC Devices and wear proper masks – ASTM level 3

So why do we need to be using HVE?

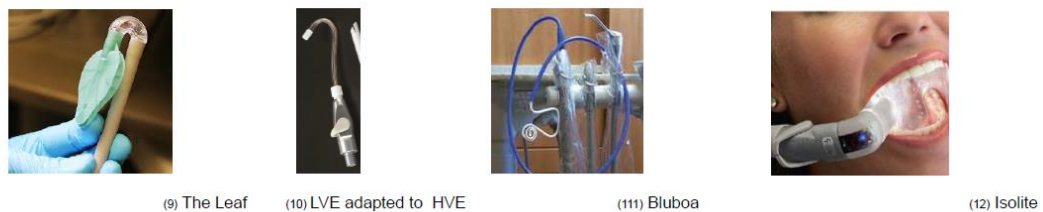
Aerosols and splatter produced during dental procedures do contain saliva, blood, bacteria and pathogens. This risks the spread of illnesses such as common cold, Flu, influenza, herpes, SARS, Hep C, Candida Aures, TB. This is especially a concern for dental providers who work on patients with undiagnosed or undetected cases.

HVE offers the best solution for controlling aerosolized particles *before they leave the mouth* and studies have shown HVE to reduce over 90% of aerosols.

Device design is extremely important. A straight HVE tip has high volume and a given width of air pathway footprint. Another device may perform with slightly less air volume (CFM) but have higher port velocity and wider air path footprint enabling it to capture a broader pathway of aerosols. *Below:* Examples of *hand-held* devices which offer high volume evacuation with wide hole pattern and wide air pathways. These can be purchased on the market. Many are ergonomic, lightweight and can be easily used in the mouth.



Below: Examples of hands-free stationary devices and adapters which utilize the HVE port. hands-free evacuators were designed to collect water in the back of the mouth. The smaller tubing and hole size limitations in the design, could restrict airflow and lower the performance of air volume (CFM) and air velocity. These devices work for pooling water but according some studies,⁽⁴⁾ tend to be ineffective for aerosol management.



Clinicians need to know whether the power/static pressure (InHg), airflow volume (CFM) and port velocity of their HVE performs to adequate safety levels. Clinicians must rely on existing data from independent and manufacture tests to determine the effectiveness of the devices they use and ***just because an evacuator plugs into an HVE suction port does not mean it is operating at an acceptable suction volume level on the terminus or user end point.** Vacuum performance can vary greatly from office to office. *Clinicians need to look for devices which have high port velocity and wide airpath footprint for good aerosol reduction.*

There are several reasons clinicians would benefit from using an HVE/mirror system combo.

- 1) Higher accuracy with clear indirect vision.
- 2) Easier access and mobility in all areas of the mouth.
- 3) Ergonomic design features that reduce strain on hand and arm
- 4) Better water management and capture of generated aerosols

Reference List

- American Dental Association Policy on Evidence-Based Dentistry <http://www.ada.org/en/about-the-ada/ada-positions-policies-and-statements/policy-on-evidence-based-dentistry#Disease>. 2012
- Armitage, G. C. (1999, Dec). Development of a classification system for periodontal diseases and conditions. *Ann Periodontol*, 4(1), 1-6.
- Badersten A, Nilvéus R, Egelberg J. Scores of plaque, bleeding, suppuration and probing depth to predict probing attachment loss. 5 years of observation following nonsurgical periodontal therapy. *J Clin Periodontol*. 1990;17:102–107.
- Barca, E., Cificibasi, E., & Cintan, S. (2015). Adjunctive use of antibiotics in periodontal therapy. *Journal of Istanbul University Faculty of Dentistry*, 49(3), 55–62. <http://doi.org/10.17096/jiufd.90144>
- Bower, R. C. (1979). Furcation morphology relative to periodontal treatment: Furcation entrance architecture. *Journal of Periodontology*, 50(1), 23-27.
- Busslinger, A., Lampe, K., Beuchat, M., & Lehmann, B. (2001). A comparative in vitro study of a magnetostrictive and a piezoelectric ultrasonic scaling instrument. *J Clin Periodontol*, 28, 642-649.
- Centers for Disease Control and Prevention. Guidelines for Infection Control in Dental Health-Care Settings – 2003. MMWR 2003; 52(No. RR-17): [inclusive page numbers].
- Claffey N, Engelberg J. Clinical indicators of probing attachment loss following initial periodontal treatment in advanced periodontitis patients. *J Clin Periodontol*. 1995;22:690–696.
- Costerton, J. W., Stewart, P. S., & Greenberg, E. P. (1999). Bacterial biofilms: A common cause of persistent infections. *Science* (New York, N.Y.), 284(5418), 1318-22
- Drisko, C. L., Cochran, D. L., Blieden, T. et al. (2000, November). Research, Science and Therapy Committee of the American Academy of Periodontology. Position paper: Sonic and ultrasonic scalers in periodontics. *Journal of Periodontology*, 71(11), 1792-1801.
- Drisko, C. L. (1993). Scaling and root planing without over instrumentation: hand versus power-driven scalers. *Current Opinion in Periodontology*, 78-88.
- Dufou Lr, HS Bissell - [Periodontal Attachment Loss Induced by Mechanical Subgingival Instrumentation in Shallow Sulci](#) *The Journal of Dental Hygiene* Volume 76 Issue III Summer 2002
- Eke, P., Dye, B., Wei, L., Thornton-Evans, G., & Genco, R. (2012). Prevalence of Periodontitis in Adults in the United States: 2009 and 2010. *Journal Of Dental Research*, 91(10), 914-920. doi:10.1177/0022034512457373
- Everett, J. D., Rossmann, J. A., Kerns, D. G., & Al-Hashimi, I. (2017). Laser Assisted Non-surgical Periodontal Therapy: A Double Blind, Randomized Clinical Trial. *The Open Dentistry Journal*, 11, 79–90. <http://doi.org/10.2174/1874210601711010079>
- Fundamentals of Periodontal Instrumentation and Advanced Root Instrumentation - 8th Edition by Jill S. Nield-Gehrig

George, M. (n.d.). *Ultrasonic Periodontal Debridement: Theory and Technique* – 2014 Wiley Publishing

Giannobile, W. V., Braun, T. M., Caplis, A. K., Doucette-Stamm, L., Duff, G. W., & Kornman, K. S. (2013). Patient Stratification for Preventive Care in Dentistry. *Journal of Dental Research*, 92(8), 694–701. <http://doi.org/10.1177/0022034513492336>

Greenstein G, Caton J, Polson AM. Histologic characteristics associated with bleeding after probing and visual signs of inflammation. *J Periodontol*. 1981;52:420–425.

Haffajee AD, Socransky SS, Lindhe J, Kent RL, Okamoto H, Yoneyama T. Clinical risk indicators for periodontal attachment loss. *J Clin Periodontol*. 1991;18:117–125.

Hall-Stoodley, L., Costerton, J. W., & Stoodley, P. (2004). Bacterial biofilms: From the Natural environment to infectious diseases. *Nat Rev Micro*, 2(2), 95-108

Harrel and Molinari. Aerosols and splatter in dentistry: a brief review of the literature and infection control implications. *JADA* 2004.

Hodges, K. Components of Optimal Ultrasonic Therapy *Dimensions of Dental Hygiene*. January 2014;12(1):22–24,26–27.

Khatiblou, F. & Ghodssi, A. (1983). Root surface smoothness or roughness in periodontal treatment. *Journal of Periodontology*, 54(6), 365-9367.

Jepsen, S., Ayna, M., Hedderich, J., & Eberhard, J. (2004). Significant influence of scaler tip design on root substance loss resulting from ultrasonic scaling: a laserprofilometric in vitro study. *Journal Of Clinical Periodontology*, 31(11), 1003-1006. doi:10.1111/j.1600-051X.2004.00601.x

Lea, S. C., Landini, G., & Walmsley, A. D. (2006). The effect of wear on ultrasonic scaler tip displacement amplitude. *Journal of Clinical Periodontology*, 33, 37-41.

Lea SC, Felver B, Landini G, Walmsley AD. Three-dimensional analyses of ultrasonicscaler oscillations. *J Clin Periodontol* 2009; 36

Lindhe J, Haffajee AD, Socransky SS. Progression of periodontal disease in adult subjects in the absence of periodontal therapy. *J Clin Periodontol*. 1983; 10:433–442

Luigi Nibali, Chuanming Sun, Aliye Akcalı, Yi-Chun Yeh, Yu-Kang Tu and Nikos Donos, The effect of horizontal and vertical furcation involvement on molar survival: A retrospective study, *Journal of Clinical Periodontology*, **45**, 3, (373-381), (2018)

Luigi Nibali, Chuanming Sun, Aliye Akcalı, Xsuan Meng, Yu-Kang Tu and Nikos Donos, A retrospective study on periodontal disease progression in private practice, *Journal of Clinical Periodontology*, **44**, 3, (290-297), (2016)

Luigi Nibali, Anna Krajewski, Nikos Donos, Henry Völzke, Christiane Pink, Thomas Kocher and Birte Holtfreter, The effect of furcation involvement on tooth loss in a population without regular periodontal therapy, *Journal of Clinical Periodontology*, **44**, 8, (813-821), (2017)

MARCACCINI, A. M., PAVANELO, Â., NOGUEIRA, A. V. B., de SOUZA, J. A. C., PORCIÚNCULA, H. F., & CIRELLI, J. A. (2012). Morphometric study of the root anatomy in furcation area of mandibular first molars. *Journal of Applied Oral Science*, 20(1), 76–81. <http://doi.org/10.1590/S1678-77572012000100014>

Matsuda, S. (n.d.). The right moves. *Dimensions of Dental Hygiene*. April 2013; 11(4): 26–28.

Maurizio S. Tonetti, Allis L. Christiansen and Pierpaolo Cortellini, Vertical subclassification predicts survival of molars with class II furcation involvement during supportive periodontal care, *Journal of Clinical Periodontology*, **44**, 11, (1140-1144), (2017)

Nield-Gehrig, J. S. (2013). *Fundamentals of periodontal instrumentation & advanced root instrumentation* (8th ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

O'hehir, Tricia <http://www.dentaltown.com/Images/Dentaltown/magimages/0413/DTApr13pg106.pdf>

Paramashivaiah, R., & Prabhuji, M. L. V. (2013). Mechanized scaling with ultrasonics: Perils and proactive measures. *Journal of Indian Society of Periodontology*, 17(4), 423–428. <http://doi.org/10.4103/0972-124X.118310>

Parini, M. R. & Pitt, W. G. (2005, December). Removal of oral biofilms by bubbles: The effect of bubble impingement angle and sonic waves. *Journal of the American Dental Association*, 136(12), 1688-1693.

Paraskevas S, Huizinga JD, Loos BG. A systematic review and meta-analyses on C-reactive protein in relation to periodontitis. *J Clin Periodontol*. 2008 Apr;35(4):277-90. Epub 2008 Feb 20

Pattison, Anna *Dimensions of Dental Hygiene*. October 2005;3(10):28, 30-31

Pitt, W. G. (2005, October). Removal of oral biofilm by sonic phenomena. *American Journal of Dentistry*, 18(5), 345-352.

Position paper: Diagnosis of periodontal diseases. (2003, August). *Journal of Periodontology*, 74(8), 1237-1247.

Position paper: Guidelines for periodontal therapy. (2001, November). *Journal of Periodontology*, 72(11), 1624-1628.

Sefo, D. Instrumenting the Dental Implant *Dimensions of Dental Hygiene*. April 2009; 7(4): 32-33

Stach, D. Furcation Invasion *Dimensions of Dental Hygiene*. January 2011; 9(1): 42, 44, 46-48

Tunkel, J., Heinecke, A., & Flemmig, T. F. (2002). A systematic review of efficacy of machine-driven and manual subgingival debridement in the treatment of chronic periodontitis. *Journal of Clinical Periodontology J Clin Periodontol*, 29(S3), 72-81. doi:10.1034/j.1600-051x.29.s3.4.x

Websites References

<https://www.acteongroup.com/us/>

<http://www.Medtronic.com/your-health/bradycardia/device.htm>

<http://bostonscientific.com/templatedata/imports/HTML/CRM/patient/index.html>

<https://mariannedryer.com/>

Acteon

<https://www.youtube.com/watch?v=X5VtWjS2Wd0&t=71s>

Dentsply

<https://www.youtube.com/watch?v=aAqY99TL9oM>

Smart Scaling

<https://www.youtube.com/watch?v=1TJSaby53f8&t=446s>

Oral DNA

<https://www.oraldna>