VOLUME 2

HOW CAN BIOFILM AFFECT MY DIAGNOSIS AND TREATMENTS?

An eBook by

AdDent INCORPORATED

Advancing Dental Excellence

CHAPTER 1:

CAN BIOFILM BE VISUALIZED AND DIAGNOSED?

Biofilms are invisible to the unaided eye, but by using 405nm fluorescence, we can see it.

Fluorescence has been used as a fast, easy, noninvasive, selective, and sensitive diagnostic tool for the estimation of treatment results in oncology and diagnosis of occlusal caries in dentistry.[1] It has been used for years by the dental community to diagnose abnormal soft tissue lesions in the patient's mouth.

In the medical field, the use of fluorescence has been introduced and validated as a diagnostic method for the detection of bacterial wound colonization or clinical wound infections. Bacteria can be visualized in real-time in tissues using a handheld imaging device that emits a low-intensity violet light (405 nm) that excites bacteria fluorescent either red or cyan.[2]

Fluorescence diagnostic technologies provide an important adjunct to conventional dental clinical examinations which typically rely upon visual examination, probing the surfaces of teeth, into periodontal pockets, and taking dental X-rays.[3]

The ultraviolet (UV) spectrum is traditionally divided into three UV bands: UVA (315-400 nm, also termed black light, long wave, or near UV), UVB, and UVC. Having the lowest photon energy of the three ultraviolet wavebands, Near-UV *(405nm) has virtually no effect on human tissue with short-term exposures.*[4]

Near-UV light-induced fluorescence at 405nm has proven to be very useful as an alternative to classic caries staining dyes without the mess. Near-UV 405nm fluorescence has the potential for both early detection purposes and as a support to the final diagnosis.

A near-UV (405nm) light emitting unit offers a wide range of features and benefits that can be extremely useful in your daily practice:

- Evaluation of micro-leakage
- Plaque detection for perio and implant maintenance
- Fissure cleaning control
- Detection of fluorescent restorative composites before shade-matching resin cement clean-up
- Crack transillumination
- Distinguishing sound dentin before composite placement occlusal caries.[5]

Because approximately one in five adults suffer from the more aggressive forms of periodontal disease, there is growing interest in the use of fluorescence diagnosis systems. Fluorescence can provide an endpoint to the scaling and root planning procedures that are undertaken by the dentist and dental hygienist.[3]

CHAPTER 2:

CONCLUSION

A Device using NUV-405nm wavelength can greatly assist in diagnosing and treating dental procedures.

The AdDent Microlux DW Illuminator, with a wavelength of NUV-405 nm, is an ideal solution for detecting the presence of Biofilm and its impact on your patient's oral health. Unlike dyes that can discolor teeth and restorations, the device works without staining. The Microlux DW Illuminator is user-friendly and delivers prompt and accurate information for diagnosing biofilm and its effects.

When NUV 405nm light is used, surfaces with active biofilm or calculus can be identified and removed due to the appearance of red fluorescence. This makes it possible to prevent the further development of disease by the visualization and elimination of active biofilm.[6]

To improve the accuracy of restorative procedures and prevent future issues, the use of the Microlux DW Illuminator can aid in visualizing bacteria and prior restorative materials. This technique can enhance the preparation of restorative procedures, resulting in better restorations.

COLOR EMISSIONS FROM 405NM FLUORESCENCE EXCITATION:	
Sound Tooth Structure	Green, Blue, or Aqua Blue
Bacteria (plaque or dental caries)	Orange to Pink or Red
Supra and subgingival calculus	Orange or Pink or Red

Fluorescence is a helpful tool for diagnosing tooth decay. It allows dentists to identify where the disease is present while preserving as much of the natural tooth as possible. Autofluorescence, which changes color from green to orange to red in affected teeth, can indicate the level of decay, demineralization, and the presence or absence of bacteria. By isolating the affected tooth anatomy based on its autofluorescence type, dentists can reduce the risk of complications, such as removing healthy tooth structure, increased tooth sensitivity, and compromised tooth vitality. Overall, fluorescence provides a less invasive approach to treatment.[7]

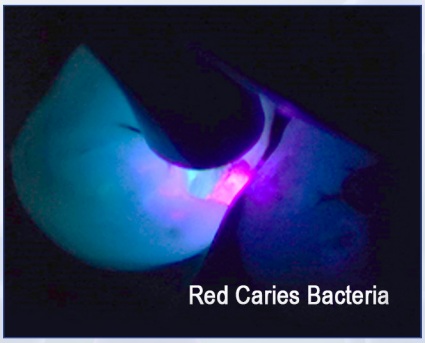
CHAPTER 2:

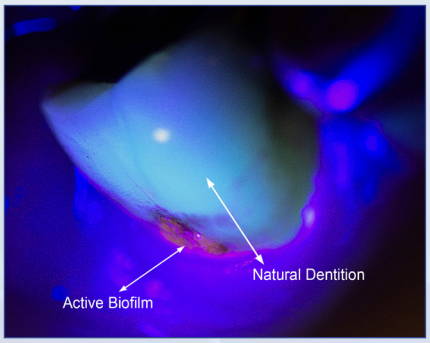
MICROLUX DW ILLUMINATOR

The Microlux DW Illuminator is a tool that helps diagnose Biofilm using a NUV-405nm fluorescent wavelength. It's easy, safe, and precise, and can diagnose most bacteria without the need for contrasting agents. With immediate color information, it's easy to know where to debride or use antimicrobial protocols. The non-invasive visualization makes it a routine diagnostic aid for all dental practices.

Use of the Microlux DW fluorescence illumination:

- Visualize Biofilm
- Visualize caries bacteria.
- Evaluation of White Spot Lesions and Demineralization
- Evaluation of Micro-leakage
- Visualize Plaque for Perio and implant maintenance
- Fissure cleaning control
- Differentiate between tooth fluorescent vs. non-fluorescent restorative materials
- Distinguishing sound dentin before composite placement
- Distinguish between enamel and composite





Images courtesy of Stephane Browet, DDS & Prof. Herve Tassery

References:

1. The role of fluorescence diagnosis in clinical practice - Aleksander Sieroń, Karolina Sieroń-Stołtny, Aleksandra Kawczyk-Krupka, Wojciech Latos, Sebastian Kwiatek, Dariusz Straszak and Andrzej M Bugaj https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3735341/#:~:text=Autofluorescence%20diagnosis%20allows%20us%20to,upper%20and%20lower%20digestive%20tract.
2. Fluorescent imaging of bacterial infections and recent advances made with multimodal radiopharmaceuticals - Mick M. Welling, Albertus W. Hensbergen, Anton Bunschoten, Aldrik H. Velders, Henk Scheper, Wiep Klaas Smits, Meta Roestenberg & Fijs W. B. van Leeuwen https://link.springer.com/article/10.1007/s40336-019-00322-7
3. Fluorescence Applications in Dentistry by Laurence J. Walsh https://www.novuslight.com/fluorescence-applications-in-dentistry_N1270.html
4. Ultraviolet-induced fluorescence: shedding new light on dental biofilms and dental caries - By Professor Laurence J. Walsh and Fardad Shakibaie https://www.researchgate.net/publication/43480412_Ultraviolet-induced_fluorescence_Shedding_new_light_on_dental_biofilms_and_dental_caries
5. Near-UV light detection by Javier Tapia Guadix http://www.moderndentistrymedia.com/jun_jul2018/tapia-guadix.pdf
6. Red and Green Fluorescence from Oral Biofilms - Catherine M. C. Volgenant, Michel A. Hoogenkamp, Bastiaan P. Krom, Marleen M. Janus, Jacob M. ten Cate, Johannes J. de Soet, Wim Crielaard, Monique H. van der Veen https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5173178/pdf/pone.0168428.pdf
7. Biofilm and Dental Biomaterials – Marit Oilo and Vidar Bakken https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5455733/