Caries is a chronic infectious disease affecting both children and adults worldwide. Research within the last decade suggests that caries be treated as a preventable disease with emphasis placed on early detection and minimally invasive intervention to preserve healthy tooth structure.

The advent of fluoridation has caused caries to "underground," making fissure caries more challenging to diagnose. The "watch and wait" philosophy is not effective, because often enough the decision to treat the tooth is decided after the caries process had been well established. Subsurface decay may then progress to the point of extensive excavation and loss of valuable tooth structure.

Traditional caries detection modes, visual, tactile and radiographic techniques, are quantitative, subject to operator interpretation and can produce varied diagnoses. Treatment and prevention of dental caries requires new strategies by the dental team. The adjunctive use of laser fluorescence by DIAGNOdent raises early caries diagnosis beyond 90 percent.

What is laser fluorescence and how does it work?
Laser fluorescence is the use of visible light dispersed according to its wavelength. Fluorescence occurs as a result of light absorption when electromagnetic radiation comes in contact with tooth structure. When compared with healthy enamel and dentin, fluorescence increases in the presence of caries because lesions that contain cariogenic bacteria show significantly higher fluorescence than those without. Fluorescence is produced when bacterial complexes known as porphyrins are activated by red light.

What is DIAGNOdent and how does it quantify carious lesions?
DIAGNOdent (KaVo, Lake Zurich, Ill.) became available in 2001 allowing clinicians another clinical option for detection of carious lesions including Class I, II, V, and secondary decay existing at amalgam margins and around certain types of sealant materials. The DIAGNOdent is based on the laser fluorescence principle and emitted light is proportional to the scale of the carious lesion, allowing DIAGNOdent to indicate the severity of the lesion.

It operates at a wavelength of 655 nm. At this particular wavelength, clean healthy tooth structure exhibits little or no fluorescence, and results in very low display readings. The DIAGNOdent handheld devices (tabletop and pen versions) emit the laser light and can specify the location and extent of the lesion in tooth structure. As the laser light is emitted on the tooth, the two-way handpiece optics permits the electronic unit to simultaneously quantify the reflected laser light energy. This degree of fluorescence is expressed in a numerical value (0–99) and displayed on the digital screen. An audible tone is emitted from the unit allowing the operator to hear changes in the scale values on the display.

Are there any false positive readings when using the DIAGNOdent?
When used properly, DIAGNOdent is over 90 percent accurate. The device has a high degree of sensitivity, making false positives very uncommon. However, false positives may arise when the operator fails to completely remove stain or debris. To ensure this does not occur on patients with heavy stain such as tobacco or coffee stain, pit and fissures should be treated with an air polisher such as the PROPHYflex® and rinsed thoroughly.

When do you recommend using the DIAGNOdent?
It is recommended that DIAGNOdent be used as an adjunct before placing fissure sealants.

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About the author

Donna L. Catapano, RDH, BS, MA, is a dental hygiene graduate from Farmingdale State College in New York and joined their faculty as an adjunct clinical instructor in 2002. Prior to 2002, she worked as an adjunct clinical and laboratory instructor as well as an adjunct lecturer at New York University College of Dentistry. Catapano holds a master’s degree from Hofstra University, where her research focused on the oral-systemic link between gingival inflammation and cardiovascular disease. Another area of research throughout her experience includes forensic odontology. She currently practices clinical dental hygiene full-time in private practice and intends to pursue a doctorate degree in science.