COMMENTARY

ACCURACY OF LED AND HALOGEN RADIOMETERS USING DIFFERENT LIGHT SOURCES

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The authors have touched on a very contemporary and clinically important topic: the ability to appropriately assess power density, and thus, the potential effectiveness of a light-curing unit. With the wide variety of light types currently available (QTH, LED, and PAC), conflicting and confusing information is often provided by manufacturers related to the power output of their light system and its proper measurement.

Operation of these meters is based on filtered light reaching a photodiode, which then generates a current that is measured by some metering device: an analog or a digital readout. Variation in photodiode response, linearity of the metering scale, accuracy of the light standard to which the meter was correlated ("calibrated"), quality of light filtering, and consistency in components can all affect readings, as well as the tip diameter and incident angle at which the light strikes the detecting surface. However, the spectral distribution of light output is not accounted for in any chairside metering system. In addition, the output levels of many high-powered contemporary lights exceed the recording capacity of older types of meters, rendering those meters useless.

Clinicians may inappropriately assume that readings obtained with the handheld devices are to be taken as being "accurate," and that, regardless of light or tip type, the reading obtained will provide a valid indicator of probable clinical effectiveness. Such is not the case, and the authors have correctly emphasized the true utility of these devices as being used to perform periodic evaluation of light output in checking for unit or tip degradation over time. Thus, readings obtained are really only relative indicators of a specific light-and-tip combination performance over time. Because tip characteristics can also affect readings, dental office personnel need to make sure that periodic maintenance readings performed using these handheld devices includes the use of the exact same curing tip each time. In fact, it would be advantageous to record all light/tip combinations that are used in that office on a periodic basis. In this way, problems arising not only from the light source, but also from the damage or degradation of the light guide, may also be detected.

Many clinicians may feel that the output power of LED lights do not need to be checked, as LEDs would not have the potential to degrade over time as do the QTH sources. Although the solid-state devices do have long life expectancy, heat buildup within the chip itself can result in permanent damage to only a small portion of the emitting chip, resulting in decreased output. However, because the light is still emitting high levels, this change would not be undetectable to the eye. Also, there is the potential for the epoxy coating covering the chip to darken from use as a result of internal heating, causing output levels to decrease with unit operation. Thus, even with the new LED lights, use of the handheld radiometers is still required to ensure that the clinician is fabricating the best restoration possible.

One last aspect needs to be considered. Recent work by this group, as well as by others, has clearly indicated large differences in the rates that power density drops off with increasing tip-to-target distances.[1–3] Also, the nonuniformity of intensity across the exiting beam has been shown to result in measurable differences on both the top, irradiated surface, as well as the surface underneath.[4] Therefore, measurement of power density values at the tip may be misleading as to delivery of light when the tip is used at clinically relevant distances from the preparation or restoration.

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