

Feeling That Heat? (9/03)

Thermal emission by different light-curing units. Yap AUJ, Soh MS. Oper Dent 2003;28:260-266.

Few studies have been published comparing the amount of heat generated by new light-emitting diode (LED) curing units to that of halogen units. Many manufacturers of LED units claim this as an advantage of their products. The authors in this study chose three LED units (Elipar Freelight, 3M ESPE; GC e-Light, GC America; CoolBlu, Dental Systems) and three halogen units (Max, Dentsply/Caulk; Elipar Trilight, 3M ESPE; Astralis 10, Ivoclar Vivadent) to measure. The thermal emission of each unit was measured using a K-type thermocouple and a digital thermometer at distances of 3 mm and 6 mm from the end of the curing tip. Measurements were made operating the units using their different curing modes. Temperature profiles and mean maximum temperature changes were recorded using a sample size of seven. The average maximum temperature ranges measured during the study are presented in the following table.



Type of Unit	At 3-mm Distance	At 6-mm Distance
LED	4.1°C - 12.9°C	2.4°C - 7.5°C
Halogen	17.4°C - 46.4°C	12.7°C - 25.5°C

Based on statistical testing, the authors concluded that the LED units tested emitted significantly less heat at both distances than did the halogen units. Based on curing mode, temperature changes differed significantly for each unit as well as between LED and halogen units.

DIS Comment: LED curing lights have become popular because of their many advantages compared to halogen lights. These include being smaller, more portable, and quieter. One purported benefit is that LED units produce less heat at the end of their curing wands than do halogen units. The reason that we want to use lights that produce less heat is because excessive heat can be harmful to pulpal tissues. The primary difficulty in relating these findings to the clinical situation is that temperature rise has to be measured in the pulpal tissues to determine if the heat is excessive. This, of course, can only be simulated, and will be affected by remaining dentin thickness, thickness of the light-activated material being placed, and distance of the light wand from the tooth. The finding of this study that LED units produce less heat than halogen units needs to be qualified, however. First, the LED and halogen lights in this study were used in the various curing modes for the times recommended by their manufacturers. Because many of the initial LED units had a lower irradiance than halogen units, it is not surprising that they generate less heat. DIS has found, however, that longer exposure times need to be used with some of the first-generation LED units to adequately cure certain resins. If used in this way, the LED lights may produce more heat. Therefore, the findings of this study apply only to the tested lights and only when used for the exposure times and in the curing modes described. As the irradiance increases with each new generation of LED curing lights, future studies may find no real significant difference in heat emitted from the light tip between LED and halogen curing lights.