COMMENTARY

IRRADIANCE DIFFERENCES IN THE VIOLET (405 nm) AND BLUE (460 nm) SPECTRAL RANGES AMONG DENTAL LIGHT-CURING UNITS

Kraig S. Vandewalle, DDS, MS*

"Why doesn't my light-emitting diode (LED) curing light adequately cure some of my materials?" I have addressed this question on occasion from clinicians at federal dental facilities around the world. Manufacturers developed LED-curing lights with a narrow emission spectrum of blue light that closely matches the absorption spectrum of camphorquinone (CQ), the most common initiator in photo initiated dental materials. However, manufacturers also introduced materials containing other photoinitiators, such as monoacylphosphine oxide (TPO) or phenyl propanedione, which require light in the violet range and may not be initiated by the narrow emission of the single-spectrum LED-curing light. These alternative initiators, which are less yellow in color than CQ, may be used in a few materials such as surface sealants, compomer cements, and translucent or bleaching shades of composite resin restorative materials. To compensate for this potential incompatibility, a few manufacturers have introduced a new generation of LED-curing lights with a combination of chips with different emission wavelengths to produce a broader spectrum of light. These multispectrum LED-curing lights have the potential to cure all dental materials containing any photoinitiator, similar to the broad spectrum quartz-tungsten-halogen and plasma arc curing lights. However, as found in this well-done study, the unique placement of the different LED chip types within the curing light may produce an emitted light with an uneven distribution of wavelengths. In other words, some surfaces of the photoinitiated material may receive wavelengths of light in the blue range, whereas other areas only receive light in the violet range. The variability in the emission wavelengths and irradiance distribution may cause uneven polymerization and subsequent variation in mechanical properties. Further laboratory research is necessary to evaluate the effects of the fragmented light on properties such as surface hardness. Manufacturers may be encouraged to implement positional modifications of their LED arrays or redesign light guides to potentially redistribute the light in a homogeneous manner.

*Air Force Consultant in Dental Biomaterials, Director, Dental Research, Two-year Advanced Education in General Dentistry Residency, 1615 Truemper Street, Lackland AFB, TX 78236, USA

The views expressed in this commentary are those of the author and do not reflect the official policy of the United States Air Force, the Department of Defense, or the US Government. The author does not have any financial interest in the companies whose materials are discussed in this article.

This commentary is accompanied by article, "Irradiance Differences in the Violet (405 nm) and Blue (460 nm) Spectral Ranges among Dental Light-Curing Units," Richard B.T. Price, BDS, DDS, MS, PhD, FDS RCS (EDIN), FRCD (c), Daniel Labrie, PhD, Frederick A. Rueggeberg, DDS, MS, Christopher M. Felix, BSc, DOI 10.1111/j.1708-8240.2010.00368.x.

© 2010, COPYRIGHT THE AUTHORS
JOURNAL COMPILATION © 2010, WILEY PERIODICALS, INC.

Copyright of Journal of Esthetic & Restorative Dentistry is the property of Wiley-Blackwell and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.