THE DENTAL ADVISOR™

"Improved Patient Care Through Research"

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THE DENTAL ADVISOR evaluates and rates dental products and equipment by objective clinical and laboratory protocols. The publication consists of clinical evaluations, comprehensive long-term evaluations, product comparisons and specialty reports. To subscribe, please call 734-665-2020.

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LED Light-Curing Units

Several generations of LED (light-emitting diode) light-curing units have been introduced over the last few years. The 1st-generation LED lights generally were low in intensity and did not cure materials completely. The diodes were designed to activate CQ (camphorquinone) initiator around 460 nm. However, alternative photo-initiators used in bleach shades and incisal (translucent) shades of composites and in sealants and bonding agents are not activated by these "blue-light" units.

The 2nd-generation LED light-curing units (***bluephase***, ***Elipar Freelight 2***, ***L.E. Demetron 1***, ***radii***, ***Allegro***, ***SmartLite iQ***, ***the CURE***) have a single, high-powered diode with multiple emission areas. These units have a large surface area of emission and high-energy output. The 3rd-generation LED light-curing units (***UltraLume 5***) have two or more diode frequencies and emit light in different ranges to activate CQ and alternative photo-initiators.

While most dentists are still using quartz-tungsten-halogen (QTH) light-curing units, the convenience of the LED units is making them increasingly popular.

Advantages

- Battery powered
- Portable – compact, lightweight
- Energy-efficient – long battery life
- Low emitted heat
- Durable – diodes last 5,000 hours

Disadvantages

- Narrow spectral range – most units only work with CQ initiator
- Heat generated in chip

Light Emission

- Glass-fibered tip – less spread of radiation with increasing distance and perhaps more uniform distribution of power over the irradiated area
- Small plastic lens in front of the uncovered diode – light may not be uniformly distributed
- Uncovered diodes – output pattern varies the most with tip-to-tooth distance and is probably the least uniform
- Observe the pattern of light distribution over an area and relate this pattern to how far to hold the tip away when exposing

Other Featured Products

bluephase
(Ivoclar Vivadent)

Cooling
- Indicator of an internal heat-sink capability – greatest detriment to diode life is overheating
- Increased diode temperature results in decreased output
- More expensive units use internal fans or large metallic components to draw heat away from the diode
- Less expensive units merely shut themselves down to avoid overheating

Heat – In Curing Unit And In Tooth
- High-power units get hot internally, having the potential to damage a patient's lip, tongue, or cheek
- Units heat at target based on "photo-thermal effect" resulting in a rise of intrapulpal temperatures with no infrared energy present
- Run the unit through a number of sequential, repeated exposures and sense the temperature to gauge amount of heat at housing and tip

Battery
- Lithium-ion – longer charge, no memory effect, 40% more capacity than Ni-Cad
- Nickel-metal-hydride (Ni-MH) – less memory effect and greater capacity than Ni-Cad
- Nickel Cadmium (Ni-Cad) – older technology, must use battery until drained before recharge or develops a "memory effect"

Corded vs Cordless Units
- Corded units – no recharge time, no worry about battery
- Cordless units – must have a ready supply of batteries for operation. It is a good idea to select a light that comes with an extra battery or optional AC cord

Ergonomics
- Pencil grips – easy use of many controls with one finger
- Gun – familiar, requires adjusting controls with two hands
  - Cordless units – battery size, weight, and positioning affect unit balance and ease of use
  - Corded units – balance between unit and cord affects holding comfort
  - Investigate the ability to place the tip easily into difficult-to-reach regions

Curing Time
- Depends on intensity of light-curing unit, composite, and shade
- Do a test cure

Intensity Readings
- Wide variation in output values
- Radiometers only give a relative indication of output for that light over time
- Comparison of output between LED and other light types is not valid ■

THE DENTAL ADVISOR Recommends:

Allegro, Elipar Freelight 2, L.E.Demetron 1 and Smartlite iQ

Smartlite iQ
(DENTSPLY/Caulk)

Allegro
(Den-Mat)

Product	Company	Cordless	Built-in Radiometer	Weight	Extra Battery	Spectra Wavelength Range, nm*	Cost	Clinical Rating
bluephase	**Ivoclar Vivadent**	Yes**	Yes	9.5 oz.	Yes	430-490	$1,350	**ce**
Coltolux LED	**Coltene Whaledent**	Yes	No	2.2 oz.	No	450-470	$767	**ce**
Elipar Freelight 2	**3M ESPE**	Yes	Yes	7.8 oz.	No	430-480	$1,350	**94%**
Flashlite 1001	**Discus Dental**	Yes	Yes	3.6 oz.	No	465-475	$695	**na**
Smartlite iQ	**DENTSPLY/Caulk**	Yes	Yes	8 oz.	No	430-475	$1,230	**98%**
L.E.Demetron 1	**SDS/Kerr**	Yes	Yes	12.9 oz.	Yes	450-470	$1,333	**96%**
radii	**Southern Dental Industries, Inc.**	Yes	Yes	5.4 oz.	No	440-480	$695	**ce**
Allegro #033959000	**Den-Mat**	Yes	Numeric value	12 oz.	Yes	415-490	$995	**97%**
Allegro #033960000	**Den-Mat**	Yes	No	12 oz.	No	415-490	$695	**na**
the CURE	**Spring Health**	No	No	1.5 oz.	n/a	450-490	$499	**ce**
TPC Uni-LED	**TPC Advanced Technology**	No	No	2.7 oz.	No	450-490	$359	**na**
UltraLume 5	**Ultradent**	No	No	12 oz.	n/a	375-500	$999	**na**

na = not available, ce = currently evaluating
Costs are listed for comparison only and are not used to calculate ratings.
All costs are shown in U.S. dollars.
** As reported by the manufacturer.*
*** This product has an optional AC cord.*

Editors' Note: *The Allegro is now available with a glass tip as well as two acrylic tips.*