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Performance of New Curing Lights

Gordon's Clinical Observations: The physical characteristics of curing lights and their clinical use relate directly to the success or failure of any light-cured dental material. You have significant control in the way a light is used, but little ability to modify the light itself. There have been some innovative changes in curing lights over the past months that will help to provide optimum results. *CR scientists and clinicians tell you about the new lights in this issue.*

Recent innovations in curing lights include thinner heads, wider tips, higher power, alignment aids, expanded functions, and the first diode laser light source.


Bluephase PowerCure


enLITE


Monet


PinkWave


Radii Xpert


SmartLite Pro


The Cure TC-3

The following report includes an evaluation of seven new curing lights, a first look at the Monet laser, clinical tips, and CR conclusions.

Features to Consider

Curing lights are critical instruments for achieving optimal material properties. The following are desirable characteristics to consider when choosing a light.

- High power output with a large, uniform spot for good material coverage and dependable polymerization
- Ergonomic design with slim, 90° head for easy access and accurate positioning
- Durable construction that will survive in clinical environment
- Smooth, sealed surface for easy infection control and cleaning
- Simple, intuitive controls and versatility for all light-cure procedures
- Convenience features that help ensure consistent, reliable performance


Excellent intraoral access with a slim, 90° head design *(The Cure TC-3)*

Clinical Tips

- **Position light perpendicular to surface** of material, as close as possible.
- **View light through orange lens** to protect eyes and maintain proper position throughout cure.
- **High intensity lights generate significant heat** in teeth and soft tissues. Use multiple short cures separated by pauses to allow heat dissipation. Or use an air stream to cool tooth during cure, especially in deep preps near a live pulp.
- **Add cure time for materials in deep preps.** Cure interproximal surfaces of Class II preps after removing matrix.
- **Carefully remove any material cured to tip of light**, and periodically check light output with a radiometer to ensure output has not diminished.
- **Verify polymerization of new materials** by test curing a small portion in a flat washer or similar mold.
- **A dedicated light in each treatment room** can be more convenient than sharing a light among rooms. This is often a corded model positioned with other handpieces on the delivery cart.
- **Ensure staff are familiar with light**—its operation modes, uses, and maintenance.

First Look: Monet Laser Curing Light

The Monet *(AMD Lasers)* is the first dental curing light based on blue laser diodes. The optical design, controls, and high output make it competitive with current LED curing lights. Unique features include:

- **Wide, collimated beam:** The full irradiance is delivered to the surface of the material whether positioned close or far from the light *(e.g., deep prep)* for better assurance of polymerization.
- **Monochromatic wavelength** *(450 nm)*. Broad spectral output *(400–520 nm)* was once the standard for compatibility with different photoinitiators. Narrow spectrum LED lights *(450–470 nm)* forced manufacturers to reformulate materials for compatibility. The monochromatic blue laser is an extremely narrow spectrum. Ongoing clinical validation is needed, but to date, CR has found no compatibility issues.
- **High intensity spot:** The bright blue spot is not diminished with distance or angle. Eye protection is required. Oral tissues are quickly heated by the high energy. Use caution to aim correctly.
- **Snap-on attenuators:** Apertures and filters limit beam size and intensity for specific needs, such as tack curing or deep preps near a live pulp *(2mm aperture shown)*.

Overall, the Monet exhibited a very good combination of features and performance and appears very promising.


Snap-on aperture

Performance of New Curing Lights *(Continued from page 1)*

Characteristics of Seven Curing Lights

The following table shows features and performance characteristics of recently evaluated curing lights. Numerous additional brands are available.

	Laser	LED Curing Lights					
							
Brand *Company*	**Monet** ***AMD Lasers***	**Bluephase PowerCure** ***Ivoclar Vivadent***	**SmartLite Pro** ***Dentsply Sirona***	**PinkWave** ***Vista Dental Products***	**The Cure TC-3** ***Spring Health Products***	**Radii Xpert** ***SDI***	**enLITE** ***Brasseler USA***
Cost	$1,999	$1,937	$1,750	$1,650	$714	$1,365	$749
Irradiance at 3mm	4010 mW/cm²	3010 mW/cm²	1010 mW/cm²	1980 mW/cm²	910 mW/cm²	1300 mW/cm²	2160 mW/cm²
Light Guide Diameter	≈ 13.2 mm	≈ 8.1 mm	≈ 10.3 mm	≈ 12.1 mm	≈ 11.3 mm	≈ 7.7 mm	≈ 7.2 mm
Spot Uniformity	Fair	Good	Good	Excellent–Good	Excellent–Good	Fair	Good–Fair
Head Angle, Height	90° ≈ 15 mm	75° ≈ 15 mm	90° ≈ 14 mm	90° ≈ 15 mm	90° ≈ 11 mm	90° ≈ 19 mm	60° ≈ 24 mm
Infection Control	Excellent–Good	Excellent	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good
Controls	Excellent–Good	Excellent–Good	Excellent	Excellent–Good	Excellent–Good	Excellent–Good	Good
Built-in Light Meter	Yes	Yes	Yes	No	No	Yes	No
Power Supply	Battery	Cord or battery	Battery	Battery	Cord or battery	Battery	Battery
Notable Features	Collimated laser beam, aiming beam	PolyVision aiming aid; vibration feedback	Transillumination tip; vibration feedback, changeable head	Focused output; expanded spectrum of blue, red, and IR; white light mode	Low cost, corded model TC-24a available	Focused output, aiming beam, changeable head	Low cost
Warranty	2 yr	3 yr *(1 yr battery)*	2 yr *(1 yr battery)*	3 yr *(1 yr battery)*	1 yr	3 yr *(2 yr battery)*	1 yr
Overall Rating	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Excellent–Good	Good

Summary

- **Each curing light evaluated had a unique combination of features**. All were clinically useful with adequate intensity *(>1000 mW/cm²)* to quickly polymerize light-cure materials.
- **Promising innovations** included aiming aids *(Bluephase PowerCure, Monet, Radii Xpert)*, white light for exam or transillumination *(PinkWave, SmartLite Pro)*, and blue laser light source *(Monet)*.
- **Compatibility testing** with over 50 brands of light-cure dental materials indicated that the monochromatic output of Monet laser curing light *(blue 450 nm)* polymerized all materials tested.
- **Lights with a good combination of features and performance noted by Evaluators were:** Bluephase PowerCure, SmartLite Pro, PinkWave, Monet, The Cure TC-3, and Radii Expert. See *Clinicians Report* March 2019 for additional lights rated highly, including Bluephase G4, Fusion Grand, Magicure, Soleil 770, and Valo Grand.

CR CONCLUSIONS: Recent innovations in curing lights provide greater assurance of effective polymerization and add convenience. Innovations include a laser light source with collimated beam, slim head designs, wide tips, high irradiance, aiming beams, alignment aids, expanded wavelengths, additional functions, and improved controls. Each light evaluated had a unique combination of features, and all could be used with clinical success. Watch for additional new lights coming on the market soon. Today's highest intensity lights are very bright: ***eye protection must be used***. Exercise caution to avoid overheating oral tissues.

What is CR?

WHY CR?

CR was founded in 1976 by clinicians who believed practitioners could confirm efficacy and clinical usefulness of new products and avoid both the experimentation on patients and failures in the closet. With this purpose in mind, CR was organized as a unique volunteer purpose of testing all types of dental products and disseminating results to colleagues throughout the world.

WHO FUNDS CR?

Research funds come from subscriptions to the Gordon J. Christensen Clinicians Report®. Revenue from CR's "Dentistry Update®" courses support payroll for non-clinical staff. All Clinical Evaluators volunteer their time and expertise. CR is a non-profit, educational research institute. It is not owned in whole or in part by any individual, family, or group of investors. This system, free of outside funding, was designed to keep CR's research objective and candid.

HOW DOES CR FUNCTION?

Each year, CR tests in excess of 750 different product brands, performing about 20,000 field evaluations. CR tests all types of dental products, including materials, devices, and equipment, plus techniques. Worldwide, products are purchased from distributors, secured from companies, and sent to CR by clinicians, inventors, and patients. There is no charge to companies for product evaluations. Testing combines the efforts of 450 clinicians in 19 countries who volunteer their time and expertise, and 40 on-site scientists, engineers, and support staff. Products are subjected to at least two levels of CR's unique three-tiered evaluation process that consists of:

1. Clinical field trials where new products are incorporated into routine use in a variety of dental practices and compared by clinicians to products and methods they use routinely.
2. Controlled clinical tests where new products are used and compared under rigorously controlled conditions, and patients are paid for their time as study participants.
3. Laboratory tests where physical and chemical properties of new products are compared to standard products.

Clinical Success is the Final Test

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CRA Foundation® changed its name to CR Foundation® in 2008.

This team is testing resin curing lights to determine their ability to cure a variety of resin-based composites.

Every month several new projects are completed.

THE PROBLEM WITH NEW DENTAL PRODUCTS.

New dental products have always presented a challenge to clinicians because, with little more than promotional information to guide them, they must judge between those that are new and better, and those that are just new. Because of the industry's keen competition and rush to be first on the market, clinicians and their patients often become test data for new products.

Every clinician has, at one time or another, become a victim of this system. All own new products that did not meet expectations, but are stored in hope of some unknown future use, or thrown away at a considerable loss. To help clinicians make educated product purchases, CR tests new dental products and reports the results to the profession.