Last month, John Kanca, III, DMD posted the following on the DentalTown Message Boards: "In the Feb 2002 issue of DentalTown, Dr. Gordon Christensen wrote 'Despite the fact plasma arc lights that cure in 3 seconds without damage to resin or tooth preparations have been available for a few years, halogen lights continue to be used.... Fortunately, research and clinical practice have shown that there is no damage caused by faster resin curing....' Readers of this magazine should know that research presented by Dr. Murray Boushlicher (U of Iowa) AADR, 2001, showed that 3 seconds of plasma light exposure leaves composites significantly underpolymerized. He suggested that 7-10 seconds exposure was necessary to properly polymerize resin composites. It is also completely false to say that research has not shown damage to teeth via fast curing. I am the author of just such a paper. It was published in a peer-reviewed journal (Am J Dent June 1999), rather than simply in a newsletter free of editorial review. The vast body of peer-reviewed published science is totally in agreement that fast polymerization is far worse for a tooth than slower polymerization. There is not a single paper in a peer-reviewed journal which supports rapid polymerization. Even CRA data supports slow polymerization. In the May-June 1999 issue of the CRA Newsletter, Z100 and TPH caused the most enamel cracking while BisFil II and Heliomolar caused the least amount of enamel cracking. This is exactly what would be expected. TPH and Z210 polymerize the fastest, and BisFil II and Heliomolar polymerize the slowest. Thus, the CRA data is correct, their interpretation is not. Readers should also know that plasma lights have tips with 5-8mm diameters, which means separate exposures for mesial and distal boxes, doubling time required. 2-3 exposures are needed for anterior veneers. A 13mm halogen light tip covers the whole prep virtually all the time for much less money. Faster is NOT better. With shrinking materials, faster is just a few:

5. The Effect of Cure Rate on the Mechanical Properties of Dental Resins, Dental Materials, 2001; 17:504

Clinical Research Associate Findings

Following is the research regarding slow vs fast cure from the December 1998 CRA Newsletter. The topics are:

Resin Shrinkage-How much does resin shrink when cured?
Summary: Shrinkage ranged from 1.8 to 3.4 percent. The curing light used did not have a significant effect resulting shrinkage of the resin. Heliomolar had the lowest shrinkage values; while Spectrum TPH had the highest. For comparison, BisFil II auto-cure control resin had 2.7 percent shrinkage.

Stress at Gingival Margin-How much stress on a tooth prep is created from resin shrinkage?
Summary: Stress levels ranged from 8.7 to 28.4 MPa. The curing light used to cure the resin did not significantly affect marginal stress levels. Z100 resin produced most stress. For comparison, the auto-cure control resin BisFil II produced 12.2 MPa of stress.

Resin “Brittleness” (Flexural Modulus)-How brittle or stiff is a material?
Summary: Modulus values ranged from 2,120 to 17,469 MPa. All curing lights produced similar modulus values for each resin and color. Heliomolar consistently had the lowest modulus, while Z100 & BisFil II had the highest. Use of the minimum cure time versus the standard cure time resulted in slightly lower values. There was a trend for lighter colors to have a slightly higher modulus.

CRA showed that conventional halogen lights cause more temperature increase in the pulp due to the longer light exposure. All these can be found on CRA’s website. CRA’s research has been published in Compendium (1999; 20:542-554), Journal Of Dental Research (1999; 78:395, Abstract 2316).

In my opinion, Dr. Kanca is misquoting research. It is absolutely false to say, “they all shut off at ten seconds.” Den-Mat’s Virtuoso/Sapphire lights (broad spectrum Plasma Arc Lights) can operate continuously for hours.

Dr. Kanca states that there is not a single paper in a peer-reviewed journal that supports rapid polymerization. That is not true. Here are just a few:

Dr. Gordon Christensen has published an article in JADA (Vol. 131, July 2000, pages 1067-1069) titled, "Curing Restorative Resin: A Significant Controversy." Here is what he wrote:

"There have been reports that fast resin-curing lights modify the resins in a negative way. CRA has shown that resins cured with PAC lights and lasers had no properties after curing that were..."
different from those of resins cured with typical lights. Other sources have reported additional restorative resin shrinkage with the fast lights. However, CRA research has not shown more shrinkage with the fast lights. Other sources report that there is more stress in the restored tooth after use of fast-curing lights. CRA research has not shown more stress in restored teeth when the fast lights are used. There have been reports that the heat generated by fast lights could injure the pulp. CRA research showed less heat in the pulp with fast lights than that with the typical halogen curing lights, assuming that both types of lights were used correctly.

Some people have suggested that because of the alleged negative aspects of curing resin rapidly, teeth could have more postoperative sensitivity. This suggested phenomenon has no basis in fact; rather, the reverse has been reported by clinicians in the field (G.J. Co, oral surveys of practitioners, ongoing research). Both scientific and empirical evidence support the use of fast-curing lights.

Let’s look back at the development of dental composite resins. We had chemical cure composites first. Compared to light-cured composites, chemical cure is slow. How many of us would go back to self-cured composites?

Clinical Success is the Final Test
With research addressed above, what is the answer? Dr. Christensen says clinical success is the final test. I agree.

I practice with Dr. Ouellet in the central coast of California. The office has four operatories with an additional one for a hygienist. Dr. Ouellet purchased one Virtuoso fast curing light about four years ago and within 6 months, he purchased another three lights, one for every operatory. The office sees 20 patients (not including hygiene patients) everyday on average. We do 10-15 composite cases every day (have not done an amalgam since the 1980’s) and two to four porcelain veneer cases every week. We use the Rembrandt curing lights for ortho, crown/bridge cementation, and almost every procedure.

Do we see composites cracking the tooth, porcelain veneers popping off, or any other failures related to fast curing (i.e. sensitivity)? No.

There are about 20,000 fast PAC lights currently being used in practices. Dr. Christensen has said that dentists who have fast-curing lights will not switch.

It should be pointed out that fast curing started in early 1990 with the laser-curing light. It has limitations due to the narrow output spectrum, as other PAC lights do. The Rembrandt Sapphire (DenMat) is unique. The spectral output closely matches the photo initiators used in composites and has greater light intensity delivered to a larger spot size. This is clinically significant because it cures more composites to a greater depth. In addition, it has more safety and convenience features than other systems. Ask any of the thousands of dentists who are using the Sapphire if they would give it up for another light. The Rembrandt PAC lights optimize faster curing.

With long term clinical success, why is there still controversy regarding fast curing versus slow curing? Where is the problem?

For additional information call (800) 872-4343 or visit www.denmat.com.