

Dr. Timothy Dunbar

Busted! **6 Myths of** **Composite** **Warming**

Unsure about composite warming? It's time to take a closer look at warming to separate fact from fiction – and see how a little heat could go a long way.

Unsure about composite warming? Here's why you should reconsider – and how you could benefit from heating things up.

Many dental professionals still have questions about composite warming. However, if your composite is manufacturer-approved for warming, and backed by testing for safety and efficacy, then there's no reason not to warm your composite. Let's take a look at how a little bit of heat could change the way you approach restorations – and break down the myths of composite warming.

MYTH #1:

Warming will damage my composite and compromise the stability and opacity of the restoration




FALSE.

When heated to the correct temperature, warming-approved composites will maintain the equivalent aesthetic, physical and mechanical properties as room temperature composite. Studies have shown that pre-warming composites to 60-70°C for a limited time will not only have no effect on mechanical properties such as fracture toughness, flexural strength or diametral tensile strength, but also won't impact depth of cure.¹⁻³

One other mechanical property can't be overlooked, as it can greatly impact the success of your restoration: polymerisation shrinkage and shrinkage stress. It may seem intuitive that warming your composite could increase stress, due to a potential for a higher degree of cross-linking.^{4,5} But far from being negatively affected, pre-heated composite actually generates the same or lower shrinkage forces than room-temperature composite.^{1,2,6}

With the increasing demand for natural-looking restorative dentistry, one also needs to know how warming could affect the aesthetic properties of the composite. Thankfully, studies show that pre-heated composites also maintain the same colour, opacity and polish retention properties as room temperature composite.^{1,2} But if warming doesn't alter the properties of the composite, why should you care? Because this

means that dental professionals can take advantage of the other clinical advantages of warmed composite – such as improved adaptation due to a lower viscosity – without worry.

Room Temperature	Property	Warmed
✓		✓
✓		✓
✓		✓

MYTH #2:

Warming will make the composite polymerise too soon and jeopardise the success of the restoration

FALSE.

Studies have shown that pre-heating composite will not compromise polymerisation in the cavity, as long as it's heated correctly.^{7,8} For example, select 3M™ Filtek™ Restorative composite capsules can be heated to 70°C for up to one hour, while select 3M™ Filtek™ Restorative flowable syringes can be warmed to 70°C repeatedly – up to 25 one hour cycles. This manufacturer approved warming procedure has been proven effective with no impact on the material or spontaneous polymerisation

(unless heated over 140°C, far above recommended temperatures).^{1,5,7,8} Just be sure to contact the manufacturer of your composite to ensure it can be safely warmed.

MYTH #3:

Warmed composite will damage my patients' teeth and gums or will cause sensitivity

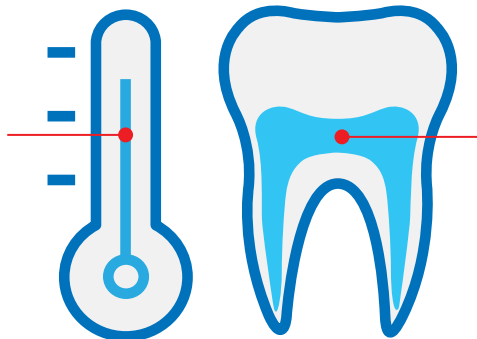
FALSE.

Patient safety is a concern for any dental procedure and heated composite is no exception. However, multiple studies have shown that as long as the composite is warmed to the appropriate temperature, there will be minimal heat transfer to the tooth and pulp.

How much heat is transferred to the pulp during composite placement depends on a number of variables including remaining dentine thickness, thermal properties of the tooth and composite, speed and duration of heating, and cavity prep. While it's generally accepted that the pulp can be compromised by a prolonged temperature increase of 5.5°C, recent studies show that the pulp can tolerate transient temperature increases of 8.9-14.7°C without damage.⁹

Composites are generally heated to a temperature between 50°C and 70°C (a range that healthy teeth and gums withstand daily from hot foods and liquids) but begin to cool the moment they come off heater and continue to cool throughout placement.^{5,10} In fact, when using heated composites, the remaining tooth structure acts as a heat sink, quickly lowering the composite temperature, while room temperature composites may actually warm up during placement.¹¹ Studies have shown that using composite heated to 60°C results in a less than 1.0°C rise in pulpal temperature – lower than temperature increases from light curing, and far below the threshold for critical pulpal temperature increase.¹⁰

Composite heated to 60°C results in a <1.0°C rise in pulpal temperature



Pulp temperature tolerances – 5.5°C prolonged increase, 8.9-14.7°C transient increase

MYTH #4:

Toxic chemicals will leak out of the warmed capsule

FALSE.

You may have heard concerns that warming composites could cause hazardous substances to leach into the mouth and cause irritation or sensitivity, or diffuse into the room and create a toxic environment. And any change in procedure – such as composite warming – capable of affecting material properties should always be thoroughly evaluated for potential impact on the health of patients or staff. That's why it's so important to follow manufacturer specifications, and to read up on your composite.

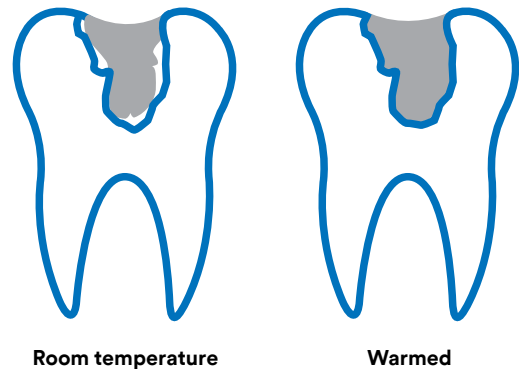
For example, before approving select 3M™ Filtek™ Dental Restoratives for warming, 3M conducted rigorous tests to ensure the safety of pre-warmed composite for both clinicians and patients.¹² Three universal and two bulk fill restoratives were warmed and rigorously tested by a board-certified toxicologist, who found them to be biocompatible according to ISO 10993-1:2018.¹ Regardless of which product you use, always follow the manufacturer's instructions for how – or whether – to warm your composite.

MYTH #5:

Warmed composite is sticky and more difficult to work with

FALSE.

Heating composite reduces its viscosity and improves flow, which in turn lowers the force necessary to extrude from the compule. This not only decreases hand fatigue, but also allows for faster, easier, more precise control when placing the material into areas with limited access. And because the composite is more flowable, it's able to fill all the nooks and crannies of the cavity prep – enabling less invasive cavity prep with more unique geometries and improved adaption.^{1,4-11}



MYTH #6:

Manufacturers don't actually support composite warming

FALSE.

It's true that until fairly recently, manufacturers did not support warming – and unless you were willing to dig into the literature, it was easy to overlook. However, evidence of its benefits have existed since the 1980s and the trend is only growing.⁴

While some manufacturers have been slower to update, some manufacturers have responded to the evidence with advanced composite compositions to make things

easier – and warmer. Before writing off composite warming, make sure to check the manufacturers' instructions – there's a chance you may already have a warming-compatible composite on hand. However, when you're evaluating your composite for warming potential, make sure that it's backed by the appropriate testing to ensure you're getting all the benefits without sacrificing efficacy or safety.

Summary

While many dental professionals have concerns about composite warming, the facts speak for themselves. If your composite is manufacturer-approved for warming, backed by testing for safety and efficacy and used correctly, warming:

- Will not damage your composite or impact the aesthetic, physical or mechanical properties of the restoration – and will generate the same or lower shrinkage forces than room-temperature composite.
- Will not impact the material or cause spontaneous polymerisation.
- Will not damage teeth, gums or cause patient sensitivity.
- Will not leach chemicals or hazardous substances.
- Can improve flow for easier handling, lower extrusion force and the potential for improved adaption.

In addition, manufacturers have begun to take note of these benefits and have started to test, develop and approve composites for warming. In the end, a little heat can go a long way.

One last reminder: Be sure to contact the manufacturer of your composite to ensure it can be safely warmed.

6 Reasons Not to be Afraid of Composite Warming



Dr. Timothy Dunbar PhD | 3M

Timothy Dunbar was born and educated through high school in Pittsburgh, PA. He graduated Summa Cum Laude from Wheaton College (IL) with a B.S. in Chemistry in 1992. He received his Ph.D. in Physical Chemistry from The Pennsylvania State University in 1998. After completing a two-year post-doctoral research fellowship with Sandia National Laboratories (Albuquerque, NM), he was hired into 3M's Corporate Research Materials Lab in 2000.

Since 2007, he has worked as a product developer for 3M Oral Care Solutions, with major contributions to products such as Filtek™ Universal Restorative, Filtek™ One Bulk Fill Restorative, Filtek™ Bulk Fill Posterior Restorative, Paradigm™ Nano Hybrid Universal Restorative, and Filtek™ Supreme XTE Flowable Restorative. He has worked in the field of nanotechnology for over two decades and the field of colour science for ten years.

Author of over fifteen publications and inventor of sixteen issued U.S. patents, Timothy resides in Woodbury, MN, with his wife and four children.

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