Press Release

Heraeus Kulzer symposium during the IADR-PER Congress 2014
Light-curing is an important key factor to long-lasting restorations

Hanau, December 2014 – Light-curing dental materials have to be cured properly in order to fully develop their mechanical properties. What sounds like a banality is in fact an underestimated requirement. As one of the leading producers of dental materials worldwide, Heraeus Kulzer has a strong interest in providing their clients with new and essential information on handling dental products and materials. New insights and developments in light-curing that can help to prolong the durability of restorations are not yet widely known. That is why Heraeus Kulzer organised a symposium during the Congress of the International Association of Dental Research (IADR) for the Paneuropean Regions carrying the title “Who cares, cures properly!” The symposium took place on September 23rd in Dubrovnik, Croatia. Participating dental scientists and clinicians appreciated the symposium both for the presentation of new findings in the domain of light-curing, and for useful advice for testing and clinical work on light-curing dental materials.

Adhering to manufacturers’ recommendations is essential for safe light-curing

Light-curing is a crucial step for many treatments in dentistry. Still, the science behind the blue light for curing dental materials is often neglected. Secondary caries and fractures are still the main reasons for the replacement of restorations. Inadequate light-curing supposedly
contributes to these failures. In addition, there is a noticeable trend towards using high-power curing lights and further shortening the curing time. This can lead to an incomplete curing of dental materials, because the photoinitiators need a certain time to be activated and to start the polymerisation. If the light-curing is not optimally executed, fractures, discolourations, secondary caries and irritation of soft tissue by the discharge of incompletely set components of the dental material etc. may occur.

Two experts in the field of dental light-curing, Prof. Claus-Peter Ernst, University of Mainz, Germany, and Prof. Fred Rueggeberg, Georgia Regents University, USA, presented their recent study results. They provided both further information on the situation of light-curing in dental offices and actual findings on the characterisation of light-curing devices. The latter is not only extremely important for the selection of suitable curing lights, it also gives valuable advice for the clinical procedure of light-curing.

Ernst confessed himself concerned about the fact that 2% of the curing lights from 300 dental offices in Germany investigated by his team showed a power output of less than 200 mW/cm² and 7% less than 400 mW/cm². These are alarming figures, as a minimum irradiance of 500 m/cm² is mostly recommended for properly curing light-curing dental materials. He also pointed out that the procedure of light-curing needed much more attention than the devices themselves. He deduced that from a study regarding the curing procedures in dental offices. Ernst and his team had set up questionnaires for participating clinicians and dental assistants. In a second step, they measured the light energy actually delivered through the participants’ light-curing technique via a
simulator. By comparing both the results from the questionnaires and the measurement data, the scientists discovered an alarming deviation between the theoretical line of action via the questionnaires and the practical realization. Ernst and his team reasoned from these results that quite a number of resin composite materials may be underpolymerized among particular practitioners. All too often, the number of light-curing cycles performed when placing a composite restoration is insufficient. Roughly 50% of those dental practitioners (dentists and nurses) who underwent a short instruction in light-curing after the simulator-run, showed improved results in light energy delivery. Ernst concluded that further knowledge about how light-curing is performed in dental offices has to be collected in order to provide better training for dentists and students.

Rueggeberg confronted his audience first with general assumptions about light-curing in order to then challenge their validity. He pointed out, for instance, that the irradiance value as feature of a curing light is not one number and that in fact the distribution of the irradiance across the tip surface is more important. A homogeneous distribution of irradiance and wavelength across the tip area of a light-curing unit are needed for safe curing, whereas inhomogeneous distribution leads to inhomogeneous curing. Accordingly the beam profile, which specifies the distribution of irradiance and wavelength spectrum across the light tip, should be taken into consideration for the selection of curing lights, rather than a single irradiance value. He also rebutted the assumption that the light scattering of the filler particles within composite materials homogenised an inhomogeneous distribution of irradiance and wavelength. Another of his valuable references concerned the
irradiation time. A longer irradiation time mostly leads to a higher and more constant hardness of the composite and thus in better polymerisation results. Yet, the irradiation time could not be raised indefinitely, especially when using high-power curing lights, as the augmented temperature might cause damage to the pulp. While Rueggeberg did not want to challenge this empirical value, he still pointed at the out-datedness of most studies and announced a newly set up study concerning pulp damage through polymerisation. The scientist advised an article on clinical guidelines for practitioners on safe and efficient light-curing that is the outcome of the first Symposium on Light Curing in Dentistry. International experts, scientists and manufacturers, agreed on these guidelines to improve light-curing. Heraeus Kulzer also attended this important meeting at Dalhousie University, Halifax, Canada. The open access article is available under http://jad.quintessenz.de/jad_2014_04_s0303.pdf².

Last but not least, Dr. Andreas Utterodt, Manager R&D Composite Materials at Heraeus Kulzer, pointed out that in order to sufficiently cure dental materials and to achieve long-lasting restorations, the manufacturers’ recommendations on curing times, layer thickness, wavelength spectrum and minimum irradiance in the instructions for use needed to be followed thoroughly. Only sufficiently cured materials develop their mechanical, chemical and biological features. Curing lights with high irradiance values above 2000 mW/cm² bear an increasing risk of damaging the pulp due to temperature increase. He also called upon manufacturers to give more precise instructions for use to their clients in order to make light-curing easier for dentists.
An optimised knowledge transfer and reliable and practicable curing recommendations for dentists are imperative. Universities and manufacturers have to work hand in hand in order to ensure such a knowledge transfer. Heraeus Kulzer acted on this demand by organising the above mentioned symposium in order to bring some light into the darkness of dental light-curing. Among its broad range of dental products, many have to be light-cured. Accordingly, the company is very concerned to ensure its materials to be sufficiently cured so that they can display their outstanding mechanical properties.


**About Heraeus Kulzer**  
Heraeus Kulzer GmbH is one of the world’s leading dental companies with its headquarters in Hanau, Germany. As a trusted partner, the company supplies dentists
and dental technicians with an extensive product range, covering cosmetic dentistry, tooth preservation, prosthetics, periodontology and digital dentistry. More than 1,400 employees at 25 locations worldwide are driven by their expertise and passion for the dental market and embody what the name Heraeus Kulzer stands for: service, quality and innovation. In 2013 Heraeus Kulzer’s product turnover exceeded 400 million USD.

Heraeus Kulzer has been part of the Japanese Mitsui Chemicals Group since July 2013. Mitsui Chemicals Inc. (MCI) is based in Tokyo, and has 134 affiliates with more than 14,700 employees in 27 countries worldwide. Its innovative, practical chemical products are as much in demand in the automotive, electronics and packaging industries as they are in other fields such as environmental protection and healthcare.

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