Bisphenol-A Exposure from Sealants (5/06)


The dental profession has seen enormous success with composite resin-based materials. Composite resins are formulated from a mixture of monomers, most commonly based on bisphenol A glycidyl methacrylate (BIS-GMA) which may contain minor amounts of impurities such as bisphenol A (BPA). Other monomers such as triethylene glycol dimethacrylate (TEGDMA), bisphenol A dimethacrylate (BIS-EMA), and ethylene glycol dimethacrylate (EDMA) may be added to the resin. Sealants and other composite resins wear over time and the resin molecules are swallowed and pass through the gastro-intestinal tract. Little is known about the metabolism of dental resins in the human body. It is possible that esterase may degrade BIS-DMA into BPA by attacking its ester linkages. Laboratory screening assays have shown that BPA may be weakly estrogenic under extreme conditions.

The purpose of this study was to determine the levels of bisphenol-A (BPA) in human saliva and urine after placement of dental sealants. Healthy military personnel were selected with no existing resin-based materials on their teeth. Helioseal F (Ivoclar Vivadent, Amherst, NY) or Delton Light Cure (Dentsply International, York, PA) sealants were placed with cotton roll or dry-angle isolation. Fourteen participants received sealants on a total of 84 posterior teeth. Salivary samples were collected immediately before and after, and one-hour after sealant placement. Urine samples were collected immediately before, one-hour after, and 24-hours after sealant placement. Measurements of BPA were made with selective and sensitive isotope-diluted mass-spectrometry-based methods. Helioseal F leached negligible amounts of BPA with urinary and salivary levels similar to baseline levels. After Delton LC placement, saliva BPA concentrations increased dramatically and urinary BPA concentrations remained elevated for at least 24 hours. BPA exposure after Delton LC sealant placement was significantly higher than exposure with placement of Helioseal F. The authors concluded that Delton LC placement may result in low-dose exposures that are within the range at which estrogen receptor-mediated effects are seen in rodents. Further research is necessary to determine if detrimental human health effects can result from such exposures.

DECS Comment: Monomer release from dental resins shows a dramatic decrease in component concentration over time, essentially reaching completion within 1 – 3 days. The levels of BPA present as an impurity or produced as a degradation product from dental restorations are purportedly quite small and below the doses needed to affect the human reproductive tract. The potential for adverse estrogenic effects in humans from leachable components of resin-based dental materials is extremely low. The American Dental Association (ADA) states in a position paper “…there is no evidence to suggest a link between any adverse health condition and BPA leached out of dental sealants.” See link: http://www.ada.org/en/member-center/oral-health-topics/bisphenol-a. Further research should be directed at evaluating the pharmacokinetics and pharmodynamics of the long-term release of contaminants from resin-based dental materials. (e.g., BPA).

References
1. Soderholm K, Mariotti A. Bis-GMA-based resins in dentistry: are they safe? J Amer Dent Assoc 1999;130:201-209.