

Appendix I

The Safety of Composite and Other Alternatives to Dental Mercury

In addition to the advantages of being mercury-free, composites offer the additional environmental benefit of being widely available without bisphenol A (BPA). BPA is rarely an ingredient in these mercury-free alternatives.¹ Dental associations, governments, and scientific organizations around the world agree that composite is safe for humans and the environment. Here are a few examples:

- **British Dental Association (2011):** In 2005, the BDA adopted an official position statement on BPA in filling materials: “as the majority of sealants and filling materials only contain Bis-GMA, there will be no resultant oestrogenic effect from using these materials.”² In 2011, BDA issued a “fact file” reviewing the risks of BPA in filling materials in even greater detail.³ It concluded: “Current evidence suggests that only a very small and specific group of dental materials is susceptible to the release BPA, and then in only very small amounts. The majority of resin based dental materials appears not to release BPA, which should alleviate concerns regarding potential health risks...It would appear that BPA is released from only a small number of resin-based dental materials. Thus the contribution of dental materials to the overall body/environmental burden of BPA is very small indeed. Also, where BPA release has been detected, the amounts involved have been very low and well within the TDI of 0.05mg/kg bw/day set by the EFSA... Expert opinion currently suggests that BPA doses from dental materials are low and well within the safe exposure limits.”⁴ The BDA’s fact file concludes with a long list of dental materials that did not release BPA at all when tested, including:

Material	Manufacturer
Delton	Dentsply Trubyte
Concise	3M/ESPE
Helioseal	Ivoclar
Prisma Shield	Dentsply Caulk
Seal-Rite I	Pulpdent Corp
Seal-Rite II	Pulpdent Corp
Defender	Henry Schein
Filtek Supreme XT	3M/ESPE
ClearFill Core	Kuraray
Filtek Silorane	3M/ESPE

- **Canadian Dental Association (2008):** On its website, CDA says “Most sealants and resins contain no (or very little) bisphenol A and it does not release in the application... These materials, including resins and sealants, are all very low risk.”⁵ In a letter to the media, CDA explained “Learned scientists around the world have carefully examined the BPA content issues related to dental materials and concluded that there is no risk. Health Canada’s researchers reached the same conclusions, realizing that there is a world of difference between polycarbonate plastic baby bottles that might be filled with boiling hot water – compared to resin dental fillings that will never be exposed to extreme heat.”⁶
- **American Dental Association (2010):** In 2010, the ADA Council on Scientific Affairs concluded “ADA research, confirmed by direct communications from dental manufacturers, indicates that BPA is rarely used as a formula ingredient in dental products...based on current evidence, the ADA does not believe there is a basis for health concerns relative to BPA exposure from any dental material...Based on current research the Association agrees with the authoritative government agencies that the low-level of BPA exposure that may result from dental sealants and composites poses no known health threat.”⁷

- **International Academy of Oral Medicine and Toxicology:** “There is a good deal of literature now available comparing exposures with reference doses and toxic threshold data on BPA in its various uses. Two things stand out. First, dental manufacturers claim that there is no free, unreacted BPA in bis-GMA or bis-DMA resins. It would take heating to a temperature of several hundred degrees to liberate the BPA from these resins. Second, measurements of exposure to BPA from dental resins reveal potential doses that are hundreds or thousands of times less than any known toxic level. That’s about as much reassurance as we can get, given the artificial nature of dental materials.”⁸

- **Article published in *Pediatrics*, The Official Journal of the American Academy of Pediatrics (2010):** “On the basis of the proven benefits of resin-based dental materials and the brevity of BPA exposure, we recommend continued use...On the basis of the substantiated preventive benefits of resin-based dental sealants and given the brevity of elevated exposure to BPA after sealant application, we recommend continuing application of resin-based sealants in dental practice and in school--based/school-linked dental-sealant programs.”⁹

- **Association of State and Territorial Dental Directors (USA) (2011):** “The Association of State and Territorial Dental Directors supports and recommends the continued use of composites and dental sealants for all populations...The literature suggests the following simple precautionary application techniques that can be used to considerably reduce BPA exposure...”¹⁰

- **European Commission Scientific Committee on Health and Environmental Risks (SCHER) (2008):** “Due to the low mammalian toxicity of these compounds, indirect risks to human health from release of the alternatives [to amalgam] without mercury are estimated as low.”¹¹

- **World Health Organization & Food and Agriculture Organization of the United Nations Expert Meeting (2010):** “BPA levels in saliva from dental materials were low. The Expert Meeting determined that there was no need to collect additional data on BPA levels from dental materials, as exposure is short term and unlikely to contribute substantially to chronic exposure.”¹²

- **Swedish Chemicals Agency (KEMI) (2011):** “Risk assessments of BPA have so far generally concluded that exposure from dental materials does not contribute significantly to total exposure...”¹³

- **PlasticsEurope:** BPA is only rarely an ingredient in composite dental fillings,¹⁴ but PlasticsEurope explains that: “Scientific evidence has concluded that the existing manufacturing and use patterns of bisphenol A (BPA) pose no risk to the environment... The EU risk assessment (updated in 2008) confirmed that there is no concern regarding the environment from the production or use of BPA and its follow-up products. Comprehensive studies have shown that BPA is readily biodegradable as set by criteria from the Organization for Economic Cooperation and Development (OECD). This means that BPA rapidly breaks down in the environment. The trace levels of BPA that might still be detected in the environment are not regarded to have an adverse effect on the environment.”¹⁵

- **American Chemistry Council:** According to the American Chemistry Council’s Polycarbonate/BPA Global Group, there is a survey of the literature on BPA use in composite that concluded “Composites without the filler and coupling agent are commonly used as sealants, which effectively isolate pits and fissures to help prevent caries in adults and children... Small amounts of BPA may leach from dental sealants immediately after application of the sealants to teeth. No BPA has been detected in blood samples, indicating that there is no detectable systemic exposure to BPA from dental sealants. The source of BPA that leaches from dental sealants is likely to be from hydrolysis of bis-DMA, a common monomer used in dental resin formulations. When evaluated as an acute exposure event, the highest level of BPA reported in saliva from dental sealants is more than 50,000 times lower than the LD50 values that have been reported for

BPA. Although BPA exposure from dental sealants does not occur daily throughout a lifetime, the highest level of BPA reported is also below the maximum acceptable or "reference" dose for BPA of 0.05 mg/kg body weight/day. A recent three-generation study has confirmed the safety of the maximum acceptable or "reference" dose for BPA of 0.05 mg/kg body weight/ day. Consequently, human exposure to BPA from dental resins is minimal and poses no known health risk."¹⁶ Even if a small amount of BPA is in dental materials, the Polycarbonate/BPA Global Group explains in its environmental fact sheet that "Measurements of bisphenol A in the environment have confirmed that bisphenol A [from all sources, not just dental], when detected at all, is present only at very low levels, typically less than a part per billion in surface water. Numerous validated studies have been conducted to determine what happens to bisphenol A in the environment and the possible environmental impacts. Comprehensive reviews of these studies conclude that bisphenol A is not a risk to the environment." It explains that, unlike mercury, BPA is not persistent in the environment, it does not bioaccumulate, and it does not endanger aquatic ecosystems.¹⁷

¹ ADA Council on Scientific Affairs, *Statement on Bisphenol A and Dental Materials* (July 2010), <http://www.ada.org/1766.aspx>

² British Dental Association, *Position Statement: Bisphenol* (June 2005), <http://www.bda.org/pct-healthbody/policyandcampaigns/science-health/public-health/position-statements/bisphenol.aspx>

³ British Dental Association, *Fact File: Bisphenol A in dental materials* (2011), http://www.bda.org/Images/bisphenol_a_in_dental_materials.pdf

⁴ British Dental Association, *Fact File: Bisphenol A in dental materials* (2011), http://www.bda.org/Images/bisphenol_a_in_dental_materials.pdf

⁵ Canadian Dental Association, *Bisphenol A FAQs*, http://www.cda-adc.ca/en/oral_health/faqs_resources/faqs/bpa_faqs.asp

⁶ Canadian Dental Association & British Dental Association to Globe and Mail (2008)

⁷ ADA Council on Scientific Affairs, *Statement on Bisphenol A and Dental Materials* (July 2010), <http://www.ada.org/1766.aspx>

⁸ IAOMT, *Bisphenol-A in Dental Composites*, <http://www.iaomt.org/articles/files/files276/BPA%20review.pdf>

⁹ Abby F. Fleisch, Perry E. Sheffield, Courtney Chinn, Burton L. Edelstein and Philip J. Landrigan, *Bisphenol A and Related Compounds in Dental Materials*, PEDIATRICS (2010), <http://pediatrics.aappublications.org/content/early/2010/09/06/peds.2009-2693.full.pdf+html>

¹⁰ Association of State and Territorial Dental Directors, *Dental Sealants and Bisphenol A (BPA) Policy Statement* (3 February 2011), http://www.astdd.org/docs/Dental_Sealants_and_BPA_Policy_Statement_February_3_2011.pdf

¹¹ SCHER, *Opinion on the environmental risks and indirect health effects of mercury in dental amalgam* (2008), http://ec.europa.eu/health/ph_risk/committees/04_scher/docs/scher_o_089.pdf, page 16

¹² Joint FAO/WHO Expert Meeting to Review Toxicological and Health Aspects of Bisphenol A, Summary Report (2010), http://www.who.int/foodsafety/chem/chemicals/BPA_Summary2010.pdf

¹³ KEMI, *Bisfenol A* (2/11), http://www.kemi.se/Documents/Publikationer/Trycksaker/Rapporter/Rapport2_11_BisfenolA.pdf, page 9

¹⁴ ADA Council on Scientific Affairs, *Statement on Bisphenol A and Dental Materials* (July 2010), <http://www.ada.org/1766.aspx>

¹⁵ PlasticsEurope, *Environmental Impact of Bisphenol-A (BPA)*, <http://www.bisphenol-a-europe.org/index.php?page=environmental-safety>

¹⁶ American Chemistry Council, Polycarbonate/BPA Global Group, *Bisphenol-A in Dental Composites*, <http://www.bisphenol-a.org/human/dental.html>

¹⁷ American Chemistry Council, Polycarbonate/BPA Global Group, *Bisphenol A Fact Sheet: Environmental Safety* (2007), <http://www.bisphenol-a.org/pdf/FactSheet-environmental.pdf>