Bisphenol A

A real threat in Pediatric Dentistry? Narrative review

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Introduction

Bisphenol A (BPA) is a **chemical xenoestrogen** worldwide used in the **manufacture of polycarbonate plastics** and **epoxy resins**[1-3]. These materials have many applications in industry, including house appliances, food-storage containers and inner coating of metal-based food and beverage cans[1,4,5].

However, several *in vitro* studies have shown that BPA is an **endocrine disruptor** with both **potential estrogenic** and **anti-androgenic effects**[6,7]. In studies involving rodents, fetal and perinatal exposure to environmental BPA levels have induced adverse effects on the reproductive system and development of the animals[3,5,7]. Recently, observational studies have suggested an association between **BPA exposure** and **behavioural and developmental alterations in children** and with **obesity**, **diabetes** and **cardiovascular disease in adults**[2,3,5,8]. These toxicity suggestive data have led the European Commission and the FDA (Food and Drug Administration) to **eliminate the production of BPA-containing plastic baby bottles** and other infant feeding cups[3,10].

In dentistry, BPA is used in the synthesis of **dimethacrylate matrix monomers** – Bis-DMA and Bis-GMA – in **composites** and **sealants**[1,3,6]. Some studies have linked the BPA present in these dental materials, which are particularly used in **Pediatric Dentistry**, to the occurrence of biological changes based on the BPA binding potential to estrogen receptors[1,2,3].

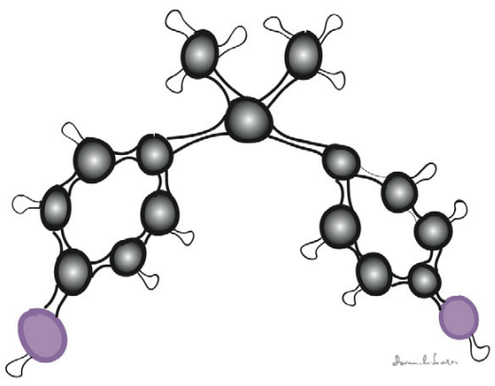

Fig. 1 - Bisphenol A (2,2-bis[4-hydroxyphenyl] propane).

Objectives

The present work aims to provide a **narrative literature review**, featuring BPA exposure when released in the oral cavity and its hypothetical risks to children health.

Material and Methods

The literature search was done in **Pubmed/Medline**, in **English**, using the terms **"Bisphenol A"** *and* **"sealants**" as keywords. The search was limited to studies in **humans** published in the **last 10 years** with **abstract available**. A total of **121 publications** was identified according to the inclusion criteria and **17 were selected** after examining the abstract scientifical content.

Results

	STUDY	OBJECTIVES	RESULTS AND MAIN CONCLUSIONS	
Systematic review	Azarpazhooh *et al.* **2008**	To evaluate the toxicity of BPA in fissure sealants	- Patients **are not at risk** for exposure to BPA	- However, **precautions** are recommended to **reduce** the BPA **toxicity potential** from sealants
	Kloukos *et al.* **2013**	To assess BPA levels in saliva, blood and urine after placement of fissure sealants	- Moderate evidence supports that BPA **is released** in saliva	- BPA exposure is **temporary** and can be potentially controled
Clinical study	Joskow *et al.* **2006**	To assess BPA levels in saliva and urine after placement of two different fissure sealants (in adults)	Delton® Light Cure (LC) (Opaque, Dentsply/Ash, York, Pa.): - **Higher** BPA release	Helioseal F® (Ivoclar Vivadent, Amherst, N.Y.): - Similar to baseline levels
	Downs *et al.* **2010**	To assess BPA levels in saliva and blood after placement of fissure sealants in low-dose and high-dose groups (in adults)	- BPA was **detected in saliva** (higher levels at the one-hour post time period) - BPA was **not detected in blood** samples	
	Chung *et al.* **2012**	To assess BPA levels in urine of patients with composite restorations or fissure sealants (in children)	- **Higher** BPA levels in children with **11 or more surfaces restored or sealed**	
	Maserejian *et al.* **2014**	To evaluate the relationship between exposure to sealants and composites and developmental factors (in children)	- **No association** was found between exposure and child behavioural, neurophysiological and physical development	
	Maserejian *et al.* **2013**	To evaluate the relaionship between exposure to sealants and composites and immune function alterations – 5-year *follow up* (in children)	- **No association** was found	
	Maserejian *et al.* **2012**	To evaluate the relationship between exposure to composites and development (in children)	- **No association** was found with body fat percentage or growth	
	Kingman *et al.* **2012**	To assess BPA levels in saliva and urine before and after placement of composite restorations (in adults)	- **Higher** BPA levels in saliva **1h** after restoration placement - **Higher** BPA levels in urine to **30 hours** after restoration placement - Rubber dam use did not reduce BPA absorption	
	Sasaki *et al.* **2005**	To assess BPA levels in saliva after composite restorations placement (in adults)	- **Higher** BPA levels after restoration placement - Levels normalize after the patient gargles with water	

BPA

- Degradation product[1,3,4] (bisphenol A dimethacrylate [bis-DMA] and bisphenol A glycidyl methacrylate[bis-GMA])
- Trace material – in the production of other components used in composites and sealants[1,4,6];

Incomplete polymerization → Production of residual BPA-containing monomers that remain in the tooth surface[1]

Tooth exposure to the effect of chemical and mechanical factors[1,3,5,6,11]

BPA risk of exposure reduction:

- Patients should gargle with tepid water for 30 seconds
- Wash the dental surface for 30 seconds with water spray while suctioning
- Polish with mild abrasive with a prophy cup
- Rubber dam use[1,3,4]
- Particular efforts should be made in pregnant patients appointments to minimize exposure[2].

Discussion and Conclusions

The obtained **results** are **not unequivocally conclusive** about the existence of a **marked risk to children health**, although several **precautions** after using BPA-containing dental materials are **recommended** to reduce its potential effects. Even though it is recognized the importance of developing additional studies with higher level of evidence in humans, the manufacturers growing concern about minimizing this substance in dental materials is also mentioned in literature.

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