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Cytotoxicity Comparison of 2 Bulk Fill Resin-Composites

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1. Introduction

The use of composite resins as restorative materials in Dentistry has been extensive. However, the toxicity has been linked to some of its components, in particular the monomers present as a result of incomplete polymerization, which may elute into the oral cavity[1,2]. The appearance on the market of a new range of resins that calls the possibility of restoration block with thicknesses up to 4 mm requires further studies in vitro and in vivo to ensure its biocompatibility.

2. Objective

To compare the cytotoxic reaction produced by two different composite resins Bulk fill, namely Filtek™ Bulk Fill (3M™ ESPE) (FBF) and Tetric EvoCeram® Bulk Fill (Ivoclar Vivadent®) (TEC), used in dental restoration, in cultures of fibroblasts in order to infer about their biocompatibility.

3. Methods

Cultures of 3T3 cells (mouse embryonic fibroblasts) (Fig. 1) were incubated in DMEM at 37°C in a humidified atmosphere (5% CO_2/95% air).[3,4]

Discs of each of the resins (4x4mm; n=10/grp, 2 groups) were prepared according to the manufacturer's instructions (single increment) (Fig. 2).[5,6]

Discs incubated in Dulbecco's modified Eagle Medium nutrient mixture (DMEM) (24h, 37ºC, 5% CO_2/95% air) to yield extracts with eluted components.[3,4]

Cultures were exposed to different dilutions of the extracts (10%, 50%, 100%) (24 h, 37ºC, 5% CO_2/95% air).[3,4]

Cell viability was quantified by 3-(4,5-Dimethylthiazol-2-yl)-2,5-Diphenyltetrazolium Bromide (MTT) assay (spectrophotometry, 595 nm).[7]

Cell viability data were statistically analysed by using a two-way ANOVA, at a significance level of 5%, considering resin and extract concentration as main effects.

Fig. 1 — 3T3 fibroblasts observed at the microscope: 1 day after thawing (left); With 80% confluence after 3 days of incubation in DMEM - used in cytotoxicity tests (center); Morphological changes visible after 24h of contact with FBF100% (right).

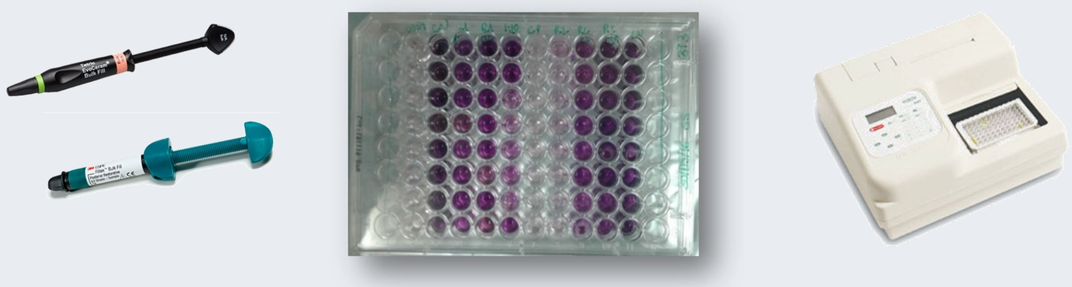


Fig. 2 — TEC and FBF resin-composites[5,6] used in this study (left); The 96-well plate after incubation of the cells for 24 h with the resin extracts and solubilization of the formazan crystals with dimethyl sulfoxide (DMSO), immediately prior to the spectrophotometric analysis (center); Spectrophotometer microplate reader, model 680 (Bio Rad®) (center).

4. Results

Concentration of the extract	Citotoxicity (%)	
	TEC	FBF
100%	72,0	81,1
50%	49,2	39,6
10%	41,5	36,9

Table 1 - Comparative cytotoxicity between the TEC and FBF resins at different dilutions of extract.

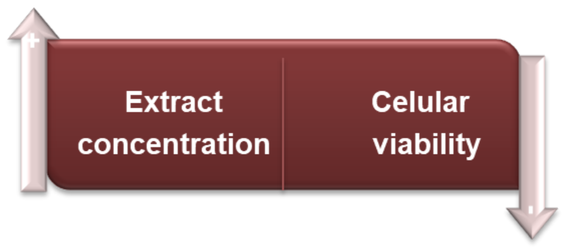
All dilutions of added resin extracts caused high cell death.

No statistically significant differences were observed between the cytotoxicity of the tested resins (p=0.154).

In both resins, there was a decrease in cell viability when increasing extract concentration (p=0.809).

There's a correlation between extract concentration and toxicity.

No interaction effect was identified between resin and extract concentration (p=0.809).



5. Conclusions

- In the first 24h, there was release of cytotoxic components in both resins.
- They were cytotoxic in all dilutions tested, although no significant differences were observed between them.
- The identification of toxic components is important to avoid their use in dentistry.

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