Antibacterial properties of contemporary dental luting agents

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INTRODUCTION: In prosthetic dentistry, acid-base reacting or self-etching cements are used to fixate crowns and bridgeworks onto supporting teeth. In addition to biocompatibility, mechanical integrity and good handling properties, effective dental cements should also inhibit caries or plaque formation. Restoration failures are most often caused by secondary caries [1], developing in small gaps or margins where bacteria can proliferate unhindered. Antibacterial properties of the cement thus becomes of critical importance to preserve the integrity of the restoration for as long as possible. The current study was aimed at evaluating the antibacterial properties of four commercially available dental cements (RelyX™ Unicem, Ketac™ Cem, Ceramir® C&B and Harvard zinc phosphate cement) and two reference materials (glass-ionomer cement and calcium aluminate cement), compared to a negative control material (PMMA).

METHODS: After being prepared in accordance with manufacturer instructions and allowed to set in 1.5 mm deep and 5 mm diameter moulds, the cement samples were aged in 37°C and 100 % relative humidity for 10 min, 1 day or 7 days before testing for antibacterial properties. *S. mutans* suspension, adjusted to 10^9 CFU/mL, was used to determine growth inhibition activity of the investigated cements, as well as the effects of varying pH and the bactericidal effect of fluoride. A method allowing direct contact between the bacteria and the surface under investigation was employed [2], and a metabolic assay was used to quantify remaining viable bacteria. Optical density (OD) measurements were used to determine bacterial proliferation in solutions with pH ranging from 1.5 to 9, as well as in solutions containing up to 2000 ppm fluoride.

RESULTS: The strongest antibacterial properties were found for calcium aluminate, followed by Ceramir and RelyX. Ketac, Harvard and the reference glass-ionomer showed bacteria content either higher than, or not significantly different from the PMMA control in all instances. pH levels below 6.3 and above 9.0 were found to have negative effects on bacterial proliferation, and a continuous reduction in the bacterial growth rate was observed with increasing fluoride concentration

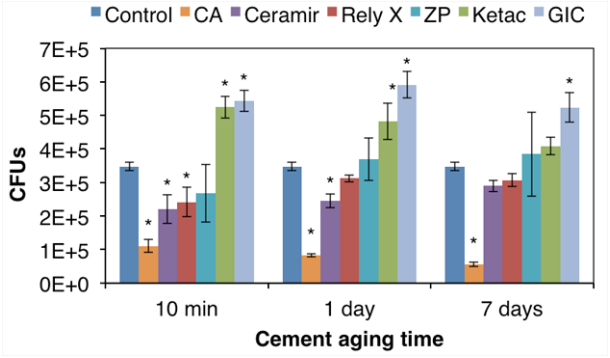

*Fig. 1: CFUs present in solution after direct contact tests. Significant differences ($p < 0.05$) from control indicated by *. Note: First bar in each group shows the same control PMMA data since these samples were not aged.*

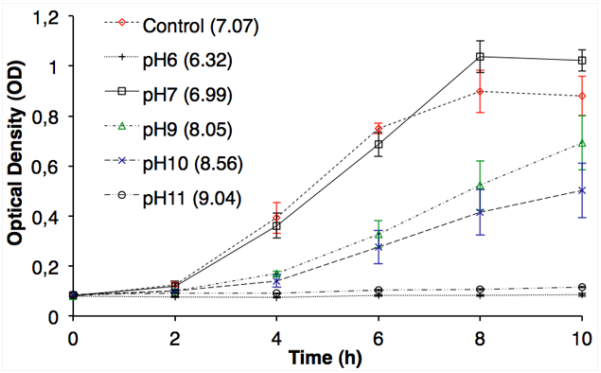

Fig. 2: Growth curves of S. mutans in BHI at different pH buffer/BHI solutions. Value in brackets indicates the resulting pH of buffer/BHI solution.

DISCUSSION & CONCLUSIONS: Low pH and high fluoride concentration reduces bacterial growth rates. However, no correlation between either acidic materials (Ketac, GIC, ZP) or fluoride release (RelyX, Ceramir, GIC) and antibacterial properties could be seen in this study; rather, basic materials (CA, Ceramir) showed stronger antibacterial properties.

REFERENCES: [1] G. Libby et al (1997) *J Prost Dent* **78**:127-31. [2] E. Weiss et al (1996) *Endod Dent Traumatol* **12**, 179–84.