

## Antibacterial activity of dental luting cement

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### Abstract

This in vitro study was conducted to study the antibacterial property of five luting adhesive cements (Panavia Ex, Marycol, Superbond, Glass ionomer, polycarboxylate cement), using a modified agar diffusion test upon inoculated agar by *S. mutans*. This anti-bacterial inhibition property was measured in a semi-quantitative level in two periods of time, one hour and 24 hours intervals. The results show that glass ionomer and polycarboxylate cements are better than others, due to the effects of their fluoride and acid contents. *First published in Dental Update 2004;11(2): 27-9.*

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### Introduction

Microbial infection is the prime cause for the inflammation of the dental pulp and periodontium<sup>1</sup>. Recent findings indicate that even the presence of any residual traces of infection in the site of restoration affects the success of restoration<sup>1,2</sup>. Antibacterial properties of dental materials were studied by many researchers<sup>1,3</sup> and by different methods of testing. The most useful and popular one is the Agar Diffusion Test (ADT)<sup>1,5</sup>. However, it is affected by magnitude of contact area between the agar and the material, the rate of diffusion and the power of inherited antibacterial activity<sup>2</sup>. This study is made to find the antibacterial activity of luting agents used for cementation of prosthesis, which needs to be clarified.

### Material and methods

Selected luting cement was used in this experiment (Table 1). Ten samples of each were prepared by producing cylindrical samples (6x4 mm) in dimension. The standardization of the samples was approximately gained by the use of pre-sterilized cartoon mould<sup>6</sup>.

**Table 1.** Type of luting cements used

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| 1. Panavia Ex, (Cavex, Haarlem, Holland) |
| 2. Superbond (Kuraray Co., Japan)        |
| 3. GI (Fuji Co., Japan)                  |
| 4. Polycarboxylate (Bayer Co., Germany)  |
| 5. Marycol (Voco, Cuxhaven, Germany)     |

A freshly isolated cariogenic bacteria, streptococcus mutans, was used to measure the antibacterial property of luting agent. This strain of bacteria was inoculated and dispersed upon mitis-salivarius Bactracin (MSB) agar (2%) plates and dispersed upon agar plates and incubated at 37° C for 72 hours. A colony of this was re-streaked on (MSB) plates, then inoculated in liquid media. The resultant strains of streptococci mutans were identified according to cellular morphology and biochemical properties. It is seeded on (MSB) agar plates till a resultant outgrowth of (Ca 5 x 10<sup>7</sup> / 200 ml).

The specimen luting agents samples were prepared by mixing each sample according to the manufacturer's instructions and were then seeded in the growth agar at 4°C, every five samples being placed in one plate. The antibacterial property was assessed by the surface area of inhibition zone, and the quantitative measures of antibacterial were obtained using a special simplified scoring system<sup>6</sup> (Table 2).

**Table 2.** Scoring system

Score	Description
0	No antibacterial growth
1	Partial inhibition (Single colony growth)
2	Full inhibition (no growth)

The assessments were made after one hour and 24 hours. The inhibition factor of each sample was assumed by multiplying two diameters of perpendicular inhibitory zones by the score<sup>6</sup>. This agar diffusion test is considered because it is easier, faster and economical<sup>4,6,7</sup>. However, it gives semi-quantitative results.

## Results

Table 3 shows the mean and standard deviations antibacterial effects of the tested luting cements through one hour and 24 hours

estimates. It shows clearly the increase on antibacterial growth through the time of one hour and 24 hours for each type of cement. Polycarboxylate cements show the highest value of antibacterial growth.

**Table 3.** Mean and SD of scores

Types	1 Hour	24 Hours
Panavia Ex	8.75 ± 3.61	15.71 ± 6.89
Superbond	12.65 ± 4.33	22.82 ± 6.77
Fuji GI	23.68 ± 6.89	54.59 ± 9.61
Polycarb-oxylate (Bayer)	36.13 ± 12.76	121.83 ± 40.22
Marycol	3.31 ± 1.98	13.00 ± 3.91

## Discussion

The main use of luting cement is to aid in retention of the casted restoration, as well as to aid in sealing property of the restoration-tooth margins<sup>8</sup>. Therefore it should exhibit some barrier against microleakage with all its problems, such as pulpal irritation, and marginal caries that could be due to bacteriological activity of *S. mutans*<sup>9</sup>. The results in Table 2 show that all the types of luting cements exhibit inhibitory property against *S. mutans*. This was increased clearly after 24 hours. The highest value was found for polycarboxylate cement and glass ionomer cement, because of their better homogenous structure and fluoride and acid contents<sup>4,5,7,11</sup> and might effect electrolyte metabolism and acid consumption of *S. mutans*<sup>12</sup> This property was low for Marycol, Panavia Ex and Superbond materials. This may be due to the presence of methacrylate content, which has a high tendency to present porous structures, thus facilitating microbial growth. This study demonstrates that some luting cements exhibit antibacterial activity, which needs to be clarified and should be added to every luting cement.

### 摘要

该体外研究旨在通过对变形链球菌嫁接的琼脂使用一种改良的琼脂扩散试验, 来研究五种密封胶浆( Panavia

Ex, Marycol, Superbond、玻璃离子、聚羧酸粘剂) 的抗菌性质。这种抗菌抑制特性用一种半量化的方式在两个时间段内测量, 间隔分别为1小时和24小时。结果表明玻璃离子和聚羧酸粘剂因其含氟和酸性物质, 抗菌效果较其它密封胶浆更好。首次发表于 *Dental Update* 2004;11(2): 27-9.

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### Resumen

Este estudio *in vitro* se realizó para estudiar las propiedades antibacteriales de cinco cementos adhesivos (Panavia Ex, Marycol, Superbond, Ionómero vítreo, cemento policaboxilato), y se utilizó una prueba de difusión en agar modificado sobre agar inoculado con *S. mutans*. Se midió esta propiedad inhibitoria antibacteriana a un nivel semi-cuantitativo en dos periodos de tiempo, a intervalos de una hora y 24 horas. Los resultados mostraron que los cementos ionómero vítreos y policaboxilatos son mejores que los otros debido a los efectos de su contenido de fluoruro y de ácido. Publicado primero en *Dental Update* 2004; 11(2): 27-9.

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