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Polymerizable Multifunctional Antimicrobial Quaternary Ammonium Monomers

ADASRI Case # 19-0001

Background

With an ageing population, the global tooth filling materials market is expected to grow to \$2.6 billion by 2027. Resin composite fillings are widely used, offering advantages of color matching and having no mercury content, unlike traditional amalgam. However, a major drawback to their use is that the bonding integrity at the interface between the restoration and the dentin and enamel may become compromised due to stress and exposure to the oral environment. This compromises the margin integrity and allows penetration of bacteria, which can lead to secondary caries, and ultimately, failure of the restoration. Problems with existing potential additives include toxicity, compromised mechanical properties, and questionable long-term effectiveness.

Invention Description

ADA researchers have developed a new series of quaternary ammonium monomers that, when added to dental restorative materials, increase the antimicrobial behavior of the restorative compared to existing products, and in some cases, increase the degree of vinyl conversion of the dental restorative monomers themselves, while maintaining other mechanical properties comparable to existing products. Preliminary data also shows that the materials are not toxic to the surrounding tissues at the physiologically relevant levels of incorporation into the restorative materials.

Potential Applications

The antimicrobial monomers of the present invention may be used as:

- Additives to dental resins and adhesives
- Additives to other implantable polymeric materials
- Additives to other polymeric medical devices (e.g. catheters)

Benefits and Advantages

- Increased antimicrobial activity compared with commercial dental additives (up to 5x for *P. gingivalis* and 100x for *S. mutans*)
- Preliminary data indicates materials are not cytotoxic
- Maintains degree of vinyl conversion comparable with commercial products
- Maintains mechanical properties (flexural strength, Young's modulus comparable with commercial products)
- No adverse effects on color matching for dental restoratives