

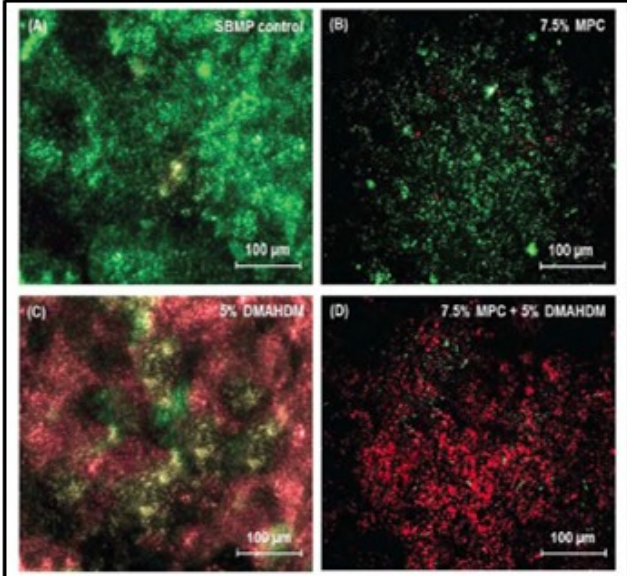
**TECHNOLOGY**

# Protein-Repellant Compositions to Inhibit Protein Absorption and Bacteria Attachment for Dental Applications

**OVERVIEW**

The mechanism underlying dental caries is demineralization through the attack by acid generated by acidogenic bacteria. Acidogenic bacteria growth typically occurs in plaque and biofilm. When biofilms forms at the tooth restoration margins, the demineralization of the enamel and dentin leads to secondary caries, restorative material fractures, and worsening failure of the tooth. Researchers at UMB have developed the first protein-repellent dental composites and bonding agents that can repel biofilm and plaque at the tooth restoration. When combined with the antimicrobial agents and remineralization agents of the invention, secondary caries are significantly reduced.

Protein-repellent adhesive formulations incorporating quaternary ammonium methacrylates, such as 2-methacryloyloxyethyl phosphorylcholine (MPC) can inhibit protein adsorption and bacteria attachment. MPC has been used to repel protein absorption and prevent bacterial adhesion in medical applications but had not been previously used in dental products. UMB researchers have incorporated MPC, new antibacterial quaternary ammonium monomers, and remineralization agents into dental composite and bonding agents. These unique formulations have demonstrated excellent mechanical properties, reduced bacteria attachment, and reduction of secondary caries in animal models.



Typical live/dead staining images of 2-day biofilm growth on resin disks. SBMP: commercial control; **Green:** live bacteria; **Red:** dead bacteria

## **APPLICATIONS**

According to the National Institute of Dental and Craniofacial Research, 92% of adults ages 20-64 in the US have had dental caries in their permanent teeth, with an average of 3.28 decayed or missing permanent teeth and 13.65 decayed and missing permanent surfaces. The CDC reports 84% of all adults in the same age range have had a dental restoration. The US market for dental materials had a market value of ~\$1 billion in 2013 and is expected to grow to \$1.5 billion by 2020. An expanding aging population and the increased prevalence of dental caries is expected to lead to a rise in tooth repair procedures and thus a growing demand for dental restoration supplies such as composite resins, amalgams, bonding agents, and dental ceramics. The dental materials market is very dynamic, as there are continuous technological advancements in the field.

## **ADVANTAGES**

First dental material to inhibit biofilm growth

Can be applied to multiple other types of dental materials

## **STAGE OF DEVELOPMENT**

This technology has been tested in vitro in multiple species of periodontist-related biofilms.

(As of 2/23/2017)- MEW

## **LICENSING POTENTIAL**

Available for licensing

## **CONTACT INFO**

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## **Additional Information**

### **INSTITUTION**

University of Maryland, Baltimore

### **PATENT STATUS**

PCT/US2015/042103

### **LICENSE STATUS**

Available for licensing

### **CATEGORIES**

- Medical implants
- Dental

### **INVESTIGATOR(S)**

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## **ATTACHMENTS**

-  [Download HX-2014-154 Marketing Sheet 5-17-17 FINAL.pdf](#)

## **EXTERNAL RESOURCES**

- [Novel protein-repellent dental adhesive containing 2-methacryloyloxyethyl phosphorylcholine](#)
- [Protein-repellent and antibacterial dental composite to inhibit biofilms and caries](#)
- [A novel protein-repellent dental composite containing 2-methacryloyloxyethyl phosphorylcholine](#)
- [A protein-repellent and antibacterial nanocomposite for Class-V restorations to inhibit periodontitis-related pathogens](#)

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