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Harnessing the antibacterial properties of fluoridated chitosan polymers against oral biofilms

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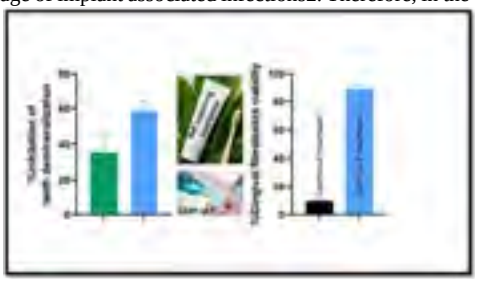
Dental caries is a worldwide endemic chronic disease affecting people of all ages, with high incidence in the young population of developing countries1. Due to the limitations of daily used oral hygiene products, there is an unmet need for new, effective, safe and economic oral hygiene products. Using chitosan as a starting material we exploit a sustainable source and address an environmental issue as the same time. In fact, food waste from the shellfish food industry can be recycled to extract chitin the precursor of chitosan. We have recently demonstrated that N-(2(2, 6-diaminohexanamide)-chitosan (CS3H Lys) has enhanced antibacterial properties against *Staphylococcus aureus*, a bacterium responsible for a high percentage of implant associated infections2. Therefore, in the present study we evaluated its efficacy against *Streptococcus mutans*, the main cariogenic bacterium. We further investigated the effect of fluoridation of this polymer (CS3H Lys F) on its antibacterial properties and the ability to protect teeth from acid demineralization. Finally, the polymers were formulated into mouthwash preparations and their cytocompatibility and physicochemical stability were assessed over 6 months3. CS3H Lys F was found to be 1.6-fold more effective than a 1450 ppm NaF aqueous solution in preventing acid demineralization. This higher efficacy was obtained with a concentration of fluoride ions 3000 times lower compared to the NaF 1450ppm solution used as control. This demonstrated that the mode of delivery of fluoride ions is more important for efficacy that the dose4. CS3H Lys F also had a 3 to 5-fold lower minimum inhibitory concentration value against *S. mutans* than values reported in literature for other chitosan polymers5 and showed negligible cell toxicity. The mouthwash formulation developed containing the chitosan polymers was stable at both 25 and 40°C for 6 months. Further work is under way towards other CS3H Lys F oral hygiene products such as toothpaste.



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Biography

Marta Roldo is a Reader in Biomaterials at the University of Portsmouth. Her research focuses on the development and characterization of novel biomaterials for biomedical applications. She has developed novel polymeric derivatives with antibacterial and anticoagulant properties, and composite hydrogels for tissue regeneration and has an interest in the development of state-of-the-art imaging techniques to visualize oral biofilm and test its removal efficacy using different oral hygiene strategies.

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