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Oluwadamilola M. Kolawole, Wing Man Lau, Vitaliy V. Khutoryanskiy

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## Methacrylated chitosan as a polymer with enhanced mucoadhesive properties for transmucosal drug delivery

Oluwadamilola M. Kolawole<sup>a</sup>, Wing Man Lau<sup>b</sup>, Vitaliy V. Khutoryanskiy<sup>a\*</sup>

<sup>a</sup>Reading School of Pharmacy, University of Reading, Whiteknights, PO Box 224, Reading, RG6 6AD, Berkshire, United Kingdom

<sup>b</sup>School of Pharmacy, The Faculty of Medical Sciences, Newcastle University, Newcastle Upon Tyne, NE1 7RU, United Kingdom

\*Corresponding author at: Reading School of Pharmacy, University of Reading, Whiteknights, PO box 224, Reading, RG6 6AD, United Kingdom. Tel.: +44 (0) 118 378 6119. E-mail address: v.khutoryanskiy@reading.ac.uk

### Abstract

Chitosan is a cationic polysaccharide that exhibits mucoadhesive properties which allow it to adhere to mucosal tissues. In this work, we explored chemical modification of chitosan through its reaction with methacrylic anhydride to synthesise methacrylated derivative with the aim to improve its mucoadhesive properties. The reaction products were characterised using <sup>1</sup>H NMR, FTIR and UV-Vis spectroscopy. <sup>1</sup>H NMR and ninhydrin test were used to quantify the degree of methacrylation of chitosan. Turbidimetric analysis of the effect of pH on aqueous solubility of the polymers revealed that the highly methacrylated derivative remained turbid and its turbidity did not change from pH 3 to 9. However, solutions of native chitosan and its derivative with low methacrylation remained transparent at pH 6.5 and exhibited a rapid increase in turbidity at pH > 6.5. The mucoadhesive properties of chitosan and its methacrylated derivatives were evaluated using flow-through method combined with fluorescent microscopy with fluorescein sodium as a model drug. The retention of these polymers was evaluated on porcine bladder mucosa in vitro. The methacrylated derivatives exhibited greater ability to retain fluorescein sodium on the bladder mucosa compared to the parent chitosan. Toxicological studies using MTT assay with UMUC3 bladder cells show no significant differences in toxicity between chitosan and its methacrylated derivatives suggesting good biocompatibility of these novel mucoadhesive polymers.

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