

Effect of physico-chemical characteristics of chitosan on its binding to corn oil emulsion droplets in an in vitro simulation of the digestive tract.

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Justification: Chitosan is a cationic biopolymer that has been used extensively in dietary supplements to reduce fat absorption in the fight against obesity. The method and degree of fat binding of chitosan is not fully understood and has been the subject of controversy. It is important to gain understanding of the mechanism involved.

Objective: The objective of this study was to investigate how different chitosan preparations influence and bind oil emulsion droplets and the effect of chitosan on different type of oils like corn-, olive- and cod liver oils.

Methods: Different oils were emulsified separately with Tris-HCl buffer, pH 7.8 and phosphatidylcholine in an ultrasonic sonicator. The premix was dyed with a concentrated solution of Nile Red dissolved in acetone. The emulsion was diluted to the final composition of 0.4% oil, 0.0423% phosphatidylcholine, 15mM CaCl₂, 0.15M NaCl, 2mM Tris-HCl buffer, and 6mM bile salts. Chitosan (viscosity 1134, DDA 92% dissolved in 0.05M HCl) was added to the solution to give a final concentration of 0.1%. The pH was increased from pH 2 to 7.5 with NaOH. Samples were collected at pH 2, 4, 6 and 7.5. The samples were then dyed with Calcofluor White. The samples were moved to a Confocal Laser Scanning Microscope and excited with laser at 488 nm and 543 nm.

Results: These results will be correlated with various physical characteristics of the various chitosan preparations and oil emulsions. The results demonstrated that chitosan adsorbed the oil to a different degree depending on the type of oil by forming a gel structure embedding the oil emulsion droplets.

Significance: The results suggest that the gelation of chitosan may be a crucial step for entrapping oil emulsion droplets and thereby decreasing fat absorption and digestion.