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Complexation With Polysaccharides Enhanced Polyphenol Gastrointestinal Stability and Activity

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Objectives: Fruits and vegetables contain dietary polyphenols and polysaccharides. Accumulating evidence suggests that polyphenol-containing whole foods are protective against inflammation-promoted chronic colonic diseases. However, isolated polyphenols are less stable and may not confer the same gastrointestinal health benefits as that of the whole food matrix. Therefore, we hypothesized that the complexation of anthocyanins, a class of polyphenols, with polysaccharides would enhance colonic concentration and stability of anthocyanins, and attenuate impaired barrier function.

Methods: In this study, we first extracted the polyphenols from purple-fleshed potatoes and purified them using C18 cartridges into phenolic acid and anthocyanin fractions and confirmed the purity using UPLC. The fractions were complexed with four different polysaccharides (pectin, inulin, starch, cellulose) and their mixture in equal proportions. SEM images were used to visualize the complexation patterns. The stimulated *in vitro* oral, gastric and small intestine

digestion was used to determine the complexation efficiency and stability of anthocyanins. Intestinal permeability was determined using Caco-2/HT29-MTX co-cultures and FITC-dextran.

Results: Anthocyanins showed significant differences in their complexation pattern with different polysaccharides. After the stimulated *in vitro* digestion, the % loss of total phenolics and anthocyanins of polysaccharide and anthocyanin complexes were shown here for pectin (16.00 ± 1.5 ; 47.13 ± 0.5), inulin (58.95 ± 0.1 ; 80.67 ± 0.09), starch (74.31 ± 3.0 ; 89.81 ± 0.03), cellulose (76.82 ± 1.5 ; 72.11 ± 0.1) and mixture (50.32 ± 3.2 ; 69.90 ± 0.6). Pectin exhibited the best complexation efficiency among different polysaccharides. Caco-2 and HT29-MTX cocultures treated with lipopolysaccharide (LPS) and FITC were used to measure the permeability. Pectin-anthocyanin complex effectively ameliorated LPS-induced increase in cell permeability followed by anthocyanin complexes with the mixture, cellulose, starch, and inulin, respectively.

Conclusions: These results suggest that pectin is the best candidate for the complexation with anthocyanins for improved gastrointestinal stability and barrier function.

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