Inhibition of excessive fructose intake in the small intestine could alleviate fructose-induced diseases such as hypertension and non-alcoholic fatty liver disease. We examined the effect of phytochemicals on fructose uptake using human intestinal epithelial-like Caco-2 cells which express the fructose transporter, GLUT5. Among 35 phytochemicals tested, five, including nobiletin and epicatechin gallate (ECg), markedly inhibited fructose uptake. Nobiletin and ECg also inhibited the uptake of glucose but not of L-leucine or Gly-Sar, suggesting an inhibitory effect specific to monosaccharide transporters. Kinetic analysis further suggested that this reduction in fructose uptake was associated with a decrease in the apparent number of cell-surface GLUT5 molecules, and not with a change in the affinity of GLUT5 for fructose. Lastly, nobiletin and ECg suppressed the permeation of fructose across Caco-2 cell monolayers. These findings suggest that nobiletin and ECg are good candidates for preventing diseases caused by excessive fructose intake.

Nobiletin and ECg inhibited fructose uptake in human intestinal epithelial-like Caco-2 cells presumably by affecting GLUT5.