IN VITRO AND IN VIVO MODELING OF LIPID BIOACCESSIBILITY AND DIGESTION FROM ALMOND MUFFINS: THE IMPORTANCE OF THE CELL-WALL BARRIER MECHANISM

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This study compares in vitro and in vivo models of digestion of lipid from almond particles within a complex food matrix (muffins). It investigates whether the cell-wall barrier mechanism regulates the bioaccessibility of nutrients within this matrix, as has been shown previously for masticated almonds. Muffins (48 g lipid) containing small (AF) or large (AP) particles of almond, with high or low predicted digestibility respectively were prepared. Muffins were digested in triplicate using an in vitro dynamic gastric model (DGM, 1h) followed by static duodenal digestion (8h). AF muffins (almond particle size <450 μm) had 97.1 ± 1.7% of their lipid digested, whereas AP muffins (almond particle size 1700-2000μm) had 57.6 ± 1.1% digested. In vivo digestion of these muffins by an ileostomy volunteer (0-10h) gave similar results with 96.5% and 56.5% lipid digested, respectively. The AF muffins produced a higher postprandial triacylglycerol iAUC response (by 61%) than the AP muffins. Microstructural analysis of small and large almond particles showed that some lipid remained encapsulated within the plant tissue throughout digestion. In vitro modeling of digestion can accurately mimic digestion of complex food matrices in an ileostomy model. The cell-wall barrier mechanism is the main factor in the bioaccessibility of lipid from almond particles.