**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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**Abstract:**
This study compares in vitro and in vivo models of lipid digestion from almond particles within a complex food matrix (muffins) investigating whether the cell-wall barrier regulates the bioaccessibility of nutrients within this matrix. Muffins containing small (AF) or large (AP) particles of almond were digested in triplicate using an in vitro dynamic gastric model (DGM, 1 h) followed by a static duodenal digestion (8 h). AF muffins had 97.1 ± 1.7% of their lipid digested, whereas AP muffins had 57.6 ± 1.1% digested. In vivo digestion of these muffins by an ileostomy volunteer (0–10 h) 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 showed that some lipid remained encapsulated within the plant tissue throughout digestion. The cell-wall barrier mechanism is the main factor in regulating lipid bioaccessibility from almond particles.