The effects of processing and mastication on almond lipid bioaccessibility using novel methods of in *vitro* digestion modelling and micro-structural analysis.

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Abstract:
A number of studies have demonstrated that consuming almonds increases satiety but does not result in weight gain, despite their high energy and lipid content. To understand the mechanism of almond digestion, in the present study, we investigated the bioaccessibility of lipids from masticated almonds during in vitro simulated human digestion, and determined the associated changes in cell-wall composition and cellular microstructure. The influence of processing on lipid release was assessed by using natural raw almonds (NA) and roasted almonds (RA). Masticated samples from four healthy adults (two females, two males) were exposed to a dynamic gastric model of digestion followed by simulated duodenal digestion. etween 7·8 and 11·1% of the total lipid was released as a result of mastication, with no significant differences between the NA and RA samples. Significant digestion occurred during the *in vitro* gastric phase (16·4 and 15·9 %) and the *in vitro* duodenal phase (32·2 and 32·7 %) for the NA and RA samples, respectively. Roasting produced a smaller average particle size distribution post-mastication; however, this was not significant in terms of lipid release. Light microscopy showed major changes that occurred in the distribution of lipid in all cells after the roasting process. Further changes were observed in the surface cells of almond fragments and in fractured cells after exposure to the duodenal environment. Almond cell walls prevented lipid release from intact cells, providing a mechanism for incomplete nutrient absorption in the gut. The composition of almond cell walls was not affected by processing or simulated digestion.