Understanding the Effect of Particle Size and Processing on Almond Lipid Bioaccessibility through Microstructural Analysis: From Mastication to Faecal Collection.

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Abstract:
We have previously reported on the low lipid bioaccessibility from almond seeds during digestion in the upper gastrointestinal tract (GIT). In the present study, we quantified the lipid released during artificial mastication from four almond meals: natural raw almonds (NA), roasted almonds
(RA), roasted diced almonds (DA) and almond butter from roasted almonds (AB). Lipid release after mastication (8.9% from NA, 11.8% from RA, 12.4% from DA and 6.2% from AB) was used to validate our theoretical mathematical model of lipid bioaccessibility. The total lipid potentially available for digestion in AB was 94.0%, which included the freely available lipid resulting from the initial sample processing and the further small amount of lipid released from the intact almond particles during mastication. Particle size distributions measured after mastication in NA, RA and DA showed most of the particles had a size of 1000 μm and above, whereas AB bolus mainly contained small particles (<850 μm). Microstructural analysis of faecal samples from volunteers consuming NA, RA, DA and AB confirmed that some lipid in NA, RA and DA remained encapsulated within the plant tissue throughout digestion, whereas almost complete digestion was observed in the AB sample. We conclude that the structure and particle size of the almond meals are the main factors in regulating lipid bioaccessibility in the gut.