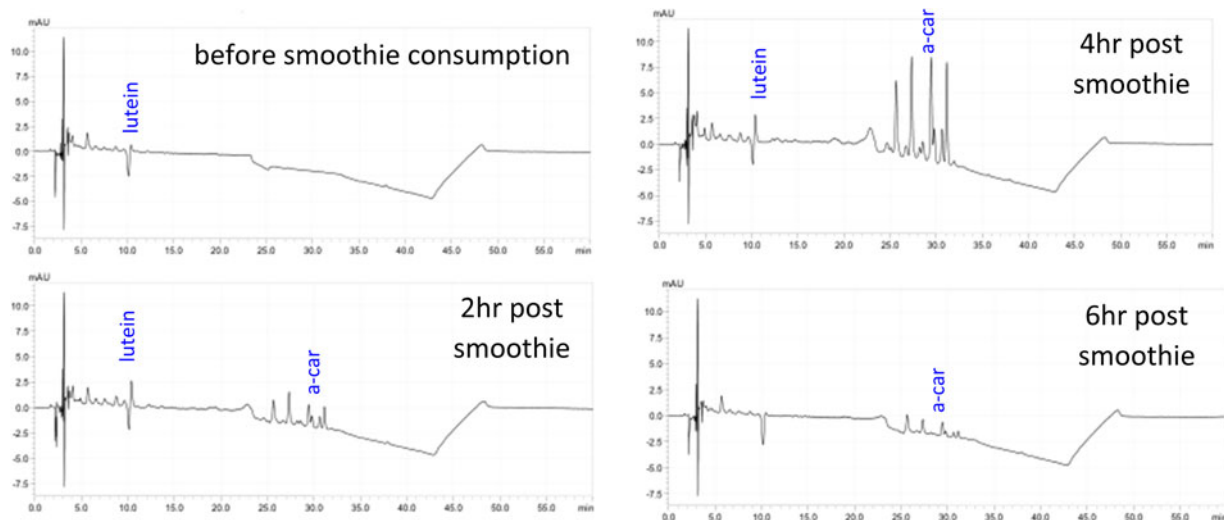


## Absorption of lipophilic micronutrients from smoothie

E.M.S. Robertson<sup>1</sup>, G.H. Evans<sup>2</sup> and B.A. Graf<sup>1</sup>

<sup>1</sup>Food and Nutrition, Department of Health Professions, Faculty of Health, Psychology and Social Care, Manchester Metropolitan University, M15 6BG Manchester. and <sup>2</sup>School of Healthcare Science, Faculty of Science and Engineering, Manchester Metropolitan University, M1 5GD Manchester.

Lipid soluble nutrients are packaged into chylomicrons immediately after absorption<sup>(1)</sup>. Isolation of chylomicrons from human plasma and analysis of micronutrient content allows the investigation of relative bioavailability of recently ingested micronutrients. Biological effects can only occur if bioactive molecules are absorbed and transported to target tissues. Efficient absorption of functional food compounds is essential when considering the development of functional food including food supplements, medicinal food, optimised food for the elderly population and for cost-optimized food in developing nations. Using carotenoids as model compounds this study tested the usefulness of a chylomicron isolation protocol for future bioavailability studies.



**Fig. 1.** Carotenoid content in chylomicrons. Chylomicrons were isolated from fresh plasma and carotenoid content was identified by HPLC-DAD at 450 nm.

Participants (n = 3) were on a carotenoid restricted diet for 24 hours (h). After a 12 h overnight fast a carotenoid rich smoothie (36 mg/500 mL) was consumed and blood was collected at 0, 2, 4 and 6 h. Chylomicrons were isolated from plasma via density gradient ultracentrifugation<sup>(2)</sup>. Carotenoids were extracted from plasma, chylomicrons and smoothie, identified and quantified by HPLC-DAD with a high sensitivity flow cell. Carotenoid content in chylomicrons was absent at time 0, and increased at time 2, 4 and 6 h (Figure 1), indicating that the chylomicron fraction contained recently absorbed carotenoids derived from the smoothie.  $\beta$ -carotene content in chylomicrons (expressed as nmol/L plasma, i.e. carotenoid content in the chylomicron fraction present in 1L of plasma) peaked at 4 h with 50, 28 and 34 nmol/L in participants A, B and C. In contrast,  $\beta$ -carotene content in whole plasma was 351, 887 and 283 nmol/L at baseline and increased to 404, 994 and 776 ng/mL at 4 h, in participant A, B and C, respectively. It is concluded that the chylomicron fraction is indeed a useful vehicle for the determination of recently absorbed carotenoids.

1. Reboul E, Borel P (2011) *Progress in Lipid Research* **50**, 388–402.

2. Brown MJ, Ferruzzi MG, Nguyen *et al.* (2004) *American Journal of Clinical Nutrition* **80**, 396–403.