

Are Fatty Acids of Cheek Cells Adequate Biomarker for the Fatty Acid Status after a Supplementation with Linseed Oil and Olive Oil?

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Background: For the detection of the fatty acid (FA) status in humans, biomarkers of choice are blood fractions, like plasma, red blood cells or peripheral mononuclear cells. For the subjects the invasive sample removal is an unpleasant part in human intervention studies. Cheek cells may be a non-invasive alternative.

Aim: To investigate the expressiveness of oral cheek cells as a biomarker for dietary FA intake, cheek cells were collected during a human intervention study involving an ALA-rich (*n*-3) linseed oil and oleic acid-rich (*n*-9) olive oil supplementation.

Methods: The collection of the cheek cells was performed by scraping the inside of a cheek with a brush from 38 subjects. Over an 8 week period an ALA-rich linseed oil was supplemented to the test group (*n*=23), while the control group (*n*=15) received olive oil (*n*-3-free). Cheek cells and blood were collected on day 0, 7 and 56 of the study.

Results: ALA portion in cheek cells was significantly increased from 0.27% FAME (baseline) to 0.38% FAME after 7 days and to 0.51% FAME after 56 days of linseed oil supplementation. Additionally, endogenously converted long chain *n*-3 metabolites like ETA and EPA increased significantly. The olive oil supplementation did not affect the *n*-3-PUFA levels in cheek cells while the oleic acid significantly increased. Cheek cell DHA neither changed during the intervention with ALA-rich linseed oil nor with *n*-3-free olive oil. Reflecting the intervention the *n*-6/*n*-3 ratio in cheek cells decreased in the test group whereas in the olive oil group this ratio remained unchanged. The analysis of blood fractions generally confirmed observed alterations in cheek cells.

Conclusion: The increase of long chain *n*-3 PUFA in cheek cells reflects that a regular use of ALA-rich linseed oil can improve the *n*-3 PUFA status. Fatty acids of cheek cells can be considered as adequate non-invasive biomarker for the detection of the fatty acid status after a supplementation with linseed oil and olive oil.

ALA, alpha-linolenic acid; EPA, eicosapentaenoic acid; ETA, eicosatetraenoic acid; DHA, docosahexaenoic acid; FAME, fatty acid methyl ester;