



HAL
open science

First characterization of lipid emulsification in the human stomach

Martine Armand, Patrick Borel, C Dubois, M Senft, J Peyrot, J Salducci, H Lafont, D Lairon

► **To cite this version:**

Martine Armand, Patrick Borel, C Dubois, M Senft, J Peyrot, et al.. First characterization of lipid emulsification in the human stomach. *Reproduction Nutrition Development*, 1994, 34 (6), pp.618-618. hal-00899694

HAL Id: hal-00899694

<https://hal.science/hal-00899694>

Submitted on 11 May 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Nutr 55, 81-88], we tested the postprandial 'fiber effect' of the supplementation with RS.

Six volunteers tested the control meal as a breakfast (providing 2 600 kJ, 20% as proteins, 40% as lipids, 40% as carbohydrates) and the supplemented meal (control + 26 g dry raw potato starch (RPS) providing 22 g RS) at one-week intervals, in a random order. Vitamin A (100 000 UI) was added to each meal, since postprandial plasma vitamin A ester was used as a marker for exogenous lipid metabolism. Blood samples were collected every 30 min for 7 h from the beginning of the meal. Glucose, insulin, triglycerides (TG), total cholesterol and vitamin A ester concentrations were measured in plasma. Chylomicron fraction was isolated from the plasma and TG and cholesterol were analyzed.

The supplementation with 30 g RPS did not modify postprandial glycaemia and insulinemia. While RPS provided a small fraction of digestible starch (5 g), this was not perceptible on glycaemia. In the same way, no significant effects on mean plasma and chylomicron TG and cholesterol responses were observed. However, 2 out of the 6 subjects, with high basal TG levels (1.8 and 1.9 mmol/l) had their chylomicron TG and cholesterol decreased by the supplementation. Plasma vitamin A ester response decreased from 0.42 ± 0.10 g/l to 0.29 ± 0.08 g/l over 7 h (mean \pm SEM, $n = 6$), meaning that RS supplementation altered intestinal lipid absorption. While the supplementation of a normal meal by RS had little or no effects on postprandial blood parameters of normal subjects, the intestinal absorption of lipids appeared to be impaired and chylomicron remnant clearance improved in the case of 2 subjects with high fasting TG levels. These findings should be confirmed on hypertriglyceridemic patients.

First characterization of lipid emulsification in the human stomach.

M Armand¹, P Borel¹, C Dubois¹, M Senft¹, J Peyrot², J Salducci², H Lafont¹, D Lairon¹ (¹ *Unité 130-INSERM (National Institute of Health and Medical Research), 18, avenue Mozart, 13009 Marseille;* ² *Service d'Hépatogastro-Entérologie, CHU Nord, 13015 Marseille, France*)

Fat emulsification is a key step in fat digestion. For instance, the available lipid droplet surface is a

rate-limiting step on lipase action, as recently shown *in vitro* [Armand *et al* (1992) *J Nutr Biochem* 3, 333-341; Borel *et al* (1994) *J Nutr Biochem* 5, 124-133]. Though believed to be important, fat emulsification has never been studied in the human digestive tract. Thus, this study aims to determine the extent of fat emulsification in the stomach of healthy subjects, and the influence of lipolysis on gastric lipase.

Each subject was given a coarsely emulsified test meal (droplet median diameter: 52.9 μ m) through a naso-gastric tube. The meal contained commercial olive oil, 1 raw whole egg, 1 egg white and sucrose and was brought to a total volume of 400 ml with 0.15 mmol/L NaCl. The liquid meal provided 960 kcal (4010 kJ) with 29.5% carbohydrate, 65.5% fat and 5.0% protein. The meal also contained a reasonable amount of cholesterol (about 250 mg) and the triglycerides/phospholipides ratio (w/w) was close to 40:1 which is representative of usual western diets.

Gastric contents were collected 1, 2, 3 and 4 h after intubation of the test meal. Gastric lipase activity was determined using a pH-Stat titrator, the different lipid classes (free fatty acid, monoglycerides, diglycerides, triglycerides, and cholesterol) were analysed by thin-layer chromatography and video-densitometry, and fat globule size was measured using a particle-size analyser (Capa 700).

Gastric lipase activity was about 25 000 U/L 1 h after meal intake and steadily returned to higher levels close to value measured in the fasting state after 4 h (56 000 U/L). The extent of olive oil triglyceride lipolysis was in the range of 9-12%.

As regards fat globule size, we observed that during intra-gastric digestion, non-emulsified fat (droplet diameter ≥ 100 μ m) represented a minor fraction. A significant amount of large 70-100 μ m lipid droplets present in the test meal disappeared and fine 1-10 μ m droplets were generated. Thus, the emulsion median diameter decreased (21.9 vs 52.9 μ m) and consequently emulsion surface area increased (1.56 vs 0.58 m²/g), indicating a significant increase of dietary lipid emulsification.

In conclusion, the present data demonstrate for the first time that in human stomach most dietary lipids are present in the form of emulsified droplets, in the range of 20-40 μ m, and that gastric lipolysis (12%) can play an important role in fat digestion by facilitating fat emulsification.