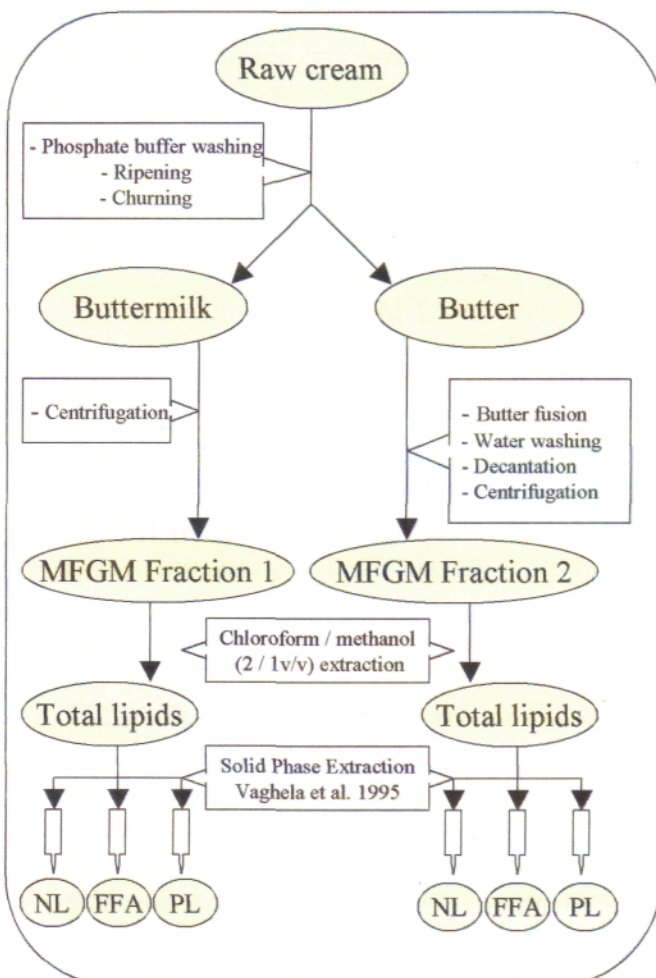


Introduction

The milk fat globule membrane (MFGM) surrounds the lipid core and prevents the fat globule from coalescing. This emulsifying property is certainly linked to the MFGM composition and its particular organisation. Of mammary secretory cell origin, MFGM consists of a complex trilayer membrane composed for half of proteins, mainly enzymes, glycoproteins, and half of lipids of which approximately 69 % is triacylglycerides, 27% is phospholipids (including in majority sphingolipids, phosphatidylcholine and phosphatidylethanolamine), 3% is cholesterol and the rest is other minor components such as glycolipids (Danthine et al., 2000; Miura et al., 2004).

This study constitutes a preliminary step on the MFGM extraction from raw cream. It contributes to a larger research which aims at the fractionation and the characterisation of MFGM lipidic classes using emerging technological processes and specific analytical methods like HPLC-ELSD and LC-MS. MFGM extraction procedure is described here and the corresponding results of MFGM composition are presented and compared.

Experimental strategy



Results

MFGM extraction yield is 0,93 +/- 0,03g MFGM / 100g lipids for fraction 1 extracted from buttermilk and 0,58 +/- 0,08g MFGM / 100g lipids contained in raw cream for fraction 2 extracted from melted butter

MFGM proteins and lipid classes extracted from raw cream by the proposed procedure (in mg / 100g lipids contained in cream)

	MFGM fraction 1 mg / 100g lipids contained in cream	MFGM fraction 2 mg / 100g lipids contained in cream	Total MFGM mg / 100g lipids contained in cream
Proteins	331 +/- 25	124 +/- 13	455 +/- 38
Neutral lipids	321 +/- 4	244 +/- 37	565 +/- 41
Free fatty acids	28 +/- 1	9 +/- 1	37 +/- 2
Polar lipids	145 +/- 7	108 +/- 16	253 +/- 18

Protein and fat contents of MFGM fractions 1 and 2

	MFGM Fraction 1	MFGM Fraction 2
Protein content / dry MFGM (%)	36,9 +/- 1,6	23,7 +/- 0,9
Fat content / dry MFGM (%)	55,1 +/- 0,9	69,0 +/- 0,5
Lipids / proteins ratio	1,5	2,9

Lipid classes separation of MFGM fractions 1 and 2

	MFGM Fraction 1	MFGM Fraction 2
Lipid classes	% / total lipids	% / total lipids
Neutral lipids NL	65,0 +/- 1,2	67,6 +/- 1,1
Free fatty acids FFA	5,7 +/- 1,6	2,5 +/- 0,9
Polar lipids PL	29,4 +/- 2,5	29,9 +/- 1,1

Conclusion

Following the proposed extraction process, a yield of 1,5g MFGM / 100g lipids contained in raw cream is achieved. The MFGM removed from cream is the sum of two fractions resulting of the disruption of lipid cores. MFGMs extracted from buttermilk and from melted butter present a different lipid/protein ratio (1,5 and 2,9 respectively), although lipid classes profiles are similar.

According to Corredig et al., 2003, the potential phospholipids yield from MFGM in buttermilk is about 0,25 mg/mg protein. By cream washing with phosphate buffer, we achieved a potential polar lipids yield of 0,44 mg/mg protein from MFGM in buttermilk and 0,87 mg/mg protein from MFGM in melted butter.

Research works are now concentrating on the analytical characterisation of the molecular components of the different extracted lipidic fractions.

Bibliography :

- Corredig M., Roesch R.R., Dalgleish D.G., 2003. Production of a novel ingredient from buttermilk. J. Dairy Science. 86 - 7- 2377-2383.
- Danthine S., Blecker C., Paquot M., Innocente N., Deroanne C., 2000. Evolution des connaissances sur la membrane du globule gras du lait: synthèse bibliographique. Lait, 80 - 209-222.
- Miura S., Tanaka M., Suzuki A., Sato K., 2004. Application of phospholipids extracted from bovine milk to the reconstitution of cream using butter oil. JAOCS, 81- 1, 97-100.
- Vaghela M.N. and Kilara A., 1995a. A rapid method for extraction of total lipids from whey protein concentrates and separation of lipid classes with solid phase extraction. JAOCS, 72 - 10, 1117-1121.