

1150 Extraction of lipids from buttermilk using supercritical carbon dioxide. Johanna C. Astaire*¹, Harit K. Vyas¹, and Rafael Jiménez-Flores¹, ¹*Dairy Products Technology Center; California Polytechnic State University, San Luis Obispo.*

Buttermilk contains the milk fat globule membrane (MFGM), a material that possesses several lipids known to function as intracellular signaling molecules. For example, certain sphingolipids contained in the MFGM influence apoptotic pathways in cancer cells. These anticancer properties make them good candidates for use as potential therapeutic agents, or health enhancing supplements. In order to purify these potentially beneficial lipids without the use of conventional lipid extraction solvents not generally recognized as safe, we employed supercritical fluid extraction (SFE) using carbon dioxide as the only solvent. SFE is a method that employs achieving a solvent's supercritical state by using temperature and pressure conditions above a solvent's critical temperature and pressure points; carbon dioxide is frequently used as the solvent. In this state the solvent possesses a gas-like viscosity, allowing it to easily infiltrate a variety of samples. When introduced to the solvent specific compounds are solubilized, allowing them to be separated when the solvent is returned to ambient conditions. By optimizing conditions to remove nonpolar lipids with SFE we increased the purity of the MFGM lipids in our starting product; buttermilk powder, and microfiltered buttermilk powder processed to concentrate the MFGM were used. The conditions of extraction were 32 MPa, 333 Kelvin, and a constant flow rate of carbon dioxide at 25 g/min over two duplicate runs of 100 minutes. Thin Layer Chromatography (TLC) was used to obtain lipid profiles of the starting sample before and after extraction, and the product removed from the sample. The following solvent systems were used: petroleum ether:ethyl ether:acetic acid (85:15:1)(v:v) to analyze nonpolar lipids, and chloroform:methanol:water (65:25:4)(v:v) to analyze polar lipids (including the MFGM lipids). Standards were used to verify lipids present. The extraction process removed a fraction containing all nonpolar lipids, while the remaining sample retained all the MFGM polar lipids of interest.

Key Words: Buttermilk, Milk fat globule membrane (MFGM), Supercritical fluid extraction (SFE)