Dairy Lipids

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The great nutritional and commercial importance of butterfat has prompted extensive studies of bovine milk triacylglycerols. These studies have emphasized the complexity of bovine milk fat composition, the analysis of which has required combined application of complementary analytical systems. It has been estimated that bovine milk contains some 400 different fatty acids, making 64 million triglyceride species possible [Jensen, R.G., A.M. Ferris and C.J. Lammi-Keefe, *J. Dairy Sci. 74*:3228 (1991)]. Considering only the ten major acids, which make up just over 90% of the total, the number of molecular species would reach 1,000. However, with each of the minor acids combined with two major acids, the proportion of the minor triacylglycerols would approach some 30% of total butterfat. Therefore, compositional and structural analyses of butterfat become a major undertaking, and only a few laboratories have made significant progress.

The analytical manuscripts included here (presented at the 1992 AOCS Annual Meeting; held in Toronto, Canada) represent the more successful chromatographic and mass spectrometric applications for determining the natural and modified bovine milk triacylglycerol profile and structure. The manuscripts present actual experimental results obtained with these techniques, and not merely a demonstration of their potential. We begin with papers on the structure of disaturated monoenoic triacylglycerols (Laakso and Kallio), and on saturated dimonoenoic triacylglycerols (Laakso and Kallio) in winter butter. The next two manuscripts describe the chiral nature of the short-chain triacylglycerols (Itabashi *et al.*), and the identification and quantitation of some of the less common isologous short-chain triacylglycerols (Myher *et al.*). Another paper presented at the Symposium, concerning the identification of natural butterfat triacylglycerols by a combined application of high-performance liquid chromatography and gas–liquid chromatography, was withdrawn from this collection of papers and has appeared in detail elsewhere [Gresti, J., M. Bugaut, C. Maniongui and J. Bezard, *J. Dairy Sci. 76*:1850 (1993)]. The studies on natural butterfat are concluded by a paper on modern methods of industrial fractionation of bovine milk fat along with determination of structure of the subfractions obtained (Deffense). These five papers are complemented by a description of the fractionation of lipase-modified butter oil (Kemppinen and Kalo) and the determination of the structure of enzymatically modified butterfat (Kalo and Kemppinen).

The above studies present, for the first time, complete details of the structure of bovine milk fat triacylglycerols, including the identification of significant numbers of both major and minor molecular species. The data provide information about milk fat structure not previously available for designing rational experiments in nutritional and clinical studies, as well as for a sound discussion of the role of butterfat in health and disease. Furthermore, these papers provide definitive triacylglycerol structures for the assessment of chromatographic behavior of other ruminant milk fat triacylglycerols separated under comparable conditions.

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