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THE EFFECT OF UNSATURATIONS ON SPHINGOMYELIN- AND CERAMIDE-INDUCED LATERAL DOMAIN SEGREGATION IN LIPID MEMBRANES.

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Sphingomyelins (SM) are important phospholipids in plasma membranes of most cells. Due to their mostly saturated nature (commonly 16:0, 18:0 and 24:0 N-linked acyl chains), they affect the lateral structure of membranes. These SM can interact with cholesterol (Chol) and ceramide (Cer) and give rise to the formation of highly ordered lipid domains, either fluid or gel. However, SM containing 24:1 N-linked acyl chains are also common in most tissues and have been described as unable to form ordered domains in the presence of Chol, apparently because of their unsaturated chain. Thus, unsaturated SM could act as a natural tool for preventing lateral phase separation in cell membranes. The aim of this study was to determine the influence of unsaturated SM and Cer in the formation of SM-Chol-Cer segregated lateral domains. Membrane models (liposomes or supported planar bilayers) of dioleoylphosphatidylcholine, SM, Chol and Cer were built, using SM and Cer containing either 16:0, or 24:1, or a mixture of both. The samples were analyzed by differential scanning calorimetry (DSC), confocal microscopy and atomic force microscopy (AFM). Contrary to what was expected, 24:1SM did not systematically prevent the formation of Cer-rich domains. The results obtained using both 24:1 Cer and 16:0 Cer in the same sample depended on the SM: (i) 16:0 SM induced the formation of homogeneous bilayers, whose properties were close to a 24:1 Cer domain, (ii) 24:1 induced lateral phase separation, with formation of domains whose physical properties differed from those of the continuous phase. Partly supported by Mineco BFU 2015-66306. Busto et al. (2014) Biophys. J. 106:621. Mate et al. (2014) Biophys. J. 106:2606.