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Enhancement of Intestinal Absorption of Lipophilic Compounds by Archaeal Membrane Lipids

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Summary

The third domain of life, now commonly referred to as the archaea, is a surprising collection of biochemical motifs, some resembling those of prokaryotes and eukaryotes and others resembling neither. The identification of unique archaeal motifs and functions has revolutionized scientific views of life's adaptability. In this study, we evaluated the effect of archaeal membrane lipids on intestinal absorption of lipophilic compounds for utilization of unique archaeal components. Membrane lipids were prepared from the aerobic hyperthermophilic archaeon *Aeropyrum camini* and *Aeropyrum pernix* K1. The two dimensional TLC showed a simple composition of the membrane lipids and major lipids were archaetidyl(glucosyl)inositol and archaetidylinositol. We investigated the absorption of cholesterol, carotenoids (fucoxanthin and astaxanthin), and coenzyme Q10 in mixed micelles containing archaeal lipids by differentiated Caco-2 cells, which is a useful model for studying the absorption of dietary compounds by intestinal cells. The cellular uptake of these lipophilic compounds from mixed micelles containing archaeal membrane lipids was 1.7 - 4.8 times higher than from mixed micelles containing only lysophosphatidylcholine (lysoPC). These results strongly suggested that archaeal membrane lipids enhance the intestinal absorption of the lipophilic compounds.