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# The role of lipids in cellular membrane

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## DESCRIPTION

Lipids are a diverse group of chemically diverse compounds. Because the majority contain Fatty Acids (FA), these compounds are useful for studying processes ranging from the cellular to the macroscopic levels of organisation. FA have structural functions as constituents of phospholipids, which are the "building blocks" of cell membranes; they serve as storage materials in cells as part of neutral lipids; and FA derivatives are involved in cell signalling. FA analysis and metabolism are important in many fields of study, including biology, bacteriology, ecology, human nutrition, and health.

Specific FA and their ratios in cellular membranes could be used as biomarkers to identify organisms, study bacterial cell adaptation to toxic compounds and environmental conditions, and reveal food web connections. In this study, they discuss the various roles of FA in prokaryotes and eukaryotes, as well as how FA analysis can be used to elucidate ecological mechanisms. They examine the role of Poly Unsaturated Fatty Acids (PUFA) and the suitability of using FA as biomarkers of organisms, as well as the role of FA as modulators of cell membrane properties and FA ability to store and supply energy to cells. The cellular envelop in prokaryotes plays a critical role in protecting these organisms from their surroundings.

Gram-negative bacteria have a thin peptidoglycan cell wall surrounded by a lipopolysaccharide-rich outer membrane, whereas gram-positive bacteria do not have an outer membrane but have a thick peptidoglycan layer in their cell walls. Cell walls in the phylum action bacteria, which includes genera like *Rhodococcus*, *Mycobacterium*, and *Nocardia*, contain mycolic acids, which are complex hydroxylated branched-chain long fatty acids. The cellular membrane is a phospholipid bilayer that protects and surrounds the cytoplasm in all cells.

The phospholipids, which have a polar head group and two hydrophobic FA tails, contribute to the amphiphilic nature of cyto plasmatic membranes. In aqueous environments, these molecules spontaneously form bilayers. The lipids in archaea contain distinct condensed isopropyl units that are linked to the sn-glycerol-1-phosphate backbone *via* ether bonds.

The carbon chains in prokaryotic and eukaryotic cells are mostly linear, but archaeal lipids are branched every fourth carbon, with a single methyl group linked to these carbon atoms. The ability of these organisms to resist and thrive under extreme environmental conditions has been attributed to the unique structure of archaeal lipids and their stereo specificity. Despite this, archaeal strains have been discovered in non-extreme environments and bacteria in extreme ones. Bacteria can make membrane ether lipids, and archaea can make non-ether-linked FA. This suggests that prokaryotes modulate their membrane in response to environmental signs.

Microorganism's ability to maintain biological functions under stressful environmental conditions may involve changes in their protein, sterol, hopanoid, and carotenoid content, but it is primarily accomplished through changes in the lipid composition of their cellular membranes. Because one of the mechanisms by which cells generate metabolic energy occurs at the membrane, where energy transducing systems convert chemical (or light in phototrophs) energy into electrochemical energy or vice versa, cellular membrane integrity is critical for cell survival. Through a mechanism known as "homeoviscous adaptation," cells attempt to maintain membrane fluidity by changing the FA composition of the membrane phospholipids.