

The role of dietary fats in cellular function and metabolic regulation

 **Nataša Moser***

General Hospital "Dr. Josip Benčević", Slavonski Brod, Croatia

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***ADDRESS FOR CORRESPONDENCE:** Nataša Moser, Opća bolnica "Dr. Josip Benčević" Slavonski Brod, Andrije Štampara 42, HR-35000 Slavonski Brod, Croatia. / Phone: +385-98-90-84-215 / E-mail: natasa.moser@gmail.com

ORCID: Nataša Moser, <https://orcid.org/0009-0007-1764-6966>

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The importance of proper nutrition, encompassing both dietary diversity and a balanced intake of nutrients, is now indisputable. In the modern food pyramid, the position of fats has undergone a remarkable transformation compared to that of the 1990s, shifting from the top to the bottom. This change reflects a growing body of evidence emphasizing the fundamental significance of both the quantity and quality of dietary fats^{1,2}. Those fats form the lipid pool that serves as a source of fats for many essential physiological functions, for example, they are fundamental components of cellular membranes, forming the hydrophobic tails of phospholipid bilayers. The completer and more balanced the lipid pool, the better the structural and functional integrity of the cell membrane. The quality and proportion of lipids within membranes determine not only membrane fluidity and permeability but also the efficiency of cellular metabolism. Just as maintaining a balanced dietary intake of saturated, monounsaturated, and polyunsaturated fatty acids is essential, their proportional balance within the membrane structure is equally critical. An excessive amount of either saturated or unsaturated fatty acids disrupts the integrity of the cell membrane due to its rigidity and permeability and stimulates cholesterol synthesis as a compensatory mechanism. The relative proportion of polyunsaturated fatty acids, particularly omega-6 and omega-3, also influences inflammatory potential. During membrane remodeling, these fatty acids are released and metabolized into pro- or anti-inflammatory mediators. While inflammation is an essential defensive mechanism involved in immune responses and tissue repair, an excess of pro-inflammatory mediators, because of an excess of their precursors, such as arachidonic acid (omega-6), may lead to a self-sustaining inflammatory cycle. This uncontrolled process can result in chronic inflammation, a key contributor to many metabolic and degenerative diseases^{1,3}. Cell membranes and their fatty acid composition are therefore crucial determinants of overall cellular metabolism. The molecular characteristics of the membrane should not be neglected in clinical practice, as its lipid profile reflects both intrinsic biosynthetic capacity and long-term dietary habits.

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LITERATURE |||||

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