

## The Role of Polyunsaturated Fatty Acids in Dairy Products and Their Impact on Human Health: A Review

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**Abstract:** Dairy products are carriers of bioactive compounds such as polyunsaturated fatty acids (PUFA), including  $\alpha$ -linolenic acid, linoleic acid, and Arachidonic acid, along with their metabolites. These compounds give dairy products their health-promoting and therapeutic properties for the treatment and prevention of life-threatening diseases, such as cardiovascular diseases, digestive disorders, inflammation reduction, improved immune biomarkers, and mitigating the impact of diabetes and cancer. Consequently, food and dairy industry trends are shifting towards developing functional foods from animal sources like milk, fortified with polyunsaturated fatty acids. This can be achieved by altering the diet of milk-producing animals or fermenting milk with lactic acid bacteria to enhance its health properties. This review provides an overview of the effects of PUFA and their metabolites on the body's biomarkers, highlighting their role in reducing plasma triglycerides without affecting body weight or levels of low-density lipoprotein (LDL).

**Keywords:** PUFA • CLA •  $\alpha$ -linolenic acid • LDL • Prostaglandins.

## INTRODUCTION

The rapid economic development in recent years has led to a significant change in human lifestyle, resulting in a substantial increase in the prevalence of chronic diseases such as cardiovascular diseases, diabetes, inflammation, and hypertension, which are major causes of death worldwide compared to other causes of mortality (Organization, 2020). The most significant risk factors contributing to chronic diseases include an unhealthy diet characterized by high blood pressure, elevated blood lipid levels, obesity, diabetes, osteoporosis, and cancer (Ministerio *et al.*, 2016). Consequently, the cost of healthy food has increased, prompting some governments to promote and develop dietary systems that provide health benefits, leading to the emergence of functional foods that reduce the risks of these diseases (Durán & Valenzuela, 2010). Functional foods are defined as foods that serve three functions: providing essential nutrition for survival, sensory function based on taste, smell, and texture, and physiological function by positively affecting health (Yamada *et al.*, 2008). One of the widely used functional foods is dairy products, as they contain secondary fermentation products resulting from the fermentation of milk by lactic acid bacteria. These products include organic acids, active compounds, and bioactive peptides that enhance health, as well as reducing lactose content, benefiting lactose-intolerant consumers. Additionally, they prolong shelf life and improve sensory and nutritional characteristics of food (Nyanzi *et al.*, 2021). In general, consuming functional foods, including dairy products, helps reduce the risk of diseases. It has been observed that the consumption of dairy products leads to a decrease in saturated fatty acids, total cholesterol, triglycerides, and low-density lipoprotein (LDL) cholesterol, while increasing high-density lipoprotein (HDL) cholesterol and beneficial polyunsaturated fatty acids (PUFA), including docosahexaenoic acid, Arachidonic acid, and eicosapentaenoic acid, which have bioactive properties (Dawczynski *et al.*, 2010). Furthermore, Al Musa and Al Garory (2022) noted that dairy products are known to prevent Hypothyroidism, reduce harmful LDL cholesterol, and increase beneficial HDL cholesterol, thereby reducing the risk of cardiovascular diseases.

### Polyunsaturated fatty acids (PUFA) :

Polyunsaturated fatty acids (PUFA) are fat-soluble and beneficial for health due to their multiple unsaturated bonds. They are divided into  $\alpha$ -linolenic acid and linoleic acid, as well as long-chain fatty acids such as docosahexaenoic acid, Arachidonic acid, and eicosapentaenoic acid (Islam *et al.*, 2023). PUFA are essential fatty acids obtained from food, with a high presence of n-3 fatty acids in fish oil, seafood, flaxseed

oil, walnuts, wheat germ, human milk, and an inability for the body to produce them. They improve immune biomarkers, act as anti-inflammatory agents, and reduce the risk of arteriosclerosis, obesity, metabolic disorders, diabetes, nervous disorders, heart disease, vascular diseases, and Alzheimer's due to their bioactive properties. On the other hand, n-6 fatty acids are found in corn oil, peanut oil, cottonseed oil, soybean oil, and