

## Original Article

# Milk Consumption and Human Health: A Critical Review of Scientific Evidence on Benefits and Potential Risks

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## Abstract

Milk is widely consumed across cultures and is traditionally regarded as a complete food due to its rich nutritional composition. It provides high-quality proteins, calcium, phosphorus, vitamins, and bioactive compounds essential for growth and development. However, recent scientific discourse presents a complex understanding of milk consumption, highlighting both substantial health benefits and potential risks. This critical review examines epidemiological, clinical, and mechanistic evidence published over the past two decades regarding the impact of milk intake on bone health, growth, cardiometabolic outcomes, gastrointestinal tolerance, cancer risk, and inflammatory responses. While moderate consumption supports skeletal development and nutrient adequacy, individual variability in lactose tolerance and emerging debates regarding chronic disease associations necessitate balanced dietary recommendations. The review emphasizes contextual and personalized nutritional guidance.

**Keywords:** Milk consumption, dairy nutrition, lactose intolerance, bone health, cardiovascular risk, chronic disease

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## Introduction

Milk has historically occupied a central position in human nutrition. Across societies, it has been recommended as a primary dietary component for children and adolescents due to its nutrient density. The perception of milk as a complete food arises from its balanced composition of proteins, carbohydrates, fats, vitamins, and minerals. However, evolving nutritional science has introduced debate regarding optimal intake levels and long-term health implications.

## Objectives

- 1) To evaluate scientific evidence regarding the nutritional benefits of milk.
- 2) To examine potential association between milk consumption and chronic diseases.
- 3) To analyze biological mechanisms underlying proposed health risks.
- 4) To compare dairy milk with plant-based alternatives from a health perspective.

## 1. Nutritional Composition of Milk

Milk contains casein and whey proteins that provide all essential amino acids required for tissue growth and repair. It is a major source of dietary calcium with high bioavailability, supported by an optimal calcium-to-phosphorus ratio. Milk also supplies vitamin B12, riboflavin, potassium, and often fortified vitamin D. The lipid fraction includes saturated and unsaturated fatty acids, whose health implications have been extensively studied.

## 2. Benefits of Milk Consumption

Substantial evidence supports milk's role in bone mineralization, particularly during adolescence when peak bone mass is achieved. Clinical and observational studies indicate that adequate dairy intake enhances bone mineral density and reduces risk of osteoporosis later in life. Additionally, milk proteins stimulate muscle protein synthesis and support physical growth. Emerging evidence also suggests potential protective effects against metabolic syndrome and type 2 diabetes.



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### 3. Cardiometabolic Health

Traditional dietary guidelines cautioned against high saturated fat intake due to cardiovascular risk. However, recent meta-analyses suggest that the food matrix of dairy products may modify lipid responses. Some cohort studies report neutral or modest protective associations between moderate dairy consumption and cardiovascular disease outcomes.

### 4. Lactose Intolerance and Gastrointestinal Concerns :

Lactose intolerance results from reduced lactase enzyme activity, leading to gastrointestinal symptoms after milk ingestion. Prevalence varies geographically and genetically. Public health recommendations must consider population-specific tolerance levels. Fermented dairy products often exhibit better tolerance due to reduced lactose content.

### 5. Milk Allergy

Cow's milk protein allergy primarily affects infants and young children and may present with immune-mediated reactions. Though many children outgrow the condition, early diagnosis and dietary management are essential.

### 6. Milk and Cancer Risk

The association between milk consumption and cancer risk remains complex. While calcium intake may offer protective effects against colorectal cancer, some observational studies have explored potential links between high dairy intake and prostate cancer. Evidence remains inconclusive and often context-dependent.

### 7. Hormonal and Inflammatory Considerations

Milk naturally contains trace hormones and growth factors. Scientific investigations continue to examine whether these components exert clinically significant effects post-digestion. Some studies suggest associations between dairy intake and acne in adolescents, though mechanisms are not fully established.

### 8. Comparison with Plant-Based Alternatives

Plant-based beverages such as soy, almond, and oat milk are increasingly consumed. While they provide lactose-free options and lower saturated fat content, their protein and micronutrient composition varies significantly unless fortified. Nutritional equivalence with dairy milk depends on formulation and fortification practices.

### 9. Public Health Implications

Nutritional recommendations regarding milk must consider genetic variability, dietary diversity, cultural practices, and socioeconomic conditions. Moderation, balance, and individualized guidance represent the most evidence-based approach to milk consumption.

### Conclusion

- 1) Milk remains a nutritionally valuable food when consumed appropriately.
- 2) Its contributions to bone health, growth, and nutrient sufficiency are well supported.
- 3) However, gastrointestinal intolerance and debated associations with chronic diseases warrant nuanced recommendations.
- 4) Future longitudinal and population-specific research will enhance clarity regarding long-term health outcomes.

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