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Milk Protein for Healthcare Improvement

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Introduction

Bovine milk is a liquid food (87% water) with an average of 13% total solids and about 9% fat-free solids. Milk is a nutrient-dense food high in calcium, vitamin D (especially in fortified forms), protein, vitamin B12, vitamin A, riboflavin, potassium, and phosphorus. Milk is an important source of niacin equivalents due to its high content of the amino acid tryptophan, a niacin precursor. It also contains a variety of bioactive compounds with medicinal (nutraceutical) properties. Milk and its products have been linked to a lower risk of metabolic disorders, cardiovascular disease, hypertension, cancer, and other diseases associated with malnutrition,

The total protein content of bovine milk is approximately 3.5% by weight (36g/L), accounting for nearly 38% of total solids nonfat content and approximately 21% of whole milk energy. Milk is well-known as a high-quality protein source with numerous nutritional, functional, and physiological properties. Milk is also a unique source of biologically active peptides. Peptides derived from casein fractions and whey proteins, such as opioid peptides, antihypertensive peptides, casein phosphopeptides (CPPs), glycomacropeptide (GMP), and lactorphins, have a variety of physiological functions, including opioid-like properties, immune stimulating activities, antihypertensive activities, antibacterial and antiviral effects, and calcium absorption enhancement.

Milk Proteins

Milk's main proteins are Casein Protein and Whey Protein. Casein accounts for approximately 80% (29.5g/L) of total protein in bovine milk, while whey protein accounts for approximately 20% (6.3g/L). Casein is primarily phosphate conjugated and consists primarily of calcium phosphate micelle complexes. It is a diverse family with four major components: alpha- (s1- and s2-casein), beta-, gamma-, and kappa-casein. Whey protein is a globular protein with a high level of -helix structure and a fairly balanced distribution of acidic basic

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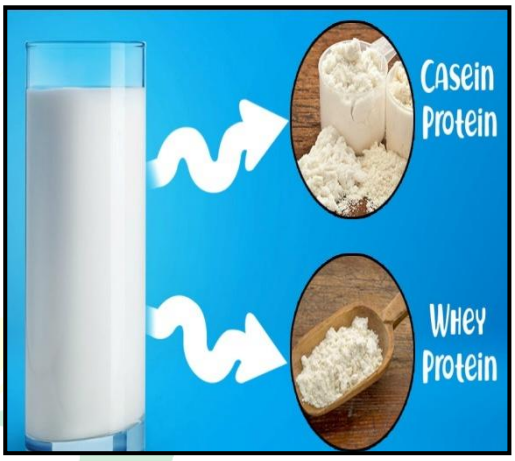
and hydrophobic hydrophilic amino acids. Alpha-lactalbumin (αLA) and beta-lactoglobulin (β-LG) are the predominant whey proteins and comprise about 70-80% of the total whey proteins. Among the other types of whey proteins, immunoglobulins (Igs), serum albumin, lactoferrin (LF), lactoperoxidase (LP), and protease peptones must be mentioned.

Types of Milk Protein

The physiological and biological properties of caseins and whey proteins differ. Milk proteins are classified into two types: Serum proteins are also known as asseric proteins, solubles (found in whey), and coagulable casein.



This last group accounts for more than 80% of milk protein. Cow's milk has a protein concentration of 3.2% on average, with 2.6% caseins and 0.6% whey proteins. Caseins are divided into three subcategories (alpha, beta, and kappa) and are available as a colloidal suspension (micelle). Unlike casein, serum proteins are soluble molecules in milk's aqueous phase. They are divided into four categories: -lactalbumin, -lactoglobulin, bovine albumin serum, and proteosis peptones. Caseins are responsible for the formation of curd during the cheese-making process, while serum proteins are responsible for the formation of whey. Milk proteins with high nutritional value also have solubility, viscosity, hydration, gelation, emulsification, and aroma retention properties that vary depending on their nature..

Nutritional Benefits

All nine of the essential amino acids are present in bovine milk protein in amounts that are similar to those needed by the body, making it a high quality or complete protein. Because of its high quality, bovine milk protein is used as a standard reference protein to assess the nutritional value of other food proteins. Furthermore, milk proteins contain more

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branched chain amino acids (isoleucine, leucine, and valine) than many other food sources. These amino acids, particularly leucine, help to reduce muscle wasting when protein breakdown is high and can stimulate muscle protein synthesis. Whey protein also contains a high concentration of sulfur-containing amino acids (cysteine and methionine), which are precursors of glutathione, a tripeptide with antioxidant, anticarcinogenic, and immunostimulatory properties.

Therapeutic Benefits

Several studies suggest that milk proteins, particularly whey proteins, may protect the human body against certain cancers (colon, breast, and prostate gland), most likely by increasing cellular glutathione levels and promoting hormonal and cell-mediated immune responses. Whey proteins such as LA, LG, LF, LP, and Igs have been shown to have anticarcinogenic activity. Whey protein (30g daily for 6 months) has been shown to normalise the number of blood leukocytes in cancer patients. Whey protein supplementation has also been shown to increase plasma glutathione levels and natural killer cell activity in patients with chronic hepatitis B. Diabetes mellitus is regarded as one of the most common metabolic disorders and a major public health issue globally. It affects nearly 6% of the global population, with type 2 diabetes accounting for 90-95% of diagnosed cases. Diet and lifestyle interventions are the preferred treatment strategies for this metabolic disorder, with pharmacotherapy prescribed only when diet and lifestyle interventions fail. Consumption of milk and dairy foods is associated with a lower incidence of type 2 diabetes, according to epidemiological evidence.

Conclusion

The recent discovery of numerous important biologically active substances on milk and its derivatives has piqued the scientific community's interest in prevention. Milk proteins and peptides are typically well tolerated and oral bioavailable. According to this point of view, they have the potential to act as health-promoting ingredients and to participate in auxiliary therapies to improve overall success in chronic diseases.

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