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A1 AND A2 MILK: THE NEW TREND IN DAIRY INDUSTRY

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India is an agriculture-based country, majority of its population depends on agriculture as their sole source of income. Livestock population of India plays an important contribution to the agricultural sector. Out of the major products contributed by the livestock, milk leads the list. India ranks one in terms of total livestock population as well as total milk production in the world. India contributes about 22 percent of the total global milk production. Milk is known for its fat and SNF content. Milk is known to be an important source of protein. The protein content in milk varies in different species. In the recent need to increase the nutritive value of the milk, the composition of milk has been taken into account. The milk protein is the current topic of discussion in the advent of A1 and A2 milk.

Casein constitutes the major protein proportion in milk, acting as sources of peptides with bioactivity. Out of these peptides, Beta-casomorphins (BCMs) are defined as a group of peptides with opioid properties that are formed from proteolytic digestion of β-casein. Out of all beta casomorphins, beta-casomorphin 7 (BCM7) is the most important. Beta Casein has 209 amino acids. There are 13 variants present in bovine milk, including A1, A2, A3, A4, B, C, D, E, F, H1, H2, I, and H, of which A1 & A2 are the common. A1& A2 milk differ in their 67 th position having histidine & Proline, respectively. The A2 is mostly associated with the desi cows while A1 is associated with crossbred cows. The histidine is loosely bound with BCM 7 as compared to Proline so, A1 milk acts as a source of beta casomorphin. Various physiological effects of these peptides have also been documented, i.e., secretion of mucus, increased activity of superoxide dismutase and catalase, increased levels of prolactin, and analgesic role. Beta casomorphins are also associated with various immunological functions, such as development of innate immunity, lymphocyte proliferation and cellular immunity, role in autoimmune diseases, histamine release, and allergy. These modulate gut secretions and motility, blood pressure and have antithrombotic, antioxidant, antimicrobial, and

immunomodulatory activities. With research, it has been found that Beta casomorphins is linked to cardiovascular diseases & diabetes type 1. Due to the consumption of milk with higher BCM7 it was found that there is sudden infant death syndrome & various neurological disorders. So, in higher concentration it is considered as the devil in the milk.

Functional Importance of BCM 7:

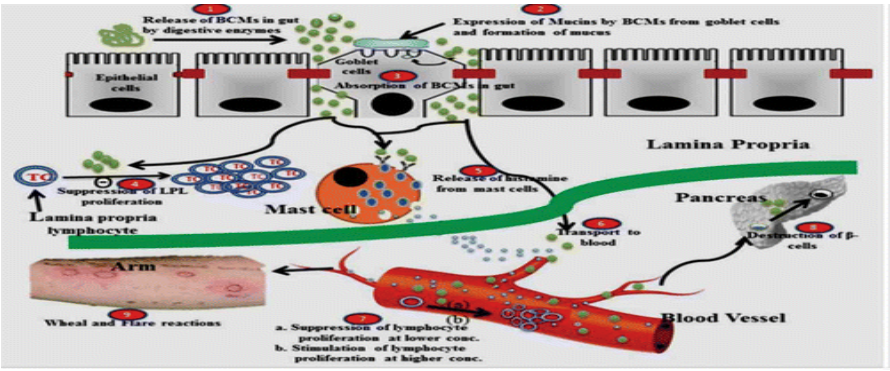
BCM-7 has a protective role against hyperglycemia and free radical-mediated oxidative stress : It has been found that oral administration of BCM-7 to the diabetic group of rats increased plasma insulin level, decreased glucagon level, and elevated the activity of superoxide dismutase and catalase.BCM7 exerts a positive inotropic and antiarrhythmic effect and thus had a cardioprotective function.In recent studies it has been noted ,BCM-7 contributed to the redox state and epigenetic modifications that appear to influence neural development.

Immunological Perspective of Beta Casomorphin: BCMs are known to show many immunological activities like chronic inflammatory responses, such as allergy, mucin production, lymphocyte proliferation etc.

Mucus Secretion and Innate Immunity: BCM-7 contributes significantly to mucin production via a direct effect on intestinal goblet cells and the activation of μ-opioid receptors. BCM-7 improves intestinal protection, supports innate immunity, and thus also has dietary and health applications.

Lymphocyte Proliferation & Cellular Immunity: High concentration of beta casomorphins result in stimulation of lymphocyte proliferation. High affinity of BCMs for μ-opiate receptors exploit their endorphin-like activity on the development of T lymphocyte function and cellular immunity.

Heath Complications Related to A1 Milk: Various epidemiological studies have shown, significant association between the intake of A1 milk and the incidence of **diabetes type-1**. BCM7 may act as an adjuvant in the autoimmune reaction involved in destruction of β-cells. The intake of BCM-7 with **cardiovascular disease** mortality. This cause hypercholesterolemia or atherosclerosis.



High BCM-7 levels in the blood remained results in a higher risk of **delayed psychomotor development.** High level of beta casomorphin results in Sudden Infant Death Syndrome (SIDS). The higher levels result in apnea.

Milk allergy: BCMS result in selective release of histamine from the mast cells. They result in a wheal & fare reaction.

Milk intolerances: BCM-7 slows down the passage of food through the digestive system (like other opioids) providing a longer time for lactose fermentation.

Conclusion

Efficacy of beta casomorphins to promote health and well-being is a matter of debate. Even if these are potential modulators of various regulatory processes in the body, these have been associated with various physiological disorders. Since in A1 milk the histidine is loosely bound to the beta casomorphins, the digestive enzymes result in the release of BCMs, & thus result in physiological disorders like diabetes, cardiovascular diseases etc. While in A2 milk , the Proline is strongly attached to beta casomorphins & hence result in very least complications. Thus, there is a growing global interest for A2 milk as an alternative milk product.

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