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Popular Article

Potential health benefits of A2 milk against A1 Milk

Saurabh Sharma, Ruchi singh, Hari R., Pratiksha Thakur, Rashmi Vishwakarma
Department of Veterinary & A.H. Ext. Edu., COVSc & AH, NDVSU, Jabalpur
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Milk is a whole food with numerous nutritive components exploited by man for many thousands of years with a balance of protein, carbohydrate and fat coupled with essential minerals dairy milk has been a staple food to many populations, especially for early infant development where milk and/or milk-based formulas are the only source of nutrition. It contains the essential micro-nutrients needed for growth and development of human health as well as for the neonate animal. In USA, Australia, New Zealand and other developed countries, people use to consume milk according to their needs and use milk like A2 milk, since A2 milk is harmless whereas A1 milk is harmful for health. So, our future breeding policies for dairy animals should be done in a systematic manner, keeping an eye on producing clean and healthy milk which is none other than A2 Milk. Beneficial components of milk are still being identified, such as whey protein, sphingomyelin and conjugated linoleic acid (CLA), however it is established that the protein component of milk provides significant nutritional contribution itself rationalizing the consumption of milk for growing developing individuals. A major protein component of cow's milk is beta casein, of which there are two primary variants, A1 and A2. Research into the beta casein variants has reported that:

- A2 is the original form of the beta casein protein when cows were domesticated thousands of years ago, the A1 type arose and spread with breeding and migration of man.
- Digestion of A1 beta casein, but not that of A2 beta casein yields β -casomorphin-7 (BCM-7), an exogenous opioid peptide (exorphin) that can potently activate opioid receptors throughout the body.



- Opioid receptors are important regulators of signalling processes throughout the body, including the gastrointestinal tract, immune system, and the central nervous system.
- A2 is more comparable to the human beta casein than A1 in terms of digestive breakdown.
- Excessive exposure to A1 beta casein or BCM-7 is implicated adverse response, including interference with gastrointestinal function and symptoms of intolerance reactions.
- Reducing or eliminating the consumption of A1 beta casein and replacing it with another major protein source, such as A2 beta casein, may avoid some of these disorders or improve their symptoms and in the long term reduce the risk of some clinical conditions.

A1 v/s A2 milk?

Milk contains about 85% water. The remaining 15% is the milk sugar lactose, protein, fat and minerals. Beta-casein is about 30% of the total protein content in milk. A2 milk is the milk that contains only the A2 type of beta-casein protein whereas A1 milk contains only A1 beta casein or A1A2 type variant. A1 protein variant is commonly found in milk from crossbred and European breeds of cattle. A2 milk is found basically in indigenous cows and buffaloes of India (Asia as a whole). A2 milk is branded by the A2 Milk Company like A2 Corporation and sold mostly in Australia, New Zealand, United Kingdom and other developed countries.

History of A1 and A2 Milk

A2 beta-casein is the beta-casein from cows that have been produced since before they were first domesticated over 10,000 years ago. It has no known negative effects on human health. In the past few thousand years, a natural mutation occurred which has resulted in a proportion of cows of European breeds producing a casein variant called A1 beta-casein. Slowly, these protein variant became dominant in milk which producing A1 milk. The gene encoding beta-casein was changed such that the 67th amino acid in the 209 amino proteins was switched from proline to histidine. This new kind of beta-casein that was created is known as A1 beta-casein which is found in the milk of many crossbred cows such as Holstein, jersey and Friesian.

Beta Casein and Their Digestion

Casein proteins make up 80% of the total protein in milk and comprise three classes; alpha, beta and kappa which aggregate to form micelles which reflect light to give milk its white colour. Beta caseins are present at a concentration of ~1gram per 100ml, or 2.5grams a standard serving. In cow's milk, two primary variants of beta casein, termed A1 and A2, and several rarer sub-variants have been identified. A1 and A2 beta casein differ in their protein structure by a



substitution of the amino acid at position 67. A1 beta casein contains a histidine residue at this position, which allows cleavage of the preceding seven amino acid residues to yield the peptide β -casomorphin-7 (BCM-7). A2 beta casein contains a proline residue, which prevents cleavage of this peptide.

Mechanism of BCM-7 generation in the small intestine

The A1 and A2 variants of bovine β -casein differ at amino acid position 67 with histidine in A1 and proline in A2 milk. This polymorphism leads to key conformational changes in the secondary structure of expressed β -casein protein. Due to presence of histidine at amino acid 67 position, digestion of A1 β -casein milk releases a 7 amino acid bioactive peptide called beta-casomorphin 7 (BCM-7) in small intestine, while proline in A2 milk at 67 position prevents the split at this particular site and generates peptide BCM-9. It is believed that generation of BCM-7 is the major causative factor associated with A1 milk related health disorders. However, A2 β -casein not been linked to any of such health issues.

Impact of A1 and A2 milk on human health

Milk from dairy cows is providing a high-quality source of protein and essential micronutrients like energy, calcium, magnesium and phosphorus to human beings since long time. A significant relationship was observed between bovine milk protein consumption and the incidence of type 1 diabetes, ischemic heart disease and arteriosclerosis. Besides, neurological disorders such as schizophrenia and autism and sudden infant death syndrome were also appeared to be known to potentiated by milk.

The relationship between disease risk and bovine milk consumption is the focus of this review with special emphasis to A1 and A2 hypothesis. In many of the medical literature we get to know the link between the development of ischemic heart disease (CVD) and specific milk protein intake. Besides, some populations such as the Masai (East African) and Samburu (Northern Keyan) had virtually no heart disease despite consuming a diet rich in animal milk. But that milk fortunately came from Zebu cattle, which is a breed that carries the A2 allele exclusively. Western countries, which had similarly high bovine milk consumption from predominantly the Holstein breed, jersey and other breeds, had a greater incidence of CVD than nations with low milk consumption. It is so because people of small nations consume fortunately A2 milk. But epidemiological analyses concerning the two alleles of β -casein and the incidence of CVD underscores the apparent relationship between the risk of chronic disease and milk protein variant intake. Above all many researchers have claimed the relationship of A1 milk with many human diseases like CVD, autism, schizophrenia etc.



The Food and Agriculture Organisation (FAO) (2012) has reported increase in many chronic diseases arising out of milk. These diseases if studied thoroughly can be alleviated by improving the health benefiting milk components. The β -casein composition of the protein fraction has become of special interest recently because of a possible relationship between β -casein genotype and the health of population of consumers. Genetic variants in bovine β -casein gene (A1 and B) release a bioactive peptide, β -casomorphin-7(BCM-7) upon digestion, responsible for many human disorders like Type 1 diabetes, autism, schizophrenia and heart diseases but A2 milk does not cause such type of illnesses. Infants may absorb BCM-7 due to an immature gastrointestinal tract. Adults, on the other hand, appear to reap the biological activity locally on the intestinal brush boarder. BCM-7 can potentially affect numerous opioid receptors in the nervous, endocrine, and immune systems.

Whether there is a definite health benefit to milk containing the A2 genetic variant is unknown and requires further investigation unlike harmful effects of A1 milk. With the increasing intake of dairy products, then consumption of other essential nutrients such as zinc, vitamin A, magnesium, folate, and riboflavin are also increasing. However, we are able to get only about 700 mg of calcium per day, which comes primarily from dairy products. This amount is against the recommended amount of 1,000–1,500 mg (NIH Consensus Development Conference, 1994). Most other food sources contain low concentrations of calcium. Calcium content of milk may reduce the risk of osteoporosis and colon cancer and including milk in the diet may promote weight loss. The ideal calcium to magnesium ratio for the human body should be 2:1. The A1 milk's ratio is 10:1. By relying on A1 cow's milk for calcium, we will have magnesium deficiency and imbalance, but A2 milk does not cause such imbalances. Magnesium relaxes us, helps improve digestion, is anti-inflammatory in action, involved in nerve and muscle function, de-toxifier, increases alkalinity of the blood and flexibility of the tissues. Magnesium is required for the body to produce and store energy. Without magnesium there is no energy, no movement, no life. So, A1 milk will lower magnesium levels whereas A2 milk does not. The inflammation from A1 milk casein causes lymphatic congestion and metabolic suppression. A1 milk worsens acne, eczema, upper respiratory infections, asthma and allergies. It causes digestive problems, not because of the lactose but because of massive histamine release from casomorphin. Ear infections, bronchitis, tonsillitis are driven by A1 casein. A1 milk casein causes endometriosis because of its inflammatory and immune-disruptive effect. Endometriosis is a gynecological condition in which cells from the lining of the uterus (endometrium) appear and flourish outside the uterine cavity, most commonly on the membrane which lines the



abdominal cavity. Many women with infertility may suffer from endometriosis and other reproductive complications.

Conclusion

We can now conclude that we should drink A2 milk only as it prevents us from milk related health complications especially from A1 milk.

