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Review Article

NUTRITIONAL SIGNIFICANCE OF INDIGENOUS COW MILK WITH REGARD TO A2 β-CASEIN – AN OVERVIEW

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Abstract: Most important economic trait milk constituents include fat, protein, SNF, lactose and ash. Being rich in these components, milk is considered as one of the essential foods all over the world. Amongst the milk constituents, β-casein has gained importance and popularity in the health conscious people due to its recent health related issues. The status of A1 or A2 beta casein variants in Bos taurus cattle breeds from different countries have been shown that the presence of A1 variant in European cattle which has been linked to a range of illness. Our indigenous dairy animals produce milk containing A2 variant and India is endowed with A2 rich dairy animals since our civilizations, protecting the masses from ill effects of A1 milk. But Cross breeding program has been declining the availability of A2 milk in India. It is a matter of great concern for the public health. There is a need to crosscheck our breeding policies, so that the purity of desi breeds and their beneficial qualities can be conserved.

Keywords: A2 β-Casein, Indigenous breed, Human health, Cross breeding.

Introduction

Milk is the highly evolved secretion of mammary glands of mammals and the most perfect food for infants. India is the world's largest milk producer and consumer, yet it neither exports nor imports the milk. In the recent past, there is a growing public health concern, especially regarding the food we take. Milk has about 86% water, 4.6% lactose sugar, 3.7% triglycerides, 2.8% milk protein, 0.54% minerals and 3.36% other constituents. Milk protein constitutes of 36% α-Casein, 27% β-Casein, 9% κ-casein and 27% peptides and amino acids. The protein fraction composition of β-casein has become of special interest recently because of a possible relationship between β-casein genotype and the health of consumers. Milk that contains A1 β-Casein and A2 β-Casein are known as A1 milk and A2 milk respectively. 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).

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History of A1 and A2 Milk

A2 β-casein is the protein that has been produced from the cows, since before they were 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 β-casein. Slowly, these protein variant became dominant in milk which results in A1 milk. The gene encoding β-casein was changed such that the 67th amino acid in the 209 amino proteins was switched from proline to histidine. This new kind of β-casein that was created is known as A1 β-casein which is found in the milk of many crossbred cows such as Holstein Friesian and Jersey.

Impact of A1 and A2 milk on human health

The Food and Agriculture Organization (FAO, 2012) has reported an increase in many chronic diseases arising out of milk. These diseases if studied thoroughly can be alleviated by improving the health benefiting milk components. A significant relationship was observed between bovine milk protein consumption and the incidence of certain diseases by many researchers all over the world.

Diseases associated with milk consumption	Source
Type 1 diabetes, cardiovascular diseases	McLachlan, 2001; Laugesen and Elliott, 2003; Elliott *et al*., 1999; Thorsdottir *et al*., 2000, Virtanen *et al*., 2000; Monetini *et al*., 2002 and Birgisdottir *et al*., 2002.
Arteriosclerosis	Tailford *et al*., 2003.
Schizophrenia and Autism	Woodford, 2006.
Sudden infant death syndrome	Sun *et al*., 1999; Sun and Cade, 1999 and Sun *et al*., 2003.
Ischemic heart disease	McLachlan, 2001; Laugesen and Elliott, 2003 and Tailford *et al*., 2003.

McLachlan (2001) conducted a study on Masai (East African) and Samburu (Northern Kenyan) tribes and found that they had virtually no heart diseases despite consuming a diet rich in cattle milk. He concluded that this scenario may be probably due to the tribes dependency on zebu cattle's milk, which is a breed that carries the A2 allele exclusively. Besides this, epidemiological analyses concerning the two alleles of β- casein and the incidence of Cardiovascular diseases indicates the apparent relationship between the risk of

chronic disease and milk protein variant intake (Laugesen and Elliott, 2003). The population in the countries which were predominantly depended on Holstein, Jersey, Brown Swiss and other breed's milk had a greater incidence of CVD than nations with low milk consumption. Above all many researchers have claimed the relationship of A1 milk with many human diseases like CVD, autism, schizophrenia etc (Woodford, 2011, Mishra *et al*., 2009). Upon digestion, the genetic variant of β-casein gene may release a bioactive peptide, β-casomorphin-7 (β-CM-7), which is responsible for many human disorders like Type 1 diabetes, autism, schizophrenia and heart diseases but A2 milk does not cause such type of illnesses (Woodford, 2006; Mishra *et al*., 2009; Sodhi *et al*., 2012). Infants may absorb β-CM-7 due to an immature gastrointestinal tract which might leads to sudden infant death syndrome. Further β-CM-7 can potentially affect numerous opioid receptors in the nervous, endocrine, and immune systems.

Another relevant component need to be addressed is the calcium content of A1 milk. An average person is able to get only about 700 mg of calcium per day, which comes primarily from dairy products (Weinberg *et al*., 2004; Ervin *et al*., 2004). This amount is against the recommended amount of 1,000–1,500 mg (NIH Consensus Development Conference, 1994). Calcium content of milk may reduce the risk of osteoporosis and colon cancer (Heaney *et al*., 1999; Birt *et al*., 1999) and including milk in the diet may promote weight loss (Phelan *et al*., 2003). The A1 milk's calcium to magnesium ratio is 10:1, which is far higher than the ideal ratio (A2 milk's) i.e., 2:1. It indicates that relying on A1 cow's milk for calcium will leads to magnesium deficiency and imbalance, but A2 milk does not cause such imbalances.

A1 milk worsens acne, eczema, upper respiratory infections, asthma, ear infections, tonsilitis and allergies. The inflammation from A1 milk casein causes lymphatic congestion and metabolic suppression. Massive histamine release from casomorphin may provoke the digestive problems. It may causes endometriosis because of its inflammatory and immune-disruptive effect.

Conclusion

The A2 milk (Desi cow's milk) should only be recommended as it prevents the human beings from milk related health complications, which are due to A1 milk (Exotic cattle's milk). In India, the exotic/crossbred milch cattle increased from 14.4 million to 19.42 million, an increase of 34.78 % (19th Livestock Census- 2012). It's the nation's responsibility to cease cross breeding programmes and protect purity of desi breeds like Ongole, Gir, Tharparker, Hallikar, Kankrej, Deoni, Kangeyam, Nagpuri and Vechur. In this aspect, Government's

support is needed to accomplish the above anomalies of milk quality and to conserve the indigenous breed's purity.

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