

# "The Reality of the White" A1 vs A2 Milk- A Critical Review

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**Abstract:** Milk from dairy cows has been regarded as nature's perfect food, providing an important source of nutrients including high quality proteins, carbohydrates and selected micronutrients. Being rich in these components, milk is considered as one of the essential foods all over the world. Amongst the milk constituents,  $\beta$ -casein has gained importance and popularity in the health conscious people due to the health related issues. Recently, a relationship between disease risk and consumption of a specific bovine  $\beta$ casein fraction with either A1 or A2 genetic variants, has been identified. The status of A1 or A2 beta casein variants from different countries have shown that the presence of A1 variant in European cattle has been linked to a range of illnesses. India is endowed with A2 rich dairy animals and since then our civilizations, have been protecting the masses from ill effects of A1 milk. But cross breeding programmes has been declining the availability of A2 milk in India. It is a matter of great concern for the public health and hence there is a need to crosscheck our breeding policies, so that the purity of desi breeds and their beneficial qualities can be conserved.

**Keywords:** A1 and A2 betacasein, BCM7, Indigenous/Desi breed, Disease risk, Cross breeding

## 1. 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 milk.<sup>1</sup> In the recent past, there is a growing public health concern, especially regarding the food we take. Milk from dairy cows has been regarded as nature's perfect food, providing an important source of nutrients including high quality proteins, carbohydrates and selected micronutrients. More than 95% of the cow milk proteins are constituted by caseins and whey proteins. 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%  $\alpha$ -Casein, 27%  $\beta$ -Casein, 9%  $\kappa$ -casein and 27% peptides and amino acids. Among the caseins, beta casein is the second most abundant protein and has excellent nutritional balance of amino acids. Different mutations in bovine beta casein gene have led to 12 genetic variants and out of these A1 and A2 are the most common. The A1 and A2 variants of beta casein differ at amino acid position 67 with histidine (CAT) in A1 and proline (CCT) in A2 milk as a result of single nucleotide difference.<sup>2</sup> Currently, A2 milk is being marketed as a healthier choice than regular milk. It is claimed to have several health benefits, and is easier to be digested for people who are lactose intolerant.

Casein is the largest group of proteins in milk, making up about 80% of the total protein content. There are several types of casein in milk, and betacasein is the second most common. Betacasein exists in at least 13 different forms. The two most common forms of betacasein are: A1 betacasein: Milk from breeds of cows that originated in northern Europe is generally high in A1 betacasein. A1 milk comes from breeds like the Holstein, Friesian, Ayrshire and British Shorthorn. A2 betacasein: Milk that is high in A2 betacasein is mainly found in breeds that originated in the Channel Islands and Southern France. This includes breeds like the Guernsey, Jersey, Charolais and Limousin. Regular milk contains both A1 and A2 betacasein, but A2 milk contains only A2 betacasein. Betacasomorphin7 (BCM7) is the reason why regular milk is believed to be less healthy than

A2 milk. BCM7 is an opioid peptide that is released during the digestion of A1 beta-casein.<sup>3</sup>

## 2. Inter-relationship between disease risk and consumption of A1 A2 milk

Recently, a relationship between disease risk and consumption of a specific bovine  $\beta$ casein fraction with either A1 or A2 genetic variants has been identified. BCM7 is suggested to be associated as a risk factor for human health hazards as it can potentially affect numerous opioid receptors in the nervous, endocrine and immune system. It is also known to be an oxidant of low dietary lipoproteins (LDL) and oxidation of LDL is believed to be important in formation of arterial plaque. Epidemiological evidences claim that consumption of betacasein A1 milk is associated as a risk factor for type1 diabetes, coronary heart disease, arteriosclerosis, sudden infant death syndrome, autism, schizophrenia etc. A broad range of studies from American and European investigations has shown reduction in autistic and schizophrenic symptoms with decrease in A1 milk intake. Further, animal trials have also supported the linking of type1 diabetes to milk exposure in general and A1 betacasein in particular.

Type 1 diabetes is typically diagnosed in children, and is characterized by a lack of insulin in the body. Several studies indicate that drinking A1 milk during childhood may increase the risk of type 1 diabetes. However, these studies are observational in nature. They cannot prove that A1 betacasein caused type 1 diabetes, only that those who got more of it were at a higher risk of getting the disease. Animal studies have provided conflicting results. Some have found no difference between A1 and A2 betacasein. Others have shown A1 betacasein to have either protective or adverse effects on type 1 diabetes. So far, no clinical trials in humans have investigated the effect of A1 betacasein on type 1 diabetes. Several observational studies have found a link between A1 milk consumption during childhood and increased risk of type 1 diabetes. However, the evidence is mixed and more research is needed.<sup>4</sup>

Two observational studies have linked the consumption of A1 milk with an increased risk of heart disease. This is supported by one experiment in rabbits. It showed that consuming A1 betacasein promoted fat buildup in injured blood vessels. This buildup was much lower when the rabbits consumed A2 betacasein. Fat accumulation may potentially clog blood vessels and cause heart disease. However, the human relevance of the results has been debated. So far, two human trials have investigated the effects of A1 milk on heart disease risk factors. One of them included 15 men and women who were at a high risk of heart disease. The study had a crossover design, meaning that all participants received A1 and A2 betacasein at different periods during the study. The study didn't find any significant adverse effects on risk factors for heart disease. Compared with A2 betacasein, the A1 type had similar effects on blood vessel function, blood pressure, blood fats and inflammatory markers. Another study found no significant differences in the effects of A1 and A2 casein on blood cholesterol. There is no strong evidence that A1 milk increases the risk of heart disease. However, the longterm effects have not been studied.<sup>5</sup>

Sudden infant death syndrome (SIDS) is the most common cause of death in infants less than one year of age. SIDS is defined as the unexpected death of an infant, without an apparent cause. Some researchers have speculated that BCM7 may be involved in some cases of SIDS. One study found high levels of BCM7 in the blood of infants who temporarily stopped breathing during sleep. This condition, known as sleep apnea, is linked to an increased risk of SIDS. These results indicate that some children may be sensitive to the A1 betacasein found in cow's milk. However, further studies are needed before any firm conclusions can be reached. There is limited evidence that A1 milk may increase the risk of sudden death in infants. More research is needed.<sup>6</sup>

Autism is a mental condition characterized by poor social interaction and repetitive behavior. In theory, peptides like BCM7 might play a role in the development of autism. However, studies do not support all of the proposed mechanisms. One study of infants found higher levels of BCM7 in those who were fed cow's milk, compared to those who were breastfed. However, levels of BCM7 dropped quickly in some of the infants, whereas they remained high in others. For those who retained these high levels, BCM7 was strongly associated with an impaired ability to plan and perform actions. Another study indicated that drinking cow's milk may worsen behavioral symptoms in autistic children. On the other hand, some studies found no effects on behavior. So far, no human trials have specifically investigated the effects of A1 and A2 milk on symptoms of autism. There is no conclusive evidence about the effects of A1 milk on autism. However, the issue is complicated and needs to be studied further.<sup>7</sup>

Digestive Health Lactose intolerance is defined as the inability to fully digest the sugar (lactose) found in milk. This is a common cause of bloating, gas and diarrhea. The amount of lactose found in A1 and A2 milk is the same. However, some people feel that A2 milk causes less bloating than A1 milk. Supporting this, studies indicate that milk

components other than lactose may cause digestive discomfort. Scientists have suggested that certain milk proteins may be responsible for some people's milk intolerance. One trial in 41 men and women showed that A1 milk may cause softer stools than A2 milk in some individuals. Additionally, studies in rodents indicate that A1 betacasein may significantly increase inflammation in the digestive system.<sup>8</sup>

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. This amount is against the recommended amount of 1,000–1,500 mg. Calcium content of milk may reduce the risk of osteoporosis and colon cancer and including milk in the diet may promote weight loss. 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. By evidence A2 milk consumption results in a more healthier and stronger dentition with lesser skeletal jaw based discrepancies as was noted in an epidemiological study conducted on 500 school going children . It was observed that more dentofacial deformities were apparent in those children who consumed A1 milk than A2 milk.<sup>9</sup>

A1 milk also worsens acne, eczema, upper respiratory infections, asthma, ear infections, tonsillitis and allergies. The inflammation from A1 milk casein causes lymphatic congestion and metabolic suppression. Massive histamine release from caesomorphin may provoke the digestive problems. It may causes endometriosis because of its inflammatory and immune disruptive effect.<sup>9</sup>

### 3. Conclusion

Thus we can conclude that 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 milk cattle increased from 14.4 million to 19.42 million, an increase of 34.78 %. 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 3379 support is needed to accomplish the above anomalies of milk quality and to conserve the indigenous breed's purity.

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