Present status of A1-A2 Milks

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The issue related to claims of health risks associated with the consumption of A1 milk is a matter of concern for the scientific community. A brief fact sheet on the A1/A2 milk issue based on available scientific literature and related reports is provided below. It gives an overview of the basis of A1/A2 designations of milk, the claimed health concerns, the study of National Bureau of Animal Genetic Research (NBAGR) on the A1/A2 status of Indian animal herds, and the global perspectives on the issue.

A1 and A2 types of milk

✍ Milk consists of water, protein, fat, lactose, minerals, vitamins and some minor constituents.

✍ The protein in milk is basically of two types — 'Casein' and 'Whey Protein'.

✍ The Casein component consists of three main fractions viz., Alpha (?), Beta (?) and Kappa (?) caseins.

✍ ?-casein (the second most abundant protein fraction in cow milk) has 13 known variants out of which two major variants i.e., A1 and A2 are most commonly found in milk. The difference in these two variants is:

(i) A1 ?-casein contains amino acid 'Histidine' at position 67 of the amino acid chain
(ii) A2 ?-casein contains amino acid 'Proline' at position 67 of the amino acid chain

✍ Thus, A1 or A2 nature of milk is determined by the presence of histidine and proline in A1 or A2 type of ?-casein respectively.

Cattle genetics related to A1 / A2 type of milk

The production of A1 or A2 type of milk by a milch animal is determined by its genetic constitution i.e. by a pair of specific genes. An animal can have a pair of specific genes in the combination of A2A2 (milk will be definitely A2 type), A1A2 (milk could be A1/A2 type) or A1A1 (milk will be definitely A1 type).

The specific reason for a cow to have distinct genes for producing A1 or A2 type of milk are not yet fully known. Some scientists believe that initially all cow breeds produced A2 type of milk. However, due to mutation thousands of years ago, some European breeds acquired A1 type of gene and started producing A1 type of milk.

Health concerns related to consumption of A1/ A2 type of milk

✍ A1 milk is reported to have negative impacts on human health and a risk factor for certain diseases like Diabetes Mellitus Type 1, Ischaemic Heart Disease (IHD), neurological impairments etc.

✍ The other variant A2 milk has not been implicated in any of the diseases mentioned above.

✍ The negative health impacts have been attributed to a peptide called ?-casomorphin-7 (BCM-7) which is hypothesized to be released from A1 type of ?-Casein during the process of digestion. Digestion of A2 type of ?-Casein leads to release of a different peptide called ?-casomorphin-9. ***See Fig. 1.***

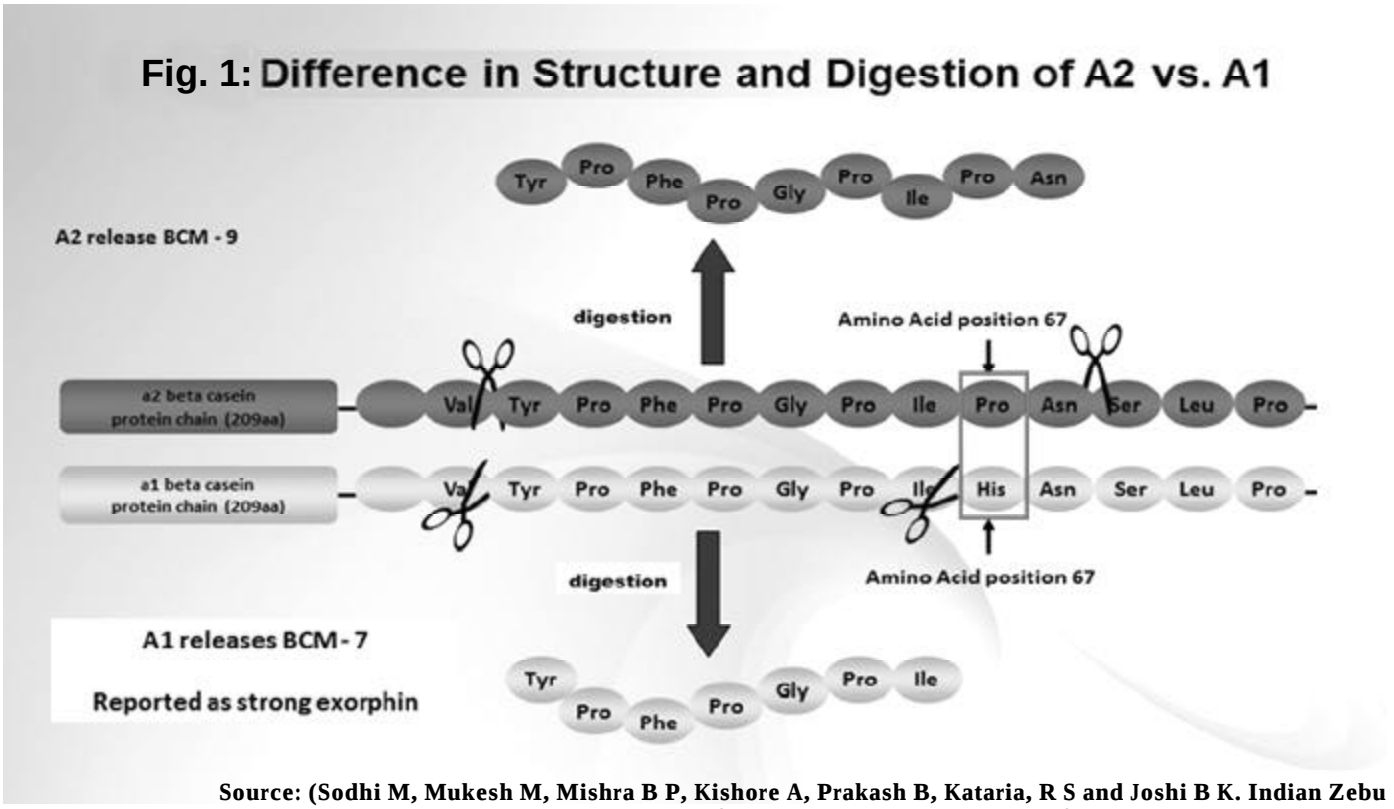
✍ BCM-7 is reported to have strong opioid properties in animals when it is injected into the blood. However, the presence of BCM-7 molecules in blood after intake of milk or casein (as food) has not been established.

Study by National Bureau of Animal Genetics and Research (NBAGR), Karnal

Status of A1/A2 variants of cattle in India: The study conducted by National Bureau of Animal Genetic Resources (NBAGR), Karnal indicates:

✍ Higher frequency of A2 type of Allele in Indian cattle. In fact five Indian Breeds (Gir, Tharparkar, Red Sindhi, Sahiwal and Rathi) showed presence of A2 allele to the extent of 100 % (i.e. at a frequency of 1.00). In all the Indian native cattle examined in the study, an overall frequency of 0.94 was observed for A2 allele.

✍ Overall 90% of the animals showed A2A2 genotype, 9.1% showed A1A2 genotype and only 1%



Source: (Sodhi M, Mukesh M, Mishra B P, Kishore A, Prakash B, Kataria, R S and Joshi B K. Indian Zebu Cattle-A Natural Resource for A2 Milk, National Bureau of Animal Genetic Resources)

animals showed A1A1 genotype.

✍ Among the breeding bulls examined, A2 allele was predominant across all animals and ranged from a frequency of 0.56 (Holstein) to 0.88 (indigenous bulls). A2A2 genotype was most common in indigenous bulls at a frequency of 0.76. None of the indigenous bulls showed a genotype of A1A1. However, 22% of the pure Holstein Friesian (HF) bulls showed A1A1 genotype.

✍ NBAGR further reports that moderate to high frequency of A2 allele among the breeding bulls favours the current belief that milk being marketed in India is safe for human consumption.

Global developments in relation to A1/A2 milk and need for further research

✍ There have been early studies/reports that suggest implication of A1 milk as a risk factor in the diseases mentioned above.

✍ On the other hand, a review article "The A2 milk case: a critical review" by A.S. Truswell published in the European Journal of Clinical Nutrition in 2005 has concluded that there is no convincing or probable evidence that the A1 ?-casein in cows milk is a factor causing DM-1 diabetes or coronary heart disease.

✍ Likewise, in 2011, the European Food Safety Authority (EFSA) conducted a review of the potential health impact of ?-Casomorphins and related peptides but could not establish any cause-effect relationship between the oral intake of BCM-7 and etiology or course of any non-communicable diseases. Therefore, it did not recommend a formal EFSA risk assessment of food-derived peptides.

✍ The Australian and New Zealand Food Safety Authorities have also stated that no relationship has been established between A1 or A2 milk and diabetes, CHD or other diseases.

✍ Thus, the issue of A1/A2 milk has remained controversial so far and there is **no conclusive and final scientific opinion** that consumption of A1 type of milk poses high risk for the above-mentioned diseases.

✍ The controversy and the inconclusive stand in context of negative health impacts of A1 ?-Casein may have its roots in the complex commercial concerns involved.

✍ In this scenario, it will be worthwhile that the scientific community continues to assess risk/benefits associated with consumption of A1 or A2 milk till conclusive evidence can be scientifically established on the basis of clinical trials.