# Letters to the Editor

## Milk proteins and human health: A1/A2 milk hypothesis

Sir,

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. 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. This polymorphism leads to a key conformational change in the secondary structure of expressed β-casein protein. Gastrointestinal proteolytic digestion of A1 variant of β-casein (raw/processed milk) leads to generation of bioactive peptide, beta casomorphin 7 (BCM7).[1] Infants may absorb BCM-7 due to an immature gastrointestinal tract whereas adults gather the biological activity locally on the intestinal brush boarder. In hydrolysed milk with variant A1 of beta-casein, BCM-7 level is 4-fold higher than in A2 milk. Initial studies on indigenous cow (Zebu type), buffalo and exotic cows (taurine type) have revealed that A1 allele is more frequent in exotic cattle while Indian native dairy cow and buffalo have only A2 allele,[2] and hence are a source for safe milk.

Recently, a relationship between disease risk and consumption of a specific bovine β-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 beta-casein A1 milk is associated as a risk factor for type-1 diabetes, coronary heart disease, arteriosclerosis, sudden infant death syndrome, autism, schizophrenia etc.[3,4] A broad range of studies from American and European investigations has shown reduction in autistic and schizophrenic symptoms with decrease in A1 milk intake.[5] Further, animal trials have also supported the linking of type-1 diabetes to milk exposure in general and A1 beta-casein in particular.

Populations, which consume milk containing high levels of β-casein A2 variant, have a lower incidence of cardiovascular disease and type-1 diabetes. The A1/A2 hypothesis is both intriguing and potentially very important for public health if it is proved correct. It should be taken seriously and deeper research is needed to verify the range and nature of BCM7 interactions with the human gastrointestinal tract and whole organism. This requires more of animal trials and generation of data on human subjects having the problems related to A1/A2 beta-casein milk consumption.

**Monika Sodhi, Manishi Mukesh, Ranjit S. Kataria, Bishnu P. Mishra, Balwinder K. Joshii**

*National Bureau of Animal Genetic Resources, Karnal, Haryana, India*

**Corresponding Author:** Dr. Monika Sodhi, National Bureau of Animal Genetic Resources, Karnal, Haryana, India. E-mail: monikasodhi@yahoo.com

## References

1. Elliott RB, Harris D P, Hill JP, Bibby NJ, Wasmuth HE. Type I (insulin-dependent) diabetes mellitus and cow milk: casein variant consumption. Diabetologia 1999; 42: 292-6.
2. Mishra BP, Mukesh M, Prakash B, Monika S, Kapila R, Kishore A, *et al*. Status of milk protein, b-casein variants among Indian milch animals. Indian J Anim Sci 2009; 79:72-5.
3. Laugesen M, Elliott R. Ischaemic heart disease, type 1 diabetes, and cow milk A1 beta-casein. N Z Med J 2003; 116:U295.
4. Tailford KA, Berry CL, Thomas AC, Campbell JH. A casein variant in cow's milk is atherogenic. Atherosclerosis 2003; 170: 13-19.
5. Cade R, Privette M, Fregly M, Rowland N, Sun Z, Zele V, *et al*. Autism and schizophrenia: Intestinal disorders. Nutr Neurosci 2000; 3:57-72.

| Access this article online | |
|---|---|
| Quick Response Code: | Website: www.ijem.in |
| | DOI: 10.4103/2230-8210.100685 |