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Community Medicine

A1 A2 – THE SECRET BEHIND THE WHITE

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ABSTRACT *Ksheera*(milk) in Ayurveda is given more importance among the *Aahara Vargas*. Among *AshtaKsheera*(8 types of milk), *GavyaKsheera*(cow milk) is considered as *Shresta*(superior). It is said to possess many benefits such as *Rasayana*(rejuvenates), *Balya*(gives strength), *Ayushya*(increases lifespan) etc. Milk is a primary source of nutrition for infants as well as human beings. It contains all the essential micro-nutrients required for the growth and development of human beings. It is a good source of protein, fat, vitamins and minerals. It is considered as biologically complete food. There are various forms of milk like A1, A2, A3 etc. among which A1 and A2 milk are predominantly present and consumed by humans. The difference between A1 and A2 milk is that it differs in single amino acid sequencing at 67th position. A1 milk contains proline which was changed to histidine in A2 milk. Milk contains 3.5% of proteins mainly Casein. A1 milk contains A1 beta casein which is known to cause various health hazards. On the other hand, A2 milk which contains A2 beta casein is said to prevent many metabolic diseases. The benefits of *Ksheera* which is said by Ayurveda Acharya's can be compared to A2 milk which is known to possess all the benefits. This article deals with health hazards of A1 milk, benefits of A2 milk and Ayurvedic concept of milk.

KEYWORDS : Milk, A1 & A2 Milk, *Ksheera*

Introduction

Milk is a nutrient rich, white liquid food produced by the mammary glands of mammals. It is the primary source of nutrition for infant mammals before they are able to digest other types of food. Early lactation milk contains colostrum, which carries the mother's antibodies to its young and can reduce the risk of many diseases. As an agricultural product, milk, also called dairy milk is extracted from farm animals.

Cow milk contains 3.5% protein of which casein accounts for 3g%, lacto-albumin 0.4g% and lacto-globulin 0.1g%. All the three have high biological values. When milk is heated, only lacto-albumin and lacto-globulin get precipitated. Casein is held in solution by calcium phosphate in the form of calcium caseinogenate.

Fats are present in emulsion as glycerides of fatty acids, mainly butyric, oleic, stearic and palmitic acids. Milk fat is easily digestible. Carbohydrates in milk are present in the form of lactose. On fermentation, this lactose is converted into lactic acid by Lactobacillus lactis, the lactic acid coagulates with casein forming curd. Milk contains most vitamins and all minerals but Vitamin C and iron are present only in small quantities.[1]

Materials and Methods

All the Ayurvedic classics, contemporary texts, journals and research works were reviewed.

Composition of milk

Milk is mainly made up of water (86.5%), Carbohydrate mainly lactose (4.8%), Fat (4.5%), Protein mainly casein (3.5%), Vitamins and Minerals (0.7%). Composition of each mammal's milk change accordingly as mentioned in Table 1

Milk products

Milk is consumed in a variety of forms as whole milk, butter, ghee, cheese, dried and condensed milk, ice cream etc.

Skimmed milk – It is devoid of fat and fat soluble vitamins, but a good source of milk protein and calcium.

Toned milk – It is a blend of natural milk and made-up milk. It contains 1 part of water, 1 part of natural milk and 1/8th part of skim milk powder. The mixture is stirred, pasteurized and supplied in bottles. Toned milk has a composition nearly equivalent to cow's milk.

Vegetable milk – It is the milk which is prepared from certain vegetable foods, for example, groundnut, soyabean etc.[3]

Milk hygiene

Milk is an efficient vehicle for a variety of disease agents. The sources of infection may be the diary of animal, the human handler, the environment, for example, contaminated vessels, flies and dust etc.[4]

Milk Borne Diseases

Diseases which can be directly transmitted through milk are Brucellosis, Q fever and Anthrax. Contaminated milk can also act as a vehicle for other pathogens and can be responsible for enteric fever, food poisoning and diphtheria. Dysentery, diarrhea and potentially even poliomyelitis, infective hepatitis might be transmitted through infected milk.[5]

Processing of Milk

Pasteurization – Pasteurization is defined as the heating of milk to such temperatures and for such periods of time as are required to destroy any pathogens that may be present while causing minimal changes in the composition, flavor and nutritive value.[6]

Concept of Milk in Ayurveda

In Ayurveda, it is said that, *Ksheera* is *Jeevaniya*(gives life), *Bruhmaniya*(nourishes), *Rasayana*(rejuvinates). There are 8 types of *Ksheera* mentioned, among which *GavyaKsheera*(Cow milk) is considered as *Pradhana*(prime importance) after *Naari Ksheera*(human milk). All the *Bruhatrayes*, explains about *Ksheera* under separate *Varga*(group) called as *Dugdha Varga.*

Ksheera is *Madhura Rasa* (sweet in taste), *SnigdhaGuna* (unctuous), *Guru* (heavy for digestion), *Sheeta*(cold in potency), does *Dhatu-vardhana* (nourishes the *Dhatu*).The properties of milk of different mammals differ as mentioned in Table 2.[7]

Shatapatha Brahmana has rightly said that the milk is the main diet of human beings. It is also indicated in many diseases such as *Rakthapitta*(bleeding disorders), *Pandu*(anemia), *Amlapitta*(gastric disturbances), *Gulma*(abdominal tumors), *Daha*(burning sensation) etc.*Ksheera* is *Vata* and *Pittahara. Acharya Sushruta* says *Ksheera* is *Mahabhisyandi* which means it vitiates the channels of circulations by producing some slimy secretions.[8]

Bhavaprakasha says, the milk which is freshly milked from the cow is *Balya*(gives strength), *Laghu*(light for digestion) and acts as nectar. It pacifies *Tridosha*, if it becomes cool should not be consumed. Milk should be consumed hot after boiling in case of cow milk and cold in case of buffalo's milk. In case of sheep milk it should be boiled and consumed hot where as that of goat milk boiled and cooled milk is ideal. If milk is consumed without boiling it blocks the channels, increases *Kapha* and is *Guru* (heavy for digestion). All the other types

of milk except cow and buffalo should not be consumed without boiling. Milk boiled and consumed hot reduce *Kapha* and *Vata,* when cooled pacifies *Pitta.*[9]

Milk from an animal immediately after its delivery, when solidified is called as *Piyusha*. Milk when it becomes sour and boiled till it becomes hard is called as *Kilata*. If milk becomes sour without boiling is called as *Ksheerashaka*. If milk is made sour by adding curd or buttermilk and liquid part is removed is known as *TakraPinda*. The liquid left is known as *Morata.*

Piyusha, Kilata, Ksheerashaka and *Takra Pinda* all are *Vrushya*(amprodisiac)*, Balya*(gives strength)*, Guru*(heavy for digestion)*,* enhance *Kapha* and pacify *Vata* and *Pitta*. Milk from that of *Krishna*(black) and *Raktha Varna Gavya*(red colour cow) is *Vata hara*, from that of *Shweta*(white) *Gavya* is *Guru*(heavy) and *Peeta*(yellow) *Gavya* is *Vata, Pittahara.*

Nindita Dugdha

Milk which is changed in its color, taste, has foul smell, is sour and salt in taste should not be consumed as it may cause skin diseases.

Result

In the 19th century, Scientists were interested to understand the effects of proteins and peptides and research was initiated to find the effects of peptides in human digestion and overall health. In 1990's RB Elliott and CNS McLachlan and collaborators reported that consumption of milk containing a particular class of protein may increase the chances of coronary heart disease, Type 1 Diabetes and some other diseases.[10]

By the end of 19th century, it was found that milk was of different forms like A1, A2, A3, B etc. among which A1 and A2 milk was predominant. Cow milk protein consists of mainly 82 parts of Casein and 12 parts of Whey protein. Casein is of different forms among which Beta Casein is predominant. There are 12 forms of Beta Casein in which A1 and A2 beta casein are predominantly consumed by humans.

Cow milk was been produced with A2 beta casein milk even before they were domesticated. Due to evolutionary changes there was replacement in the Beta Casein gene, the 67th amino acid was changed from proline which was present in A2 milk to histidine in A1 milk. So basically the main difference between A1 milk and A2 milk is the change in single amino acid sequencing at 67th position.[11]

A1 beta casein were found in the milk of Northern European native dairy cows like Friesian, Ayrshire, British Shorthorn and Holstein whereas, A2 beta casein is found in milk of Channel Island cows, Guernsey and Jersey, in Southern French breeds, Charolis and Limousin and in the Zebu original cattle of Africa.

In another independent study on beta casein, conducted by National Bureau of Animal genetic Resources, Kamal, Haryana, it was found that milk of Indian milch breeds, i.e. Gir, Tharparkar, Rathi, Red Sindhi, Sahiwal, Kankrej and Hariana had A2 beta casein present.[12]

This A1 milk slowly became dominant in the community as production of A2 milk couldn't meet the demand. A2 cow breed gives very little amount of milk whereas A1 cow breed gives more amount of milk. Man because of his greediness started rearing more of A1 cow breeds and stopped rearing A2 cow breeds.

In one of the study conducted about the frequency of beta casein variants among 618 animals, it was found that Indian native breeds had the presence of A2 variant only, where as that of foreign breeds and cross-breeds had A1 variant and some both A1 and A2 variant.[13]

When A1 milk is consumed, the A1 beta casein present in it breaks down during digestion to release a harmful substance called BCM-7(Beta Casomorphin). This BCM-7 acts on receptors of different systems such as Immune system, Endocrine system, Nervous system etc. and causes the respective health hazards.

In Immune system, BCM-7 acts as Immune Suppressant leading to most common diseases such as Diabetes, Coronary Artery disease, Cancer etc. The evidence comes from 71 studies conducted and it was suggestive that A1 beta casein is associated with onset of Type 1 Diabetes.[12] Researcher Chin Dusting have found a relation between consumption of A1 beta casein and increased risk of heart diseases.[14]

BCM-7 in GIT releases plenty of Histamine causing GIT disturbances. In a randomized, cross-over, double blind study, around 600 subjects were randomized to consume 300 ml of milk containing A1 or A2 beta casein. Subjects consumed alternative product after 7 day of wash-over period. It was concluded that milk containing A2 beta casein attenuated acute gastro-intestinal symptoms of milk intolerance, while A1 beta casein milk reduced beta casein activity and increased gastro-intestinal symptoms.[15]

During lactation, this A1 beta casein passes from mother to the child which leads to delayed psycho-motor development in children. Cow milk or cow milk based formula when fed to children results in chronic constipation.[16] Other than these, the general disease conditions such as acne, eczema, upper respiratory tract infections, asthma etc. get worse by the consumption of A1 milk. The inflammation from A1 milk leads to lymphatic congestion in turn leading to metabolic suppression there by worsens the condition.

As A2 milk is free from BCM-7, it is considered as safe for consumption. It was observed that the population consuming A2 milk exhibited a lower occurrence of cardiovascular disease and Type 1 Diabetes. A2 milk is easy to digest and is found to be protective against allergies. It is rich in Omega 3 fatty acids and Vitamin D which helps to reduce the risk of metabolic diseases.

The curd and ghee prepared out of A1 milk also has its impact on health as the protein present in the milk would be carried forward. So curd and ghee prepared out of A2 milk is safe. The impact of this protein in cow urine and cow-dung is unknown; studies are yet to be done on these.

Discussion

Ksheera is said to possess many benefits such as *Ayushya*(increases lifespan)*, Jeevaniya*(gives life)*, Bruhmaniya*(nourishes)*, Rasayana* (rejuvenates)*, Medhya*(improves intellect)*, Vrushya*(amprodisiac) etc. These benefits can be got only if the milk we consume is free from A1 beta casein. As A1 milk causes so many health hazards, it can be said that A2 milk was the milk told by Ayurveda *Acharyas* as possessing these benefits.

During the times of Ayurveda *Acharyas*, there was no such concept of A1 milk, only A2 milk was available and that was considered as *Shresta*(superior).The other *Pancha Gavyas*(5 products of cow) mentioned in Ayurveda which has benefits is also from Indian Native breeds, that is A2.

Therapeutic Effects – A1 and A2 milk

The consumption of milk and ghee on daily basis is said to act as *Nitya Rasayana* (daily rejuvenator). The fact is the milk what we are consuming now is A1 milk, the ghee used is also derived from A1 milk. As A1 milk is known to cause many diseases, the *Rasayana* benefits from this milk is questionable. *GavyaGhruta*(cow's ghee) is used as *Anupana*(adjuvent) in many diseases and also there are many formulations on *GavyaGhruta*. This *Ghruta* once again is derived from A1 milk and its impact on health is questionable.

Panchakarma, in which the foremost procedure is *Snehapana* (drinking oil/ghee)*, GavyaGhruta* is used for consumption. Other procedures such as in *Nasya, Ksheera* is mixed with other *Teekshna*(keeness) medicines to reduce its potency. In *VaitaranaBasti, Ksheera* is the main ingredient. There are many *KsheeraYogas* and *Ksheera paka* used in the practice. In all of these A1 milk is the one which is used. Hence its benefits and its impact on health are doubtful.

Milk has become the part of our daily food consumption. Hence it becomes important as to which milk are we consuming. A1 milk is known to possess so many health hazards. On the other hand, A2 milk is not much available as A1 milk. Indian breed cows give low amount of milk which is not sufficient to fulfill the needs of the community. The exotic cows or cross-breed cows give more amount of milk. To get the same amount of milk from Indian breed cow, many cows have to be reared. In that place rearing minimal exotic cows would fulfill the necessity. Also the cost of A2 milk is higher when compared to A1 milk. Due to these reasons, man because of his greediness would prefer only exotic cows.

The community unaware of its effects would continue to use whichever milk is available. On a long run, the whole community would suffer from various diseases like Diabetes, Obesity and even

Cancer, Cardio-vascular diseases leading to death. Hence, for the betterment of the community, firstly, awareness has to be created among the general public about the benefits of A2 milk as well as harmful effects of A1 milk. Preservation and domestication of our Indian breed Cow has to be encouraged. Artificial insemination has to be avoided. Natural habitat of the cow should be provided. Oxytocin injection given to stimulate the release of milk has to be avoided as it again leads to many health hazards. Government needs to support in these aspects to regulate the rules implemented, so as to preserve and domesticate the A2 cow.

Conclusion

India is naturally blessed with Cows having A2allele. Now it's time to pay attention and encourage rearing of these cows. As the prime motto of Ayurveda is *SwasthasyaSwasthaRakshanam,* in order to maintain the health of the community, Indian breed cows must be conserved. If not the next generation would be affected with various diseases. The Government needs to understand these problems and come up with strict rules. More Research works should be conducted to establish the pros and corns of A1 and A2 milk.

Table 1 – Nutritive values of different varieties of milk

Milk	Proteins (g)	Fat (g)	Carbohydrates (g)	Calcium (mg)
Human	1.1	3.4	7.4	28
Cow	3.2	4.1	4.4	120
Buffalo	4.3	6.5	5.0	210
Goat	3.3	4.5	4.6	170
Skimmed milk	2.5	0.1	4.6	120

Table 2 – Properties of different varieties of milk

Ksheera (milk)	*Rasa* (taste)	*Guna* (properties)	*Veerya* (potency)	*Karma*/ Indications
Gavya (cow)	*Madhura* (sweet)	*Snigdha* (unctuous), *Guru* (heavy)	*Sheeta* (cold)	*Sarvaroga Shantikrut* (cures all diseases)
Mahisha (buffalo)	*Madhura* (sweet)	*Snigdha* (unctuous), *Guru* (heavy)	*Sheeta* (cold)	*Nidrakara* (inducing sleep), *Abhishyandi* (blocks the channels), *Shukrakara* (increases sperm count)
Ajaa (goat)	*Kashaya* (astringent), *Madhura* (sweet)	*Grahi, Laghu* (light)	*Sheeta* (cold)	*Rakthapitta* (bleeding disorders), *Atisara* (diarrhea), *Kasa* (cough), *Jwara* (fever), *Kshaya* (tuberculosis)
Aavika (sheep)	*Lavana* (salty), *Madhura* (sweet)	*Snigdha* (unctuos), *Guru* (heavy)	*Ushna* (hot)	*Ahrudya* (not good for heart), *Tarpana* (nourishes), *Keshya* (helps in hair growth)
Gottaki (horse)	*Amla* (sour), *Madhura* (sweet)	*Ruksha* (dry), *Laghu* (light)	*Ushna* (hot)	*Balya* (improves strength)
Ushtra (camel)	*Lavana* (salty), *Madhura* (sweet)	*Laghu* (light)	-	*Deepana* (stimulates digestion), *Krimihara* (destroys worms), *Kaphahara*
Hasti (elephant)	*Madhura* (sweet), *Kashaya* (astringent)	*Snigdha* (unctuous), *Guru* (heavy)	*Sheeta* (cold)	*Bruhmana* (nourishes), *Vrushya* (amprodisiac), *Balya* (improves strength), *Chakshushya* (good for eyes)
Naari (human)	-	*Laghu* (light)	*Sheeta* (cold)	*Deepana* (stimulates digestion), *Vata, Pittahara*

REFERENCES

1. Mahajan& Gupta, Textbook of Preventive and Social Medicine, Jaypee Brothers Medical Publishers, 4th Edition, Pg no: 398-399
2. Mahajan& Gupta, Textbook of Preventive and Social Medicine, Jaypee Brothers Medical Publishers, 4th Edition, Pg no: 398-399
3. Mahajan& Gupta, Textbook of Preventive and Social Medicine, Jaypee Brothers Medical Publishers, 4th Edition, Pg no: 398-399
4. K. Park, Textbook of Preventive and Social Medicine, M/s BanarsidasBhanot publishers, 20th Edition, Pg no: 545-546
5. Mahajan& Gupta, Textbook of Preventive and Social Medicine, Jaypee Brothers Medical Publishers, 4th Edition, Pg no: 398-399
6. Mahajan& Gupta, Textbook of Preventive and Social Medicine, Jaypee Brothers Medical Publishers, 4th Edition, Pg no: 398-399
7. Bhavamishra, Bhavaprakasha, ChaukhambhaOrientalia, Varanasi, Commentary by Dr. BulusuSitaram, Prof. K. C. Chunekar, PurvaKhanda, 6th chapter, Pg no: 530-532
8. L.P.Gupta, Biogenics Secrets of Food in Ayurveda, Chaukhamba Sanskrit Pratishthan publishers, 3rd Chapter, Pg no: 57-63
9. Bhavamishra, Bhavaprakasha, ChaukhambhaOrientalia, Varanasi, Commentary by Dr. BulusuSitaram, Prof. K. C. Chunekar, PurvaKhanda, 6th chapter, Pg no: 530-532
10. Soumitra Banerjee, A2 milk: The Unknown Story about a Milk Protein, 2018, March
11. PrasantaBoro, Binoy Chandra Naha, Deep PrakashSaikia, Chandra Prakash, A1 and A2 milk & its impact on Human Health, IJSN, Vol 7, 2016
12. Soumitra Banerjee, A2 milk: The Unknown Story about a Milk Protein, 2018, March
13. B.P Mishra, ManishiMukesh, B Prakash, Monika Sodhi, R Kapila, A Kishore, et al. Status of milk protein, B-casein variants among Indian milch animals, IJAS, published in 2009, July
14. Keith Woodford, Boyd Swinburn, New evidence that type 1 diabetes is linked to the level of A1 beta-casein in most types of cow milk, 2017, Nov, 2
15. Chin- Dusting J, Shennan J, Jones E, Williams C, Kingwell B, Dart A, Effect of Dietary Supplimentation with Beta Casein A1 or A2 on makers of disease development in individuals at high risk of cardio- vascular disease, Pubmet, 2006, Jan
16. He M, Sun J, Jiang ZQ, Yang YX, Effects of cow's milk beta- casein variants on symptoms of milk intolerance in Chinese adults: a multicenter, randomized controlled study, Pubmet, 2017 Oct 25
17. Simon Brooke Taylor, Karen Dwyer, Keith Woodford, Natalya Kost, Systematic Review of the Gastrointestinal Effects of A1 Compared with A2 Beta Casein, Advances in Nutrition, 2017, Sept 7