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A REVIEW

NUTRITIVE VALUE OF THE MILK RELATED TO HUMAN HEALTH

Navneet Kumar and Nanak Singh[1]

Cane officer, Triveni Sugar mill Pvt. Ltd. Khatauli (Muzaffarnagar)
[1]Agriculture Chemistry, K.V. (PG) College Machhra (Meerut)

A Review

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Milk is white coloured heterogeneous colloidal secretion produced by mammary glands of class Mammalia in which fats and proteins are dispersed in water and other substances like sugar, minerals and other nutrients are held in solution form in water as soluble constituents. According to Geneva congress the milk is the integral product of entire and uninterrupted milking of female milch cows, which are in good health, well-nourished and not over worked. It ought to be collected in the proper manner and contains no colostrum.

Milk contains almost all the essential nutrients of food except that of the roughage. Carbohydrates, proteins, fat, mineral matter, vitamins and water are the components found in milk. The iron is not in sufficient quantity in milk which causes anemia in offspring using only milk as food. The milk constituents are divided as major like water, fat substances, proteins, milk sugar or lactose, mineral matter and minor constituents are like vitamins, enzymes, sterols, pigments, non-protein nitrogen substance and phospholipids. It is, therefore, imperative to describe in detail about the components of the milk for depicting its nutritive value related to human health.

The whole milk of the cows may be divided into water (87.34%) and remaining as total solids like fat (3.75%), proteins (3.4%), lactose (4.7%) and ash (Inorganic minerals) 0.75%. The total solids excluding fat is called solid not fat (S.N.F.) which is found 8.82% in cow's milk and 9.19% in buffaloes milk. The specific gravity varies from 1.0309 to 1.032 and freezing point is -0.543^{0}C to -0.546^{0}C. Nanak Singh (1997).

Milk fat :

It is the most important and costly constituent of the milk consequently the milk having high fat content is treated costly. The fat occurs in milk in the form of globules of different glycerides having low melting point. The cow's milk on an average contains 4.5% fat but it is high in buffalo's milk i.e. 6.5% to 8.5%. The size of the fat globules in cow's milk varies from 2.9 to 3.4 micronswhereas it is bigger in buffalo's milk i.e. 5.4 to 5.7 microns. The milk fat generally contains mixed glyceride esters of different fatty acids of low molecular weights. Some other substances like lecithins, cephalins, carotenoids, cholesterolsetc. and fat soluble vitamins like A,D,E,K, are also found in milk fat.

Water in milk :

According to koeing the quantity of water in milk varies from 83.2% to 90.37% which is variable due to different factors. Average quantity of water in cow's milk is 86.63% and the buffalo's milk contains 84.25% water. Nanak Singh (1997).

Lactose or milk sugar:

The main carbohydrate found in the milk is lactose known as milk sugar. The average lactose in cow's milk is 5.04% and in buffaloes milk it is 5.23%. Glucose is also present in minute quantity (about 0.06%) and this quantity may increase up to 0.12% with increase in lactation period. The lactose is converted into lactic acid through fermentation by lactic acid bacteria due to which the milk becomes sour. Lactose is prepared from whey which is obtained on co-agulation and centrifugation process. The fat and proteins free liquid is then evaporated for preparation of crystals of lactose.

Nitrogenous substances in milk :

Two types of nitrogenous substances are found in milk i.e. proteins and non-proteins.

Proteins :

Proteins are present in the colloidal suspension of the milk. The casein, lacto albumin and globulin proteins are found in milk. Protein percentage in cow's milk is about 4% and casein alone is found 80% of the total protein. Other proteins in traces are found in milk such as lactomucin from butter, lactenin is combined with Ca and found in whey proteins. Small amount of proteases and peptones are present in the milk left after precipitation of proteins. In crude proteins the casein is found 3.33 and 3.88%, albumin 2.255 and 3.01%, globulin 0.59 and 0.65%, in cow's and buffalo's milk respectively.

Non-protein (Nitrogenous substances) :

Urea, uric acid, peptones, proteases, creatine, creatinine and ammonia are non-protein nitrogenous substances found in milk. Milk contains about 7% non-protein nitrogen of the total nitrogen. Non protein nitrogenous substances are found 0.03% in cow's milk and 0.04% in buffalo's milk

Mineral matter in milk :

On complete evaporation and ignition of the milk, ash is left behind which contains all the inorganic mineral matter. Milk ash is alkaline whereas the reaction of milk is slightly acidic (pH 6.5). The average value of ash in milk is variable from 0.75% to 1.0%. Phosphoric acid, lime, Magnesia (Mgo), Chlorine, sulfur, ferric oxide, sodium and potash are the components of milk ash. Nanak Singh (1997).

Milk vitamins :

Vitamins A, D, E and K are fat soluble vitamins found in the milk. Vitamins B complex and C are water soluble. The best source of vitamin B is skim milk, butter milk and whey. Vitamin B is slightly affected by heat. Vitamin C is easily destroyed by heat as it is very sensitive to heat, oxidation and ultra violet rays. The processed milk is deficient in Vitamin C.

Milk enzymes and bacteria :

Milk contains considerable number of enzymes but in small quantities. Some of these are secreted in living cells and some others by micro-organisms. Some of them are introduced by bacterial contamination at the time of milking. Peroxidases, catalase, lipases, phosphatases, reductases, lactase ad proteolytic enzymes are present in the milk. The bacterial Contamination at the time of milking or dirty utensils can deteriorate the milk quality on keeping it for long time.

Milk pigments :

The colour of milk is white due to scattering of reflected light by ultra-microscopic particles (fat globules, proteins likecalcium-caseinate and phosphate etc. Milk mainly contains two pigments carotene and lactochrome.

Carotene :

It is golden in colour in pure state and soluble in

butter fat due to which the fat colour is yellowish. Cow's milk contains more quantity of carotene than the milk of other animals. The carotene is the precursor of vitamin A and one molecule of carotene produces two molecules of vitamin A on hydrolysis.

Lactochrome or lactoflavin :

It is greenish yellow coloured water soluble pigment found in the milk. The yellow green colour of whey is due to this pigment.

Sterols in milk :

These are the compounds composed of cyclopentanoperhydrophenanthrene ring. Sterol especially cholesterol occurs in milk associated with fat in free state. It is monohydric alcohol.

Lecithin in milk :

It is one of the phospholipids and a mixed glyceride found in milk with fat. It is destroyed by heat, insoluble in water but soluble in acetone. Milk contains about 0.06% of lecithin.

Nutritive value of the milk :

Milk is treated as perfect food because it contains carbohydrate in the form of lactose, proteins, (casein, albumin and globulin), enzymes, all the vitamins, mineral matter, fat in the form of triglyceride and fatty acids and water in sufficient quantity. Milk fat and carbohydrate supply energy for the activity of life. Cow's and buffaloes milk supplies 66 and 110 kcal of energy per 100 grams respectively. It develops the growth of newly born calves and the children of the human beings. Nutrition and Health (edit). There is no single food other than milk which can supply almost all the nutrients required for the body of living beings. There are evidence suggesting that the consumption of milk is effective at promoting muscles growth. Roy B.B. (2008).

Milk water acts, as dispersion medium for dispersed phase like fat, proteins and as solvent for minerals and other components which are soluble in it. Water makes the milk dilute by which the milk solids are easily digestible and their surface is large upon which the enzymes can act easily and the milk becomes digestible and absorbable easily.

Milk fat produces two and a half times more energy than carbohydrates. Some studies have suggested that conjugated linoleic acid which can be found in dairy products, is effective supplement for reducing body fat. Whigham I.D. etal (2007). Milk contains almost all fat soluble vitamins (vit. A, D, E and K) and all water soluble vitamins which prevent body from deficiency diseases caused by their scarcity. Though the vitamins are neither food nor produce energy yet in their absence several types of deficiency diseases take place. Vitamin A is called anti-xerophthalmic factor as it prevents the night blindness and improves vision of eyes. Vitamin D is known as antirecketic factor as it prevents the recket disease, Vitamin E is known as antisterility factor at it prevents sterility and vitamin K is antihaemorrhagic factor which does blood clotting and prevents haemorrhage. Milk fat also contains pigments and phospholipids in sufficient quantities than other fats which are essential for normal functioning of brain and milk fat is helpful in the digestion of calcium.

Milk protein has high nutritive value as it contains essential amino acids which are helpful in growth and development of animal and human beings. It contains 4 calories per gram of protein and has immunologic property. It takes part in several vital activities to cover the wear and tear loss in the synthesis of tissues etc.

Lactose is main carbohydrate of the milk which is beneficial than any other disaccharide and a good source of energy. Lactose is helpful in the synthesis of some vitamins in small intestines. It converts calcium into calcium lactate which is easily digestible. It activates the functioning of the brain and other physiological functions.

Bioavailability of some milk nutrients and the probable side effects :

Milk contains casein that breaks down in the human stomach to produce casomorphin, an opioid peptide. In the early 1990s it was hypothesized that casmorphin can cause or aggravate autism spectrum disorder, and casein free diets are widely promoted.

The gene in humans controls the production of lactase enzyme which catalyses the hydrolysis of lactose into galactose and glucose in small intestine for absorption. The gene in humans that controls lactase production and hence lactose tolerance and intolerance is labeled C/T-13910. Babu, J *et al* (2009). Many humans become unable to digest lactose properly as the production of lactase enzyme declines as they mature. Lactose intolerant individuals lacking sufficient lactase production may suffer diarrhea and intestinal gas on consuming milk as the undigested lactose nourish the intestinal micro-flora that excretes gas in the process of fermentation. But the lactose intolerant people may easily digest milk products like yogurt and aged cheese due to break down of some of the lactose during processing. The person lacking supplemental lactase enzyme can generally enjoy dairy foods without experiencing the unpleasant side effects. Healthy Eating –SF.Gate.

The amount of calcium from milk that is absorbed by human body is disputed. Feskanich, D. *et al* (1997). Calcium from dairy products has greater bioavailability than calcium from certain vegetables, such as spinach which contain high levels of calcium-chelating agents. Brody T. (1999) but a similar or lesser bioavailability than calcium from low oxalate vegetables such as kale, broccoli or other vegetable in the Brassica genus. Heaney *et al* (1990), Nutrition Source (2011).

Scientific research is lacking to support the hypothesis of acidosis induced by milk which leads to leeching of calcium storages in bones to neutralize P^H levels (also known as acidash hypothesis). Research has found no link between metabolic acidosis and consumption of milk. Bonjour, J.P. (2013).

Research assessment by world cancer research fund and American Institute for Cancer Research Showed increased risk of prostate cancer with increased intake of milk or dairy products possibly due to inhibition of the conversion of vitamin D to its active metabolite 1,25-dihydroxy cholicalciferol (vitamin D_3) by calcium (which some evidence suggest increases cell proliferation in the prostate), and elevation of levels of insulin-like growth factor-1 (IGF-1). But there is limited evidence suggesting that milk and dairy products are a cause of prostate cancer. American Institute cancer Research (2007).

REFERENCES

Babu J, Kumar S, Babu P, Prasad JH and Ghoshal UC (2009). Frequency of lactose malabsorption among healthy southern and northern Indian populations by genetic analysis and lactose hydrogen breath and tolerance tests. *Ameri. J Clinic. Nutri.* **91**(1): 140-146.

Bonjour JP (2013). Nutritional disturbance in acid-base balance and osteoporosis: a hypothesis that disregards the essential homeostatic role of the kidney." *Br J Nutr.*, **110**(7): 1168-1177

Brody T (1999). Calcium and phosphate". PP.761-94 in Nutritional biochemistry, 2nd ed. Boston: Academic Press, ISBN 0121348369.

Christison GW and Ivany K (2006). Elimination diets in autism spectrum disorders: any wheat amidst the chaff?. *J. Dev Behav Pediatr* 27 (2 Suppl 2): S162-171.

Feskanich D, Willett WC, Stampfer MJ and Colditz GA (1997). Milk, dietary calcium, and bone fractures in women: a 12 year prospective study. *Ameri. J. Publ. Health,* **87**(6): 992-997.

Heaney, Robert P, Weaver and Connie M. (1990). Calcium absorption from kale". *The Ameri. J. Clinic.Nnutri.* **51**(4): 656-7. PMID 2321572. "Can a Lactose Intolerant Eat Some Yogurt & Aged Cheese? *Healthy eating –SF Gate.*

Singh, Nanak (1997). Milk, its composition, Physical properties and nutritive value, Dairy Chemistry. Aman Publication Meerut, 1-13.

Reichelt KI, Knivsberg AM, Lind G and Nodland M (1991). Probable etiology and possible treatment of childhood autism. *Brain Dysfunct.* **4**: 308-19.

Roy BD (2008). Milk: the new sports drink? A Review. *J. Int. Soc. Sports Nutri.,* **5**(1):15.

Whigham ID, Watras AC and Shoeller DA (2007). Efficacy of conjugated linoleic acid for reducing fat mass: a meta-analysis in humans. *The Ameri. J. Clinic.Nnutri.* **85**(5): 1203-1211.

World Cancer Research Fund/American Institute for Cancer Research (2007). *Food, Nutrition, physical Activity, and the prevention of Cancer; a Global Perspective.* Washington DC: American Institute for Cancer research. ISBN 978-0-9722522-2-5.

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