



# *Technews*

National Dairy Development Board  
For Efficient Dairy Plant Operation

September-October 2000

No.28

## MILK AND HEALTH

This bulletin includes technical and latest development on products, systems, techniques etc. reported in journals, companies' leaflets and books and based on studies and experience. The technical information on different issues is on different areas of plant operation. It is hoped that the information contained herein will be useful to readers.

The theme of information in this issue is **Milk and Health**. It may be understood that the information given here is by no means complete.

### *In this issue ...*

1. *Introduction*
2. *Milk Calcium Controls Blood Pressure*
3. *Milk-Derived Peptides too Reduce Blood Pressure*
4. *Some Milk Proteins are Immuno-active*
5. *B Vitamins Help Control Atherogenicity*
6. *Milk Fatty Acids are Anti-cancer*

## 1. INTRODUCTION

- In Liverpool, two General Practitioners lived on nothing but milk for a month. One drank 10 pints (5.7 l) and the other 12 pints (6.8 l) of milk a day, while leading their usual busy lives. At the end of the experiment, they had proved that milk could give them all the nourishment and energy they needed. The one who drank 12 pints of milk a day even put on a bit of weight.

- A group of researchers showed that milk could also help one lose weight. Compared with a conventional weight reducing diet, clinically obese people lost significantly more weight on a diet consisting mainly of milk.

Milk is truly a wonder food. It has been regarded as the near-perfect food. It can help sustain health, give energy, and help lose weight, too. Milk helps to build strong bones and healthy teeth.

There appear, now and then, skewed, totally unscientific and unsubstantiated views of anti-milk lobby, suspectedly promoted by vested interests, highlighting milk as a health-risk food. These have no truth, and should be just ignored. This issue of **Technews** reminds some of the health benefits of milk, based on some recent publications.

The nutritional value of milk is well-known and is proven. Milk proteins help in building and maintaining body tissues, and are of highest quality. In mammary gland, casein protects against calcification. Whey proteins offer protection against tumour incidence and enhance humoral immune response.

Milk fat is a concentrated form of energy. It protects organs and insulates body from external temperature effects. Milk fat exists in an emulsion form in milk making it highly digestible. Milk fat contains essential



free acids, which cannot be synthesized by the body.

Lactose, found only in milk, stimulates the absorption of calcium and magnesium in addition to providing energy. It is suitable for diabetics. It is less cariogenic than other sugars. It prevents infection and improves intestinal health.

Heated and boiled milk contains lactulose, produced from lactose, upto 0.2%, which acts like soluble fibre. It is used for treatment of constipation and chronic encephalopathy, and may enhance calcium absorption in the intestine.

Milk is a good source of B vitamins, especially riboflavin, thiamin, folate, and vitamin B<sub>12</sub> which is needed to keep the blood and nerves in good order. In addition, whole milk also supplies vitamin A, which promotes healthy skin and vision.

Minerals are essential for maintaining bones and muscle function. Milk contains calcium, phosphorus, magnesium, potassium, iodine and zinc. Zinc is essential for general good health and boosting the immune system (Bourne, 1999). Calcium is essential to ensure the development of strong, healthy bones, partially during childhood and the teenage years. Developing strong bones when young helps to prevent brittle bones (osteoporosis) in later life. It is also essential for the development of teeth. Calcium in milk and cheese neutralizes the harmful acids that decay teeth. Additionally, it helps in on-the-spot repairs to tooth enamel. Calcium helps blood to clot when we cut ourselves and regulates the contraction and relaxation of muscles, including the heart.

Micro-constituents of milk have several specific health benefits. Some of these are described as follows.

## **2. MILK CALCIUM CONTROLS BLOOD PRESSURE**

Increased blood pressure has been shown to be associated with inadequate intake of calcium and other minerals and fibre and high intake of fat. Studies have demonstrated (McCarron, 2000) that low-fat milk/milk products are more effective than supplemental calcium in controlling high blood pressure. Dietary calcium supplied by milk products produce more homogenous blood pressure responses and results in consistent blood pressure reduction, than does the supplemental calcium. The combinations of nutrients present in dairy products is an independent factor that contributes significantly in

reducing blood pressure, and thus hypertension risk (McCarron, 1999). It is, therefore, recommended that adults regularly consume adequate levels of dietary calcium, mainly through milk products, for optimal blood pressure regulation, as well as other health benefits of calcium, including lowered risk of osteoporosis and colon cancer by inactivating harmful substances.

Studies suggest that adults who consume 1000 to 1500 mg/day of calcium through their diets reduce their risk of developing hypertension (McCarron, 2000).

## **3. MILK-DERIVED PEPTIDES TOO REDUCE BLOOD PRESSURE**

It is not only milk calcium that reduces blood pressure, other minor components of milk products, like potassium, magnesium and peptides too control blood pressure (Chandan, 2000; Fosset and

Tome, 2000; Nurminen, 2000). Milk proteins are a source of peptides, which have various functional activities. Milk derived peptides with antioxidant properties lower blood



pressures and have beneficial effect on hypertension-related vascular injury.

In addition to anti-hypertensive effect (lower blood pressure), milk peptides have other beneficial activities like mineral

binding, anti-thrombotic (anti-blood clotting), antimicrobial, immunomodulator effects (enhance immune properties) and preventing dental caries (Chandan, 2000; Fosset and Tome, 2000).

#### 4. SOME MILK PROTEINS ARE IMMUNO-ACTIVE

Whey proteins of milk are reported to exert immunomodulatory effects which are not exhibited by casein, soy, wheat, corn, egg or fish protein (van Belzen and Steijns, 2000; Chandan, 2000). These whey proteins are immunoglobulins, lactoferrin, cytokines lysozyme, lactoperoxidase, hormones and lactalbumin.

##### Immunoglobulins.

Immunoglobulins block adhesion of microbes to the intestinal surface, inactivate bacterial toxins and assist in antibody-dependent cell killing.

In the cow the major class of immunoglobulins is IgG1, with concentration of about

48 g/l in colostrums and 0.6 g/l in normal milk. Milk immunoglobulins are effective means of preventing or combating diarrhea and against pathogens including campylobacter, Clostridium, Shigella, Vibrio, E.coli and rotavirus.

Lactoferrin. The antimicrobial, anti-fungal and anti-viral properties of lactoferrin are well established. Lactoferrin has capacity to sequester iron from use by pathogens, to bind pathogen surfaces, to kill pathogens and to bind bacterial endotoxins, thereby inhibiting its interaction with immune cells and reducing inflammation.

Lactoperoxidase. It is an

enzyme and has an antibacterial effect. It also prevents tooth cavities.

**Lysozyme.** It has antimicrobial effect against Gram positive bacteria.

**Lactalbumin.** Lactalbumin is an excellent source of essential amino acids, tryptophan and cysteine. Tryptophan regulates appetite, sleep-walking rhythm and

pain perception.

**Colostrums.** It contains antibodies, lactoferrin, lactoperoxidase, cytokines and growth factors. The antibodies act as antimicrobials against infection from rotavirus (diarrhoea), *E.coli* (food poisoning), *Streptococcus mutans* (dental caries), *Helicobacter pylori* (ulcer, gastritis) etc. (Chandan, 2000).

#### 5. B VITAMINS HELP CONTROL ATHEROGENICITY

Homocysteine (an amino acid produced by the acid hydrolysis of proteins in digestion) in blood is atherogenic, i.e., causes thickening of, and loss of elasticity in, the inner walls of arteries. The most important factor leading to hyperhomocysteinemia in the general population is deficiency of three B vitamins, vitamin B<sub>6</sub> (pyridoxine), folic acid and vitamin B<sub>12</sub> (cobalamin). Deficiency of vitamin B<sub>6</sub> causes elevation of blood homocysteine following a meal containing abundant

protein. Deficiency of either folic acid or vitamin B<sub>12</sub> causes elevation of blood homocysteine in the fasting state. Insufficient dietary intake of these vitamins increases mortality and morbidity from coronary heart disease. Studies indicate that the daily amounts needed are: 400 µg (micro-g) of folic acid and 3 mg of vitamin B<sub>6</sub> (McCully, 2000).

Vitamin B<sub>6</sub> and folic acid are sensitive to factors such as heat, light, chemical oxidants and milling of grains, and are lost considerably due to



processing.

Conventional pasteurization of milk causes no loss of vitamin B<sub>6</sub> and a 10% loss of folate, and ultra-high temperature sterilization causes a 10% loss of each of the vitamins. More severe heat treatment, such as concentration by evaporation and drying, causes more loss.

Commonly consumed dairy foods are rich sources of animal protein. The amount of vitamin B<sub>12</sub> is also substantial in dairy foods, providing about 1µg/100g.

However, in general, the amount of vitamin B<sub>6</sub> and folic acid in dairy foods is quite low: about 0.04-0.09 mg of vitamin B<sub>6</sub> per 100 g and 4-11 µg of folic acid per 100 g. Therefore, diets containing substantial amounts of dairy foods need also to contain fresh vegetables, fruits or meats to supply adequate vitamin B<sub>6</sub> and folate (McCully, 2000).

Udenatured whey protein concentrate has been found to stimulate immunity in man, and to prolong the life span (McCully, 2000).

#### 6. MILK FATTY ACIDS ARE ANTI-CANCER

Milk fat contains several fatty acids. Conjugated linoleic acids (CLA) are a class of fatty acids found in milk and ghee. CLA is strong antioxidant and may prevent colon cancer and breast cancer. It has been shown to enhance immune response. CLA may reduce risk of heart disease. It may increase bone density, reduce chronic inflammation and normalize blood glucose levels by

increasing insulin sensitivity (Kritchevsky, 2000; Chandan, 2000).

Sphingolipids, another constituent of milk fat, occur at a level of only 160 µg/kg. They have shown to inhibit colon cancer, reduce serum cholesterol and elevate the good cholesterol (Chandan, 2000).

The fatty acids of milk fat comprise 60% fatty acids

which do not raise serum cholesterol.

These are only some beneficial effects of milk constituents. Milk makes an important contribution to diet

at every stage of life. The latest research is indicating that milk and the nourishment it provides may be important in helping to prevent a number of diseases.

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