



Review Article

CURD: A SEDATIVE WITH A BONUS BOWL OF USEFUL SIDE EFFECTS

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ABSTRACT

A daily bowl of fresh curd/yogurt helps in preventing numerous diseases. Curd/yoghurt may be viewed as a natural healing food supplement. It has a perfect balance of proteins, carbohydrates, fats, minerals and vitamins. It is like a benediction from our ancestors. Curd as such is easy to digest but, when combined with sugar, pepper, vegetables and/or fruits make a delicious dish. Curd has been designated as functional food, which boosts natural as well as acquired immunity and improves stamina. It offers beneficial and healthy micro flora to the alimentary canal through diet being the richest source of probiotics without any risk of adverse effects. It is used for treating various illnesses like allergy, urogenital infections, HIV, cancer, *Helicobacter pylori* infection, liver disease, inflammatory bowel disease (IBD), irritable bowel syndrome (IBS), pancreatitis, diabetes, insomnia and hypercholesterolemia. In addition to this, curd enhances the life span of a person and prevents premature ageing. Moreover, it promotes the secretion of hormones and helps the kidneys in detoxification of blood. Curd makes a favorite dish liked equally by the young as well as elderly members of the family, because of its easy availability and ample of health benefits. In a candid way, we can say that consume curd/yogurt regularly and forget illness for whole life.

Keywords: Curd, Probiotics, *Lactobacillus*, Insomnia, AIDS, Diabetes

INTRODUCTION

Yogurt/Curd is a semisolid sourish food prepared from fermented milk, which can be eaten plain or with addition of salt/pepper/sugar/fruits. Its origin is linked to India, where it is consumed throughout the year. The word da-hi seems to be derived from the Sanskrit word dadhi, one of the five elixirs (panchamrita) often used in Hindu rituals. Curd (Indian dahi) is popular due to its favorable impact on health and high nutritional value. It has been designated as functional food, which boosts natural as well as acquired immunity and improves stamina. Curd/Yogurt forms the richest source of "probiotics". Probiotics contain living microorganisms (good bacteria), which upon ingestion exert health benefits beyond inherent general nutrition. At the beginning of 20th century, Elie Metchnikoff showed that the consumption of yoghurt (fermented milk) products resulted in sound health and enhanced life-span of Bulgarian peasants.¹ Moreover, the individuals, who consumed local yogurt were able to protect their intestines from the destructive effects of other pathogenic bacteria such as *Lactobacillus*, *Bifidobacterium*, *Escherichia*, *Enterococcus*, *Bacillus*, *Streptococcus* and some fungal *Saccharomyces* strains.

Yogurt: A Complete Food

Yogurt, as well as milk, has a perfect balance of proteins, carbohydrates and fats. Yogurt holds on its own a prestigious status in the nutritional spectrum of foods.² It is not a carbohydrate, although, it is plentiful in the sugar lactose; it is not a protein strictly, but is rich in proteins with up to 22 g per cup; and it is not a pure fat, yet it is abundant in healthy fatty acids. Yogurt makes a super-natural healer by virtue of high amounts of probiotic bacteria it contains, which add the extra medicinal value.²

Method of Preparation

Dahi is generally prepared using cow or buffalo milk. The curd gel is relatively firm, when buffalo milk is used because

of the higher total solids (16-19 %) as compared to cow milk (12 %). Dahi/yogurt is formed by the process known as Lactic Acid Fermentation. Microorganisms involved in the preparation of Dahi are *Streptococcus cremoris*, *S. lactis*, *S. thermophilus*, *Lactobacillus bulgaricus*, *L. acidophilus*, *L. helveticus* and *Lactobacillus cremoris*.³ A small amount of already fermented curd is used as a starting mixing material. Addition of 0.2 % citrate has been recommended for imparting pleasing aroma to dahi. A good quality dahi has firm and uniform consistency with a sweet aroma and lovely taste. The surface of curd is usually smooth and glossy. The composition of dahi depends upon the type of milk used and the manufacturing conditions. The whole milk dahi has a thick top layer. House hold utensils are beneficial for excellent consistency of dahi.

Mechanism of Action

Curd/Yogurt forms the richest source of "probiotics". Probiotics contain living microorganisms (good bacteria), which upon ingestion exert health benefits beyond inherent general nutrition. Presently, there is growing awareness among people for the nutritional control of ailments. Nutritional supplements like Curd/yoghurt form natural healing foods. These probiotics offer beneficial and healthy micro flora to the alimentary canal through diet without any risk of adverse effects.⁴ Lactic acid bacteria (LAB) e.g. *lactobacilli* is one such example of advantageous microorganisms. Probiotics promote the health of the host by boosting the immune system of the body. Natural immunity is strengthened by the curd through stimulation of mucosal and systemic host immunity, which is manifested through enhanced levels of immunoglobulins, activated macrophages, high levels of cytokines and natural killer (NK) cell activities in the patient.³ Further, probiotic bacteria can trigger a cascade of immunological defense mechanisms by binding to recognition receptors, such as Toll-like receptors (TLRs) expressed on the surface of epithelial cells. Moreover, they

may enhance immune status of HIV patients by increasing the production of immune cells, such as CD₄ + T-cells (that mediate and control the balance of pro-inflammatory and anti-inflammatory cytokines and chemokines). Hence, curd may be viewed as the potential remedy while designing clinical studies for the treatment of illnesses like allergy, urinogenital infections, HIV, cancer, *Helicobacter pylori* infection, liver disease, inflammatory bowel disease (IBD), irritable bowel syndrome (IBS) and pancreatitis.⁶ Different probiotic strains generate diverse immune responses dependent on immune system of the host. Non-specific therapeutic modulation of probiotics in the host is mainly due to adherence and colonization of the gut, suppression of growth or epithelial binding/invasion by pathogenic bacteria, production of antimicrobial substances, and improvement of intestinal barrier function.

Role of Curd/Yogurt

In the treatment of AIDS (Acquired Immuno Deficiency Syndrome)

Lactobacillus rhamnosus GR-1 administered in the form of curd/yogurt has shown promising results for the immune function of people living with HIV (Human Immunodeficiency Virus). Moreover, other micronutrients present in curd have also demonstrated the ability to improve immune function and delay disease progression. People infected with HIV often suffer from altered gastrointestinal function, rapid decline of CD₄ lymphocytes (associated with enhanced intestinal permeability), altered gut micro biota profiles, decline of *lactobacilli* and *bifidobacteria*, diarrhea and higher concentration of pathogenic species such as *Candida albicans* and *Pseudomonas aeruginosa*.⁷ Scientific investigations have supported the beneficial role of vitamins B, C, E, folic acid, selenium and whey protein, which are all present in curd in the management of HIV.^{7,8} Thus, curd provides a safe, cost effective, and natural approach that creates a barrier against microbial infection. Furthermore, it significantly decreases the infectivity of HIV.

In the treatment of Cancer

Gastrointestinal (GI) tract cancer, Oesophageal cancer, Gastric cancer (GC), *H. pylori* (HP) and Colorectal cancer (CRC) are the third most frequent cancers worldwide (more than 1 million new cases/year) and the fourth most common cause of cancer death, with about 500,000 deaths annually.⁹ Good nutrition forms an essential component of GIT cancer treatment. Eating the right kind of food before, during, and after treatment of cancer makes the patient better and stronger. But nutrient needs vary from person to person. Therefore, eating a right combination of proteins, carbohydrates, fats, vitamins, and minerals (through curd) help in fighting cancer. Several animal studies confirm that the intake of yogurt/fermented milk like curd containing probiotic bacteria inhibit tumor formation and proliferation. It has been demonstrated that a 6-week administration of *L. acidophilus* fermented milk supplements like curd resulted in lower concentrations of soluble bile acids in faeces of colon cancer patients, which was responsible for cytotoxic effect on colon epithelium.¹⁰ It has been suggested that lactic acid bacteria or a soluble compound produced by the bacteria may interact directly with tumor cells in culture and inhibit their growth. In a study, lactic acid bacteria significantly reduced the growth and viability of the cancer cell line HT-29. In another study, milk fermented with *B. infantis*, *B. bifidum*, *B. animalis*, *L. acidophilus* and *L. paracasei* inhibited the

growth of the MCF7 breast cancer cell line, with their anti-proliferative effect not being related to the presence of bacteria.¹⁰ Thus, bacteria present in the curd play an important role along with other curd components in arresting the growth and proliferation of tumors.

In the treatment of Insomnia

Being unable to sleep at bed time is commonly referred to as insomnia. The symptoms of insomnia include waking up during the night; feeling restless in the morning, fatigue, irritability, depression, anxiety, difficulty in concentrating, headache and digestive problems. One can effectively treat occasional insomnia at home with dietary supplements, including eating yogurt/curd before bed-time. Curd/yogurt contains several nutrients with potential sleep-promoting properties. Tryptophan is a primary amino acid of the body to produce serotonin and melatonin. Both of these brain neurotransmitters are involved in inducing sleep and relaxation. Group B vitamins are also needed in the synthesis of serotonin. Deficiencies of group B vitamins and minerals may disrupt sleep. It has been shown that preparations containing melatonin, magnesium, and zinc taken daily for 8 weeks, 1 hour before bed-time improved the sleep quality.¹¹ Eating foods rich in tryptophan, such as yogurt/curd, facilitate the synthesis of serotonin and melatonin thereby, inducing sleep. People experiencing discomfort with milk due to lactose intolerance may be able to tolerate yogurt/curd without experiencing any discomfort because most of the varieties of curd contain less lactose. The components of curd that are beneficial in ameliorating insomnia include: Calcium, which reduces wakefulness and restlessness. Magnesium, which enhances the secretion of melatonin from the pineal gland, prevents nervousness and induces sleep. Vitamin B₁₂ (cobalamin) prevents confusion, dementia and fatigue. Vitamin B₅ (pantothenic acid) is good for relieving stress and anxiety and Folic Acid promotes hemoglobin synthesis and enhances alertness.

In the treatment of Diabetes and Improvement of lipid profile

Type 2 diabetes mellitus (T2DM) has rapidly increased worldwide during the past few decades. It is usually accompanied by an increased production of free radicals and impaired anti-oxidant defenses. Anti-oxidative mechanisms of probiotics (containing lactic acid bacteria) could be assigned to reactive oxygen species scavenging, metal ion chelation, enzyme inhibition and inhibition of ascorbate autoxidation. Animal studies have further confirmed that *Lactobacillus acidophilus* and *Lactobacillus casei* attenuate oxidative stress and have antidiabetic effect.¹² Modification of gut micro flora by probiotics may be seen as a novel means of regulating glucose metabolism and improving the condition of T2DM. Dyslipidemia is the leading cause of cardiovascular diseases (CVD) in type 2 diabetics.¹³ Yogurt/curd consumption caused a 4.5 % decrease in total cholesterol (TC) and a 7.5 % decrease in LDL-C compared with the control group.¹² It was shown that probiotic yogurt consumption significantly decreased TC, LDL-C, TC:HDL-C (High-density lipoprotein) and LDL-C:HDL-C ratio compared with the conventional yogurt. Among all probiotic strains investigated for cholesterol-lowering effect, *L. acidophilus* has been studied most widely. *In vitro* experiments have shown numerous possible mechanisms, which include de conjugation of bile acids by bile salt hydrolase, assimilation of cholesterol binding to cell walls of

probiotics and production of short-chain fatty acids (SCFA-inhibit hepatic cholesterol synthesis). Consuming 200 g/day of yogurt containing *L.acidophilus* L1 contributed to a 2.9 % decrease in serum cholesterol concentration of hypercholesterolemic patients³.

In the treatment of Liver Diseases

Non-alcoholic Fatty Liver Disease (NAFLD) has been reported to have high prevalent rate world-wide. Causal factors of NAFLD are excessive formation of harmful compounds such as bacterial lipopolysaccharides, inflammation inducing substances and overgrowth of gut micro flora. Medicines such as polymyxin B and metronidazole are currently employed to surmount the overpopulation of pathogens in the patients of NAFLD¹⁴. However, it is not a satisfactory therapy. Therefore, usage of probiotics such as curd is recommended. Bacteria present in the curd have the capacity to modulate micro flora overpopulation. However, most of the studies are confined to animals only. Hence, approving probiotics as a treatment option requires large scale clinical trials. Alcoholic Liver Disease (ALD) - ALD is a cause of a high rate of morbidity and mortality worldwide. Alcoholic steatohepatitis (ASH) and severe ALD is apparent in approximately 30 % of heavy drinkers¹⁴. Various *in vivo* studies done on animals and humans have shown the presence of bacteria in the bowel tracts, which produce high level of endotoxin. Unfortunately,

appropriate treatment of these patients is not available till date. However, probiotics can be administered to relieve ALD symptoms because they can modulate the gut and immune systems. Excessive growth of gut micro flora, bacterial translocation, and endotoxemia is found in patients with cirrhosis. Probiotic therapy modulates bio-ecological system in the intestinal tract by preventing the growth of pathogens. It also improves the mucosal layer and preserves intestinal epithelia cells. Hepatic Encephalopathy (HE) is an acute as well as chronic liver disease, which occurs in at least 50 % to 70 % of patients with cirrhosis¹⁴. Ammonia produced by the gut flora is released to the portal system that disrupts the central nervous system producing neuropsychiatric syndrome. Probiotics have reduced the bacterial urease activity, alleviated pH and ammonia absorption and decreased intestinal permeability. These actions are favourable for treating hepatic encephalopathy. But, there are limited clinical trials confirming these facts. Viruses like hepatitis B and C virus (HBV and HCV) are the causative agents leading to long term hepatocellular injury. Increase in plasma levels of endotoxin, high amounts of the pro-inflammatory cytokines and liver necrosis is reported in the patients with HBV and HCV¹⁴. Few reports suggest that the improvement of endotoxemia could be achieved by increasing *bifidobacteria* and *lactobacillus* numbers. But still a lot of work is needed to establish the usefulness of probiotics in this area.

Table 1: Synonyms of Curd

Kannada	Mosaru
Tamil	Thayir
Malayalam	Thayiru
Assamese, Bengali	Doi
Oriya	Dohi
Telugu	Perugu
Sindhi Marathi	Dhahi or Dhsunro Dahi
Hindi/ Punjabi	Dahi

Table 2: Dishes made up of Curd in Different Countries

Name of the Dish	Country
Sweet yogurt (meesti doi or meethi dahi)	Eastern parts of India
Mâst Chekide (kefir yogurt)	Northern Iran
Juju dhau	Nepalese yogurt
Matsoni	Russia
Zabadi	Egypt
Jameed	Jordan
Dahi bhalla	India and Pakistan
Sherikhand	India and Pakistan
Lassi	India and Pakistan
Rahmjoghurt	Germany
Tarator and Cacik	Albania, Azerbaijan, Bulgaria, Serbia and Turkey
Khayar w Laban	Lebanon and Syria
Dovga	Azerbaijan

Table 3: Nutritional Value of Curd

Nutrients of Curds	Values
Calories	61 kcal
Carbohydrates	4.7 g
Proteins	5.1 g
Fats	3.5 g
Minerals	
Calcium	121 mg
Iron	0.1 mg
phosphorus	141 mg
Magnesium	12.0 mg
Selenium	2.2 µg
Zinc	0.6 mg
Electrolytes	
Potassium	155 mg
Sodium	46.0 mg
Vitamins	
Vitamin A	99.0 IU
Vitamin C	0.5 mg
Vitamin K	0.2 µg
Vitamin B ₁₂	0.4 µg
Vitamin B ₂	0.2 mg
Vitamin D	0.1 mg
Folic Acid	7 µg



Figure 1: Benefits of yogurt/curd

Interesting Facts of Curd/Yogurt

- Curd contains 'good' bacteria, which aid indigestion.
- Curd enhances vitality, stamina and boosts immunity.
- Curd is helpful in curing Burns.
- Curd helps in beating intense heat of summer.
- If you are unable to sleep, take curd to fall asleep.
- Curd is effective in conditioning the hair. It makes the hair soft, healthy and dandruff-free.
- A mixture of oatmeal flour and curd has been found effective in making the skin fair, and soft.
- Curd has therapeutic value in allergic reactions and AIDS patients.
- Curd is useful in keeping youthful elasticity in tissues. It alleviates hot flushes and menopausal distress.
- It promotes the secretion of hormones and helps the kidneys in detoxification of blood.
- Curd is useful in vitamin A deficiency diseases like Night Blindness, Xerosis Conjunctiva, Xerosis Cornea, Bitot's Spots, Keratomalacia and Follicular Hyperkeratosis.
- Curd cures Riboflavin deficiency, which is characterized by Angular Stomatitis.
- Curd helps in Folic acid deficiency as well as Iron deficiency disorders commonly found in girls, pregnant and lactating women, who are prone to Anemia.
- Curd is effective in Vitamin C deficiency disorder called scurvy.
- Curd is beneficial in vitamin D deficiency disorders like Rickets and Osteomalacia. Curd forms a good supplement of calcium than milk.
- Curd is of value in Vitamin K deficiency diseases like haemorrhagic conditions.
- Phosphorous and Zinc deficiency disorders like loss of weight, loss of hair, retarded growth, reduced libido and general weakness can be successfully treated with Yoghurt.
- Selenium found in curd slows down ageing and hardening of tissues preventing premature wrinkles caused due to magnesium deficiency.

CONCLUSION

Curd is a semisolid food prepared from fermented milk. Its origin is linked to India, where it is consumed almost every day. It is easy to prepare, consume and digest. It contains an ideal combination of proteins, carbohydrates, fats, minerals and vitamins. Apart from these healthy ingredients, it is the richest source of probiotics. Curd forms a good supplement of calcium than milk. Curd is found to be effective for the treatment of insomnia, diabetes, liver diseases, AIDS and cancer. Curd contains 'good' bacteria, which help in digestion. Curd helps in beating intense heat of summer, in addition to enhancing vitality and stamina. If you are unable to sleep, take curd to fall asleep. Curd is effective in conditioning the hair. It makes the hair soft, healthy and dandruff-free. Curd is useful in keeping youthful elasticity in tissues. It alleviates hot flushes and menopausal distress. Curd helps in Folic acid deficiency as well as Iron deficiency disorders commonly found in girls, pregnant and lactating women, who are prone to anemia. Curd is beneficial in vitamin A, B, C, D, and K deficiency disorders. Phosphorous and Zinc deficiency disorders like loss of weight, loss of hair, retarded growth, reduced libido and general weakness can be successfully treated with Yogurt. However, clinical studies are needed in this area for establishing the potential of curd as an efficient probiotic. However in any case, consumption of this fermented milk product enhances life-span.

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