

Nutritional and Therapeutic Significance of Fermented Milk Products

- Improve digestibility
- Enhance nutritional profile
- Influence organoleptic properties
- Reduce gastric complications in lactose intolerants

Enzymes

- Improves lipid profile
- Prevents cardiovascular diseases and cancer
- Influences central nervous system
- Regulates mood and appetite

GABA, CLA

Organic Acids

- Improve shelf life of fermented food
- Prevent pathogen
- Regulate pH in gut

- Regulate mineral absorption
- Boost up metabolism
- Improve hypotensive action
- Immunomodulation

Vitamins

- Strain specific metabolites
- Enhance folate production
 - Increase riboflavin content

Bile Salt Hydrolase

- Regulate triglyceride profile
- Exert hypocholesterolemic effect

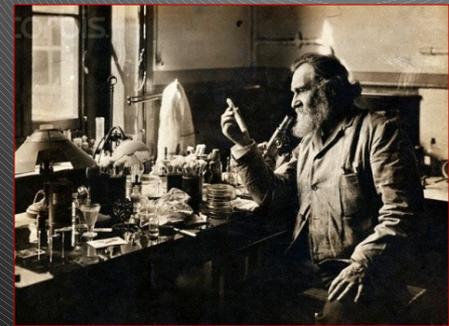
Bioactive Peptides

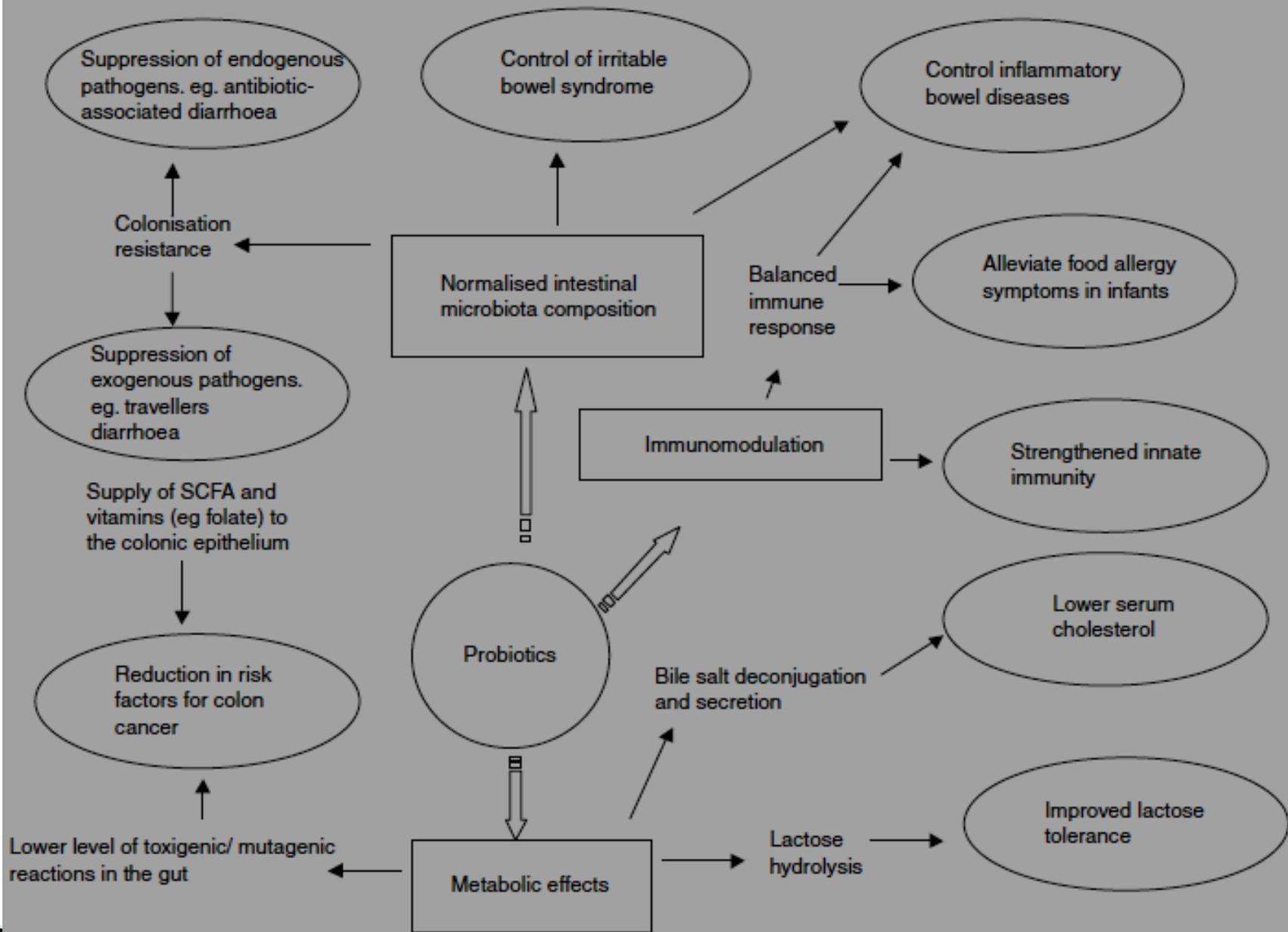


- **The role of fermented milk in human nutrition is well documented and the virtues of these products were known to man even during the ancient days of civilization.**
- **These products have long been an important component of nutritional diet.**
- **The medicinal and nutritional properties of various fermented foods have been experienced by several generations.**
- **However, the scientific community gave impetus to these beliefs in 1910, when Elie Metchnikoff suggested that man should consume milk fermented with lactobacilli to prolong his life.**

Élie Metchnikoff's Contribution

- ▶ The positive role played by certain bacteria was first introduced by Russian scientist and Nobel laureate Élie Metchnikoff, who in the beginning of the 20th century suggested that it would be possible to modify the gut flora and to replace harmful microbes with useful microbes.
- ▶ Metchnikoff proposed that consumption of fermented milk would "seed" the intestine with harmless lactic-acid bacteria and decrease the intestinal pH and that this would suppress the growth of proteolytic bacteria.
- ▶ His work inspired Japanese scientist Minoru Shirota to begin investigating the causal relationship between bacteria and good intestinal health, which eventually led to the launching of "Yakult" in 1935.

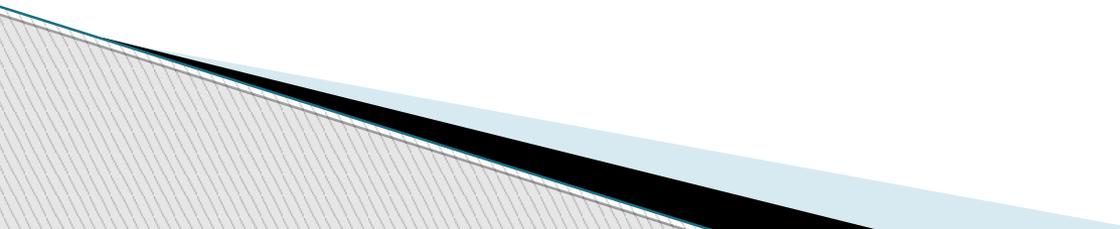




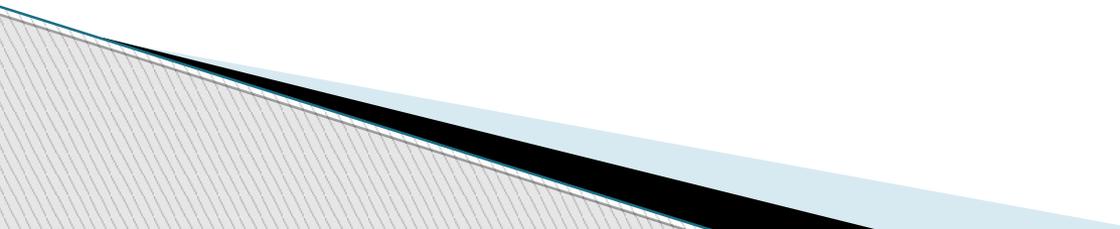
Nutrient synthesis and bioavailability

- ▶ **The action of micro-organisms during the preparation of cultured foods or in the digestive tract has been shown to improve the quantity, availability and digestibility of some dietary nutrients.**
 - ▶ **Fermentation of food with LAB increases folic acid in yoghurt, bifidus milk and kefir**
 - ▶ **Similarly, niacin and riboflavin levels in yoghurt are increased with fermentation.**
 - ▶ **LAB are known to release various enzymes and vitamins into the intestinal lumen.**
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- ▶ This exerts **synergistic effects on digestion**, alleviating symptoms of intestinal malabsorption, and produces lactic acid, which lowers the pH of the intestinal content and helps **to inhibit the development of pathogens** such as *Salmonella* spp. or strains of *E. coli*.
- ▶ Bacterial enzymatic hydrolysis may **enhance the bioavailability of protein and fat** and increase the production of:
 - free amino acids
 - short chain fatty acids (SCFA)
 - lactic acid
 - propionic acid
 - butyric acid

- ▶ **When absorbed these SCFAs contribute to**
 - **the available energy pool of the host and**
 - **may protect against pathological changes in the colonic mucosa.**
 - ▶ **SCFA concentration helps to maintain an appropriate pH in the colonic lumen, which is critical in the expression of many bacterial enzymes and in foreign compound and carcinogen metabolism in the gut.**
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Alleviation of Lactose Intolerance

- ▶ **The inability of adults to digest lactose, or milk sugar, is prevalent worldwide.**
 - ▶ **Consumption of lactose by those lacking adequate levels of lactase produced in the small intestine can result in symptoms of diarrhea, bloating, abdominal pain and flatulence.**
 - ▶ **It has been documented that many lactose intolerant individuals are better able to consume fermented dairy products, such as yoghurt, with fewer symptoms than the same amount of unfermented milk.**
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Protection against Gastrointestinal Infection

- ▶ Gastrointestinal infections including diarrhea result from a change in the gut microflora caused by an invading pathogen.
- ▶ Viable LAB interfere with the colonization and subsequent proliferation of food borne pathogens, thus preventing the manifestation of infection. *L. bulgaricus*, *L. acidophilus*, *S. thermophilus* and *B. bifidum* have been implicated in this effect.
- ▶ The beneficial effects of LAB and cultured milk products have also been attributed to their ability to suppress the growth of pathogens either directly or through production of antibacterial substances and regulate intestinal population.

Preventative and therapeutic effects against diarrhoea

- ▶ Specific strains, including *Lactobacillus* GG, *Lactobacillus reuteri*, *Sacc. boulardii*, *Bifidobacteria* spp., and others, have significant benefit for diarrhoea in young children caused by rotaviruses.
- ▶ LAB are known to release various enzymes into the intestinal lumen that exert synergistic effects on digestion, alleviating symptoms of intestinal malabsorption.
- ▶ In the paediatric population, probiotics appear to benefit viral diarrhoea, possibly by increasing secretory IgA and decreasing viral shedding, suggesting an immunological mechanism.

Anticarcinogenic Effect

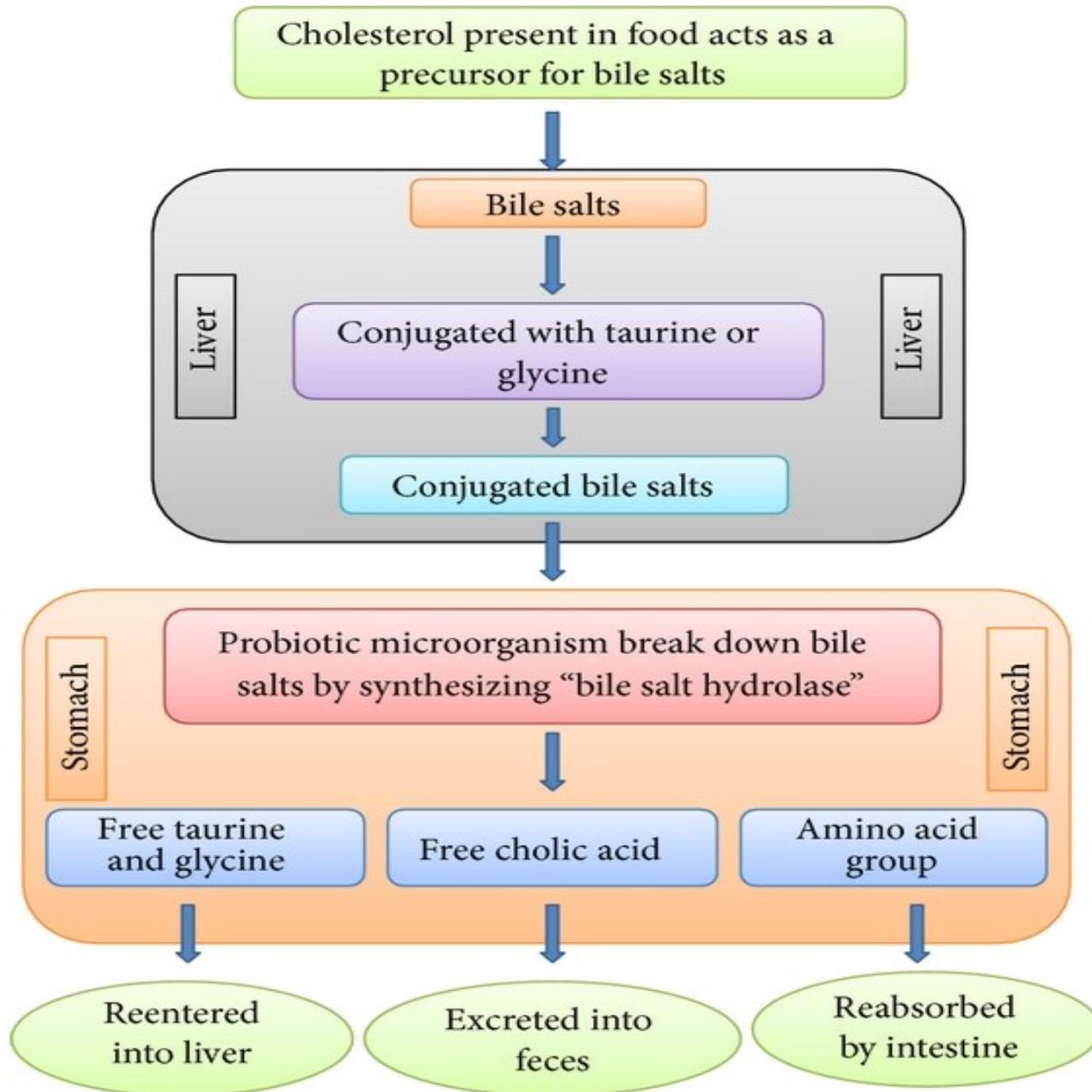
- ▶ Fermented milk products can help in control of secondary infections.
- ▶ Probiotic cultures might decrease the exposure to chemical carcinogens by:
 - (i) detoxifying ingested carcinogens
 - (ii) altering the environment of the intestine and thereby decreasing populations or metabolic activities of bacteria that may generate carcinogenic compounds
 - (iii) producing metabolic products (e.g. butyrate) which improve cell's ability to die when it should die (a process known as apoptosis or programmed cell death)
 - (iv) producing compounds that inhibit the growth of tumour cells; or stimulating the immune system to better defend against cancer cell proliferation.

Immune System Stimulation

- ▶ **Immune system provides the primary defense against microbial pathogens that have entered our bodies.**
- ▶ **Animal and some human studies have shown an effect of yoghurt or LAB on enhancing levels of certain immunoreactive cells or factors.**
- ▶ **Milk components such as whey protein, calcium, certain vitamins and trace elements are also capable of influencing immune system.**
- ▶ **Studies have shown that consumption of yoghurt or LAB results in cytokine production, intestinal antibody production, T-cell production, increase macrophage activity, enhance NK-cell (Natural killer) activity etc.**

Lowering of Serum Cholesterol

- ▶ Fermented milk products have hypocholesterolaemic effect that impair the synthesis of cholesterol. Deconjugated bile salts are less soluble and less efficiently reabsorbed from the intestinal lumen than their conjugated counterparts, which results in excretion of larger amounts of free bile acids in faeces. Also, free bile salts are less efficient in the solubilization and absorption of lipids in the gut. Therefore, the deconjugation of bile acids by LAB bacteria could lead towards a reduction in serum cholesterol.
- ▶ This promotes the potential healthful aspects of dairy products fermented with *L. acidophilus* (or other LAB), since hypercholesterolemia is considered to be one of the major factors contributing to cardiovascular disease.



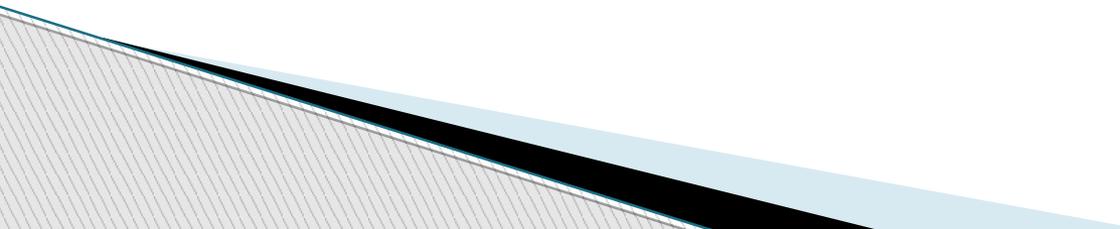
Alleviation of Constipation

- ▶ Constipation is common problem in subjects consuming the western diet and also in elderly people.
- ▶ Reported benefits include alleviation of constipation using *L. acidophilus* NCDO 1748, *L. casei* Shirota and *Lactobacillus* GG.

Antihypertensive Activity

- ▶ Casein hydrolysate, produced by an extracellular proteinase from *L. helveticus* (CP790) has been reported to show antihypertensive activity in rats.
- ▶ Two antihypertensive peptides have also been purified from sour milk fermented with *L. helveticus* and *Saccharomyces cerevisiae*. These two peptides inhibit angiotensin-converting enzyme that converts angiotensinogen I to angiotensinogen II, which is a potent vasoconstrictor.
- ▶ Consumption of certain lactobacilli, or products may reduce blood pressure in mildly hypertensive people.

Antiallergenic Qualities

- ▶ Probiotics may help prevent allergic reactions in individuals at high risk of allergies, such as food allergies.
 - ▶ Probiotic bacteria help to reinforce the barrier function of the intestinal wall, thereby possibly preventing the absorption of some antigens.
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Other possible benefits

- ▶ **Use as oral vaccines**
 - ▶ **Control of urinary tract infections**
 - ▶ **Degradation of toxins**
 - ▶ **Higher intake of low fat fermented dairy products may lower the risk of diabetes in men.**
 - ▶ **Local application for control of infection**
 - ▶ **Alleviation of depression**
 - ▶ **Food fermentations that raise the protein content or improve the balance of essential amino acids or their availability will have a direct curative effect on some of the protein or protein-calories deficiency nutritional diseases.**
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