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## **A review on impact of carbonated milk beverages on human health**

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**Abstract---**Carbonated milk beverages are drinks produced by the fermentation process (addition of yeast) and carbonated by mechanical or physical method. Recent studies show the consumption of carbonated milk beverages are becoming popular due to their nutritional and therapeutic effects. Products like kefir, koumiss, carbonated probiotic drinks and sparkling milk. According to research kefir has different health benefits like gastrointestinal proliferation, anti-bacterial spectrum, an anti-carcinogenic effect due to the presence of lactic acid formed during fermentation. It is also good for those who are lactose intolerant because of the high B – galactosidase activity enzyme which helps break down lactose sugar. Koumiss is

first used by Mongolian people to treat tuberculosis, ulcers and hepatitis. It is rich in vitamin C, A, E, D and antibiotics. Carbonated probiotic drinks help in maintaining cholesterol level because lactic acid hinders the growth of bacteria in the small intestine by attaching the hexagen. Carbonated blueberry flavoured milk helps to reduce the risk of cardiovascular diseases, anti-inflammatory effects and some forms of cancer because blueberry is a source of vitamins, flavonoids and other phenolic compounds (anthocyanins). Like this, some more benefits of carbonated milk beverages on human health are discussed briefly in this review which will be discovered by researchers.

**Keywords**--Carbonated milk beverages, Kefir, Koumiss, B – galactosidase, Hexagen, Blueberry (*Cyanococcus vaccinium*), Flavonoids, Anthocyanins.

## Introduction

The massive section of dairy beverages currently consumed is Milk. Milk has been reduced in sales in recent years because of its public image as being less healthy than another substitute. Even though Milk sales have been decreasing, drinkable Yogurt is self-assured for notable growth. Drinkable Yogurt has begun to become more and more liked and has a growth of 66% from 2012-2017. Carbonated dairy beverages are beverages that are dairy-based such as, Milk, Yogurt, and Buttermilk etc.

Carbonation can be done through either microbiological or physical methods. The inclusion of carbonation in these drink results in a prickle effect upon consumption and alters the consumer sensory experience. There has been a rise in interest, consumption and availability of carbonated dairy beverages in recent years. Cola drinks are extremely famous worldwide and a Yogurt beverage has the effect of improving the exhilarating and reviving taste of ordinary Yogurt. Thus, carbonated drinkable Yogurt may be a good option that would be available in the market. Carbonation also affects the quality, sensory attributes and pro-biotic content of dairy and yoghurt beverages. These carbonated products have been used to preserve Milk, so that it is less bio-degradable accessible and more consumable as of lactose disintegration during the fermentation process. Dairy beverages have a high amount of calcium, phosphorous, protein and micronutrient. They play an important role in the reduction of Bone Homeostasis. Carbonated items like Yogurt and soft Cheese supply a large number of nutrients than the same quantity of plain Milk because of Milk powder and makes Yogurt denser. Thus, Yogurt utilization may ensure a more regular slug of Milk products because of vicious taste. The major effects has been summarized in Table 1.

Table 1  
Healthy attributes of fermented milk beverage

Health effects	Impact on human body	Reference
ANTI-MICROBIAL PROPERTY	Milk Beverages contains some impressive	Hontala et al ;2004 Cisouka et al;2011

	substitute that can be protective against different infection and disease and it also hinders the growth of spoilage	
EFFECT ON CHOLESTROL LEVEL	Milk Beverages slows down the ventures by binding cholesterol and triglycerides in the small intestine. Propionic acid hinders the hypo-cholesteric effect	Bourrie Willing and Lotter;2016
EFFECT ON GASTRO-INTESTINAL SYSTEM	In this Lactic Acid is produced which accelerate the Lactose digestion and help in the curing Diarrhea	Drouarit and Corthier ;2016 Chang et al ;2015
HEALING ACTION ON BODY	Milk Beverages boosts up our immunity and helps for the treatment of wounds via anti-septic attributes of milk Beverages	Bourrie Willing and Lotter ;2016
EFFECT ON CARDIO-VASCULAR SYSTEM	Milk Beverages contains Lactic Acid which hinders the growth of the bacteria in the small intestine by binding the halogen-C27H46O lower its level by 33%	Rosa et al ;2017
EFFECT ON CANCER	Fermented Milk Beverages can be protective against TNF-alpha TNF-beta and Be12 lower the secretion produced as a proliferative effect against Cancer Cell. It contains LAB which lowers the actions of fecal enzyme that promotes anti-carcinogenic response.	Fredrich et al., 2019
EFFECT ON OBESITY	Consuming Carbonated milk drink can reduced obesity level as it contains Lactobacillus which has a strong correlation with the adipose and hepatic	Jeong et al ;2017

	tissue it regulates the intestinal microbiota and pre-vented obesity and oxidation which leads to a loss in obesity	
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## Literature Review

### ***Antimicrobial properties of carbonated milk beverages***

From studies, it is believed that carbonated milk beverages have certain impacts on our health. Taking into consideration, kefir is one of the substitutes that have various health benefits. Kefir has organisms that may give rise to some antimicrobial substances like lactic acid, acetic acid, CO<sub>2</sub>, hydrogen peroxide, ethanol, diacetyl, and bacteriocins (Nielsen et al., 2014)

Bacteriocin is generated from lactobacillus Plantarum forbids gram-negative and gram-positive bacteria. Kefir shows a bactericidal effect on gram-negative bacteria. This property has been noticed contrary to *Salmonella*, *Shigella*, *Staphylococcus pyogenes* bacteria, and *Candida albicans* fungi. Kefir grains are seen to have more antimicrobial activity than kefir itself and mainly in opposition to gram-positive cocci with staphylococci and gram-positive bacilli. (Rosa et al., 2017)

So from studies of the twentieth century, it was noticed that the fermented milk was prepared in liquid form also when kefir grains were used and the antimicrobial property of kefir was separated. Also, it was noticed that kefir and fermented milk contain some amazing substitutes that can further be used in the protection from various infections and diseases. It was also observed that phenolic compounds were also connected with antimicrobial activity for a very long time. Blueberries are also seen as a valuable and fine source for antimicrobial negotiators for medicinal, pharmaceutical, cosmetic, and food industries (Burdulis et al. 2009; Hontala et al.2004, Cisowska, Wojnicz and Hendrich 2011). Many authors have researched the in-vitro antimicrobial activity of blueberry extracts, making them hinder the growth of good pathogens like *E.coli*, *Vibrio cholera*, *Vibrio parahaemolyticus*, *Acinetobacterbaumannii*, *Salmonella typhimurium*, *Salmonella enteritidis*, *Shigellasonnei*, *Bacillus cereus*, (Pertuzatti et al. 2016; Khalifa et al.,2015; Shen et al. 2014; Lacombe et al. 2012; Zimmer et al., 2014). Furthermore, various authors have announced that the extracts of blueberry may help lower biofilm formation, bacterial resistance to traditional antimicrobial warriors (Zimmer et al., 2014; Bjarnsholt 2013; Bridier et al., 2015; Fux et al. 2005; Silva et al., 2016). Although, blueberries extract was also used in curing certain infections and diseases. At present, the consumption of carbonated milk beverages is remarkably high in terms of health benefits, thus granting comfort to human health.

### ***Effect of carbonated milk beverages on cholesterol level***

As we all know that for maintaining our cholesterol level, a proper diet should be taken. Studies recommend that by consuming fermented milk our cholesterol

levels will be maintained (Bourrie et al., 2016). Probiotic pints of milk are also suggested for maintaining cholesterol levels. Lactic acid hinders the growth of bacteria in the small intestine by attaching the hexogen cholesterol and is abundant in kefir and reduces the level of cholesterol by 33% either directly or indirectly (Rosa et al., 2017). During the fermentation process, kefir particles reduce the level of cholesterol in milk (Bourrie et al., 2016). Kefir contains certain bacteria that get delinked with bile salts and lower the level of serum cholesterol. Bile salt hydrolase (BSH) enzyme is produced from *Lactobacillus* spp. that make sure the process of deconjugation.

The dissolved particles in deconjugated bile acids are less and several of these acids are engaged by the intestine thus, increasing the bile acids discharge from the intestine. From a study, it was revealed that hypercholesterolemic males were dealt with kefir for about 4 weeks and it was established that there is no remarkable change in serum cholesterol, HDL cholesterol, triglyceride, LDL cholesterol levels, from cholesterol (St-Onge et al., 2002). One more study revealed that there was a quite reduction in the level of triaxial glycerol, total cholesterol, and LDL cholesterol of mice that is consuming a high-fat diet. Kefir brings down the cardiac and vascular sympathetic hyperactivity and provides firmness to cardiac parasympathetic hypoactivity (Klippel et al., 2016).

### ***Healing action of carbonated milk beverages***

Healing action is a set of many actions which comprises cell migration, cell division, chemotaxis, and many types of differentiation in the cell. Even though vital antibiotics are generally used for treating the wound but there can be certain side effects of medicines on our health so from studies it is suggested that probiotics can reduce the inflammation of lymphocyte and macrophage group alternatively in wounds and on the other hand it boosts up our immunity and hastens the wound healing action via antiseptic attributes of kefir polysaccharide which obstruct the accumulation of dangerous bacteria. In research of rats, it was supervised that augmentation of collagen collection of kefir in the rats have matured the corrosive esophagitis and have convinced effect on the healing of the wound (Yasar et al., 2013). Kefir tends to fend off the expansion of fungus and bacterial cells, regulates the immune system, and stabilizes the movement of wound healing (Bourrie et al., 2016). An additional study happened with rats that assessed the wound healing effect of kefir, a poisoned injury that was doctored with kefir gel for about 7 days which later got diminished quickly (Rodrigues et al., 2005).

### ***Effect of carbonated milk beverages on gastrointestinal system***

Many studies observed that carbonated milk beverages have some beneficial effects on our gastrointestinal system. Some fermented dairy products hinder the unacceptable microorganisms and help in the production of beneficial lactic acid microflora in the small intestine. There are some severe boundaries for the resistance to the probiotic bacterium in the gastrointestinal system, like the presence of pH issues, bile salts, and digestive enzymes.

Additionally, probiotic bacteria safeguard from pathogenic bacteria by joining with intestinal epithelial cells, restoring them. Milk kefir maintains the pH level of the

stomach hence providing much time to the bacteria to proceed to the upper parts of the small intestine (Vinderola et al., 2005). Foods that contain probiotic substances modify the intestinal microbiota and contribute helpful effects to the presenter by making sure that the species enter the gastrointestinal system or by encouraging the growth of helpful bacteria (Bourrie et al., 2016). From an animal study, it is believed that consumption of kefir increases the rate of beneficial bacteria like lactobacilli, bifidobacteria and diminishing the growth of negative bacteria like *Clostridium perfringens* (Hamet et al., 2016). The additional study recommended that from consuming kefir the seriousness of giardia intestinal infection in rats might get alleviated (Franco et al., 2013). There is an anaerobic Gram-negative bacteria *Clostridium difficile* which causes complications in our gastrointestinal system such as diarrhoea. Some studies in rats believed that kefir is beneficial against enterocolitis which is caused by *Clostridium difficile* (Bolla et al., 2013).

At the starting of this century, it was believed that consuming fermented milk containing feasible lactic acid greatly intervene with the colonization and proliferation of food borne pathogens, thus avoiding illustration of infection (Schoster 2018). However, it is recommended that lactic acid bacteria are protective against antibiotic-induced diarrhoea in patients. Numerous apparatus have been advised counting the ability of the cultures to lower the pH of the intestine which commend the growth of lactic acid bacteria, and their capability to build acids, which can adverse the environment for accumulating pathogenic bacteria. In many studies, the ingestion of fermented milk products has minimized the life span of diarrhoea connected with rotavirus infection.

Talking about the last decade, it is stated that a big fragment of anthocyanins in blueberries milk drink does not get digested in the upper gastrointestinal tract. But most of the ingested anthocyanins revealed the intestinal microbiota which successively ingests and does not affect the bioavailability and bioactivity of anthocyanins, nevertheless begins with separate metabolites which one by one may have some non-identical health-promoting effects (Bingham 2006). Phenolic compounds alter the gastrointestinal tract all over and later the process has its objective for some analysis (Selma, Espin, and Tomas- Barberan 2009).

Koumiss is also a classic fermented milk drink that is made from mare's milk. In China and central Asia, it is one of the important and major foodstuffs. The concentration of lactic acid and alcohol content in koumiss is in an excessive amount than in any other fermented milk products. By consuming koumiss, our body can have many health benefits which can improve our gastrointestinal system as it is rich in probiotics (Apostolidis et al., 2007; Bakir et al., 2015). As koumiss is a fermented milk product so it contains a high variety of microorganisms and microbial metabolites that can have a therapeutic effect on the gut microbiota.

### ***Anti-aging effect by carbonated milk beverages***

Through recent research conducted by several researchers, it has been proved that carbonated milk beverages have a high amount of anti-oxidant property. Kefir and fermented milk reducing power is very high and suggested that certain

metabolites such as Glutathione that demonstrate superior reducing power might be produced during Kefir fermentation and which could react with free radical to stabilize and terminate radical chain reaction (Liu et al 2006)

### **Role of carbonated milk beverages in treating cancer**

Research conducted on carbonated milk beverages shows that consumption of fermented milk on regular basis can lower the risk of having cancer. Strains that are present in Lactic Acid Bacteria reduce the activity of Fecal Enzyme which is known to promote the synthesis of carcinogen to stimulate the host immune system but there is little evidence. According to Kefir, research kefir contains *Lactobacillus* which plays an important role in the anti-tumor effect and shows the positive effect of the consumption of the immune system (Ahmed et. al, 2013). Kefir also decrease the TNF-ALPHA, TNF-BETA, and Be12 secretion lower the level of TNF-ALPHA secretion produced as an anti-proliferative effect against Cancer cell (Sharifi et al; 2013).

### **Effect of carbonated milk beverages on cardiovascular system**

According to recent research carbonated beverages has a Huge Impact on health especially on the cardiovascular effect, in fermented Milk, two strains of *Lactobacillus helveticus* were used to produce fermented milk rich in Angiotensin-converting enzyme through the In-Vitro revealed that fermented milk with the two strains *Lactobacillus helveticus* control the blood pressure. The Enzyme Angiotensin 1 and 2 helps in the breakdown of bradykinin which causes Cardiovascular Diseases.(Fuglasang et al., 2003) but in the Kefir research said that because of a presence of Lactic Acid, which inhibits the bacteria in the small intestine by binding the hexogen cholesterol which directly and indirectly reduces the cholesterol level by 33% (Rosa et al., 2017) According to the Epidemiological Studies investigate suggest that cardiovascular disorder is an Endothelial function is a flow-mediated dilation in the Brachial Artery using high-resolution ultrasound. Anthocyanin present in the blueberry reduced cardiovascular disease and other outcomes is like Blood Pressure, Blood Lipid Profile due to Heterogeneity. (Erdman et al., 2007)

### **Effect of carbonated milk beverages on obesity**

According to the research data evidence that consuming Kefir can help in lowering the obesity level due to the presence of *Lactobacillus* / *Lactococcus* and the total yeast, the amount is higher which showed a strong correlation with adipose and PAP-alpha genetic expression in hepatic tissue. Kefir regulated the intestinal microbiota and prevented obesity and NAFLD by stimulating fatty acid and oxidation which cause a loss in obesity but for the blueberries researcher work on Lyophilized has no significant on weight gain or loss in simulation in mice fed with a high-fat diet (Prior et al 2010, Defuria et al 2009) but the same author work on the Anthocyanine extract significant reduction in body fat and fat accumulation in the body, for the fermented milk there is no such research which suggests that there is any role in the reduction of weight by consuming it.



## Conclusion

The above investigation gives so many reasons to consume carbonated milk beverages not only in the matter of sensory experience but also have a wide range of health benefits. It can be concluded that beverages like Kefir, Carbonated Probiotics, Koumiss and Carbonated flavoured milk have a number of health benefits such as antimicrobial properties, maintaining cholesterol level, improve the gastrointestinal system and antiaging properties respectively. It is also good for people suffering from obesity due to the presence of bacteria and yeast in high amount which show strong relation with adipose tissue. Some evidence also shows that consumption of carbonated milk beverages helps in treating cancer. So our study shows that consumption of carbonated milk beverages is good for us and people have change their perception. There are still some researches are going on related to the benefits of carbonated milk beverages.

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