

# A Review on Anticancer Property of Colostrum

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## Review Article

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## ABSTRACT

Colostrum is defined as 'the early milk which is secreted at the time of parturition', which works as an immune booster in post-natal health, and additionally is rich in antibodies. It provides passive immunity to the newborn, also called as "foremilk". Bovine Colostrum (BC) contains high amount of proteins, immunoglobulin, lactoferrin and growth factors which are essential for specific functions. Many studies have suggested that colostrum components like antimicrobial factors, immunoglobulin and growth factor not only benefits physically active person but also used in the treatment of autoimmune disorders while antimicrobial factors provide passive immunity and protection against infections during the first few days of life. Lactoferrin, has been investigated as novel therapeutic and it also has anticarcinogenic properties against colon and other cancers. In this review main focus is on the beneficial effects of colostrum supplementation in the treatment of cancer.

## INTRODUCTION

Colostrum is the "early" milk which is produced by female mammals and it is the first four days of milk post parturition <sup>[1,2]</sup> in the case of bovine. This "early" milk nutrient profile and immunological composition is found to be substantially different from 'mature' milk. Before lactogenesis and lactation, colostrogenesis, results in the secretion of colostrum <sup>[3-5]</sup>, this is supposed to be under endocrine and local control and regulation [6]. For a newborn, colostrum not only provides nutrition, but also provides protection against infection while immune system is still developing. Many of the bioactive whey proteins, notably lactoferrin, immunoglobulins <sup>[7-13]</sup> and growth factors, occur in colostrum in higher concentrations than in milk, thus they are important to the health of the newborn calf <sup>[14-16]</sup>. Several weeks before parturition the immunoglobulins <sup>[17-29]</sup> are transported to mammary secretion from maternal circulation selectively <sup>[30]</sup>. It contains macronutrients and micronutrients like proteins, oligosaccharides, carbohydrate, fats, vitamins and minerals respectively. It is rich in natural antimicrobials, oligosaccharides, immune regulation factors <sup>[31]</sup> and antioxidative factors. Bovine milk and colostrum are suggested to be the important sources of natural bioactive components. Since past two decades, major advances have taken place with regard to the technology, science and commercial applications of bioactive components present naturally in bovine milk and colostrum.

**Table 1: Immune Factors in Bovine Colostrum**

| Immune factors | Bovine Colostrum (mg/ml) |
|----------------|--------------------------|
| Lactoferrin    | 100                      |
| IgA            | 3.9                      |
| IgG            | 47.6                     |
| IgG2           | 2.9                      |
| IgM            | 4.2                      |

Source: <sup>[32]</sup>

## LACTOFERRIN

Lactoferrin (LF) <sup>[33-36]</sup> is an iron-binding protein which is mainly found in milk, colostrum and cells of most of the mammalian species. It is one of the types of glycoprotein. It confers many biological properties, such as

antioxidative [37-43], antimicrobial, anti-inflammatory [44,45], anticancer [46-54], and also have immune regulatory properties [55-58]. It enhances body's immune system against microbial infections and eradicates free oxygen radicals. LF was discovered in the early 1960s and since its biological properties have been the subject of scientific research. It increases the sensitivity of bacteria for certain antibiotics, such as penicillin [59-65], vancomycin and cephalosporins. Over the last decade the anticarcinogenic activity of LF has been studied intensively and many mechanisms like iron-chelation-related antioxidative property and immunoregulatory and antiinflammatory functions have been suggested. In in vitro experiments lactoferrin [66-69] has been shown to regulate both humoral and cellular immune systems by-

- 1) activation of monocytes, macrophages, natural killer cells, and neutrophils;
- 2) stimulation of proliferation of lymphocytes;
- 3) stimulation of intestinal and peripheral antibody response;
- 4) induction of cytokine and nitric oxide production [57].

During the past two decades many animal and human studies have proved that orally administered LF exerts many beneficial effects on the health of animals and humans. Several excellent articles have been compiled and reviewed through these studies [56-58,70].

Animal studies with mice or rats have shown that orally administered LF and its related compounds can suppress the overgrowth of certain intestinal bacteria, such as *E. coli*, *Streptococcus* and *Clostridium* strains, suppress the translocation of intestinal bacteria and also, orally administered lactoferrin reduced the infection rate caused by *H. pylori*, candidiasis, *Toxoplasma gondii*, and *Tinea pedis* and influenza virus. In addition animal studies have shown beneficial effects of LF ingestion as it can inhibit carcinogen - induced tumors in the colon, esophagus, lung, tongue, bladder, and liver.

A recent study [71] has showed that oral supplementation of lactoferrin to healthy infants for 12 months reduces lower respiratory tract illnesses and higher hematocrits when compared to group which received regular infant formula and that group was referred as control. Other human studies have shown that if LF is administered in connection with triple therapy, it can increase the removal rate of *H. pylori* gastritis. LF is produced industrially by many companies worldwide at a large scale and is expected to be used as an ingredient in functional foods and pharmaceutical preparations in future [72]. Currently some of the commercial applications of LF are in infant formulas marketed in Japan, South Korea, and China and yogurt products marketed in Taiwan and Japan and baby foods. Synergistic effects of LF and bovine colostrum or probiotic bacteria can be seen by applying in different dietary supplements. Owing to potential synergistic actions LF has also been used in combination with lysozyme and lactoperoxidase and has been applied into many human oral health care products, such as mouth rinses, toothpastes, chewing gums, and moisturizing gels.

## EFFECT OF MILK COMPONENTS AGAINST CANCER

The milk derived bioactive peptides include antithrombotic [73], antihypertensive [74], immunomodulating [75], antioxidative [76], mineral carrying [77], antimicrobial [78], anticancer [76-86], and growth-promoting properties [81]. Breast cancer is one of the most common cancer and 1.4 million females have been diagnosed with breast cancer in 2010 [87,88] and this rate is increasing drastically. Conjugated linolenic acid (CLA) in colostrum has antitumor properties. Animal studies and in vitro experiments have shown anticarcinogenic property of CLA in the mammary glands of females, as it either inhibits the cyclooxygenase-2 pathway or the lipo-oxygenase pathway or it induces the expression of apoptotic genes [89]. It reduces immunosuppressive substances like leukotrienes and prostaglandins [90]. CLA also inhibits carcinogens by inducing apoptosis through mechanism which involves the inhibition of eicosanoids synthesis. Studies have also shown that eicosanoids receptors control the release of messengers which are important for differentiation, cell proliferation and apoptosis [91-97]. Other reports have proved that proteins and peptides present in milk are cancer preventive agents [98-101]. For example, lactoferrin helps to prevent the growth of cancer cells or it shrinks the cancer cells. It is also known for its inhibitory action on cancer cells proliferation as well as for its anti-inflammatory and antioxidant abilities against them [99,101-103]. Lactoferrin prevents many cancers like colon, bladder, tongue, esophagus, lung cancer and thus it can be said that it boosts the immunity.

## CONCLUSION

Colostrum has become the Ancient Food for Modern Times due to its nutritional composition and hence can be considered as a nutraceutical. Bovine colostrum is more effective than human colostrum and can be given alone as a treatment to reduce the length and severity of established infections or it can be used in conjunction with

traditional treatments such as antibiotics. It can be said that colostrum supplements can treat autoimmune disorders like rheumatoid arthritis. There are still no reports regarding the side effects or drug interactions associated with supplementation with high quality colostrum, thus making it an exceptionally safe and useful nutraceutical product to be used in wide range of applications. Still the mechanisms of LF action are not fully understood, there is some proof representing its ability to interact with some receptors, as well as it can modulate genetic expression of several molecules that are necessary to the cell cycle and apoptosis [104-114] machinery.

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