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Review Article

Immunological Aspect of Colostrum As A Preventative Medication

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Abstract

Nutraceutical products are used to endow with health and medical benefits for prevention and treatment of different diseases. Colostrum is a natural product which is rich in macro- and micronutrients, and because of this, it is measured as a best natural food supplement**.** Colostrum is the first milk secreted at the time of parturition, is also the sole source of passive immunization because the colostrums is an excellent source of immunoglobulins and highly biological value proteins ,Growth Factor, lipids, carbohydrates, antioxidants, vitamins ,minerals and viable cells. A viable cell like neutrophils, macrophages secretes cytokines and antimicrobial proteins and peptides, such as lactoferrin, defensins, and cathelicidins. In view of so many health factor through Colostrum, the use of Colostrum has been extended to so many health problems like treatment of autoimmune disorders, gastrointestinal conditions, including non-steroidal anti-inflammatory drug–induced gut injury, H pylori infection, immune deficiency related diarrhea for all age group.
This review explores the recent knowledge on the advantageous effect of immune factors containing Colostrum in the above conditions as well as the results of research aimed at realizing untouched significance in milk.

Key words: Colostrum**,** Immunoglobulins, Micronutrients, Natural Food Supplement

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1. Introduction

Colostrum is the first milk secreted at the time of parturition, differing from the milk secreted later, by containing more lactalbumin, lactoprotein and also being rich in antibodies that confer passive immunity to the newborn. It lasts for 2- 4 days after the lactation has started. Colostrum play a vital role in passive immunization.
There are three main primary component of Colostrum [1, 2]

- Immune Factor
- Growth Factor
- Nutritional Factor

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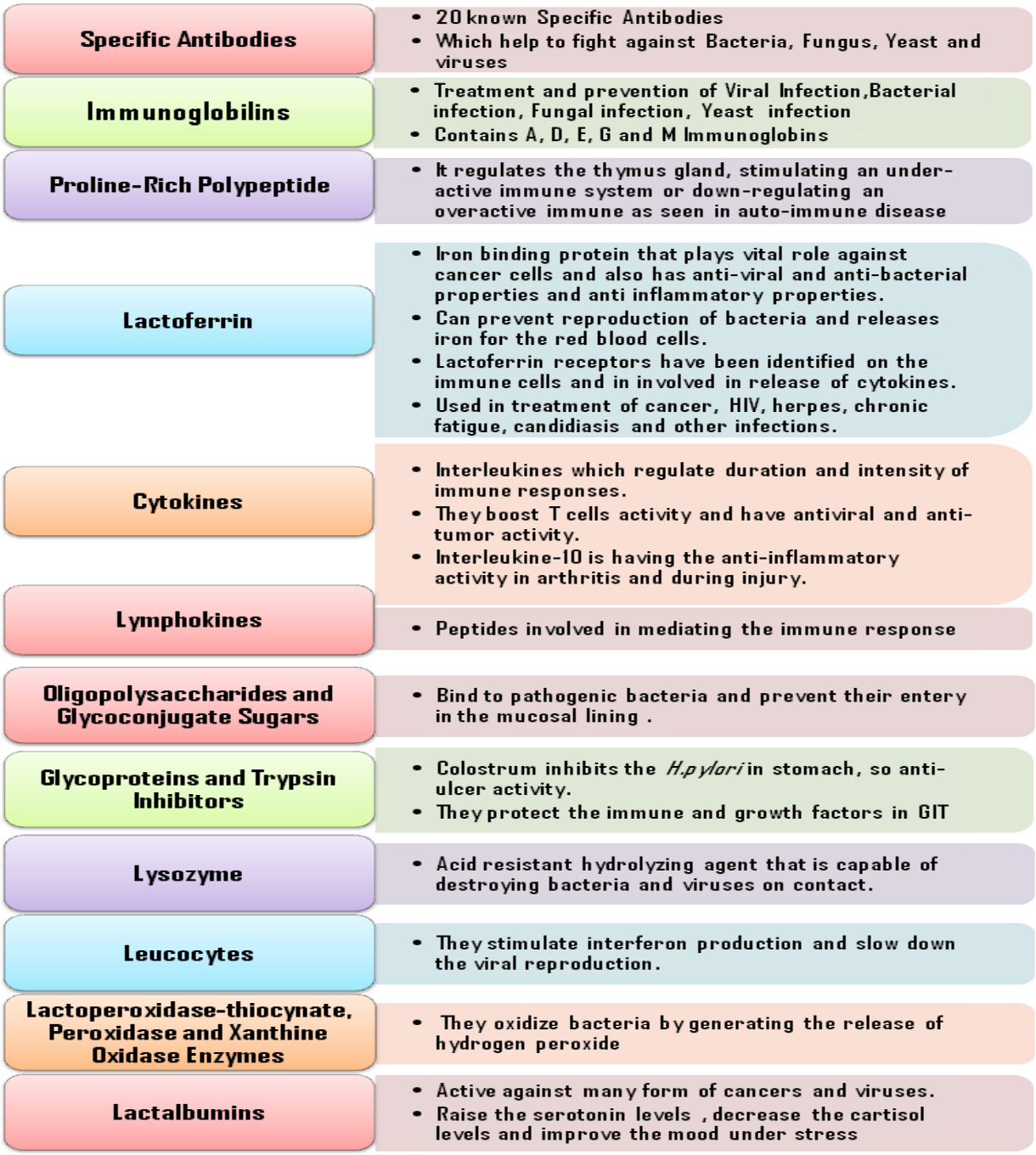


Figure 1. Details of Immune Factors present in Colostrum [3,4,5,6]

Growth Factors [7, 8]

They arouse growth, help in regeneration and accelerate the repair of aged original muscle, Skin, Collagen, Bone, Cartilage and Nerve Tissue. Growth factors also stimulate the body to burn fat for fuel instead of the body's muscle tissue in times of fasting and incline built.

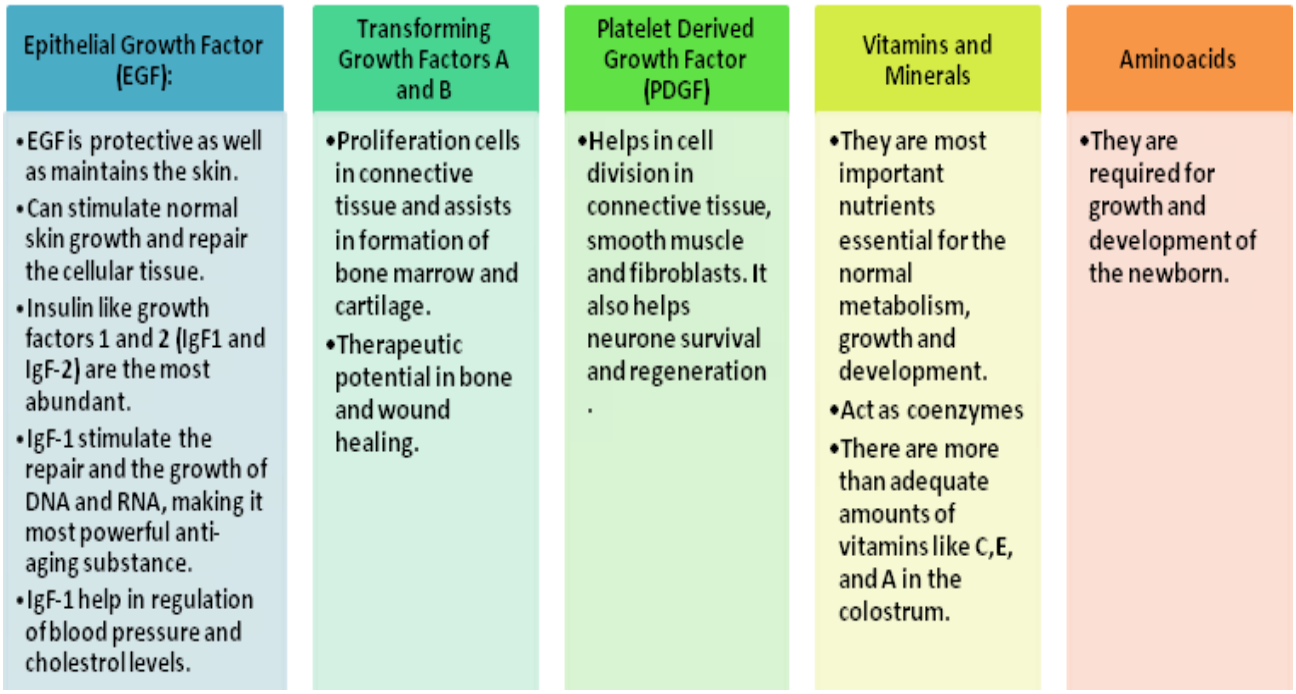


Figure 2. Nutritional Composition of Human Colostrum and Bovine Colostrum [9,10,11]

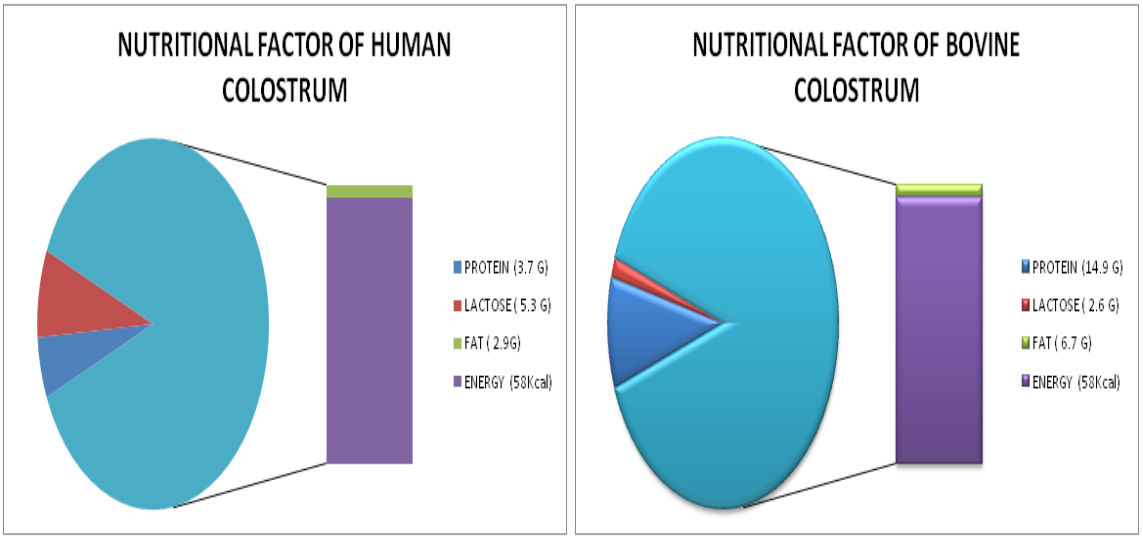
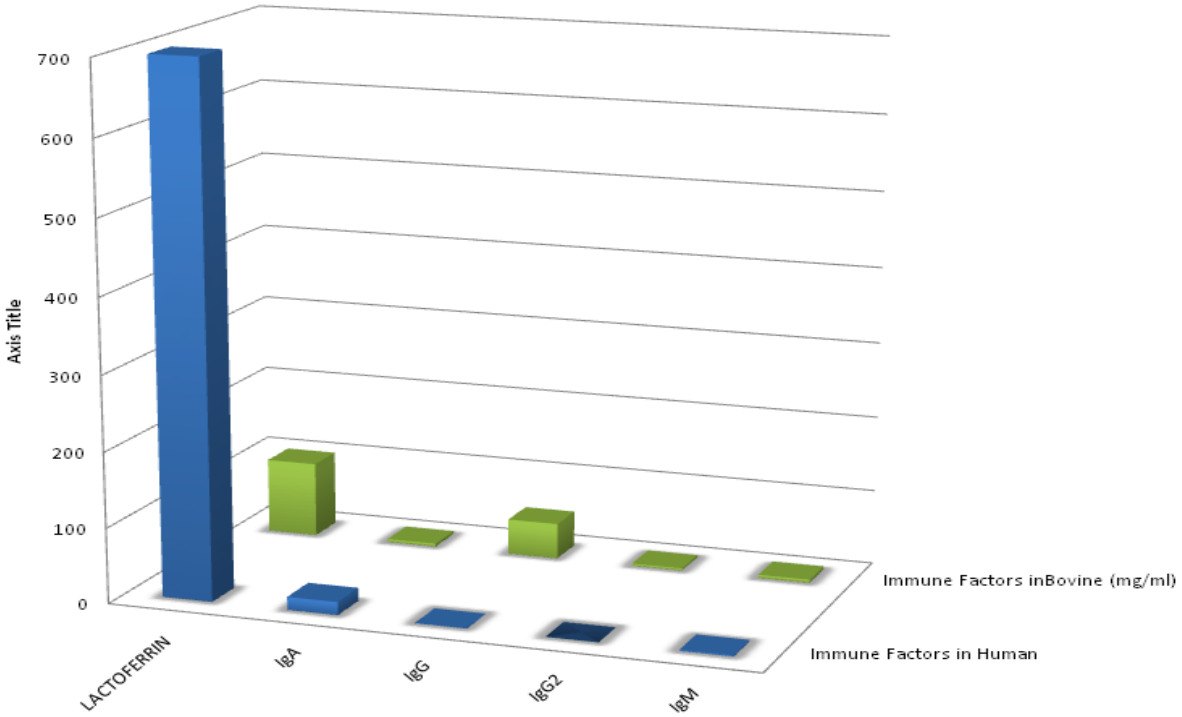


Figure 3. Nutritional Factors in Human Colostrum and Bovine Colostrum[9,10,11]

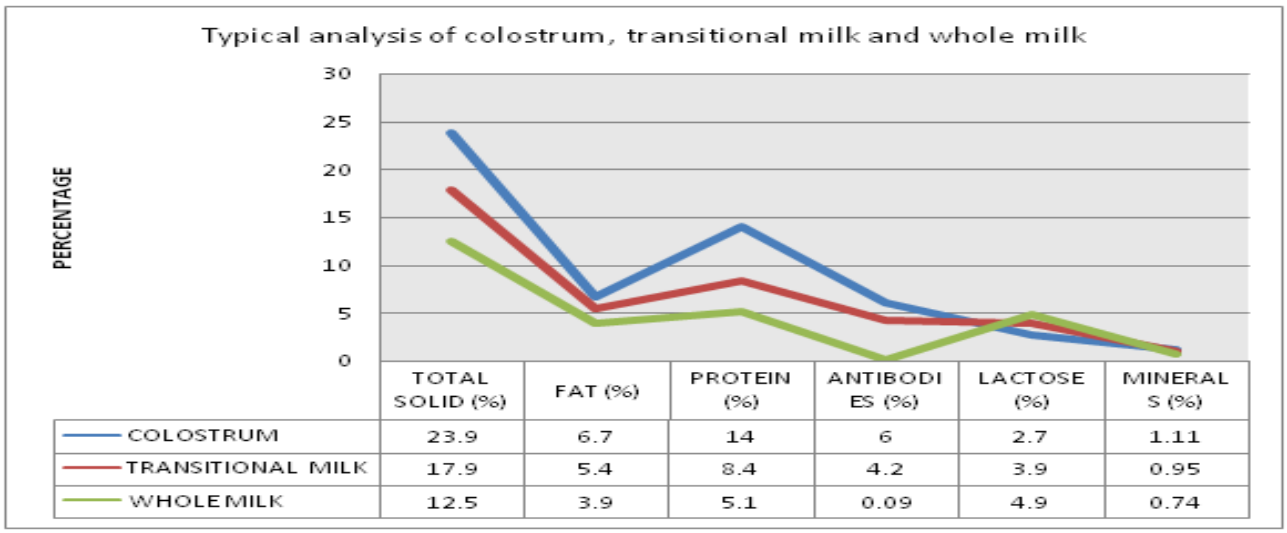


	LACTOFERRIN	IgA	IgG	IgG2	IgM
Immune Factors in Human Colostrum (mg/ml)	700	17.35	0.43	0	1.59
Immune Factors inBovine (mg/ml)	100	3.9	47.6	2.9	4.2

Figure 4. Immune Factors in Human Colostrum and Bovine Colostrum[9,10,11]

	Human Colostrum	Bovine Colostrum2
Epidermal growth factor (EGF)	200mcg/L	50 mcg/L
Transforming growth factor(TGF α)	7.2 mcg/L	7.2 mcg/L
TGF β	40 mg/L	2 mg/L
Insulin like growth factor (IGF)	18 mg/L	10 mg/L
Vascular endothelial growth factor (VEGF)	75mcg/L	NA
Growth hormone (GH)	41Ng/L	0.03NG/L

Table No. 1. Growth Factors in Human Colostrum and Bovine Colostrum



	TOTAL SOLID (%)	FAT (%)	PROTEIN (%)	ANTIBODIES (%)	LACTOSE (%)	MINERALS (%)
COLOSTRUM	23.9	6.7	14	6	2.7	1.11
TRANSITIONAL MILK	17.9	5.4	8.4	4.2	3.9	0.95
WHOLE MILK	12.5	3.9	5.1	0.09	4.9	0.74

Figure 5. Typical analysis of Colostrum, transitional milk and whole milk

Bovine colostrum (BC), which has been found to be almost indistinguishable to human colostrum in terms of its advantageous components with no side-effects. The use of bovine colostrum as dietary supplement has increased drastically over the past decades. Bovine colostrum is harvested within first few hours of calving from dairy animals. The herds of cows are kept under close supervision in good state of hygiene without exposure to antibodies, pesticides and anthelmintic. The colostrum collected within 24 hours contains maximum substances but less in amounts, colostrum collected later will be more but contain less immunoglobins. Research shows that colostrum can help to

- Increase strength and endurance
- Build lean muscle mass,
- Burn body fat,
- Boost immune function,
- Shorten recovery time and accelerate healing of injuries.

Colostrum processing involves a series of steps planned to ensure product purity, potency, safety, and stability.



Figure 6. The main steps include in Colostrum processing

1. Milk Collection: The source of colostrum is one of the most significant factors to consider when evaluating diverse brands of colostrum. Immediately after milking, the filled jugs are put in freezer and kept frozen until collection by plant. It is inspected by trained personnel and placed in a freezer and maintained at -5 degrees F +/- 5 degrees.

2. Raw milk Quality Control: It is tested to verify that it is from the first milking and free of hormones and pesticides. The components for which constantly monitoring include PRPs, Lactoferrin, TGF (Transforming Growth Factor), IGF-1 (Insulin-like Growth Factor), IgA, IgG, and other immune and growth factors. High Performance Liquid Chromatography (HPLC) used to examine colostrum after collection and after processing to ensure that all components are intact and bioactive. Enzyme-Linked Immunosorbent Assay (ELISA) is employed in quality control, and manufacturing is performed under cGMP (certified Good Manufacturing Practices) and HACCP (Hazard Analysis and Critical Control Procedures).

3. Low Temperature long time (LTLT): Pasteurization process that is extra effectual than standard pasteurization processes at maintaining biological activity. Pasteurization of dairy products are preserved and sterilized for their safe human consumption and extended durability. The essence of pasteurization is short-term is an increase in temperature of the processed liquid to 72 °C with classic pasteurisation or 132 °C with UHT, high temperature destroys the pathogenic microorganisms, but it also destroys sensitive advantageous bio-active components which are also sensitive to heat like immune substances, proteins, enzymes, vitamins, proteins) which are plentiful in colostrum [12].

4. Separate to Remove Cream: Raw colostrum contains fat and casein, which are eliminated from the colostrum. In this step use of 10, 5 and 3 micron filter are used. The filtration removes large components, such as aggregates of lipids, proteins, and other materials, which may interfere with absorption or may result in sterile abscesses, without affecting nutritious components of it.

5. Reduction of Bioburden: Cold sterilisation or Sterilisation by filtration is a process where cold fluids pass through special micro-filters, which grab dangerous microorganisms whilst its natural bio-active and biological components remain untouched. Sterilization is accomplished by 1.0 to 4.5 Mrad gamma-irradiation.

6. Ultrafiltration to Concentrate: A crossflow system designed for quick concentration and diafiltration is use for Whey Ultrafiltration. The ultrafiltration membrane was composed of hydrophilic polyethersulfone, with a molecular mass cut off of 10 000 Daltons and a membrane area of 24 cm^2. Pressure transducers were used to determine the pressure at the inlet and outlet. The feed temperature was controlled by a heat exchanger. The crossflow velocity was changed using a peristaltic pump. The retentate containing whey protein concentrate was discarded; the permeate was lyophilized until a white powder containing no residual water was obtained [13].

7. Spray Drying: Spray drying produce stable, a low moisture powder (whey protein concentrate, WPC) having a protein content as high as 80% w/w and finding widespread use as a food ingredient. This procedure turns the liquid colostrum into a fine powder that is stable for prolonged periods.

8. **Quality Control:** IgG concentration is generally used as the measurement of

colostrum quality. High quality colostrum is defined as having an IgG concentration of greater than 50mg/ml. The quality of colostrum can be assessed using either direct or indirect methods:

• Direct methods measure the level of antibodies

Radial Immunodiffusion (RID) assay : Which measure the actual levels of antibodies in the colostrum.

• Indirect methods estimate the level of antibodies

1. Refractometer:

A Refractometer is a device that uses light to determine the density of a liquid. Refractometer calibrated in the Brix scale, can be used to assess the quality of colostrum with good accuracy.

Brix (%)	Quality Colostrum	IgG per ml
<15	Poor	0-28
15-20	Fair	28-50
20-30	Good	50-80 (90.5-92.5% sensitivity; 80-85%, specificity)
>30	Very Good	>80

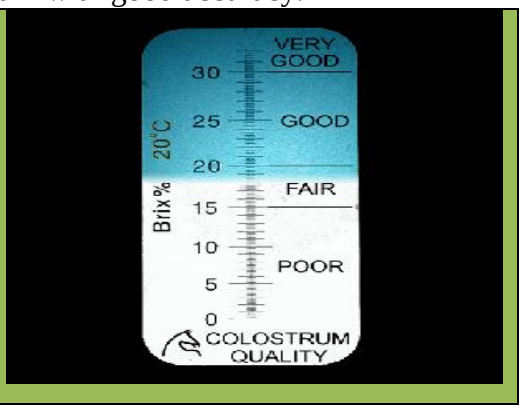


Figure 7. Description of Refractometer

The scale in a Brix refractometer is designed to measure the amount of sucrose in a solution, but Brix values can be related to IgG in colostrum. [14, 15]

2. Colostrometers:

The colostrometer is an inexpensive tool which is designed to provide an estimate of the quality of colostrum on farm. The device is floated in the colostrum and a colour coded chart on the side is used to identify the estimated level of IgG contained in the sample.

Colour Indicator	Amount of Ig
"Green"	Contains > 50 mg/mL of Ig
"Yellow"	Contains 20 to 50 mg/mL of Ig
"Red"	Contains < 20 mg/mL of Ig

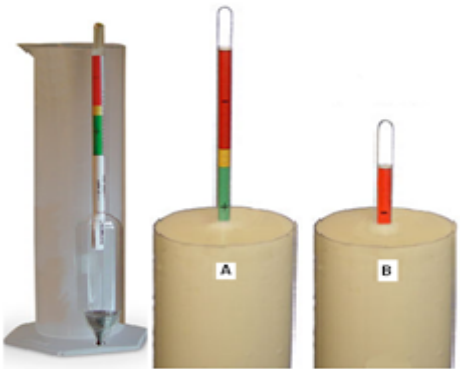


Figure 8. Colostrometer floating in a sample of colostrum. In this sample is in the green category and contains at least 50 mg/mL of Ig.

3. Visual assessment: Judging the quality of colostrum by its colour and consistency (visual assessment) . Visual testing is based on the notion that thicker, darker coloured colostrum will be more concentrated and therefore have higher IgG levels. However a visual assessment is better than none, and becomes more valuable when used in combination with another indirect test such as colostrometer or refractometer.

Colostrum as reviewed can be of use in variety of setting [16]

- Athletic Performance: It protects athletes from infections caused by the physical and emotional stress of competition. Using colostrum as a dietary supplement also increases the efficiency of the digestive tract for athletes in training. The intestines are able to make more nutrients available to the muscle cells and the body's vital organs.
- Useful in Prevention of non-steroidal anti-inflammatory drugs (NS AIDS) induced gut injury.
- Local Immunity, Systemic Immunity
- Antigen Handling.
- Prevention of Diarrhea
- Joint Disorders like Rheumatoid Arthritis
- Useful in the Auto-Immune and Allergic Disorders: to reduce or eliminate the pain, swelling, and inflammation associated with allergies and autoimmune diseases (multiple sclerosis, rheumatoid arthritis, lupus, myasthenia gravis). These effects are related to PRP's ability to inhibit the overproduction of lymphocytes (white blood cells) and T-cells.
- Useful in Respiratory Tract Infections, Sinusitis and Pneumonia.
- Anti-Oxidant and Fibroblast Activation Anti-Aging properties.
- Anti-Cancer Activity: cytokines contained in colostrum have been a major area of research in seeking a cure for cancer. Researchers have found that the lactoferrin in colostrum has some anti-cancer activity. In addition, the combination of immune factors and growth factors in colostrum appears to inhibit the growth of cancers.
- Anti-bacterial activity: Colostrum has proved to be capable of killing *Campylobacter*, *Helicobacter pylori*, *Listeria*, *Salmonella*, *Shigellosis*, and five types of streptococci.

Conclusion

The nutritional composition of colostrum favors its use as Ancient Food for Modern Times and hence can be considered as a nutraceutical. Bovine colostrum is rich sources of immune components that are contributed by both the acquired and innate immune systems. These immune factors play a role in conveying passive immunity to the offspring and protective host immunity of the mammary gland itself, athletic performance, maintenance of integrity of mucosa, permeability, local immunity, systemic immunity and antigen handling. Colostrum has lot of scope in the prevention and treatment of various illnesses in human being.

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