Ministry of Higher Education

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College of Agricultural Engineering Science

Department of Food Technology

Colostrum and its Effects on the Health

Research project

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Content

Abstract

Colostrum ‘the first milk secreted at the time of parturition, differing from the milk secreted later, by containing more lactalbumin and lactoprotein, and also being rich in antibodies that confer passive immunity to the newborn, also called “foremilk”. Human Colostrum (HC) and Bovine Colostrum (BC) are rich in protein, immunoglobulin, lactoferrin and growth factors. Recent studies suggest that colostrum components, immunoglobulin and growth factor benefits physically active personandin treatment of autoimmune disorders. It is used for the treatment of a wide variety of gastrointestinal conditions, including non-steroidal anti-inflammatory drug–induced gut injury, H pylori infection, immunedeficiency related diarrhea as well as infective diarrhea. This review explores the current knowledge on the beneficial effect of colostrum supplementation in the above condition.

1.Introduction

Colostrum is pre-milk substance that is produced immediately after birth. Within few minutes of birth, baby can suckle the breast. Colostrum is thick yellow mammary secretion and is rich in proteins. This lasts for 2-4 days after the lactation has started (Ahmed L, et al, 2004).

Colostrum is high in protein and low in fat and sugar. It's filled with white blood cells that produce antibodies. These antibodies strengthen baby's immune system, protecting him or her from infection. Colostrum is highly concentrated and nutrient-dense even in tiny doses, so baby's tummy doesn't need a lot to reap its benefits. (Uruakpa, et al, 2002).

The nutrients kind of colostrum is rich in nutrients that protect and nourish baby unlike anything else. It's made up of Immunoglobulin A (an antibody), Lactoferrin (a protein that helps prevent infection), Leukocytes (white blood cells), Epidermal growth factor (a protein that stimulates cell growth).

It gets its color from carotenoids (an antioxidant) and vitamin A. Vitamin A plays a vital role in baby's vision, skin and immune system. Colostrum is rich in magnesium, which supports your baby’s heart and bones, and copper and zinc, which also support immunity (Walker A, 2022).

Colostrum contains antibodies, proteins, salt, and more to help protect your newborn's vulnerable systems and give them a jumpstart on thriving outside the womb. In particular, colostrum benefits gut function and the immune system. During birth a baby goes from the relatively sterile environment of the womb, where nutrition was received directly through the placenta, to the wide world where bacteria poses a threat and nutrition will need to be taken orally and digested. (McGrath, et al, 2016).

Colostrum will help provide your infant's gut with the good bacteria necessary to have a healthy gut biome. This will help baby's digestive system adjust to eating as well as activate their immune system. (Thapa, 2005).

Colostrum also acts as a laxative, helping baby to have their first bowel movement, called meconium. When babies eliminate meconium it also clears bilirubin. Bilirubin is a byproduct of dead red blood cells, something the infant's body will have a lot of at birth. Removing bilirubin helps to prevent jaundice. These colostrum benefits are unique to colostrum and are not included in the regular breast milk that will follow it. (Lopez, A., 2022).

The aim of this study is to find out what colostrum is made of, what its nutritional value is and what its health benefits are for the human body.

2.The Physicochemical Composition

The physicochemical composition changes dramatically in the first few days those distinguish it from mature milk. Not only is it an excellent source of macronutrients (proteins , carbohydrates , fat) and micronutrients (vitamins , minerals , antioxidants).

Carbohydrates	Lactose and oligosaccharides
Proteins	Casein, Immunoglobulins (IgG, IgA, and IgM), Lactoferrin
Lipids	Short, medium and long-chain fatty acids, mostly saturated
Minerals	Ca > K > Na > Mg, Zn > Fe
Vitamins	A, E, D, K, C and B complex
Free amino acids	Lys > Phe > His > Leu > Glu > Ile > Val > Met > Pro
Cytokines	Interleukins, Tumour necrosis factor, Interferon
Growth Factors	Epidermal growth factor (EGF), Betacellulin (BTC), Insulin-like growth factor (IGF-1), Transforming growth factor β1 (TGF-β1), fibroblast growth factor 1 and 2 (FGF1 and FGF2), platelet-derived growth factor (PDGF)
Enzymes	Lactoperoxidase, Lysozyme, Proteinases, Lipases, Esterases

Figure 1. Colostrum Composition and its type.

Colostrum constituents (nutritionals, immunological, and growth factors) in humans and various animal species:

high values for many bioactive substances in colostrum, so it is considered one of the best natural food supplements. Generally, colostrum has not so much lactose but rather more protein, antibodies, fat, peptides, non-protein nitrogen, vitamins, minerals, ash, hormones, growth factors, cytokines and nucleotides than normal milk, all these components' contents (except lactose) decline quickly during the initial three days postpartum. All colostrum Igs (IgG1, IgG2, IgM, IgA) achieved much greater levels that decreased rapidly and gradually within the first 0–72 h postpartum parallel to the transition from colostrum to normal milk,

antimicrobial peptides (lactoferrin LF, lactoperoxidase LP, lysozyme LZ, alpha-lactalbumin,,beta-lactoglobulin, immunoglobulins) and growth factors [Epidermal

growth factor (EGF), Transforming (TGFα, TGFβ), Insulin-like growth factors (IGF-1, IGF-2)], Frioblast (FGF), Platelet derivative (PDGF), Growth hormone (GH) and vascular endothelial] plus anti-inflammatory, antioxidants and immune-enhancing components, which necessary for the survival and healthy life of offspring, helps promote growth and health by providing passive immunity. The composition of colostrum changes hourly as its biological and nutritional value decreases over time; this is an important reason to provide colostrum soon after calving. (Mehra, R.,et al, 2022).

Depending on genetic changes and the nature and composition of the body, we find that the difference between the components of human and bovine colostrum is as follows:

Composition	Human Colostrum	Bovine Colostrum
Protein	3.7	14.9
Fat	2.9	6.7
Lactose	5.3	2.6
Antibodies	3.43	6.0
Energy (kcal)	58	130

Table 1. Differences between Human and Bovine Colostrum.

The components of bovine colostrum are composed in higher proportions than human colostrum, and this is because the body of a newborn calf needs more energy, because moments after birth it must stand on its feet and consume more colostrum than a human child according to its needs, but only the lactose in human colostrum is higher than that of bovine, in order to be taste acceptable to the child. (Pietrzak-Fiećko, R., Kamelska-Sadowska, A., 2020).

2.1 Colostrum & Breast Milk

Colostrum is a nutrient-rich first milk produced by your breasts during pregnancy. It changes to transitional breast milk a few days after a baby is born. However, small amounts of colostrum remain in your breast milk for several weeks.

There are distinct differences between colostrum and breast milk:

1. Colostrum is filled with immunoglobins to boost a baby's immune system and protect it from illness.
2. Colostrum has two times as much protein.
3. Colostrum has four times as much zinc.
4. Colostrum is lower in fat and sugar so it's easier to digest.
5. Colostrum is thicker and more yellow. (Munblit, D., et al, 2016).

Colostrum *Mature milk*

Constituents%	Colostrum	Mature Milk
Lactose	2.7	5.0
Fat	6.7	4.0
Protein	14.0	3.1
S.N.F	16.7	8.8
Ash	1.11	0.74
T.S	23.9	12.9

Table 2. The difference between Colostrum and Mature milk depending on its composition rate.

3.Health Benefits of Colostrum

When consumed, bovine colostrum or colostrum milk helps in treating many health conditions, including:

• One of the uses of bovine colostrum or colostrum for athletes is to burn fat, build muscle, increase endurance and vitality, and reduce fatigue.

•It also has a role in treating infections. The upper respiratory tract resulting from exercise.

•It is also used to strengthen the immune system, accelerate recovery from injuries, repair damage to the nervous system, improve mood and feel comfortable, and delay the symptoms of aging. It also has an antibacterial and antiviral role.

•bovine colostrum is used in the treatment of colitis, also is used in the vagina for human papillomavirus (HPV).

• Treatment of infectious diarrhea for adults and children, and diarrhea resulting from the use of antibiotics. Treatment of diarrhea resulting from HIV infection (AIDS).

• Flu treatment. Taking a specific type of bovine colostrum by mouth for 8 weeks helps prevent influenza infection, including in people who have already been vaccinated against influenza and people with heart disease who have a higher risk of getting the flu.

• Treatment of viral diarrhea, such as diarrhea caused by rotavirus infection, Treatment of muscle weakness for adults, improve memory, Improving the level of sugar for diabetics, Improving the health of children with growth retardation (it improves weight, not height), Burn fat, and Dry eye.

• Increase stamina and vitality, and Oral infections. (Playford, R., Weiser, M., 2021).

Figure 2. Two example for the colostrum treatments which Oral infections and colitis.

4.The most common diseases that colostrum protects against:

4.1 Autoimmune Diseases/ Leaky Gut Syndrome

Colostrum contains immune factors which can regulate the immune response, growth factors to help to repair damaged cells and anti-inflammatory substances to reduce Inflammation.Proline rich protein (PRP) fromcolostrum acts as regulatory substances of the thymus gland. It improves or eliminates symptomatology of both allergies autoimmune diseases. PRP inhibits overproduction of lymphocytes and T cells and reduces pain, swelling and infection.Lactoferrin from colostrum restores humoral immune response which is mediated by T cells and B cells.19 Lactoferrin minimizes the viral and bacterial infections and beneficial in maintaining gut permeability and stability. EGF helps to reverse the destruction of skin cells that can occur with autoimmune disorder. TNF stimulates tissue repair.

Several studies have shown that NSAIDS taken for 1-7 days' increases gut permeability approximately threefold. But when colostrum was taken with the NSAIDS there was no increase in permeability.

4.2 Cancer

Lactoferrinhelps to prevent or shrink cancer cells.Lactoferrin prevents colon, bladder, tongue, esophagus, lung cancer. This is due to effect of lactoferrin as it boosts immunity. Colostrum contains milk fats which have anti carcinogenic properties. Conjugated linolenicacid (CLA) in colostrum has anti carcinogenic properties.

4.3 Helicobacter Pylori infection

H pylori require lipids to bind with gastric mucosa. Colostrum prevents the adhesion of this organism to the lipid binding sites of the GI tract. Studies have shown that bovine colostrum has potential to stop adhesion activity of H Pylori and H Mustelae. As colostrum prevents the adhesion of this microorganism therefore it can ever prevent peptic ulcers occurrence.A dose of 20grams of hyper immune bovine colostrum containing anti H pylori bovine Immunoglobulin was given to nine adults with gastritis for 3 – 4 weeks and it was seen that the severity of symptoms was reduced and

inflammation and organism was eradicated is one subject. The severity of symptoms and rate of colonization were reduced in 20 children positive of H Pylori, when given 12g hyper immune bovine colostrum. But the organism was not eradicated.Breastfeeding protects against early acquisition of H Pylori. (Silva, E., et al, 2019).

5. Cases in Which the Child Should Not Be Breastfed Colostrum

It is not recommended to refrain from giving colostrum to newborns except in a few cases, such as:

1. Certain medications used by a nursing mother may be excreted in breast milk.
2. The mother underwent general or local anesthesia during childbirth.
3. Bacterial nipple infection.
4. The mother's infection with pulmonary tuberculosis.
5. The inability of the newborn to swallow due to problems in the nose, palate, respiratory system, or heart disease.

6. Colostrum Marketing

Now in some countries, colostrum shopping has grown constantly in normal or online markets where novel functional foods lead the global market, due to its excellent benefits not only as an immune health-promoting diet but also as an alternative to the treatment and protection of many human diseases. In Brazil, it is now used to improve diseases of the digestive, respiratory, inflammation and bone growth. BC is available on the world market in a natural form or dietary supplement products for human, animals, sports nutrition, infant formulas, functional foods, chewed gums, liquids, lozenges, concentrates, powders, tablets, capsules, pharmaceuticals and cosmetics. Likewise, BC is the most popular used for supplements for human consumption in food or in medicinal therapy as pasteurized or dried pills and powders due to its rich nutrients and Igs values that increase immunity, help fight infection and promote better gut health.

Among the most popular products that are included in its composition are the following:

1. California Gold Nutrition Colostrum Powder: Is a cow's milk concentrate that supports the immune system, the powder contains immunoglobulins up to 20% and protein-rich polypeptides approximately 15%.

2. Vegetarian capsules: The dietary supplement is extracted from the milk produced by cows, which is rich in a variety of bioactive proteins. Chief among these are immunoglobulin proteins, lactoferrin and other factors that support the immune system.

3. Jarrow Formulas, Colostrum Prime Life: Supplements contain a high immunoglobulin content of up to 30%. This dietary supplement is extracted from the milk of pasture-fed American cows within the first 16 hours of calving.

4. Symbiotics Colostrum Plus capsules: Contains lactoferrin, a protein with multiple functions in the body. In addition, it contains multiple peptides and is rich in proline, which is known for its powerful effect on the immune response and its role in regulating it efficiently. The product contains 25% immunoglobulin C antibodies. (Fasse, S., et al. 2021).

Figure 3. popular products that are included Colostrum in its composition

7. Conclusion

Colostrum is pre-milk substance that is produced immediately after birth. Within few minutes of birth, baby can suckle the breast. Colostrum is thick yellow mammary secretion and is rich in proteins, it is an excellent source of macronutrients (proteins , carbohydrates , fat) and micronutrients (vitamins , minerals , antioxidants), When consumed, bovine colostrum or colostrum milk helps in treating many health conditions, shuch as Treatment of viral diarrhea, such as diarrhea caused by rotavirus infection and Treatment of muscle weakness for adults.

Shouldnt refrain from giving colostrum to newborns except in a few cases, such as: Certain medications used by a nursing mother may be excreted in breast mil and The mother underwent general or local anesthesia during childbirth, also rhe most common diseases that colostrum protects against are autoimmune Diseases, Leaky Gut Syndrome ، and cancer.

Among the most popular products that are included in its composition, such as California Gold Nutrition Colostrum Powder, Vegetarian capsules, Jarrow Formulas, Colostrum Prime Life, and Symbiotics Colostrum Plus capsules.

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