COLOSTRUM-MIRACULOUS FLUID

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Abstract*—Colostrum known colloquially as beestings, bisnings or first milk is a form of milk produced by the mammary glands of mammals (including humans) in late pregnancy. Droplets of Colostrum expressed from the breast of a 40-weeks pregnant woman. Newborns have very immature digestive systems, and Colostrum delivers its nutrients in a very concentrated low-volume form. It has a mild laxative effect, encouraging the passing of the baby's first stool, which is called Meconium. This clears excess bilirubin, a waste-product of dead red blood cells, which is produced in large quantities at birth due to blood volume reduction from the infant's body and helps prevent jaundice. Colostrum is known to contain immune cells (as lymphocytes) and many antibodies such as IgA, IgG, and IgM. These are some of the components of the adaptive immune system. Other immune components of Colostrum include the major components of the innate immune system, such aslactoferrin, lysozyme, lactoperoxidase, complement, and proline rich polypeptides. A number of cytokines (small messenger peptides that control the functioning of the immune system) are found in Colostrum. Colostrum is very rich in proteins, vitamin A, and sodium chloride, but contains lower amounts of carbohydrates, lipids, and potassium than mature milk. The most pertinent bioactive components in colostrum are growth factors and antimicrobial factors. The antibodies in colostrum provide passive immunity, while growth factors stimulate the development of the gut. They are passed to the neonate and provide the first protection against pathogens.*

Keywords*—*Colostrum; Miraculous Fluid; Infant Booster; Immuno-regulator; First line of Defense; Bioactive Component; Pathogen Killer; Antimicrobial component

1. INTRODUCTION

Colostrum known colloquially as beestings,[1] bisnings[2] or first milk is a form of milk produced by the mammary glands of mammals (including humans) in late pregnancy. Most species will generate Colostrum just prior to giving birth. Colostrum contains antibodies to protect the newborn against disease. In general, protein concentration in Colostrum is substantially higher than in milk. Fat concentration is substantially higher in Colostrum than in milk in some species, e.g. sheep[3][4][5] and horses,[6][7] but lower in Colostrum than in milk in some other species, e.g. camels[8]and humans.[9] Droplets of Colostrum expressed from the breast of a 40-weeks pregnant woman. Newborns have very immature digestive systems, and Colostrum delivers its nutrients in a very concentrated low-volume form. It has a mild laxative effect, encouraging the passing of the baby's first stool, which is called Meconium. This clears excess bilirubin, a waste-product of dead red blood cells, which is produced in large quantities at birth due to blood volume reduction from the infant's body and helps prevent jaundice.

Colostrum is known to contain immune cells (as lymphocytes) [10] and many antibodies such as IgA, IgG, and IgM. These are some of the components of the adaptive immune system. In preterm infants some IgA may be absorbed through the intestinal epithelium and enter the blood stream though there is very little uptake in full term babies.[11] This is due to the early "closure" of the intestinal epithelium to large molecule uptake in humans unlike the case in cattle which continue to uptake immunoglobulin from milk shortly after birth.

Other immune components of Colostrum include the major components of the innate immune system, such aslactoferrin,[12] lysozyme,[13] lactoperoxidase,[14] complement,[15] and proline-rich polypeptides (PRP).[16] A number of cytokines (small messenger peptides that control the functioning of the immune system) are found in Colostrum as well, including interleukins,[17] tumor necrosis factor,[18] chemokines,[19] and others.

Colostrum also contains a number of growth factors, such as insulin-like growth factors I (IGF-1),[20] and II,[21] transforming growth factors alpha,[22] beta 1 and beta 2,[23][24] fibroblast growth factors,[25] epidermal growth factor,[26] granulocyte-macrophage-stimulating growth factor,[27]platelet-derived growth factor,[28] vascular endothelial growth factor, and colony-stimulating factor-1.[29]

Colostrum is very rich in proteins, vitamin A, and sodium chloride, but contains lower amounts of carbohydrates, lipids, and potassium than mature milk. The most pertinent bioactive components in colostrum are growth factors and antimicrobial factors. The antibodies in colostrum provide passive immunity, while growth factors stimulate the development of the gut. They are passed to the neonate and provide the first protection against pathogens.

2. MAJOR COMPONENTS OF COLOSTRUM

IMMUNOGLOBULIN'S (Ig) also known as antibodies are used by the immune system to identify, attack and neutralize foreign objects such as bacteria and viruses. Absorption of immunoglobulin's is essential for the passive immunity of neonatal mammals after birth. IgG provides a large portion of immunity against invading pathogens. IgG also helps to initiate the cascade of other immune functions.[30] IgA strategically resides in areas like the gastrointestinal, respiratory and urogenital tracts to play a critical role in mucosal immunity by preventing specific pathogens from colonizing. Antibodies'' Secretory Immunoglobulin A (IgA)'' helps to protect the mucous membranes in the throat, lungs, ear and intestines of the infant. IgM is first responder to pathogens entering the body. Attacks bacteria, rendering them inactive.[31] IgE plays an important role in allergenic reactions and aids in the response to parasites in the digestive system. IgD functions closely with IgM to send a signal to B cells, initiating them into action. IgD participate with other immunoglobulins to bolster the body's immune system. Also help in creating specificity to antigens.[32]

CYTOKINES are found in Colostrum, contains many of these biological response modifiers. These can be protein, peptide or glycoprotein signaling molecules that are used in cellular communications. Cytokines have a specific role as regulators of epithelial cell growth and development, including intestinal inflammation and epithelial restoration following mucosal damage. They are also important mediators in the regulation of immune and inflammatory responses.[33]

LACTOFERRIN an iron-binding glycoprotein is one of the antimicrobial components of the immune system that fights bacteria and fungi in the body. It binds metal ions which are necessary bacterial metabolites, making them unavailable for bacterial development. This anti-inflammatory glycoprotein binds free iron ions in biological fluids, transporting the iron to blood cells. Lactoferrin has been shown to inhibit the growth of specific microbes, like E. coli and Salmonella. Lactoferrin has additionally demonstrated antiviral effects.[34]

LYSOZYMES are antibacterial enzymes that help to support the immune system by disrupting the cell walls of harmful bacteria. A special attribute of lysozyme is its interaction with other colostral components. It has been shown to work in a synergistic effect with lactoperoxidase, IgA and lactoferrin. With lactoperoxidase, lysozyme partly activates it by forming a complex. With IgA, it works in synergy to combat E. coli and in the presence of lactoferrin, the antimicrobial effects of lysozyme is also enhanced.[35]

LACTALBUMIN an important nutrient and water-soluble protein found in milk which contains essential amino acids necessary for body growth and development.

LACTOPEROXIDASE is a major antibacterial enzyme found in colostrum. Protects the lactating mammary gland from infections. It works with lactoferrin for some antibacterial effects. [36]

PROLINE RICH POLYPEPTIDES are small chains of amino acids that have a powerful effect in initiating and balancing immune responses. Functions include modulating the immune system, acting as molecular signaling devices, promoting growth and the differentiation of B-cells, stimulating Natural Kill cell (NK cell) activity and promoting the proliferation of leukocytes (white blood cells).

GROWTH FACTORS help stimulate cell growth, cellular differentiation and cell maturation. Growth factors act as signaling molecules from one cell to another as well as regulating a variety of cellular processes.[37]

EPIDERMAL GROWTH FACTORS play an important role in the regulation of cell growth, proliferation and differentiation. The EGF family of growth factors can help modulate development of the epidermis, mammary gland, and gut. FIBROBLAST GROWTH FACTORS are involved in the growth of new blood vessels and wound healing. INSULIN-LIKE GROWTH FACTOR are single chain polypeptides with amino acids. They play an important role in childhood growth and have an anabolic effect in adults. PLATELET-DERIVED GROWTH FACTOR one of numerous proteins that regulate cell growth and division, playing a significant role in blood vessel formation. TRANSFORMING GROWTH FACTORS induce epithelial tissue development. TGF-beta plays a crucial role in tissue regeneration, cell differentiation, formation of bone cartilage, and regulation of the immune system.[38]

ESSENTIAL NUTRIENTS Colostrum provides energy and nutrients. It is rich in energy-giving ingredients like carbohydrates, lipids, and proteins. Carbohydrates are naturally available in colostrum, along with vitamins and minerals like calcium, sodium, magnesium, potassium and zinc. VITAMINS included are vitamins A, B2, B9, B12, and D. Vitamins are essential organic nutrients that, like minerals, work as catalysts or co-factors in biological functions. They are important for such processes as retinol development, transportation of important matter across cellular walls, and processing other nutrients. ESSENTIAL MINERALS & IONS include calcium, chloride, iron, magnesium, phosphorus, potassium, sodium and zinc. Minerals act as catalysts in body functions such as metabolism and ATP formation. Minerals are also important building blocks of bone and teeth. CARBOHYDRATES from simple sugars to complex oligosaccharides, carbohydrates are an important energy source and used in cellular recognition. AMINO ACIDS consist of a large number of compounds

that are the building blocks of proteins through the linking of peptide bonds. Amino acids are important for nutrition and muscle development. PROTEINS provide essential nutritional components for muscle and tissue development.

3. BENEFITS OF COLOSTRUM:

Physicians observe a direct correlation between formula feeding and a dysfunctioning immune system in children. Human colostrum is high in carbohydrates, high in protein, high in antibodies, and low in fat (as human newborns may find fat difficult to digest). Human colostrum is rich in nutrients such as zinc, calcium and vitamins like A, B6'', B12'', K those need for overall growth and development of baby. Unlike colostrum-containing breast milk, formula does not contain the same source of nutrients designed to equip a newborn's immune system with the right tools. In fact, formula is believed to increase the risk of the following health conditions-Colitis, Allergies such as asthma, Childhood cancer, Chronic infections such as urinary tract and lung infection, Infant mortality, Type-1 Diabetes. The act of breastfeeding does more than create a connection between mom and child. Breastfeeding aids in the development of an intricate immune system. Bioactive compounds help to develop tissue and organs, of which the gastrointestinal tract may be of greatest importance and priority. At birth a baby receives most of the immune defense properties it will require throughout life. As newborn ages the mother's milk becomes less concentrated with immune-boosting Colostrum. While these protective properties are critical at birth, Colostrum can strengthen the immune system throughout all stages of life.[39]

Colostrum supports the human organism in two main ways. First, its multiple immune factors and natural antibiotics provide strong support for the immune system. Second, its many growth factors offer a broad- spectrum boost to the organism to encourage optimum health and healing. The immunoglobulin, growth factors, antibodies play a role in prevention of infection that is in passive immunity. The vital nutrients help for tissue development, growth and energy. The growth factors present in the Colostrum provide a novel treatment option for gastrointestinal conditions. Human Colostrum has higher concentration of growth factors.[40]

Colostrum could be the most important natural substance. Research shows that Colostrum can help to increase strength and endurance, build lean muscle mass, burn body fat, boost immune function, which typically dips after strenuous exercise, shorten recovery time and accelerate healing of injuries.

Colostrum contains the growth factors that help build lean muscle, including insulin-like growth factors (IGF-I & IGF-II) and growth hormone (GH). IGF-I, which is found naturally in Colostrum, is the only natural hormone capable of promoting muscle growth by itself. The growth factors in Colostrum "shift fuel utilization from carbohydrate to fat. It mean that body will burn more fat, including fat made from the carbohydrate and protein that are consumed, producing fuel more efficiently. The IGF-1 in Colostrum increases uptake of blood glucose and facilitates the transport of glucose to the muscles, which keeps energy levels up. Together with growth hormones, IGF-1 also slows the rate of protein breakdown (catabolism) that occurs after a vigorous workout. It speeds up protein synthesis, which results in lean muscle mass without an increase in the amount of stored fat. Colostrum improves the assimilation of nutrients, which leads to improved energy levels and performance.[41]

Another growth factor of Colostrum, platelet-derived growth factor (PDGF) helps to stimulate the production of other growth factors, including IGF-1. Other growth factors in Colostrum that help in the healing of injuries include growth hormone (GH) shown to accelerate bone regeneration, TGF α and TGF β shown to regulate cellular migration, proliferation and fibroblast growth factor (FGF) shown to be a powerful stimulator of angiogenesis and a regulator of cellular migration and proliferation. Cytokines also show great potentials in future clinical application, as they have been shown to accelerate tendon repair.[42,43,44]

GI tract is barraged with lots of microbiological organism, antigens, food ingredients and drugs. These do have effect on the GI tract by the way of direct action or by stimulation of the immunological process. Colostrum has immunological factors that protect against micro organism. Colostrum contains trypsin inhibitors and unchanged Colostrum goes down the GI tract maintain the healthy epithelium linings and immune system. This way Colostrum protects against GI disorders.[45] 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. As Colostrum prevents the adhesion of this microorganism therefore it can ever prevent peptic ulcers occurrence. Breastfeeding protects against early acquisition of H Pylori. The concept of passive immunization is a logical alternative approach as it similar to natural means of protecting from infectious disease.[46]

While in a mother's womb, a baby receives all of the immune regulating factors it requires by mimicking the same defense mechanisms of the mother's immune system. This is because immune defenses such as auto antibodies are supplied through the placenta. Before birth and during labor, different types of antibodies are transferred to the child who will strengthen the newborn's own immune system. The final part of the equation is the feeding of breast milk designed to initiate stem cell proliferation, gene function, and the development of a strong immune defense.

Lactoferrin, a compound contained in Colostrum, is a protein required for the metabolism of iron. Organs and cells in the body have receptors for this protein to bind to and inhibit autoimmune responses and inflammation triggered by problems like leaky gut. Lactoferrin activates T-cells, regulates antigen pathways, and promotes enzyme activity. Lactoferrin also exhibits strong antioxidant and detoxification properties which reduce systemic inflammation. As a result, the existence of Lactoferrin in the body inhibits inflammatory immune responses and may reduce the risk of cancer and disease.
As a result of lactoferrin's ability to reduce inflammation and scavenge free radicals, Colostrum containing Lactoferrin protects the body from invading compounds such as pathogen-containing water and food supply, and chemically preserved and antibiotic-ridden foods. The lymphatic system becomes less hindered by toxic compounds pushed from the intestines and into lymph nodes. As a result, Colostrum may also reduce the duration of cold and flu-like symptoms.[47]

A peptide known as human beta-defensin-2 (hBD-2) has been found in Colostrum from human breast milk. HBD-2 boosts immune system activity by defending against possibly fatal bacterial infections. Colostrum is associated with the reduced frequency from infection of the following bacteria:

- Acinetobacter baumanii
- Pseudomonas aeruginosa
- E. coli
- Salmonella

Another antimicrobial property found in Colostrum is T-cells. Specific T-cells are designed to detect foreign microbes and prevent against pathogenic bacteria overgrowth and infection. Stress can leave our immune systems susceptible to an attack from foreign bacteria and therefore it is crucial to maintain the integrity of the gut micro biome. Colostrum can reduce the risk of this occurrence and protect the body from bacteria-induced inflammation and an autoimmune response associated with Crohn's disease.

Patients with metabolic syndrome, including those with type-2 diabetes, may benefit from the supplementation of 10-20 mg of Colostrum daily. Colostrum may heal liver damage, reduce fatty acid levels, decrease postprandial glucose spikes, and better regulate insulin production. The immune system is the body's best defense mechanism for maintaining the health of the whole body. Comparable to a surveillance system, a strong immune system requires numerous factors to function properly. Colostrum promotes the development of a strong immune defense and can equip the body to defend against cancer.

Lactoferrin helps 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. The mechanism of CLA's anti carcinogenic properties is not clearly understood. There are few researches which prove this theory. In an in vitro study, CLA has been found to stimulate the production of lymphokines and interleukin 2, by 32% and 29% respectively and also increases certain levels of immunoglobins. It also said to lower immunosuppressive substances like leukotrienes and prostaglandins.[48]

Colostrum may be recommended as an immunotherapy strategy without unintended side effects. It actually works as a natural and 100% safe vaccine. It contains large quantities of an antibody called which is a new substance to the newborn.[49] Colostrum contains antioxidant and anti-inflammatory properties and protects the gut lining. Colostrum is high in cholesterol, which is essential for the growth of baby's nervous system at this stage. Sugars in Colostrum provide the energy required by baby's growing body. Some studies suggest the protein content in Colostrum provides a full feeling to baby, enabling baby to sleep longer. It is also responsible for containing the passive immunizes that were provided in utero by the placenta, such as polio-virus and rubella.[50]

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