



The most important components of colostrum can be broken down into three major categories: Immune Factors, Growth Factors and Nutritional Components.

### Immune Factors

- **Proline-Rich Polypeptides (PRP's)**

Immune Factors Proline-Rich Polypeptides (PRPs) Proline-rich polypeptides (PRPs) act systemically, modulating the complex immune system and are therefore the most important ingredient in colostrum. They work as hormones that regulate the thymus gland (the body's central command for the immune system).

Peptides are short chains of amino acids — the building blocks of proteins — without the complex tertiary structure of proteins. Proline-rich polypeptides (PRPs), so-called because they contain an unusually high proportion of the amino acid proline, are intercellular signaling molecules that have the unique ability to modulate the immune system.

Immunomodulating colostrum peptides appear under various names in literature, including transfer factor, colostrinin and Proline-rich polypeptides (PRPs).

- **Immunoglobulins (IgG, IgA, IgE, IgM, IgD)**

The immunoglobulin fraction in bovine colostrum is composed of approximately 70-80% IgG, 10-15% IgA, 10-15% IgM, while IgE and IgD are found in small amounts. Local protection in the form of immunosupplementation with bovine milk antibodies has been shown to be an effective means of providing local protection to the GI tract.

The function of these immunoglobulins (antibodies) is as follows:

IgG — predominant immunoglobulin in bovine milk colostrum.

IgA — predominant immunoglobulin in human milk and colostrum; primary role is as first line of defense, protects mucosal surfaces.

IgM — primary role is “first to fight;” enhances.

IgE — involved with the allergic reaction and histamine-associated allergic reaction.

Laboratory analyses of both immune and growth factors from bovine colostrum indicate that they are identical to those found in human colostrum except for the fact that the levels of these factors are significantly higher in the bovine version. Bovine colostrum is actually 40 times richer in immune factors than human colostrum. For example, human colostrum contains 2% of IgG (immunoglobulin G) while cow colostrum contains 86% of IgG, the most important of the immunoglobulins found in the body.

- **Lactoferrin**

Lactoferrin is an iron-binding protein that helps deprive bacteria of the iron they require to reproduce and releases iron into the red blood cells enhancing oxygenation of tissues.

- **$\alpha$  – Lactalbumin and  $\beta$  – Lactoglobulin**

These are the major nutritional whey proteins in milk and colostrum.

- **Cytokines**

Cytokines are small proteins that are secreted by specific cells of the immune system. They are a category of signaling molecules that are used extensively in cellular communication. They are proteins, peptides, or glycoproteins.

- **Lysozymes**

Lysozymes can help support the immune system. Enzymes Lactoperoxidase-thiocyanate, peroxidase, and xanthine oxidase oxidize bacteria through their ability to release hydrogen peroxide.

- **Glycoproteins**

Glycoproteins are a digestive factor that has been shown to help immune and growth factors survive the passage through the highly acidic digestive system.

### **Growth Factors**

Colostrum contains many growth factors, including insulin-like growth factor-1 and 2 (IGF-1 and IGF-2), Epithelial growth factor (EGF), Fibroblast growth factor (FGF), Platelet-derived growth factor (PDGF), and Transforming growth factors alpha  $\beta$  (TGA- $\alpha$  and TGF- $\beta$ ). Growth factors, are peptides that function as intercellular signaling molecules to turn on or turn off the production of specific proteins in the target cells. Their presence in colostrum is primarily to complete the growth and development of the newborn gut, but in older children and adults they help support a healthy gut wall.

### **Nutritional Components**

Vitamins, Minerals, Amino Acids, and Essential Oils Colostrum is a combination of vitamins, minerals, and amino acids that are naturally occurring in a perfect combination. Vitamins A, B1, B2, B6, B12, and E are found in small amounts while traces of all other vitamins, as well as minerals such as calcium, sodium, magnesium and zinc, are also present in colostrum. Colostrum is a rich source of both essential and non-essential amino acids, as well as essential fats, including phospholipids, which enable colostrum protein protection and easy absorption in the gut by forming liposomes around them.

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