Bovine Secretory Immunoglobulin A (sIgA)

Introduction

The beneficial aspects of milk and colostrum in maintaining health and well being are well established. In humans it has been shown that the incidence of common infections of the intestinal and respiratory systems is significantly reduced in breast fed infants when compared to non-breast fed infants.

The protective effect of human milk has been attributed to its immunoglobulin content, primarily secretory IgA, whereas in most other animals it is primarily IgG. Other non-specific factors have also been implicated, including lactoferrin and lyzozyme.

The pharmacological action of milk and colostrum lies in its ability to function as an antibacterial, anti-inflammatory, and possibly as an anti-viral agent. All these activities have been attributed to secretory IgA. The fact that secretory IgA is a normal constituent of milk and that it is found in relatively high concentration in bovine colostrum suggests that this natural food product is an ideal candidate for a natural food ingredient supplement.

Ant-Bacterial/Anti-Viral Activity

Secretory IgA is the predominate immunoglobulin in seromucousal secretions such as colostrum, milk, saliva, tears, nasal mucous, tracheobronchial secretions and genito-urinary secretions (1,2).

Structurally secretory IgA consists of two monomeric IgA molecules linked by disulfide bonds to a joining chain (J-chain) and one molecule of secretory component. The main features distinguishing secretory IgA from the other immunoglobulins is that function predominately in mucosal immunity and that the molecule is protected from proteolytic degradation by its association with secretory component.

Secretory IgA can be regarded functionally as "antiseptic paint" providing a first line of defense which prevents infectious organisms from entering the body proper. It is probably most important early in life where it may limit the extent of infection and give the newborn's system time to mature.

Adherence to epithelial cells of mucous membranes is essential for viral infection and bacterial colonization. Secretory IgA functions to inhibit the adhesion of these pathogens thus limiting disease. In addition secretory IgA

functions to neutralise the toxins and virulence factors from microbial pathogens by immuno-agglutination.

The leading cause of death to newborns in developing countries has been attributed to infantile diarrhea (3). This is also true of domestic animals where scours (enteric dysentery) is the major cause of mortality in newborn calfs (4). The enterotoxigenic form of Escherichia coli is one of the pathogens most frequently associated with this disease state (4-7). Secretory IgA has been shown to neutralise this toxin, as well as enterotoxins of Vibrio cholererae, Shigella, and Salmonella (8-11).

Anti-Inflammatory Activity

Inflammation is a complex localized event in response to either injury, invasive foreign substance (pathogen) or in some instances to internally produced substances (rheumatoid arthritis).

This is a protective adaptation that serves to isolate, destroy, and rid the infected area of both the injurious agent and the injured tissue. Inflammation is characterized by an increase in vascular permeability and vasodilation with a subsequent migration of leukocytes into the inflammed area. Clinically inflammation is associated with pain, swelling, tenderness, redness, and general discomfort. Prostaglandin's (PG) and leukotrienes (LT) play an important role in mediating the process of inflammation by increasing histamine-mediated vascular permeability. It is predominately this action, which causes the discomfort, associated with inflammation.

The common anti-inflammatory analgesic and antipyretic drugs, such as corticosteroids, aspirin, and indomethacin, inhibit PG and or LT synthesis. In fact most, if not all, of the anti-phlogistic actions of steriodal and non-steroidal anti-inflammatory drugs action by inhibiting prostaglandin synthesis. The anti-inflammatory effect of aspirin and indomethacin is inhibition of cyclooxygenase, whereas those of corticosteoids are thought to inhibit the release of fatty acids from phospholipids either by inhibition of phospholipase A2 or by interfering with the release of membrane phospholipids.

The adverse side effects associated with certain anti-inflammatory agents limits their use. In the case of natural and synthetic corticosteroids the potential side effects include the elevation of blood pressure, water and salt retention, increased calcium and potassium excretion, gastric upset and possibly peptic ulceration. In addition, the use of these compounds may also aggravate diabetes mellitus.

The non-steroidal anti-inflammatory compounds (salicylates) are synthetic biochemical substances, which can be toxic at high doses. The possible side effects associated with these substances include gastric upset and gastric bleeding, prolonged clotting time, and hepatic injury. Though the number of various anti-inflammatory agents is great so are the potential side effects and adverse reactions associated with these compounds.

It has been shown by in vitro studies that the secretory component of secretory IgA inhibiting phospholipase A2 activity and therefore prostaglandin and leukotriene synthesis by limiting the release of arachidonic acid (12-14). This inhibition of prostaglandin and leukotriene synthesis thus gives supporting evidence that secretory component and secretory IgA possess anti-inflammatory properties.

Secretory IgA and secretory component are normal constituents of bovine colostrum are therefore are a natural food product. This fact that this natural protein possesses anti-bacterial and anti-inflammatory properties suggests that it would be an ideal candidate as a natural food ingredient supplement.

References

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