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Colostrum and the Performance Horse

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Introduction

The significance of colostrum in the area of **the competing horse** lies in several very important features. Firstly, it is a highly nutritious food and secondly it contains many, many bioactive substances that have been shown to prevent disease and promote overall good health. Of specific interest to the trainer is the fact that colostrum supplementation can be an effective way by which the horse can increase **lean body mass**, **improve muscular strength**, **increase endurance & capacity, and at the same time speed recovery**. What this means to the horse is simple – it can train harder, longer, and recover faster thereby increasing respective level of performance. Of significant importance to the competing horse is the simple fact that **colostrum is perfectly safe** and further is the fact that the **International Olympic Committee (IOC) has designated colostrum to be an accepted and safe dietary supplement.** Thus it is recognized as perfectly safe and, legal by all the sports and racing regulatory bodies.

Overall Health

One very important aspect of performance is overall good health. This is especially true in the case of the trainer who wants his horse to perform at their maximal level. Colostrum supplementation has been shown in clinical trials to help prevent disease. Most infections and disease conditions begin in the gut and this is exactly where the benefits of colostrum begin – in the gut.

The bioactive molecules in colostrum include such things as immunoglobulins, immune factors, growth factors, and antioxidants. To begin with, **immunoglobulins** in the form of **antibodies** and other **immune factors** act to ward off disease. **Antibodies** are large protein molecules produced by the animals immune system to combat and neutralise foreign potentially disease causing agents (antigens). The interesting feature of antibodies is that they are specific in that there is a separate and specific antibody produced for every type of antigen.

Colostrum is produced by the mammary gland of all mammals. It is also known as “pre – milk” as it is the first milk produced by the mother following the birth of her young. The significance of colostrum lies in the fact that it is the first food the young animal receives after it is born. As such colostrum is a highly nutritious food. However of paramount importance is the fact that colostrum is involved with a phenomena known as “passive transmission of immunity”. This is a life supporting function and is best exemplified in farm animals such as the horse, cow, dog, sheep, goat, etc. Unless these animals receive

colostrum in the first day or two of life they most likely will die. Unlike humans, who are passively immunized in the womb via the placenta, these animals are born without any defense mechanism – immune system - by which they can fight off infection. Colostrum contains antibodies produced by the mother against disease causing agents she has been exposed to during her lifetime.

At the time of birth the gut of these animals is not yet sealed and whole antibody molecule can be absorbed through the gut wall directly into the blood system. By ingesting colostrum the newborn is able to obtain antibodies from the mother to help them survive until their own immune system is sufficiently developed to fight off disease. After a day or two of life the gut seals and the antibodies present in the colostrum and milk function in local immune protection of the gut. This local immune protection is not species specific and as such we as humans, and all other animals, can use bovine colostrum for it's various health benefits.

Antibodies belong to a group of bioactive molecules who as a group are referred to collectively as Immunoglobulins. Antibodies function to hunt down, fight, and destroy disease causing agents – pathogens. Colostrum supplementation has been shown to be an effective means by which infections of the gastrointestinal tract (gut) and other areas can be prevented. It has been shown in the form of clinical trials that colostrum supplementation can be effective in preventing and treating diarrhoea (scours) and other infections. In a recent investigation conducted in collaboration with the Department of Microbiology, Otago University, New Zealand it was revealed that colostrum derived from non-immunized New Zealand pasture fed cows had significant specific antibody potency (titre) to a very wide variety of potentially pathogenic (disease causing) microbes. Bovine colostrum has been shown in clinical trials to have a safe protective effect in a variety of animals, including horses.

Failure of Passive Transmission of Immunity

In a recent clinical investigation spanning two consecutive foaling seasons and involving 650 bred mares it was revealed that the primary cause of **foal mortality** was due to partial or complete **failure of passive transfer (FPT)** of immunity. Of particular interest is the high incidence of foal mortality which is associated with failure of passive transfer – in first year it was reported that 5.3% died and up to 9.8% in the second year. In a further study involving some 2,092 horses and ponies it was found that some 416 or 20% of these animals suffered from some type of immunological disorder - most common being FPT – 228 cases or 10.9%.

There are a number of reasons why FPT occurs: inadequate suckling; poor quality colostrum; mare being immuno-suppressed or even environmental stress. Whatever the reason of FPT the result is the same – increased foal mortality. Foals which are affected by FPT do not have a sufficient complement of antibodies to fight off infection and usually succumb to a bacterial infection of the blood known as **septicaemia**. Also affecting foals afflicted with FPT is another potentially life-threatening condition known as **septic arthritis**. This crippling and potentially fatal disease involves the joints of not only foals, but horses of all ages. It can be caused by either direct injury to the joint or by infection. The degree of injury to the joint is dependent on two very important factors: the degree or severity of infection and the degree to which the horse's immune system can fight the infection. Bovine colostrum has been shown in clinical trials to have a safe protective effect against many enteric disease causing microbes.

Colostrum in addition to antibodies also contains many other substances which help promote good health in the form of growth, maturation and healing. These include

growth factors and immune factors. Growth factors include Epidermal Growth Factor (EGF), Trophoblast Growth Factor (TGF), Insulin-Like Growth Factor (IGF), and Fibroblast Growth Factor (FGF). These factors function primarily in the growth, development, and maturation of cells, organs, nerves, muscle, and tissues. Immune factors include Lactoferrin, Transferrin, Cytokines, Lyzozyme, Lactoperoxidase, and Transfer Factor. These factors have a very wide assortment of actions and include the augmenting (helping) the action of antibodies and modulating (controlling) the actions of the immune system.

In addition to immunoglobulins colostrum also contains other immune factors which help ward off disease and promote overall health – including **bio-active peptides**, **lactoferrin**, **secretory component**, **transferrin**, **lyzozyme**, **lactoperoxidase**, **cytokines**, **oligosaccharides**, **complex lipids,** many others. Colostrum also contains growth promoting substances collectively referred to as "**growth factors**" which help to accelerate the growth or healing process thus aiding the competing horse to train harder and recover faster.

It has recently been discovered that colostrum is a significant source of **antioxidants**. One such antioxidant – **Glutathione** - has been described as the "**Ultimate Antioxidant**". In this capacity glutathione and glutathione precursors play an important part in colostrum's role in overall health. Glutathione also referred to, as GSH is a naturally occurring peptide or small protein, which has a primary function as an antioxidant. Linus Pauling was a leading advocate of antioxidants and their respective role in prevention of disease and the promotion of overall good health. Antioxidants for the most part are naturally occurring compounds that possess the ability to neutralize unstable "**free radicals**". Unchecked these free radicals have been linked, at least in part, as the causative agents of a number of disease conditions including cancer, heart disease, stroke, and improper nervous & immune system function. A growing number of scientific and medical research studies have successfully shown that that antioxidants can deactivate free radicals and thus limit the spread of certain disease states. Further it has been shown that glutathione enhances athletic performance by increasing muscle strength and weight gain.

Gut Health

The leading cause of death in horses is colic. There are various types of colic and they **can affect the horse at any stage of their life. It is a very well known fact that performance horses are more susceptible to colic. Colic is a general term indicating abdominal pain. As previously mentioned it can quite serious. Bovine colostrum has been shown to promote gut health and as such may afford protection from colic. It is of interest that colostrum contains relatively high levels of oligosaccharides. Oligosaccharides are a very good energy source and also function as prebiotics thus promoting the growth of probiotics or beneficial bacteria in the gut.**

An investigation involving some 100 foals ranging in age from 2 to 45 days revealed that 50% had lesions of the stomach. In fact three independent studies conducted in the USA, Ireland, and England revealed approximately 50% of fall foals had ulcers. A recent study which investigated the prevalence of ulcers in healthy or appearing to be healthy race, show and pleasure horses revealed that approximately 90% of the race horses had ulcers. The one major culprit appears to be the disruption in the normal eating and digestive patterns which have evolved in the horse species. In the case of race horses they are placed in an ever changing pattern of being stabled versus grazing. **Colostrum has been shown to be beneficial in the prevention and treatment of gastrointestinal injury.** Further colostrum has been shown to be beneficial in treating

not only ulcerative conditions but also diseases of the gut.

The direct benefits of colostrum that have been observed to date are numerous and they include overall good health, prevention of disease, improved performance, reduced healing period, increased recovery, and improved immune protection. These benefits are obvious and can be explained through biochemical pathways and various specific actions of specific components present in colostrum. However the indirect effects of colostrum are not so clear cut. What is clear is that all the wonderful things in colostrum work together in such a way as to increase the effectives of each component.

Colostrum & The Performance Horse

The beneficial aspects of colostrum on athletic performance is well documented in the form of clinical trials. It has been shown that colostrum supplementation improves running and jumping performance. It has also been shown that colostrum supplementation has a positive effect during periods of heavy training and improves physical work capacity. Of major significance is the fact that the athletes who received the colostrum supplementation experienced a greater capacity for endurance.

Thus athletes who received colostrum were shown to run further; jump higher and longer; cycle and row faster and longer. Further they where shown to recover faster as compared to the placebo group. In an investigation into the effects of bovine colostrum supplementation on body composition in association with exercise, it was revealed that the colostrum group experienced a significant increase in lean body mass as compared to the placebo group. Thus the results to the athlete must be obvious – colostrum supplementation can increase lean body mass, improve muscular strength, increase endurance & capacity, and at the same time speed recovery. What this means to the athlete is simple – they can train harder, longer, and recover faster thereby increasing their respective level of athletic performance.

How Does It Work?

It has long been established that both milk and colostrum contain peptide **growth factors**, which stimulate growth and differentiation of mammalian cells. The predominate growth factor activity though is typically concentrated in the colostral phase**.** A number of growth factors have been described in bovine colostrum. These include Insulin-like Growth Factor (IGF-1, IGF-2, and -3N:IGF-1), Transforming Growth Factor (TGF-B1 and TGF-B2), and Epidermal Growth Factor (EGF).

Insulin-Like Growth Factor 1 (IGF-1) is found in relatively high concentrations in colostrum and is of specific interest in regard to athletic performance. Specifically, this growth factor mediates the growth or metabolic effects of Growth Hormone. On a molecular level IGF-1 functions to stimulate muscle and bone cell proliferation and development - helps to build muscle and strong bones. In a recent study it was shown that oral supplementation with bovine colostrum enhances the recovery process following physical exercise or exertion. Thus it allows harder training with improved recovery. A further studies have shown that bovine colostrum has positive effect on maximal power output - increases vertical jump performance and improves repetitive movement performance.

Improves Recovery

Physical exercise and training cause muscle damage. Recovery from this damage is necessary or subsequent exertion will be limited. Bovine colostrum has been shown to

help in this recovery process. It has been demonstrated in laboratory studies that IGF-1 can promote an increase of up to 15% in muscle mass and a 14% increase in strength in adult mice.

Oxidative stress in the form of training and exercise contributes to muscle fatigue. **Glutathione** and its precursors, present in colostrum, have been shown to increase the capacity of exercise prior to the onset of fatigue. There is an ever increasing amount of evidence that suggests free radicals play a very important role in muscle damage and inflammation. Glutathione is a powerful **antioxidant** and as such is a powerful scavenger of free radicals.

In a study involving Olympic skiers it was shown that athletes taking colostrum were less fatigued and showed improved performance, compared to their counterparts who were given a placebo. **Creatine-kinase** is a critical enzyme involved with muscle metabolism and has been shown to be a marker of muscle cell damage. Elevated circulating (blood) creatine levels are often associated with significant muscle damage. In this study the athletes who consumed colostrum had, following exercise, approximately half the circulating creatine levels of the control group.

Speeds Healing

Transforming Growth Factor (TGF) and **Epidermal Growth Factor** (EGF) are also found in relatively high amounts in colostrum. Both these growth factors stimulate tissue repair & wound healing. This is especially important in the digestive tract where ulcers and colic are major disease conditions effecting horses. In particular horses are prone to ulceration of the stomach lining. In extreme cases the ulcer can extend through the stomach lining and cause rupture and death, particularly in foals. The actual causative agent of this **stomach ulceration** has not been identified but the following are thought to be contributing factors: stress, medications, infectious agents, diet, and possibly intestinal parasites. The use of bovine colostrum has been proved effective in the treatment of gastrointestinal disorders caused by aspirin and other **non-steriodal anti-inflammatory drugs (NSAID).**

Anti-Inflammatory Properties

Associated with physical exertion and strenuous exercise is inflammation. Though typically this inflammation is centred in the joints, it is also observed in the digestive tract. In colostrum and milk there are two principle molecules (proteins) that have been implicated as natural anti-inflammatory agents: **Lactoferrin** and **Secretory Component** of the secretory IgA molecule. Both proteins are abundant in bovine colostrum

Inflammation is a complex localized event in reponse 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. **Prostoglandins** (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 (**NSAID**) action by inhibiting prostaglandin synthesis. The anti-inflammatory effect

of **aspirin** and **indomethacin** is inhibition of **cyclooxygenase**, whereas those of corticosteroids 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.

It has been shown by *in vitro* studies that the **secretory component** of secretory IgA – present in colostrum inhibits phospholipase A2 activity and therefore prostaglandin and leukotriene synthesis by limiting the release of arachidonic acid. The fact that colostrum is a natural food that has no contraindications or negative side effects suggests that it is an ideal supplement to be used to counter inflammation.

The adverse side effects associated with certain anti-inflammatory agents limits their use. In the case of 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 that 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 is in this regard where colostrum has also been shown to be of direct benefit. Non-steroidal anti-inflammatory drugs (DSAIDs) are very effective agents for treatment of inflammation but unfortunately they cause gastric injury. **Colostrum has been shown to be beneficial in the prevention and treatment of gastrointestinal injury caused by NSAIDs.** Further colostrum has been shown to be beneficial in treating not only ulcerative conditions but also diseases of the gut.

Colostrum and International Olympic Committee

Colostrum is a completely natural substance that has been used as a food and nutritional supplement for thousands of years. Everything in colostrum is also found in milk, although at a much lower level. As such colostrum has been labelled by the IOC as being a “strong milk” and the **IOC does not consider colostrum to be a prohibited substance**. Further bovine colostrum supplements are not on the banned drug lists of the IOC or any other sport and racing governing body.

Safety of Colostrum

The efficacy and safety of colostrum supplementation in humans and animals has long been established in the form of clinical trials. Currently there are a growing number of either colostrum or colostrum derived products available that are registered for therapeutic use. There are no known contraindications to use of bovine colostrum supplements in horses.

New Zealand Colostrum

It is well accepted worldwide that New Zealand colostrum is the world standard. All dairy products in New Zealand are certified to be hormone, pesticide, and antibiotic free. New Zealand colostrum is derived from certified disease free non-immunized New Zealand pasture fed cows. There has never been a case of BSE in New Zealand and the NZ Ministry of Agriculture and Fisheries has certified that the country is free of not only BSE but Foot and Mouth disease as well. Due to the temperate climate and the wide diversity

in fauna present in NZ pastures colostrum sourced from New Zealand is assured to be high in specific antibody to a wide range of microbes.

In Summary

Colostrum is a very complex mixture containing many bioactive substances that have yet to fully appreciated. Among these substances so far identified are immunoglobulins, growth factors, immune factors, and antioxidants. An important feature, which must be pointed out, is the synergistic actions of a highly complex mixture like colostrum. The general belief is that this synergism is paramount for the true benefits of colostrum to be experienced**.** In regard to the competing horse, it has been shown that colostrum is an effective, safe, and legal supplement, which can have a very positive influence on performance.

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is not intended to diagnose, treat, cure or prevent disease. The statements are for informational purposes only and is it not meant to replace the services or recommendations of a physician or qualified health care practitioner. Those with health problems or pregnancy are specifically advised that they should consult their physician before taking colostrum or any nutritional supplement.

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