

## **COLOSTRUM AS NUTRITIONAL SUPPLEMENT IN SPORT**

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### **Abstract**

*Nutrition supplements and ergogenic aids are more and more used for improving the sportive performance. But, using supplements and ergogenic aids has to follow a good nutritional and medical control, and also chemical composition or associated effect with other substances has to be very well known. Bovine colostrum is the first milk secreted during the first days after calving and is a very appreciate nutritional supplement for tow reasons: is natural product and has very complex composition that can satisfy all the needs, besides oxygen for respiration. The first milk is very rich in proteins, immunoglobulins, and minerals and has less lactose and fat compare to mature milk. Colostrum supplementation has no intake restriction even for athletes before the competitions and some researchers demonstrate an improving recovery after heavy training periods.*

**Key words:** *colostrum, nutritional supplement, sport.*

### **Nutritional supplements in sports**

Some athletes try to find new ways for improve sportive performance. One of this answers is nutrition supplements and ergogenic aids. Nutritional supplements are substances that come and help the organism to achieve a high performance or to get a good physiological status after a health problem. Ergogenic aids are substances that can enhance athletic performance.

The statistics showed that over 75 percent from recreational and elite athletes use nutritional supplements and ergogenic aids for improving their physical performance (Ahrendt, 2001).

Concordant with studies in this field, every substance that provide energy (energy bars, energy drinks), contained micronutrients (vitamins, minerals, enzymes, a.o.), contribute to achieve a very good performance or enhance recovery after exercise is classified as nutritional supplement or ergogenic aid. In this group of substances are included even substances that seem to stimulate and help muscle growth as amino acids (Clarkson and Rawson, 1999).

For competitive athletes close to their trainer has to be a nutritionist. Sport nutrition is not a simple nutrition because it has to take in view the exercises, characteristics of athletes' body, psychical status, the characteristics of ambient, and not the list, the program of competition. Thus, it is known by specialists that most of the supplements are unnecessary for athletes that have a good nutrition. For achieving a balanced diet they have to eat various foods and drink adequate liquids to meet their energy and nutritional needs.

Some of these nutritional supplements are presented as follow: amino acids, androstenedione and dehydroepiandrosterone (DHEA), caffeine, carnitine, chromium, coenzyme Q<sub>10</sub> (ubiquinone), colostrum, creatinine, aphedrine, ginseng, glutamine, medium-chain triglyceride oil, pyruvate, ribose, sodium bicarbonate, a.o. (Insel et al., 2004).

In Romania there are some companies that offer various nutritional supplements. From among, herbals, hormones, enzymes, glandulars, and other compounds tempt very many athletes. All nutritional supplements using for improving performance are the subject of many studies. Researchers showed that some of nutritional supplements used without any coordination have many potentially negative effects and – in certain conditions – may become dangerous for the organism (e.g.: steroid hormones).

International Olympic Committee – IOC, National Football League – NFL, National Collegiate Athletic Association – NCAA, and U.S. Tennis Association – USTA ban (e.g.: androstenedione, ephedrine) or limited (e.g.: caffeine) the use of many nutritional supplements because the direct or side effects. During sportive competitions, sometimes-specialized organizations ask for vigorous clinical tests to see if any athletes used ergogenic aids and supplements, looking for composition and quantities.

## **Colostrum – a possible nutritional supplement for athletes**

One of the nutritional supplements using for athletes is colostrum. Colostrum is a natural product and – because of its composition – is capable to satisfy the nutritive request for a newborn baby. Thus, if this were a natural and high quality food product why wouldn't be good as nutritional supplement for a sportsman?

Colostrum is the first milk produced by a lactating mammal and is secreted during the first days after birth or calving. It contains macronutrients such as protein, carbohydrates, fat, vitamins, and minerals, and also bioactive components such as growth factors and antimicrobial elements, so it might be good for athletic health and performance. Colostrum is high in globulins and unlike mature milk is therefore heat coagulable. As much as 10% of the protein in cow colostrum is globulins and much of this globulin is immune globulins.

Compared to the later mature milk, human colostrum is richer in protein and minerals, but lower in fat and lactose. The composition of first and mature milk varies from one species to another and is different for the various breeds (Eddleman, 2005).

Colostrum has 10 times more vitamin A, 3 times more vitamin D, 10-17 times more Fe than mature milk, has higher Ca, P, Mg, C and lower K than milk, has higher levels of oligosaccharides and glycosylated casein than mature milk (Hurley – Internet).

Table 1 present the approximate biochemical composition of colostrum (the first milking) and whole milk (the 11<sup>th</sup> milking).

**Table 1.** The approximate composition of bovine milk at the 1<sup>st</sup> and 11<sup>th</sup> milking (Rice and Rogers, 1990).

| Specification       | Colostrum<br>(1 <sup>st</sup> milking) | Whole milk<br>(11 <sup>th</sup> milking) |
|---------------------|--|--|
| Total solids (%)    | 23.0                                   | 13.0                                     |
| Total Protein (%)   | 14.0                                   | 4.0                                      |
| Casein (%)          | 4.8                                    | 2.5                                      |
| Immunoglobulins (%) | 6.0                                    | 0.09                                     |
| Fat (%)             | 6.7                                    | 4.0                                      |
| Lactose (%)         | 2.7                                    | 4.9                                      |
| Minerals (%)        | 1.0                                    | 0.74                                     |

### *Colostrum as Nutritional Supplement in Sport*

As it is presented above in the table, colostrum is very rich in proteins, immunoglobulins and minerals, but has less lactose compared to the whole milk. About the lipid content, some researcher found a fewer quantum of fat in the first milk compared to the mature milk (Eddleman, 2005).

In the first 24 hours after calving the colostrum composition is change and the quantum of protein decrease from about 230 mg/ml in the first hour to 120 mg/ml at 24 hours and concentration of lactose and fat increase as follow: lactose 32 mg/ml in the first hour to 43mg/ml at 24 hours, respectively fat from 6.1 % to 8.0 % (Hurley – Internet).

After a gradual transition started with first milk (colostrum) only mature milk is produced after the 10th day in humans and 5 to 12 days in caws (Eddleman, 2005).

Human milk has more lactose but less protein that cow and goat milk. Compared to the later mature milk, human colostrum is lemon yellow and richer in protein and salts, but lower in fat and sugar. Colostrum is high in globulins and unlike mature milk is therefore heat coagulable. As much as 10% of the protein in cow colostrum is globulins and much of this globulin is immune globulins

Dietary bovine colostrum supplements may activate immunological defense systems against microbes on mucous membranes because it is an extremely rich source of immunoglobulins. The concentration of immunoglobulin G1 (52-87 g/L), G2 (1.6-2.1g/L), M (3.7-6.1 g/L), and A (3.2-6.2 g/L) in bovine colostrum is approximately 100 times greater than in normal milk (Sport Dietary Supplements and Colostrum, 2002 – Internet). Colostrum also contains polyproline-rich-peptides that help an active immune system and lactoferrin, which seems to be a potent, broad-spectrum natural antibiotic and antiviral agent (Nature's best foods: Colostrum helps athletes burn fat and build muscle – Internet).

The concentration of IGF-1 in bovine colostrum is about 200-2000 µg/L, whereas normal bovine milk contains less 10 µg/L. Also, the immunoglobulins A, G, and M concentrations are approximately 100 times higher than in normal milk (Colostrum information, 2002 – Internet).

Bovine colostrum contains bioactive components that have been shown to enhance gastrointestinal development and increase nutrient

absorptive capacity in neonatal animals. Recent studies in adult humans have shown that bovine colostrum increases lean body mass and improves exercise performance. Thus, the bovine colostrum does not affect intestinal nutrient absorption in healthy adult humans (Brinkworth and Buckley, 2003).

In 1997 an article was published and this suggesting that the athletes could take bovine colostrum as nutritional ergogenic supplement for increase levels for IGF-1 concentration (Mero et al., 1997). This compound IGF-1 (insulin-like growth factor) is an anabolic hormone and could be used as supplement, but is banned by the International Olympic Committee. Thus, if the athletes will take colostrums as ergogenic supplement for increase their IGF levels, it could be a legal route to enhanced physical performance.

Unfortunately, there is one study that have not consistently shown increased IGF-1 levels following colostrum supplementation and more, the authors suggesting errors in the experiment from 1997 (Kuipers et al., 2002).

### *Metabolism*

After nutritional supplementation with bovine colostrum may increase the IGF-1 concentrations in blood and muscle, and therefore influence human tissues by increasing protein synthesis. Because colostrum contains immunoglobulin-A that plays a major role in immunological protection of mucous membranes, it is possible that dietary bovine colostrum to activate immunological defense systems against microbes on the mucous membranes.

**Dosage:** There are different opinions about the dosage of colostrum as supplement. Thus, the dosages of bovine colostrum supplements have ranged from 20 to 60 g/day in a powder form, and in the same time, IGF-1 concentrations from supplements have ranged from 1.7-120 $\mu$ g/day (Colostrum information, 2002 – Internet).

**Administration:** Bovine colostrum can be processed and is distributed in various forms including powder, pastilles, and drinks.

**Precautions and banned or permitted consume:** Studies referring to short-term supplementation with bovine colostrum showed no known contraindications for athletes. As we said before bovine colostrum supplements are not on the banned drug lists of the

International Olympic Committee or any other sports governing bodies. Also, bovine colostrum is considered to be “strong” milk, therefore bovine colostrum is a legal nutritional supplement.

### **Effects of colostrum – scientific researches**

Buckley and col. (2002) studied the effect of supplementation with concentrated bovine colostrum protein powder (Intact) on plasma insulin-like growth factor I (IGF-I) concentrations, endurance running performance and recovery. The study demonstrated that bovine colostrum supplementation during endurance running training improves recovery, but not physical performance (Buckley, 2002; Buckley et al., 2002).

The results of another experimental study showed that in elite field hockey players and active men or women, colostrum supplementation improves sprint performance and physical endurance better than whey protein. However, there were no differences with regard to body composition or endurance performance after an uptake of colostrum (Antonio et al., 2001; Hofman et al., 2002).

Leppäluoto and col. demonstrated with an experimental study that colostrum supplementation in young athletes improves running and jumping performance, when the physical performance is restrained by a previous maximal training bout. Therefore the use of colostrum supplementation is beneficial during heavy training periods in athletes (Leppäluoto et al., 2000).

Kuipers and col. reported that daily supplementation with 60 g of bovine colostrum for four weeks doesn't change blood IGF-I or IGF binding protein-3 levels. Also, the supplementation does not followed elicit positive results on drug tests at a laboratory accredited by the International Olympic Committee and did not show any forbidden substance before or after four weeks of supplementation with bovine colostrums (Kuipers et al., 2002).

Another study tries to determine the effect of nutritional supplementation with a low fat, low lactose, concentrated bovine colostrum protein powder (Intact™, NorthField Laboratories Pty Ltd) on plasma IGF-1 concentrations and endurance running performance. The results showed no differences in dietary intakes between the group with colostrum supplementation and control group. These indicate that

oral supplementation with bovine colostrum improves the ability to perform a second bout of maximal exercise following a relatively short period of recovery from a prior bout of maximal exercise (Buckley et al., 1998).

One recent study tried to establish if there is some correlations between long-term use of dietary supplementation with bovine colostrum and enhancement of physical performance. The conclusions of this research was that oral bovine colostrum supplementation (20 g or 60 g / day) provided a small but significant improvement in time trial performance in cyclists after a 2 hours of ride at 65%  $\text{VO}_2\text{max}$  (Coombes et al., 2002).

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