Characteristics of Energy Metabolism and Nutrition Supply for Beach Volleyball

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Abstract. In this paper, we analyze the characteristics of energy metabolism, determination of physics status, and nutrition supply from the perspectives of biochemistry and nutrition science for beach volleyball sports based on literature review. These analyses will provide guidance for training, teaching and physical exercise for beach volleyball sports.

Introduction

Beach volleyball is a new program began nearly a decade of development, so the physiological characteristics related to the sport less well understood, its technical features indoor volleyball and there are many similarities, but because of its venue, the competition system, the number of entries in different aspects of the six-man volleyball to the athlete's tactics and physical fitness have higher requirements. If the training and competition without proper nutritional supplements, athletes difficult to maintain a good competitive state and play well.

Energy Metabolism of Beach Volleyball Match

Beach volleyball tournament by two players on each team, each team must always be two players in the field, the game shall not be required for the bench or substitution Athletes three games, using each ball Score game system, 21 points per game to win the opponent 2 points or 2 points or more teams for the winning team, the score is no upper limit. Each game, each team has twice suspended, each pause time is 30 seconds; the inning breaks for 1 minute. The duration of each game is approximately 30-60 minutes. According to schedule arrangements, sometimes a day or an afternoon to be three games, beach volleyball arrange more in the hot summer months (such as the National Games, the annual tournament and finals), general location on the sea beach or artificial the sand, the temperature during the game most high the sun is strong, often also experience thunderstorms and other inclement weather.

Volleyball games are spiking and blocking and so many times by the rapid hard and continuous short intermittent explosive short time, and sustained low intensity loads a relatively long time to prepare, moving activities take place thereof. Thus, volleyball body belongs to short explosive movements are separated by a short break intermittent motion. Because of the high intensity fast powerful attack and defense, there are many short and longer without the ball in the low-intensity activities, volleyball determine the characteristics of their own provided the muscle work of energy systems with other primary and secondary. Its energy supply characteristics in a non-lactic acid can (ATP-CP) system based aerobic energy supply and energy supply, supplemented by lactic acid. Wherein the aerobic energy supply in the long position volleyball game is very important, although each RALLY make the game more intense competition, it requires athletes to have a continuous jump, block, save, and continuous fast-moving defense capability requirements lactic acid energy supply system is involved in energy supply. However, a number of studies have shown that high levels before and after the volleyball match, there was no significant blood lactic acid value difference. This is due to the intermittent characteristics of athletic volleyball players in favor of the elimination of lactic acid oxidation and gluconeogenesis were smaller proportion of lactic acid can be seen for volleyball.
Exercise Physiology showed that anaerobic energy supply (collectively ATP-CP system and glycogen anaerobic glycolysis system) process is based on the aerobic energy supply on a highly developed ability. Therefore, from the movement of biochemical perspective, today's athlete needed is a combination of competitive volleyball anaerobic and aerobic energy supply capacity of the ATP-CP highly developed system of glycogen oxidation.

Nutritional Supplements Beach Volleyball Players
Because of these characteristics of the beach volleyball tournament over, athletes usually at high temperatures and intense ultraviolet radiation of the environmental movement, the energy consumed by a larger body fluids trace elements, vitamins and so lost relatively more so in terms of nutritional supplements and indoor projects it's different. Also physical condition of each athlete is different, different training load bearing capacity, should be based on long-term observation of the athlete's physical characteristics and understand the function of the situation before choosing a different nutrition.

Carbohydrate Supplement
Studies have shown that at high temperatures the environmental movement, the body glycogen breakdown is enhanced to blood sugar levels. Because of the intensity of competition is large, the high temperature period, in order to prevent physical because of massive consumption of energy substances affect the game when, before the game should add the right amount of carbohydrates. In a game of catch up on sugar pause time, which can effectively maintain blood glucose levels and delay fatigue, occurs. When carbohydrate supplement, it should pay attention to choose the type of carbohydrate supplement and complement to grasp time and concentration of sugar. GM sugar glucose, fructose and oligosaccharides. In practice, most applications of glucose, this is characterized by fast absorption for quickly. However, the downside is likely to cause glucose insulin response, so before training or before the game must have a good time glucose supplement. Movement carbohydrate supplement can save glycogen, reduce protein consumption can maintain blood glucose levels, prevent decreased exercise capacity, improve athletes high strength, intermittent shuttle running ability to improve athletes serve and defensive capabilities; accelerate fat carbohydrate supplement use if the degradation of acetyl-CoA proper balance of fat and sugar, fatty acid oxidation formed enters the citric acid cycle, acetyl CoA enters the citric acid cycle is determined by how much citric acid required for the formation of oxaloacetate, if lipolysis dominant, sugar does not provide a sufficient amount of oxaloacetate to meet the needs of lipolysis, acetyl-CoA is used to form the acetoacetate and D-3-hydroxybutyric acid (acetoacetate, D-3-hydroxybutyric acid and acetone called ketone bodies) You can’t enter the citric acid cycle, leading to reduced rate of biolysis, affecting exercise capacity; carbohydrate supplement can effectively maintain blood glucose concentration constant motion two hours ago, the central nervous system in order to ensure adequate energy supply, to maintain the ability of red blood cells to transport oxygen to help postpone fatigue, ensure athletic ability.

Additional Liquid
Since more than in the air is dry during the game, the season of strong sunshine, when human movement increased respiratory rate, significantly increased ventilation, moisture evaporation, high respiratory water loss ratio of indoor items, so the body easily dehydrated. Beach Volleyball long duration, intensity, serious depletion of body fluids, so rehydration is very important. Reasonable rehydration make heart rate, body temperature decreased, the total amount of plasma to maintain a balance, beneficial to the prevention of pre-exercise rehydration sports dehydration, to carry out a small number of principles, each fill 150ml ~ 300ml, at intervals of 15 to 20 minutes, one hour infusion shall not exceed 800ml, but less than an hour rehydration 300ml, often can not meet the need. Should use low osmolality or isotonic drinks because sugar is more than 8% of the beverage will extend their time in the stomach emptying, increasing the burden on the stomach. Fluid temperature is preferably in the 5 °C ~ 15 °C.
**Vitamin Supplements**

Vitamin A, also known as anti-dry eye vitamins, which constitute the photosensitive material within the visual cells. Beach volleyball player information collected primarily through visual feedback to the brain, to the field situation and make timely judgments, so a direct impact on the visual performance and level of athletes play.

VB1 thiamine thiamine pyrophosphate (TPP) component, and TPP is pyruvate dehydrogenase, a-ketoglutarate, transketolase cofactor, such as transketolase can not be combined with TPP. Enzymes can cause psychosis, paralysis of eye movements, standing and walking is not normal, significant disturbance of mental function. When the VB1 lack appears pentose phosphate metabolism, pentose phosphate metabolism of the main purposes is to provide important metabolite of ribose-5-phosphate and NADPH. Ribose 5-phosphate is mainly used for the formation of a nucleic acid, NADPH for reductive biosynthesis as a hydrogen and electron donor.

When the lack of vitamin B1, pyruvate easily oxidized, easy to cause tissue pyruvic acid, lactic acid accumulation, resulting in reduced supply of energy, nerve and muscle metabolism affected lower extremity heavy, rapid heartbeat, heart failure and other symptoms, thus affecting exercise capacity. VB1 can inhibit cholinesterase activity, to prevent the destruction of acetylcholine, and can promote the synthesis of acetylcholine in addition to the excitement of nerve endings, but also help nerve conduction, improve the athlete's agility.

Vitamin B2 can inhibit lipid peroxidation, protecting the integrity of the biofilm, speed up the body aerobic metabolic rate, improve exercise capacity of athletes; it is part of the FAD coenzyme form of the respiratory chain, so vitamin B2 is the central link of the energy generated; vitamin B2 at low temperatures is conducive to the secretion of growth hormone and insulin, growth hormone can stimulate protein synthesis, increase muscle strength athletes.

Vitamin C can be directly or indirectly play a clear role of free radicals and antioxidants, so vitamin C can protect the integrity of the biofilm, can promote lactic acid oxidation, acid-base balance alter muscle cells, inhibition HO2 generation, improve the body's aerobic capacity It also can promote protein synthesis, increase muscle mass; promote the absorption and utilization of Fe ions to prevent exercise-induced anemia; conducive to oxidation and glycogen synthesis of fatty acids and muscle glycogen, maintain blood glucose levels and delay fatigue. Vitamin E not only has antioxidant effects, but also improve muscle endurance, promotes protein synthesis, and can improve muscle blood supply nutrition.

**Special Nutrition Applications**

Use special nutrition is to take advantage of the special role of these substances in sports nutrition strong body metabolism and physiology, to mobilize the body's potential.

Increase nutritional applications of protein synthesis and muscle strength. Dehydration or the body temperature increases will result in the strengthening of protein catabolism, a substantial increase in the amount of sweat in sweat after nitrogen is lost, for protein requirements also increased. During the competition training, anabolic the body's weakened catabolism enhanced muscle strength decline. Increased use of intramuscular strength of nutrition, the body can get the best internal environment, improve their secretion of growth hormone, testosterone, insulin and related hormones. Currently, often supplement increases muscle strength (anabolic) and special supplements mainly arginine, glycine, taurine, BCAAs, HMβ, combined with linoleic acid, ornithine, α-ketoglutarate, eggs lecithin, methyl pyridine chromium sulfate alum, glutamine and plant soaps and the like.

**Application of Antioxidants**

When training and competition during the heat exposure, the body to withstand ultraviolet radiation and sports dual stimulation, can cause increased production of free radicals, the antioxidant capacity decreased. Therefore, during training and competition, rational use of anti-oxidants, help to increase the body's ability to eliminate free radicals, quickly eliminate fatigue and restore physical fitness. Common antioxidants mainly VC, VE, β-carotene, lycopene, CoQ10 glutathione, taurine, selenium,
zinc, lecithin, CLA, 1, 6- diphosphate (FDP) and polysaccharides, flavonoids, polyphenols soaps and the like.

References