

Research Article

Status Quo and Advances in Sports Food Study and Practice in China

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Abstract: The purpose of this study was to investigate the status quo and advances in sports food study and practice in China. By means of literature review and analysis, the author carried out the classification of sports foods and explained its role in sports field. Finally, the author foresaw that the hot spots for sports food in the future will still focus on the development of new products. There will be a broad market prospect for the sports food that plays an active role in sport performance and fatigue recovery of the athletes and is developed in time.

Keywords: Food study and practice, functional food, sports nutrient

INTRODUCTION

Sports nutrition is the study and practice of nutrition and diet as it relates to athletic performance. It is concerned with the type and quantity of fluid and food taken by an athlete and deals with nutrients such as vitamins, minerals, supplements and organic substances such as carbohydrates, proteins and fats. Although it is an important part of many sports training regimens, it is most commonly considered in strength sports such as weight lifting and bodybuilding and endurance sports events, for example cycling, running, swimming.

There are some researchers performed some researches on the sports nutrient. For example, Meng *et al.* (2015) explored the current development situation and prospect of sport nutrient food industry in China, thereby providing reference for relative department and enterprise and promoting the development of the industry. Qiu (2015) analyzed the concept and functionality of sport nutritional food and the characteristics of marketing concept and compared the sport nutritional food in China by literature, experimental comparison and comparative analysis. Hansen *et al.* (2015) examined the effect of whey protein hydrolysate intake before and after exercise sessions on endurance performance and recovery in elite orienteers during a training camp. Tanabe *et al.* (2013) investigated the influences of rehydration and food consumption on salivary flow, pH and buffering capacity during bicycle ergometer exercise in participants. Pettersson and Berg (2014a) investigated elite combat sports athletes' dietary intake between weigh-in and the first bout in Olympic combat sports. Tomlin *et al.* (2013) examined the relationship between sports participation in children and the consumption of sports drinks, sugar-sweetened beverages and other components of diet. Senevirathne (2010) identified the

significant difference between students food habits at different periods of sport activity, to identify gender differences in food habits and to identify sport performance in food habits and, sport performance among secondary school boys and girls. Pettersson and Berg (2014b) assessed prevalence of hypohydration at competition time among elite athletes' in four different combat sports and how water intake and timing of official weigh-in were related to hydration status. Larson-Meyer *et al.* (2013) discussed the significant role played by vitamin D and vitamin D supplementation in many physiologic functions that could impact the health and performance of athletes. Pyne *et al.* (2014) outlined key principles for prevention of injury and illness in aquatic sports, detail the epidemiology of injury and illness in aquatic athletes at major international competitions and in training and examine the relevant scientific evidence on nutrients for reducing the risk of illness and injury. Skolnik (1999) made some focuses on the importance of sports nutrition and explored advantages of family style restaurants to athletes.

Based on the findings of those scholars, the author discussed the current situation and advances in sports food in China.

CLASSIFICATION OF SPORTS FOOD

There is no strict definition for sports food, so there is chaos in the classification of the sports food. No corresponding standards are set in the world. The developed countries in Europe and America are accustomed to classify the sports food based on the purposes of sports nutrition, which are as follows.

Food for sports adaption: The effect of the food is to regulate the nerve excitability of the athletes, helping them get into the form, for example, caffeine, the

common function factor, which acts on the central nervous system to maintain human body in excitatory state.

Food for sports protection: The food is mainly to support the joint health and reduce the joint injury caused by overuse, which is also the most common sports injury. The main function factors include: essential fatty acid, pantothenic acid, VD, calcium, hydrolytic enzyme, glucosamine, chondroitin, methyl sulfonyl methane phthalein, S-adenosine methionine, collagen, soy isoflavone, etc.

Food for energy supplement: The food is mainly to supplement finite energy for the athletes before the sports and in the intervals of the sports, which is usually in beverage. The main function factors include: glucose, adenosine triphosphate, bicarbonate, creatine, L-carnitine, etc.

Anti-fatigue functional food: In the Fifth International Sports Biochemistry Academic Conference in 1982, fatigue was defined as that the physiological process of the body was unable to maintain the function at certain level and/or unable to maintain certain exercise intensity. The anti-fatigue food has become the hot spot of the domestic and overseas research in recent years, which is to slow down the changes of physiological functions and the performance of the comprehensive responses caused by fatigue. There are various formula for anti-fatigue additives.

Food for strength enhancement: There are high contents of protein and amino acid in the food to increase the supply of materials for the synthesis of muscle protein. In addition, some materials that can promote the muscle synthesis and improve the muscle ability to contract are the main function factors of the food, such as creatine, chromium, boron, VC and zinc.

FUNCTIONAL COMPONENTS IN SPORTS FOOD

The function of the sports food is achieved mainly by the functional components contained or added. Therefore, the selection and proportions of the functional components is the key to processing and development of the sports food. Due to the variety of the sports food, the composition of the function factors is also very complicated. This study only makes brief introduction to several kinds of representative functional components.

Soybean peptide: Soybean peptide refers to the protein hydrolysates hydrolyzed by the protease and special

handled, which usually consists of 3~6 amino acids with molecular weight mainly distributing below 1000U and main peak position locating in the range of 300~700U. In addition, the peptide also contains a small amount of free amino acid, carbohydrate, inorganic salt, etc. The soybean peptide can accelerate the recovery of red cell to increase the recovery of muscle from the fatigue. Meanwhile, the peptide can be used by the body without liver metabolism to participate in the "organization construction" of the body; in addition, the soybean peptide can raise the level of testosterone, increase the muscle weight and resist oxidation and free radicals so as to decrease the incidence of muscle injury after exercising, increase muscle endurance and accelerate the recovery from fatigue. Therefore, many bioactive peptide products have been developed and applied to the sports practice in recent years. Quest International Company in British developed a peptide-containing sports beverage named as "HyProl" in 2001. HyProl can shorten the time for fatigue recovery after high-intensity exercise into the half, from 24 h to 10~15 h and even prevent the adverse effects of excessive exercises on the athletes. And Fuji Oil Co., Ltd. in Japan has made strengthening sports beverage by soybean peptide, continuously drinking which can significantly improve the physical power and endurance of the athletes. China National Research Institute of Food and Fermentation Industries and China Institute of Sports Medicine developed a peptide-containing sports beverage in 2004, which obtained good results through human experiment and filled the gaps in peptide-containing sports beverage.

Natural components of anti-oxygen free radicals: The free radicals in the human body are mainly composed of oxygen free radicals, which accounting for over 95%. The energy consumption will increase during the strenuous exercise while the production of acidic metabolites will increase correspondingly so that the autoxidation of some substances in the body strengthens with increased production of free radicals to damage the oxygen free radicals of the histiocyte. Therefore, anti-oxygen free radicals are often added in the design of sports food. Its development is the new hot spot in sports food. The common formula components include SOD (superoxide dismutase), lycopene, capsaicin, allicin, genistein, puerarin, coenzyme Q, etc. In addition, looking for substances that can scavenge the free radicals in natural food has become an active research field in recent years. With the research progress, many natural food or medicines that can scavenge the free radicals are found, such as lycium barbarum, shiitake mushroom, ginkgo, lucid ganoderma, tea, mung beans, ginseng, gynostemma pentaphylla, bee pollen, sea buckthorn, dateplum persimmon, kiwi-fruit juice, hawthorn juice, vatica, ginger, garlic, grapefruit and citrus reticulata, fish oil, etc.

Creatine: Creatine, which is also called propanoic acid, is a natural nutrient in human body, consisting of 3 essential amino acids as arginine, glycine and methionine. It is the raw material for the synthesis of adenosine triphosphate (ATP), which can supplement the energy for the muscle to carry on quick and explosive actions. Creatine showed in the competitive sports in 1993 and became the most popular energy supplement in 1994.

The researches in recent years find that the creatine supplement is mainly to strengthen the ability of short-time, high-intensity and repeated movements. Some researches point out that creatine can relieve the athletes from the fatigue under the exercising intensity higher than that they are used to for long-distance running. At present, creatine is not only used among athletes, but also among the groups engaged in body building at different ages, which is an effective and safe nutrient supplement.

L-carnitine: L-carnitine, which is the carnitine, was found by the Russian scientists at the beginning of 21st century. It is widely believed that L-carnitine is an effective and safe nutrient supplement for accelerating the oxidation and decomposition of fatty acid, which is the carrier of fatty acid transfer that can accelerate the fatty acid entering mitochondria for oxidation and decomposition. L-carnitine can increase the rate of fat oxidation, reduce the consumption of glycogen and postpone the fatigue in long-time and high-intensity sports. It has been applied to weight loss of the ordinary people and the fat reduction and anti-fatigue of the competitive athletes. And it becomes one of the major components of diet food used by many nutrient supplement manufacturers.

Pyruvate: Due to the assistance to fat combustion in human body, pyruvate becomes the composition in slimming and weight-loss products. It is found that pyruvate is the essential product when the carbohydrate or starch is metabolized into energy in recent researches. Thus, it is widely used in sports beverage. However, pyruvate is instable in the chemical nature, which may make the users sick or gastrointestinal discomfort. Thus, it shall be cautious for the type and volume of the additives.

Taurine: Taurine is the rich amino acid in human muscles and a sports nutrient supplement for accelerating the fast muscle growth, which plays its physiological role in a manner similar to insulin that is able to inhibit the decomposition of myosinogen to make the muscles bigger and stronger. The taurine is usually added in to juices containing calcium, magnesium, potassium and other minerals and nutrients to make the sports beverage in the marketing products.

CURRENT SITUATION OF SPORTS FOOD MARKET IN CHINA

Comparing with the market development of sports nutrition food overseas, China is still in the initiation stage. The concept of sports food was proposed by Guangdong Jianlibao Group who originated the sports beverage containing alkaline electrolytes. However, the sports food was not specially classified for a very long time, which was considered as a branch of the health food. The industry of health products rose in 1980s and reached its peak in the middle of 1990s and from then on, it shows marked ups and downs. In the prosperity period, there were over 3,000 health product manufacturers producing 28,000 products with the sales amount of over RMB 30 billion, in which the real sports food only accounted for less than 0.5%. At present, only the functions of immunity enhancement, anti-oxidation, sleep improvement, physical fatigue relief, improvement of anti-hypoxia tolerance and nutritional anemia improvement among the 27 functions of health food set by the administrative departments in China are related to sports, which is to say, only the 6 kinds of health food may be manufactured as sports nutrient food. And large-scale food enterprises do not pay sufficient attention to the products even in the only 6 functions, let alone the long-term input of technologies and research and development. The market occupied by a handful of enterprises specializing in the research and development and production of sports nutrients food is only limited to the professional sports team and health clubs, which is far from the demand satisfaction of the 400 million bodybuilders.

Prospect for sports food research: It can be foreseen that the hot spots for sports food in the future will still focus on the development of new products. There will be a broad market prospect for the sports food that plays an active role in sport performance and fatigue recovery of the athletes and is developed in time. In addition, the research fields of food for athletes will be broadened without limited to the development of sports food formulas, besides which the safety of food for athletes and the evaluation on the effects of the sports food will become the hot spots of researches in the future.

In recent years, the guarantee of athlete health and reasonable dietary nutrition has been seriously impacted by food pollution. The food poisoning and positive doping testing caused by the polluted food digested by the athletes often occurs and threatens the competitive sports with fair competition severely. The herbal ingredients and their influence on hormone level in athlete body have become the key point in the recent scientific research. It can be foreseen that more and

more attention will be paid to the research about these issues and the width and depth of the researches will be broadened and strengthened.

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