SPORTS NUTRITION PRODUCTS IN 2014: SHOULD THESE PRODUCTS FURTHER BE REGULATED AT COMMUNITY LEVEL?

An overview of the current functioning of the sports nutrition market as well as the position of relevant stakeholders in relation to potential future regulatory needs for sports nutrition products

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The views and opinions expressed in this paper are those of the author unless stated otherwise

List of abbreviations

AAS = Anabolic Androgenic Steroids

ATP = adenosine triphosphate

BCAA = Branched-chain Amino Acid

BEUC = Bureau Européen des Unions des Consommateurs [European Consumer Organisation]

BfR = Bundesinstitut für Risikobewertung

BMI = Body Mass Index

BSNA = British Specialist Nutrition Association Ltd

DG = Directorate-General

EC = European Commission

EP = European Parliament

EFSA = European Food Safety Authority

ESSNA = European Specialist Sports nutrition Alliance

EU = European Union

FAO = Food and Agriculture Organisation

FBO = Food Business Operator

FIFA = Fédération Internationale de Football Association

FSA = Food Standards Agency (UK)

FSG = Foods for Specific Groups

FSMPs = Foods for Special Medical Purposes

FUFOSE = European Commission Concerted Action on Functional Food Science in Europe

GMP = Good Manufacturing Practices

HACCP = Hazard Analysis and Critical Control Points

IAAF = International Association of Athletics Federation

IDACE = European Dietetic Food Industry Association; called SNE since 2013.

IOC = International Olympic Committee

Kgbw = kilogram bodyweight

MS = Member States

PARNUTS = Foodstuffs intended for PARticular NUTritional uses

R&D = Research and Development

SMEs = Small and Medium Enterprises

SNE = Specialised Nutrition Europe

TEU = Treaty on European Union

TFEU = Treaty on the Functioning of the European Union

WADA = World Anti-Doping Agency

WHO = World Health Organisation

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ABSTRACT

The increasing popularity of sports nutrition products among the general population, as well as the high potential for innovation in this sector leading to a multitude of emerging products, represent a challenge from a regulatory standpoint. Today, there is a lack of provisions specifically covering these foodstuffs at Community level. The recent adoption of Regulation 609/2013 foresees that the European Commission should present a report to the European Parliament and the Council on the potential necessity of provisions covering sports nutrition products at Community level. As such, this paper evaluates the need for further provisions covering sports nutrition products in the European Union by taking a dual approach. Firstly, the shortcomings, if any, of the sports nutrition market under the current regulatory framework were evaluated, particularly with regards to compliance of marketed products under current European provisions. Secondly, the opinion and position of relevant stakeholders was collected either by consulting public statements or via directly contacting the latter. Relevant stakeholders in this context include regulating authorities, as well as major representatives of consumers of sports nutrition products, and the sports nutrition industry. As a result, three potential policy options were identified to address the current regulatory state of affairs for sports nutrition products in Europe: the first foresees that provisions are not taken at European level but rather at National level; the second consists of incorporating provisions covering sports nutrition products under existing pieces of horizontal legislation; the third foresees the adoption of a separate legislative Act exclusively for sports nutrition products. Considering both stakeholders' opinion and the current functioning of the sports nutrition market, it appears that the second policy option may be the preferred and most realistic alternative.

CHAPTER I – INTRODUCTION

The market for sports nutrition products has evolved tremendously since its beginnings in the 1940s (ESSNA, 2013b; Weider, 2014; Wilk, 2014). These products currently include sports supplements, sports foods such as energy bars and sports gels, as well as beverages intended for sportspeople. While created in order to answer to the needs of bodybuilders and professional athletes who were requesting compact, easy, and nutritionally adequate products to support their daily physically active lifestyle, today these products are increasingly consumed by sports amateurs as well as health-conscious consumers (e.g. SCF, 2001; International Markets Bureau, 2010; Petroczi, Taylor, and Naughton, 2011).

The increasing popularity of sports nutrition products among the general population as well as the high potential for innovation in this sector represents a challenge from a regulatory standpoint. Indeed, although regulating sports nutrition products has been on the European agenda for more than a decade, consensus on such endeavour has not yet been reached due to diverging views of stakeholders and Member States on the matter. When addressing this issue, it is important to keep in mind that there is no harmonised definition on Community level for these products, which adds to the complication faced when attempting to categorize such foodstuffs with respect to other potentially similar products. It ensues that reasons for disagreement among stakeholders and Member States included the scope of potential provisions covering sports nutrition products, as well as the number of subcategories of sports nutrition products.

Consequently, sports nutrition products that are currently sold on the European market are not regulated by specific pieces of legislation tailored especially for these products. Presently, like all other foodstuffs marketed in Europe, sports nutrition products ought to comply with Regulation 178/2002 which foresees general food law requirements ensuring product safety and suitability for human consumption. The safety requirements that have to be respected are further outlined in Regulation 852/2004 on the hygiene of foodstuffs. In addition, sports nutrition products ought to be marketed in such a way as not to mislead consumers, thus having to comply with Regulation 1169/2011 on the provision of food information to consumers and Regulation 1924/2006 on nutrition and health claims. Sports supplements have to additionally comply with Directive 2002/46/EC on the approximation of the laws of the Member States relating to food supplements.

However, further provisions may be necessary to ensure appropriate protection of consumers of sports nutrition products. To this regard, provisions laid down by Regulation 609/2013 on food intended for infants and young children, food for special medical purposes, and total diet replacement for weight control, which will enter into force in July 2016, have marked a turning point for the sports nutrition sector. Specifically, Article 13 of this Regulation foresees that the "*Commission shall (…) present to the European Parliament and to the Council a report on the necessity, if any, of provisions for food intended for sportspeople*". This report should be submitted by the 20th of July 2015 and may be accompanied by an adequate legislative proposal if deemed necessary.

I. Problem statement

Recital 32 of Regulation 609/2013 stipulates that "*no successful conclusion could be reached as regards the development of specific provisions* [covering sports nutrition products] *due to widely diverging views among the Member States and stakeholders*". Issues of discussion pertained to the definition and subcategories of sports nutrition products, the scope of further provisions covering sports nutrition products, as well as the impact that these provisions might have on innovation in the sports nutrition sector. As a result, Regulation 609/2013 invites the European Commission to submit a report by July 2015 on the potential need for provisions concerning sports nutrition products. Importantly, the regulatory framework in force in the EU should answer to the challenges of a rapidly evolving sector and should thus not have a negative impact on the functioning of the internal market, e.g. by potentially misleading consumers or by resulting in a stagnating market in the area of sports nutrition products.

II. Aim

The aim of this study is to build a snapshot of the functioning of the sports nutrition market in the dawn of 2014 as well as to identify relevant stakeholders' opinions in view of contributing to addressing the issue outlined in the problem statement here above, i.e. the potential necessity for further legislation covering sports nutrition products at Community level.

III. Structure and methodology

In order to evaluate the potential necessity for further provisions covering sports nutrition products, there is a need to evaluate the shortcomings, if any, of the sports nutrition market under the current regulatory framework. The following structure and methodology was followed to fulfil this aim.

The present introduction to this paper represents the first chapter of this study. Following this introductory chapter, the second chapter contextualizes sports and sports nutrition in 2014 in Europe. It thus explores the evolving role played by sports and sports nutrition during the past decades both from a social and policy-related perspective.

The third chapter of the present paper outlines the state of the art of the sports nutrition market by detailing the current European legal framework as well as the foodstuffs sold as sports nutrition products. To this end, in addition to consulting European and national food legislation, sports nutrition products across several European Member States[1] were evaluated with regards to their content, purpose, and presentation.

Building up on the latter chapter, the fourth chapter identifies criteria which contribute in assessing whether there may be a necessity for legal change regarding sports nutrition in Europe. These criteria include market functioning at large, as well as product safety, and the adequacy of information to consumers. This chapter consists mainly of a review of the literature, including relevant journal articles, scientific reports, as well as statements issued by sporting associations.

[1] The Author specifically looked at sports nutrition products in Belgium, France, Italy, and the United Kingdom.

Subsequently, these criteria were evaluated in the specific case of sports nutrition products in chapter five, i.e. an analysis of whether current European legislation adequately addresses these issues was carried out. The position of relevant stakeholders – National and European regulating authorities, consumers, and the industry – as well as their current perception of the functioning of the sports nutrition market, was taken into account. This was carried out both by collecting public statements of these stakeholders, as well as by contacting them directly. Specifically, the object of inquiry pertained to three topics. Firstly, contacted parties were asked about their stance on regulatory needs regarding sports nutrition products sold the European market[2]. Then, contributors were asked whether they were in possession of consumer data that they could share, or whether consumers' opinions and preferences with regards to sports nutrition products were known to them[3]. Finally, questions regarding potential emerging trends in the sports nutrition sector were posed, particularly with regards to selling practices[4]. Contacted parties include the major European sports nutrition industry representatives, i.e. SNE as representative of the specialised nutrition sector and ESSNA as representative of the sports nutrition sector, as well as the major sports nutrition product industries selling their foodstuffs in Europe, i.e. Powerbar, Isostar, Weider, Inkospor, Overstim's, Gatorade, and QNT. Similar questions were asked to the biggest European consumer organisation, BEUC, as well as to consumer organisation operating in some Member States, e.g. Italy and Germany. However, these questions remained unanswered, and consumers' standpoint regarding sports nutrition products reported in this study has been extracted from published scientific studies as well as from public statements issued by BEUC. Such questions were also asked to expert researchers in the field of sport nutrition as well as to major sporting associations active in Europe such as FIFA and European Athletics. Furthermore, a few owners/salesmen of shops selling sports nutrition products were approached in order to assess which products were sold most, and whether there were any commonly reported complaints[5] [6].

Finally, potential policy options and future legislative undertakings are discussed in chapter six in the context of provisions covering sports nutrition products in Europe.

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[2] The question was formulated in the following manner, or in a comparable way depending on the recipient: "*would you see a need for regulating sport nutrition products on the European market? If so, would you rather see the need for specific legislation on sport nutrition products or rather incorporate this food category in existing legislation such as Regulation 1924/2006 on nutrition and health claims?*"

[3] The question was formulated in the following manner, or in a comparable way depending on the recipient: "*I am having difficulties finding consumer data on perception and/or opinion of sport nutrition products, specifically when it comes to recreational and lifestyle users, e.g. what type of products they prefer, the quality characteristics that they are after (with regards to search, experience, and credence dimensions), or the perceived usefulness of nutrition and health claims. Would you perhaps have consumer data that could be helpful in this regard and that you could share with me? Or could you perhaps refer me to other useful literature?*"

[4] The question was formulated in the following manner, or in a comparable way depending on the recipient: *"Do you see any new trends developing in the sport nutrition market? For example, would you have any comments regarding the role of online sales nowadays?"*

[5] The contribution of shop owners/salesmen is mainly qualitative and was conducted at the beginning of the research process in order to get an initial feel of the sports nutrition market sector and its functioning. As such, these contributors were mainly located in Brussels (BE), location from which this study was carried out.

[6] Major European supermarket chains such as Tesco, Carrefour, Rewe-Group, and Auchan were also contacted in order to inquire as to whether sports nutrition products underwent special safety controls. Unfortunately, these queries remained unanswered, leading to retail input not being included in this study.

IV. Research questions

The following questions will be the conductive thread of the present study:

1. What is the scope of sports nutrition and sports nutrition products nowadays?

2. What is the current stance of the regulatory framework covering sports nutrition products in Europe? Is this framework respected?

3. What is the position of relevant stakeholders, i.e. regulatory authorities, consumers, and the industry, in the field of sports nutrition products?

CHAPTER II – FROM SPORT TO SPORT NUTRITION

The importance of physical activity, sport, and nutrition has acquired a new dimension in Europe over the past couple of decades. Indeed, as their often interrelated role on human health has become clearer, health professionals have increasingly advocated the beneficial effects of adequate nutrition and carrying out physical activity. The scientific consensus regarding valuable effects of adequate nutrition and physical activity have resulted in the promotion of such practices in Europe. Indeed, the EU has paid increased attention to physical activity and sports policies. In addition, progress in scientific research has led to a broad agreement regarding the nutritional recommendations necessary for the general population as well as for the more physically active population. These two phenomena – increased importance of sports and deepened understanding of nutritional needs – have resulted in the blooming of a new field of research, sports nutrition.

I. EU increased attention to sport

Sports nutrition being inevitably linked to sport, it is of interest to review the stance of initiatives taking place at the European level which evolve around sport, physical activity, and healthy behaviour. Undeniably, the role that the latter play in Europe affects the sports nutrition market.

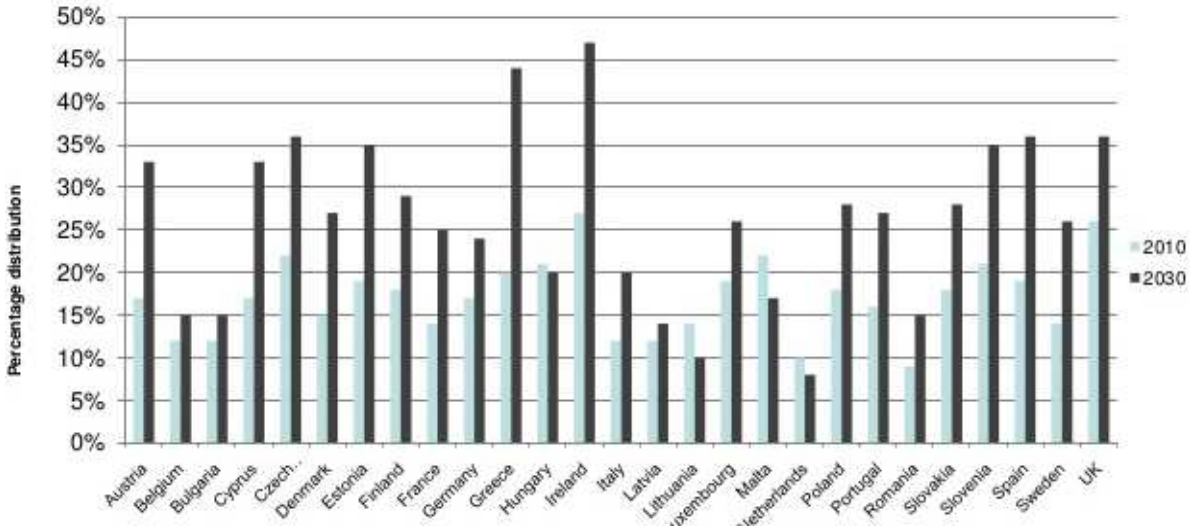
a. White Paper on Sport

The White Paper on Sport, issued in 2007, marked the first instance in which the European Commission specifically addressed sport-related matters in a comprehensive way. The aim of this White Paper is to "*give strategic orientation on the role of sport in Europe, to encourage debate on specific problems, to enhance the visibility of sport in EU policy-making (…), to raise public awareness of the needs and specificities of the sector, [and to] illustrate important issues such as the application of EU law to sport"*. To this end, the White Paper on Sport identifies areas in which sport and physical activity play an important role, particularly with regards to the societal and educational dimensions of practicing sport, as well as its paramount role in contributing towards European citizens' public health. Specifically, this Paper highlights the potential that sport has in bringing European citizens together, as well as the EU as a whole closer to third countries. Moreover, sport promotes values which resemble those promoted by the EU, i.e. fair-play, discipline and complying with the rules of the game, respect for other players, and solidarity.

In addition to the social and educational components of sport, the White Paper on Sport highlights the primordial role of physical activity in relation to public health as a "*tool for health-enhancing physical activity*", particularly in the context of the obesity epidemic. Alarming figures dated from 2008 reveal that 30 to 70% of European citizens were overweight in addition to the 10 to 30% who resulted as being clinically obese[7] (WHO, 2014).

[7] The distinction between overweight and obesity derives from the BMI score. The BMI, Body Mass Index is derived as follows: weight (kg)/[height (m)]^2. As such, a BMI between 25 and 30 is called an overweight BMI, while a BMI above 30 is referred to as an obese BMI.

In addition, the Figure below highlights that except for the Netherlands, Hungary, and Lithuania, a dramatic rise in the prevalence of obesity in European Member States is predicted for the year 2030. Preventing this alarming trend should be a public health priority across Europe, given that obesity is not only a medical condition in and of itself, but it also qualifies as a risk factor for other chronic diseases, e.g. type-2 diabetes, cardiovascular conditions, hypertension, certain cancers, as well as psychological problems (White Paper on Sport, 2007; Eurostat, 2011).



Obesity prevalence in Europe in 2010 and 2030 (projected). Adapted from WHO Europe, 2013

The WHO (2014) highlights the crucial link between the increasing prevalence of obesity and a healthy lifestyle, characterized by, inter alia, carrying out sufficient physical activity and following an adequate diet. About 150 minutes of moderate physical activity are recommended per week in order to effectively reduce the risk of developing ischemic heart disease by 30%, the risk of type-2 diabetes by about 27% and the risk of certain cancers such as colon and breast cancer by 21 to 25%. Nevertheless, it is alarming to ascertain that 14 to 35% of European citizens are insufficiently active (Eurobarometer, 2010; WHO, 2014). As such, initiatives counteracting this trend are now more than ever crucial in view of preventing a further rise in the prevalence and incidence of obesity.

Finally, the White Paper highlights how doping represents a threat to European sports, and how "*the fight against doping must take into account both a law-enforcement and a health and prevention dimension*" (White Paper on Sport, 2007). The issue of doping will be further discussed in this paper under chapter III section II(b) and chapter V section I(a).

b. Ratification of the Lisbon Treaty

Another important step in the policy arena of sport is the entry into force of the Lisbon Treaty in December 2009, an international agreement which represents the constitutional basis of the European Union. The Treaty of Lisbon amends the two core Treaties of the EU: the Treaty on European Union (TEU) and the Treaty on the Functioning of the European Union (TFEU), formerly called the Treaty establishing the European Community. New provisions have been

introduced in this Treaty, one of which enables the EU to actively promote policies on physical activity and sport for the first time (Eurobarometer, 2010). Prior to this amendment, sport was not addressed in either of the Treaties (Parrish et al., 2010). As such, the EU could not use the principle of conferral, which stipulates that "*the Union shall act only within the limits of the competences conferred upon it by the Member States in the Treaties to attain the objectives set out therein*", as per Article 5(2) of the TEU. Following the entry into force of the Lisbon Treaty, the TFEU currently includes Article 165 which addresses education, youth, and sport. Specifically, Article 165(1) foresees that "*the Union shall contribute to the promotion of European sporting issues, while taking account of the specific nature of sport, its structures based on voluntary activity and its social and educational function*". Article 165(2) stipulates that "*Union action shall be aimed at (…) developing the European dimension in sport, by promoting fairness and openness in sporting competitions and cooperation between bodies responsible for sports, and by protecting the physical and moral integrity of sportsmen and sportswomen, especially the youngest sportsmen and sportswomen*". Finally, Article 165(3) lays down that "*the Union and the Member States shall foster cooperation with third countries and the competent international organisations in the field of education and sport*". As such, the EU may now actively promote policy in the area of sport, suggesting that the importance of sport, as well as the role it plays from an educational, social, and health-related perspective has risen in the past few years within the EU, and will most likely continue to increase.

In a context in which Article 165 of the Lisbon Treaty allows for sport-specific policies and the prevalence of obesity is on the rise, European citizens may increasingly take part in sport and physical activity as a means to safeguard their health. Consequently, sports nutrition will most likely play an ever more important role in the life of Europeans.

c. Sports nutrition, innovation, and Europe 2020

Europe 2020, launched in 2010, is the EU's ten years growth strategy (European Commission, 2014a). Written in a time of economic crisis, it sets forth five targets with the aim of "*mov[ing] decisively beyond the crisis and creat[ing] the conditions for a more competitive economy with higher employment*" (European Commission, 2014a). Europe 2020 envisages (1) higher employment rates; (2) more investments in R&D; (3) addressing climate change and supporting energy sustainability by cutting greenhouse gas emission, using more renewable energy sources, and increasing energy efficiency; (4) increasing the overall European level of education; and (5) fighting poverty and social exclusion.

Undoubtedly, the future legislative framework covering sports nutrition products will have an impact on the importance of R&D in this sector, thus in turn playing a role, albeit possibly a minor one, in the Europe 2020 strategy. For instance, some stakeholders fear that very stringent provisions on sports nutrition products may represent an obstacle for the sports nutrition industry as it may then be reluctant to invest in R&D. Alternative provisions on sports nutrition products and their impact on R&D are further discussed in chapter V section III and chapter VI section I.

II. Sports nutrition

a. History of sports nutrition

The following century old anecdotal true story depicts the value of nutrition in combination with intense physical activity, as well as the importance of product safety.

The Summer Olympics of 1904 took place between the end of August and the beginning of September in St. Louis, Missouri, in the United States. Given the time of the year and the geographical area in which the marathon was organised, high temperatures had been foreseen, and indeed thermometers indicated about 90 degrees Fahrenheit that day, or approximately 33 degrees Celsius (Cronin, 2010). Adding to the heat, running conditions could hardly be defined as optimal given the seldom opportunities for hydration: the first being at about 10 kilometres into the run, the second after 20 kilometres. Finally, to make matters worse, motor cars driving along side the runners caused the latter to swallow substantial amounts of dust.

Given these conditions, it is not surprising that out of the 32 runners who were present at the start of the race, only 14 completed the whole marathon. The winner of this marathon, 28-year-old Thomas Hicks, almost died in the process. After having run for 30 kilometres, and thus having passed both opportunities for hydration, Hicks asked for water but was instead given a wet sponge and an egg white (Dunford, 2010). After running another few kilometres and almost collapsing, Hicks was given a sip of brandy, and strychnine together with a raw egg in order to disguise its characteristic bitterness. Strychnine, now recognized as a toxic compound used to kill rats, was known to act as a stimulant leading to increased physical performance when taken in small quantities. At the end of the race, Hicks was given two additional eggs together with another small dose of strychnine and two more sips of brandy (Dunford, 2010). At the end of such treatment, although Hicks effectively completed the marathon, he was unable to collect the trophy in person given that he collapsed shortly after the finish line and had to be rushed to the hospital.

This historical episode highlights (1) the poor knowledge regarding sports nutrition that athletes and their advisers had a little more than a century ago, and (2) the necessity to apply nutritional principles for the purposes of adequate training, performance, and recovery. It is thought that the search for nutritional substances or combinations of substances that would enhance physical performance and thus work as *ergogenic aids*[8] probably dates back to the start of sport and competition (Applegate and Grivetti, 1997). Indeed, Ancient Greeks already believed that certain foods had beneficial effects on physical performance, and advised warriors and athletes to consume lion heart or deer liver in the hope of maximizing strength and speed. However, the concept of researching the supposed effect of a food component by conducting scientific studies only became more widespread in the first half of the 20th century. Specifically, the first sports nutrition studies have been traced back to a Swedish research team who considered the role of carbohydrates while carrying out physical activity in the 1930s. A decade later, the role of protein both in endurance athletes and strength athletes

[8] Ergogenic aids are any devices, substances, or practices that enhance performance during exercise.

became a topic that interested researchers worldwide (Applegate and Grivetti, 1997). These were the first steps towards building the science of sports nutrition, which is now an essential component of athletes' everyday life.

Once the relationship between diet and performing capacities was established, sports nutrition became a field of interest to the food industry who saw the potential for an important and emerging sector. Sports nutrition may be defined as "*the application of nutrition knowledge to a practical daily eating plan focused on providing fuel for physical activity, facilitating repair and rebuilding process following hard physical work, and optimizing athletic performance in competitive events, while also promoting overall health and wellness"* (Fink, Mikesky, and Burgoon, 2012). As such, the industry researched nutrition-related factors that were thought to potentially represent a limiting feature in carrying out physical activity. For instance, given the suspicion of an association between nutrition and muscle mass, research focused on food components that could lead to increased muscle mass. To this end, food components thought to stimulate protein-synthesis were analysed, e.g. branched-chain amino acids taken in conjunction with carbohydrates were found to be positively correlated with increased muscle mass, while the consumption of arginine did not yield to any significant effects on muscle mass (Brouns et al., 2002).

These findings, together with the increased demand from athletes and bodybuilders for convenient, high-quality, and nutrient-dense energy sources, represented the foundations of the modern market for sports nutrition products (Weider, 2014). In this respect, Weider nutrition, founded in 1936, is seen as the company who founded sports nutrition products as they are known today (ESSNA, 2013b; Wilk, 2014). Weider, based in Arizona, has not only earned consumer trust by striving to meet manufacturing and nutritional standards, but also by keeping up with the tradition of continuously identifying those ingredients which are efficacious in fulfilling consumers' needs (Weider, 2014).

b. Rationale for sports nutrition

A successful sport session results from the optimal combination of inherent factors, i.e. genetics and talent, together with external influences, i.e. nutrition and the environment. It is thought that 30-40% of the outcome (success or failure) of a certain performance may be attributed to external factors, thus highlighting the important role played by adequate nutrition when conducting physical activity (Meyer and Parker-Simmons, 2003). As such, athletes as well as the active population should pay particular attention to adequate nutritional intake prior to, during, and following physical activity.

i. Athlete's nutritional needs

Today there is a scientific consensus that a varied and balanced diet, eaten in the amount necessary for sportspeople to fulfil their energy needs, is also sufficient to fulfil their nutritional requirements (e.g. American College of Sports Medicine; Scientific Committee on Food, 2001; Maughan, King, and Lea, 2004; FIFA, 2010; International Association of Athletics Federation, 2007; International Olympic Committee, 2010). It is recognized that although a winning performance lies largely with the talent and preparation of sportspeople,

an inadequate nutritional intake may prevent them from employing their abilities to the maximum. A position stand by the American College of Sports Medicine (2009) states that "*physical activity, athletic performance, and recovery from exercise are enhanced by optimal nutrition*". As such, in order for nutrition to be an asset and not a hindrance to sportspeople's success, experts have searched for foods and combinations of foods which are most beneficial in the context of physical activity. Although there are still minor divergences in nutritional recommendations depending on different sources of information, there is a rough consensus regarding the following dietary guidelines:

- Average daily energy intakes are estimated to be 2000kcal for women and 2500 kcal for men. Specifically, the total caloric ratio requirements for the general population foresee that about half of the daily energy intake stems from carbohydrates, 35% from fats, and 15% from proteins (FAO, 1997). When compared to the general population, it is generally thought that sportspeople should obtain more of their energy requirements from proteins and carbohydrates rather than from fat. Although precise estimates vary depending on the source, 15-30% of sportspeople's energy requirements should be fulfilled by proteins, 55-60% by carbohydrates, and 15-25% by fat (Meyer and Parker-Simmons, 2003).

- ***Carbohydrate*** – Carbohydrate is recognized as being the most important fuel for exercise. It is stored in the liver and the muscles as glycogen, a multi-branched polymeric molecule of glucose. In order to have sufficient carbohydrate stores during prolonged exercise, the athlete should consume carbohydrate-rich foods in the days preceding intense physical activity, a practice referred to as "*carbo-loading*" (Maughan, Depiesse, and Geyer, 2007; FIFA, 2010). Carbohydrate-rich foods include breakfast cereals, rice, bread, potatoes, sports drinks and soft drinks, and tropical fruits such as bananas. Depending on the duration and intensity of physical activity, recommended daily intakes range between 5 and 10 grams of additional carbohydrate per kg bodyweight (IAAF, 2007). However, it is important that this limit is not exceeded given that an excessive carbohydrate intake may lead to lower and/or upper gastrointestinal disturbances. Importantly, the amount of carbohydrate used as fuel by the human body depends on several factors such as the source of carbohydrate that is consumed, (e.g.: glucose or fructose), the weather (e.g. temperature, humidity), and the time span during which the athlete's digestive system has been subject to carrying out physical activity (Jeukendrop and Wolfart, 2009).

- ***Protein*** – Proteins are the building blocks for synthesizing new tissue and repairing damaged tissue, including muscle tissue. Also, essential enzymes and hormones are composed by proteins which are indispensable to the human body to carry out many different functions, ranging from temperature maintenance to glucose storage.
  It is still debated whether protein supplementation is required in the case of sportspeople. Indeed, although scientific data seems to support that protein needs are 50-100% higher for athletes and active people compared to the sedentary population, these needs seem to be attained by fulfilling the increased energy needs (Maughan, King, and Lea, 2004). Therefore, protein supplementation does not seem to be needed per se (Jeukendrup and Wolfarth, 2003). As a matter of fact, Millward (2003) argues in his "adaptive metabolic

demand model for protein and amino acid requirements" that the body adapts to both low and high intakes of proteins and/or amino acids. This would mean that a higher amount of ingested proteins is in turn accompanied by a higher rate of protein degradation. Interestingly, the effect of protein on muscle growth does not only depend on the sheer amount of protein ingested by the athlete, but also on the type of protein used, the moment of protein ingestion, the potentially other nutrients ingested along with the proteins as well as the total intake of energy (Jeukendrup and Wolfarth, 2003)

As such, although there is no scientific consensus with regards to the need for protein supplementation, it is recognized that dietary protein needs are higher for sportspeople than compared to the general population. Sportspeople are thus advised to consume 15 to 25g of proteins throughout the whole day and particularly during the recovery phase, (i.e. shortly following exercise) (FIFA, 2010; IAAF, 2007; IOC, 2010). Foods rich in proteins include eggs, meat, fish, cow's milk, yoghurt, soy products, and legumes.

- ***Fat*** – There is no scientific evidence that athletes and/or the active population should consume a low- or a high fat diet. As such, sportspeople should simply adjust fat intake to their increased overall energy needs in order to assure the adequate consumption of fat-soluble vitamins and essential fatty acids (Ray and Fowler, 2004).

- ***Micronutrients*** – Adequate intake of vitamins and minerals is paramount in general and some of these micronutrients are of particular importance in the context of physical activity. These are vitamins A, C, E, B6, B12 as well as the following minerals: iron, selenium, copper, manganese, magnesium, and sodium (FIFA, 2007). According to the American College of Sports Medicine, there is no need to be concerned about vitamin and/or mineral deficiency as long as overall food consumption compensates for energy lost during exercise. Foods that are particularly indicated to satisfy the requirements of minerals and B vitamins for athletes are beef, pork, chicken, tuna, beans, skimmed milk, and yoghurt. Nutritional requirements of water-soluble vitamins (vitamins A, C and E) may be satisfied by a variety of fruits and vegetables, e.g. carrots, oranges, broccoli, and spinach. Experts advise to "*eat a rainbow*", expression used to promote the daily consumption of fruits and vegetables of various colours, in order to ensure meeting the needs for a spectrum of antioxidants, i.e. molecules that help protect cells from the damage caused by free radicals, thus reinforcing the body's immune system.

- ***Hydration*** – Besides an adequate amount of nutrients and micronutrients, appropriate hydration is another essential factor for the management of an athlete's diet. Athletes are advised to consume drinks with a satisfactory carbohydrate content in view of preventing any gastrointestinal disturbances and maximising absorption from the gut (IAAF, 2007). In order for these effects to be achieved optimally, FIFA (2010) advises the consumption of drinks containing 4-8% carbohydrate. Naturally, hydration is particularly important in cases of elevated temperatures that increase the production of sweat. However, even under these conditions, sportspeople should be cautious to avoid drinking in excess, and should be careful not to take in so many fluids as to gain weight during the time span of exercise (Maughan, Depiesse, and Geyer, 2007). Importantly, athletes should be careful not to lose

excessive amounts of weight as a result of loss of carbohydrate and fat, as well as loss of water that was stored along with the molecules of carbohydrate (Jeukendrup and Wolfarth, 2009). Last but certainly not least, given that sweat is accompanied by excretion of sodium, sports/energy drinks should provide for the necessary replenishment of sodium (Maughan, Depiesse, and Geyer, 2007; Jeukendrup and Wolfarth, 2009).

ii. Relevance of sports nutrition products

Although scientific consensus has been reached regarding sportspeople's nutritional requirements, it is important to acknowledge that there might be a gap between athletes' nutritional intake *in theory* and their intake *in practice*. Indeed, counteracting the increased energy expenditure and nutritional requirements incurred by an athlete solely by eating an increased amount of normal foods may be problematic both from a time-consuming perspective as well as due to the gastro-intestinal distress that elevated amounts of ingested foods may result in.

The average energy requirements of the general population are as follows: women need around 2000 kcal per day in order to satisfy their energy requirements, men about 2500 kcal per day. If an individual is more active compared to the average population, s/he will have to compensate for the energy expenses that result from physical activity by increasing energy intake. The Scientific Committee on Food (2001) highlights that the energy needed in order to run a marathon may range from approximately 700 kcal per hour for a recreational athlete to 1400 kcal per hour for a professional athlete. This means that athletes will burn between about 2150 and 2580 kcal during the whole marathon. Similarly, the energy burned during one football game lies around 1800 kcal (FIFA, 2010).

As a reference, the calorie content of some common foods is provided: an average portion of beef steak yields 180-200 kcal, an egg about 80-100 kcal, an average portion of rice round 250-300 kcal, and an apple about 50-100 kcal. It ensues that in order to compensate for an energy expenditure of about 2000 kcal, athletes would have to eat several steaks, eggs, portions of rice and apples, which may be inconvenient. To this regard, it is interesting to note that calories should come from the "right" macronutrients. For instance, athletes should make sure to be eating the adequate amount of proteins, while being careful that the protein-containing food does not contain unnecessary amounts of fats, which is often the case (Maughan, King, and Lea, 2004).

Athletes may thus decide to consume sports nutrition products as these products may offer a convenient alternative to mainstream foods given their high protein content and low fat content. As such, although there is no scientific consensus regarding the rationale for consuming all types of sports nutrition products, some of these products certainly have a role to play. Specifically, certain sports nutrition products such as energy bars, meal replacements, protein supplements, and certain beverages intended for sportspeople may be useful in meeting the athlete's nutritional needs (Maughan, King, and Lea, 2004).

Furthermore, given that carrying out physical activity leads to a momentary impairment of digestive functions, eating a beef steak prior to or shortly after a competition or otherwise

intense physical activity, may result in intestinal distress (Scientific Committee on Food, 2001). Therefore, sports nutrition products may be a practical alternative to mainstream foods. As such, these products, although not per se *necessary* for the management of an athlete's healthy and balanced diet, may simply be more convenient and less time-consuming in the context of carrying out physical activity.

III. Conclusions

The importance of sport and physical activity in the EU has increased during the past decades. This is due to several trends taking place at Community level, which may be intertwined: a significant rise in overweight, obesity and related chronic conditions; standards of beauty which increasingly emphasize fitness and physical activity; as well as a rise in health-consciousness and consumer interest in the food items they purchase and consume (as will more closely be outlined in chapter III, section I(b)(i)). Possibly as a consequence of these trends, the Lisbon Treaty, which entered into force in 2009, foresees in Article 165 that provisions on sport may for the first time be taken at Community level. Considering the above, it is likely that European citizens will increasingly be taking part in physical activity.

As a consequence, a higher consumption of sports nutrition products in the coming years in Europe may be expected. As such, it is interesting to determine the conditions of the sports nutrition market as well as the current legal arena regulating these products with the aim of assessing whether there may be a need for further specific provisions at Community level.

CHAPTER III – STATE OF THE ART OF THE SPORTS NUTRITION MARKET IN EUROPE

Overall scientific consensus regarding the importance of both adequate nutrition and physical activity as well as the regulatory initiatives taken to support the latter have resulted in the expansion of the number and type of sports nutrition products, whether they are specifically designed for sportspeople or for the general population. As such, the distribution, nature, and target group of sports nutrition products have evolved since their first launch on the market in the 1940s. In addition, given the rapid evolution of this sector, it is interesting to review the current regulatory stance covering sports nutrition products on the European market.

I. Market conditions: characteristics of sports nutrition products and the sports nutrition product market

a. Distribution of sports nutrition products

Sports nutrition products are now increasingly available in supermarkets across European Member States, in addition to being sold in specialized shops, gyms, pharmacies and health stores. The European Specialist Sports Nutrition Alliance (ESSNA), a pan-European association representing the interests of the sports nutrition sector at large[9], has provided interesting data to this regard. Indeed, ESSNA confirms that, given the upsurge of sports nutrition products in the European market, distribution channels have increased and expanded. Indeed, ESSNA members sell more and more of their products through supermarkets, pharmacies, health stores, and gyms, a practice which was less common ten years ago. Specifically, "*almost 70% of ESSNA members distribute their products in mainstream supermarkets, a tenfold rise since 2000*" (ESSNA, 2013b). Specifically, retail sales of sports nutrition products in the United Kingdom have increased from 120 million Euros in 2000 to 300 million Euros in 2005 (IDACE, 2006). By positioning sports nutrition products in supermarkets and convenience stores, food business operators hope to reach a wider consumer base. This marketing strategy specifically targets health-conscious consumers, e.g. working mothers, sport enthusiasts, and the elderly (International Markets Bureau, 2010; Datamonitor, 2013a).

In addition, sports nutrition products may increasingly be bought online, either from the website of the company manufacturing the product or from online pharmacies. Purchasing online is the most common route through which products manufactured in third countries, mainly the United States, enter the European market (Petroczi, Taylor, and Naughton, 2011).

Finally, there are certain regulatory restrictions in some European Member States with regards to energy drinks. For instance, in Norway energy drinks may only be sold in pharmacies, while in Sweden sale of these products to consumers aged 15 years or less is prohibited (Seifert et al., 2011).

[9] ESSNA has 38 members spread across Europe; these include large businesses, smaller specialist brands, sports nutrition publications, suppliers of ingredients and national associations (ESSNA, 2013b).

b. Sports nutrition today – solely for sportspeople?

i. Health consciousness on the rise

As previously stated, sports nutrition saw the light in order to mainly answer to the nutritional requirements of bodybuilders and athletes. Over the past decades however, the consumer base for sports nutrition products has evolved and widened. Indeed, today consumers purchasing these products range from bodybuilders and elite athletes to the health-conscious general population. Already in 1995, Leeflang and van Raaij identified that European consumers pay particular attention to the nutritional content of the food they purchase. Also, health products are increasingly available on European supermarket shelves, most likely in response to a demand for these products coming from progressively health conscious consumers (Leeflang and van Raaij, 1995; Siró et al., 2008). Indeed, research conducted on sports nutrition and sports nutrition products by Euromonitor International in 2013 identifies that there is a general wellness and health trend among consumers located in most European Member States, e.g. Austria, Ireland, Portugal, where consumers are increasingly health aware and thus pursue a healthier lifestyle (Euromonitor International, 2013a; 2013b; 2013e; 2013f; 2013h; 2013j; 2013m; 2013p; 2013r; 2013s). To this regard, the British Food Standards Agency (FSA) conducted a survey which aimed, inter alia, at assessing consumers' attitudes towards eating habits, food safety, and hygiene. The results of this survey nicely mirror the general health and wellness trend that can be seen throughout the EU. For instance, it appeared that (1) more than 40% of British consumers are consuming more vegetables, salads, and fruits compared to the previous year; and that (2) 18% more consumers declare consulting the nutritional information, particularly with regards to the fat and salt content of a certain product (Food Standards Agency, 2005).

ii. Consumer categories for sports nutrition products

As part of the Eurobarometer survey of 2010, almost 27.000 European citizens were asked about their habits regarding physical activity. It appears that 40% of European citizens engage in sports at least once per week, 9% of which could be considered serious sportspeople given that they practice sport at least five times per week. European citizens who do not per se practice sports, engage in more informal types of physical exercise, e.g. walking, gardening, cycling. As such, 65% of the European population gets some type of physical exercise at least once per week (Eurobarometer, 2010). This represents a considerable proportion of the European population for which sports nutrition products may be of interest. Indeed, Datamonitor (2013b) reports that a substantial proportion of the European population purchases sports nutrition products, e.g. 32% of consumers in Spain, 24% in the UK, 23% in Germany, and 22% in France.

There is a general consensus that consumers for which sports nutrition products are currently intended can be subdivided into four consumer groups (e.g. SCF, 2001; Datamonitor, 2011, Datamonitor, 2013b; International markets bureau, 2010).

1. **Bodybuilders:** This consumer group aims at building up muscle mass by engaging in weight training all the while increasing energy intake. Bodybuilders are primarily male

and are considered as the main customer base for sports nutrition products due to the frequency and regularity at which bodybuilders consume these products.

2. **Athletes**: This consumer group includes all professional sportspeople with the exception of bodybuilders, e.g. football players and baseball players.

Bodybuilders and athletes represent the consumer group which spend most on sports nutrition products in per capita terms. They are most likely to make use of sports supplements and sports drinks rather than other sports nutrition products. The overwhelming majority, 80-100% depending on different sources, have declared making use of sports supplements (Maughan, 2004).

3. **Recreational users**: these are people who practice physical activity on a non-professional level. They practice sport as a hobby in their leisure time, or are fitness enthusiasts.

4. **Lifestyle users**: these are consumers that do not consume sports nutrition products for sporting purposes. Datamonitor (2011) places 28% of European consumers of sports nutrition products as belonging to this category, their purchases being generally on the spur of the moment and directed mainly towards nutritional bars and sports drinks. Richard Parker, senior consumer analyst at Datamonitor, declared that "*people within this group mainly consume sports nutrition products in order to provide a refreshing beverage, a quick meal replacement or simply a healthy snack.* (…) [They] *may also use sports nutrition products to provide an energy boost during illness, or even when feeling tired"* [10].

The latter two consumer groups are the main drivers for growth in the sports nutrition market. This is because consumers in the general population increasingly value the benefits of a healthy lifestyle either by practicing more physical activity and/or by seeking healthy and convenient products (Datamonitor, 2011; Euromonitor International, 2013).

iii. Different sports nutrition products appeal to different consumer categories

Sports nutrition products are discussed at length in chapter III section I(d). The purpose of this paragraph is to provide an understanding of the complexity of the sports nutrition market in terms of the variety of products and the diverging rationale behind consumers' purchases of these products.

Interestingly, some general trends have been observed with regards to the widening base of consumers of sports nutrition products: (1) such products are more and more consumed by

[10] Interestingly, ESSNA (2013) divides consumers of sport products in four groups as well, although the subdivision is slightly different: (1) **bodybuilders and elite athletes**, (2) **sports active** (which are comparable to "recreational users" above), (3) **recreational lifestyle** (which are comparable to the "lifestyle users" above), and (4) **occasional**, a group of consumers which has little knowledge of the beneficial effects of sports nutrition products, but will nonetheless occasionally buy items such as nutritional bars. Given that this latter group of consumers if not otherwise mentioned in the scientific literature, the author will refer to the four categories of consumers as enumerated above, i.e. bodybuilders, elite athletes, recreational and lifestyle users.

women who progressively engage in sport, (2) the age range of consumers is widening, and (3) the elderly increasingly express their interest in pursuing a healthy diet and exercising in order to ensure a graceful aging process (ESSNA, 2013b).

More specifically, research conducted by Morrison, Gizis, and Shorter (2004) showed that patterns of consumption of sports nutrition products varied between age categories of the general population. It appears that younger people (defined as being 30 years old or younger) use products containing creatine more compared to older segments of the population, while vitamin and mineral supplements are used most by the latter consumer category. In addition, consumers younger than 45 years of age make significantly more use of protein shakes and supplements compared to consumers above this age limit.

Finally, a practical experience confirms the above mentioned trend, i.e. different consumers purchase different types of sports nutrition products. A salesman working in a health store specifying in the sale of sports nutrition products[11], stated that the typical customer entering the store was a young male who practiced sport several times per week, either to lose weight or to newly pick up healthy sporting practices. The sports nutrition product that was most purchased by these younger customers were whey protein supplements with the aim of gaining muscle mass. This may suggest that recreational and lifestyle users are more likely to purchase items such as carbohydrate drinks and sports bars.

c. The sports nutrition market

i. Data regarding the sports nutrition market: past, present, and future

There is a recognized consensus that the sports nutrition market has greatly expanded since its beginnings and is generally characterised by promising growth potential. ESSNA reported that the EU-27 sports nutrition market amounted to 3.45 billion Euros in 2010, with an estimated annual growth of about 7% (ESSNA, 2013b). Specifically, sales in the British and German sports nutrition market amounted to approximately 1200 million Euros in 2003, which increased to 2500 million Euros in 2004 (IDACE, 2006). In addition, the sheer amount of foodstuffs being placed on the European market as sports nutrition products is generally increasing. ESSNA reports that the number of sports nutrition products manufactured by their members has multiplied by four since 2003. In addition, 12% of sports nutrition products manufactured by ESSNA members were launched in 2012, showing the considerable product turnover in this sector (ESSNA, 2013b).

Euromonitor International (2013) foresees the progressive growth of the sports nutrition market during the next years. However, this economic growth is not expected to occur uniformly across all Member States. Indeed, market growth of sports nutrition products is forecasted as ranging from very high in some Member States (e.g. the Netherlands), between

[11] The author interviewed this salesman on the 3rd of March 2014. The health shop had recently opened (since November 2013) in the centre of Brussels, Belgium.

1 and 4% CAGR[12] in other Member States (e.g. Bulgaria, Czech Republic, Denmark, Estonia, Finland), to negative in Slovakia and Slovenia (Euromonitor International 2013u and 2013w). Generally, the sports nutrition market will be positively influenced by the following possibly intertwined trends: (1) the growing number of European citizens who is expected to regularly practice some sort of physical activity in the coming years; (2) fitness and bodybuilding expected to become more popular; (3) the increasing demand for a healthy lifestyle; and (4) the changing attitudes towards appearance and beauty standards. Taken together, these factors will lead to an expansion of the consumer base, increasingly including the general population and not only bodybuilders and athletes. In contrast, the sports nutrition market may be negatively influenced by (1) the economic crisis which leaves consumers with a lower purchasing power, and (2) the more expensive subscription fees to gyms and fitness centres. As stated previously, the positive factors are expected to generally overrule the negative ones, thus leading to a positive growth of the sports nutrition market in Europe.

ii. Sports nutrition brands on the European market

In most European Member States, it are one to four companies who detain a considerable share of the sports nutrition product market. For instance, three companies accounted for nearly 60% of value shares in Belgium (Euromonitor International, 2013b). An exception to this trend is the market situation in Lithuania where thousands of different sports nutrition products may be purchased on the national market via various distribution outlets (Euromonitor International, 2013p).

The companies and brands that are most present on the European market include Nutrition & Santé with the brands Modifast and Isostar (e.g. Belgium, France, the Netherlands, Spain), Weider nutrition (e.g. Latvia, Slovakia, Spain),Maxim (e.g. Austria, Denmark), Natural Power (e.g. Austria), QNT (e.g. Belgium), Nutramino (e.g. Denmark), Musashi (Bulgaria), Nutrend DS and Aminostar (Czech Republic), Fast Sports Nutrition (e.g. Estonia), Func Food Finland (Finland), EA Pharma Led (e.g. France), Atlantic Multipower Germany (Germany), Twinlab Corp (e.g. Greece), Scitec (e.g. Hungary), Maximuscle (e.g. Ireland), Enervit (e.g. Italy), Olimp Laboratories Sp (Poland), EcoNutraceuticos (Portugal), Herbalife (e.g. Romania), All Stars Fitness Products (e.g. Slovenia) and Maxinutrition (e.g. the UK) (Euromonitor International, 2013). It is interesting to note that, with the fragile economic stance reported in certain European Member States, some consumers increasingly shift towards cheaper sports nutrition products compared to those manufactured by the previously mentioned A-brands, e.g. Decathlon's own "Aptonia" products.

d. Sports nutrition products currently available on the market

Given the absence of specific provisions regarding sports nutrition products at Community level, there is no clear, unified definition which harmonises the understanding of what is intended by sports nutrition products nor the scope of this terminology. Sports nutrition

[12] CAGR stands for Compound Annual Growth Rate, a measure of growth of the initial investment over several time periods.

products are mentioned in several Community documents such as Papers and Directives[13] as "*food intended to meet the expenditure of intense muscular effort, especially for sportsmen"*. Similarly, Datamonitor (2013) defines sports nutrition products as "*food, beverages and supplements to aid physical activity*". However, this concept of sports nutrition products may be outdated given the increasing consumption of such products not only by sportspeople but also by non-professional sportspeople as well as lifestyle users, i.e. consumers who do not use sports nutrition products in association with carrying out physical activity.

Sports nutrition products can be separated and classified via different features that separate them from each other, i.e. the format in which they are sold, the ingredients contained therein, and their intended use (e.g. prior to, during, and/or following physical activity). Although the many differentiating characteristics that may define these products give rise to endless possibilities, they also make it challenging to categorize sports nutrition products in a consistent way. For instance, in certain pieces of literature the term "sports foods" encompasses all foods targeting sportspeople, including beverages and supplements, while in other pieces of literature this term does not encompass sports drinks and/or sports supplements. For the sake of consistency, the author has decided to employ the term *sports nutrition products* when referring to all foods intended for sports people, and to use the term *sports foods* when referring to sports bars and foods intended for sportspeople resembling foods for normal consumption.

Another example showing the complex nature of such a classification is the non-harmonised definitions of these products across different countries, which may have an impact on the European market given the increasing availability of non-European products that can be bought online and shifted to Europe. Indeed, in the United States, the term "sports supplements" encompasses energy bars, sports drinks as well as meal replacements (Maughan, Depiesse, and Geyer, 2007), while this is not the case in Europe where supplements fall under the scope of Directive 2002/46/EC and would not include bars, drinks or meal replacements.

Burke (2003) offers somewhat of a solution to this condendrum by distinguishing two manners in which these products may be classified. The first is to differentiate sports nutrition products based on their *form*. In this case, the following categories can be distinguished: (1) sports foods which include bars and other foods resembling foods for normal consumption, (2) sports beverages, (3) sports supplements which include powders, capsules, and pills, and (4) sports gels[14]. Another distinction between nutrition products can be based on their separate *function*. In this case, sport foods may be viewed as products who supply the body with

[13] E.g.: Report of the Scientific Committee on Food on composition and specification of food intended to meet the expenditure of intense muscular effort, especially for sportsmen (2001); Regulation 609/2013; Directive 2009/39/EC; White Paper on Food Safety (2000).

[14] These categories were distinguished on the basis of scientific literature on the matter, as well as the type of products that were found on the European market, product categorisation on websites of the sports food industry, reports from sports associations (e.g. FIFA). The popular brands of products that have been identified are those that the author encountered more frequently in health stores and pharmacies spread in several Member States (e.g. France, Italy, the United Kingdom, the Netherlands, Belgium).

important nutrients in amounts that could be derived from normal foods, albeit in a more convenient way, and food supplements could be considered as products which supply nutrients in supra-physiological amounts.

i. Sports nutrition product classification based on their form

Sports foods

Spors foods include sports bars and foods intended for sportspeople resembling mainstream foods, also referred to as foods for normal consumption. The market for sports nutrition products is increasingly shifting from products sold in the format of bars, powders, capsules, and drinks, to products which resemble foods for normal consumption such as pasta, pancakes, cereals, and soups (ESSNA, 2013b).

Sports bars

There are several types of sports bars, answering to different needs expressed by consumers. The three main types of sport bars are (1) those that provide substantial amounts of energy in view of intense physical effort, or *energy bars*, (2) those that have a high protein content in order to facilitate increase of muscle mass, or *protein bars*, and (3) those that are intended following exercise in order to replenish the carbohydrate reserve that has been used during the intense physical activity, or *recovery bars*. The table below displays the intended function of the different types of sports bars and advised moment of consumption, i.e. prior to, during, or following exercise.

Intended function	**Moment of consumption**		
	Prior to exercise	**During exercise**	**Following exercise**
High energy	√	√	
Long energy endurance	√	√	
Recovery			√
High protein	√		√

Depending on the purpose of the sports bar, the nutritional composition of these will differ. Ingredients that can be manipulated depending on the intended purpose of a certain sport bar are the following: selected carbohydrates, vitamins, L-carnitine, whey protein, FOS, long-chain maltodextrin. For instance, energy bars will have a much higher carbohydrate content compared to protein bars.

Examples of sports bars: QNT protein bar, Weider protein bar, Isostar high energy bar, Isostar recovery bar

<u>Sports foods that resemble mainstream foods</u>

This category of sports foods is possibly the type of sports nutrition product the marketing of which has expanded the most in recent times. Examples of such products are pancake and cake mixes, sprinkles, and pasta products. The differentiating characteristic between these products and mainstream foods is usually that the former have a higher protein content and a lower fat content. Depending on the purpose of the product, they may have to be ingested prior, during, or after carrying out physical activity.

Examples of sport cake and pancake mixes

Examples of sports pasta. Left: Product marketed in Italy, contains higher amount of proteins and lower amount of carbohydrates compared to regular pasta; Right: French manufacturer Fleury michon's ready-to-eat meal with pasta and chicken breast to be consumed following physical activity

Sports gels

Sports gels are concentrated sources of carbohydrate sold in a liquid form, which usually contain either or both caffeine and L-carnitine, and may also contain vitamins, minerals such as magnesium, and guarana. Depending on the source, sports gels seem to either be considered as sports supplements, sports foods, or as a self-standing category. Given the different ways of classifying sports gels, they are presently introduced as a self-standing category. However, as per the definition of food supplements in Article 2(a) of Directive 2002/46/EC[15], one might consider sports gels to be included under the scope of the definition of supplements given that they are precisely "*ampoules of liquids*" or "*drop dispensing bottles*".

[15] Food supplements in this Directive are defined as: "*foodstuffs the purpose of which is to supplement the normal diet and which are concentrated sources of nutrients or other substances with a nutritional or physiological effect, alone or in combination, marketed in dose form, namely forms such as capsules, pastilles, tablets, pills and other similar forms, sachets of powder, ampoules of liquids, drop dispensing bottles, and other similar forms of liquids and powders designed to be taken in measured small unit quantities*"

Examples of sports gels. From left to right: Maxim energy gel, Isostar energy gel, and Overstim's energy gels.

The purpose of sports gels is to provide the body with an elevated amount of rapidly-digestible carbohydrates in a compact and easily transportable form. The carbohydrate content of these products is more concentrated compared to that of sports drinks. Sports gels come in a multitude of flavours such as apple, lemon, strawberry, banana, orange, red berries, mango, passion fruit, cola, chocolate and of course coffee.

Beverages targeting sportspeople

The market for beverages targeting sportspeople directly or indirectly has expanded during the past decades. Today, there are three broad categories of beverages which may be intended for sportspeople. Specifically, these beverages include the classical sports drinks, fortified vitamin waters, and energy drinks (Seifert et al., 2011). Sports drinks may be bought as bottles, cans, as well as effervescent tablets and drink powder mixes. In contrast, fortified vitamin waters and energy drinks are more likely to be sold solely as bottles and cans.

Scientific evidence regarding the effectiveness of beverages targeting sportspeople in enhancing physical performance depends on the type of beverage under consideration. However, it appears that a net benefit in consuming these products in place of water is that sportspeople incur in lower risks of dehydration simply because they consume more sports beverages than water due to their more appealing taste (Coombes, 2005).

Below is an overview of the different types of beverages targeting sportspeople that are currently available on the European market.

Sports drinks

There are two types of sports drinks: carbohydrate-electrolyte solutions and protein powders and drinks. Both can be found in liquid and powder form.

Examples of popular brands of sport drinks in liquid and powder form. From left to right: Lucozade, Gatorade, and Powerade

The purpose of sports drinks is to deliver carbohydrate and fluid rapidly to the body, and thus prevent dehydration, replenish the electrolyte reserve, and contribute to hydration pre- as well as post-exercise (Maughan, 1998; Coombes, 2005; Seifert et al., 2011). In addition, sport drinks may be suitable for other purposes, such as performance enhancers, metabolic/fat burners, muscle builders, meal replacements, weight gainers, and energy formulas.

Ingredients used in the composition of sports drinks may include carbohydrates (e.g. glucose), L-carnitine, caffeine, guarana, yerba mate, BCAA, vitamins, electrolytes, and flavouring agents. Recommendations for the optimal composition of sports drinks now foresee that it should be composed of 6-8% of carbohydrates, those mostly used being sucrose, glucose, and fructose (Coombes, 2005), and an electrolyte content of 20-30 mmol/L of sodium and 3-5 mmol/L of potassium (Sawka et al., 2007). Electrolytes are added in order to maintain fluid/electrolyte equilibrium and improve palatability (Coombes, 2005). Variables that can be manipulated in order to alter the purpose of a sport drinks are the concentration and type of carbohydrate, the osmolality of the drink, the electrolyte composition and concentration, its flavouring components, as well as other active ingredients (Maughan, 1998). The variables that will be manipulated depend on the formulation of the sports drink in question.

Protein powders and drinks are another category of sport drinks that are usually taken prior to and following exercise. As has been discussed in chapter II section II(b)(i), although it does not seem that sportspeople necessitate higher protein requirements than those obtained from a sufficient and balanced diet, protein powders and drinks may still be a practical alternative to mainstream foods.

Protein shake (left, brand QNT) and protein powder (right: Isostar)

Sports drinks may be taken prior to, during, or following exercise, depending on their intended function. The table below summarizes the moment in which different sport drinks should be consumed[16].

Intended function of the sports drink	**Moment of consumption**		
	Prior to exercise	**During exercise**	**Following exercise**
Rehydration	√	√	
Enhanced performance	√	√	
Long energy endurance	√	√	
Recovery			√
High protein	√		√
Mass gainer		√	

Carbohydrate-electrolyte solutions are one of the sports nutrition products for which there is general consensus that there is a beneficial effect on physical performance (Seifert., 2011). In addition to there being scientific evidence for efficacy, studies also show that consumption of such products is generally safe (Maughan, 1998). Both the safety and the efficacy of these products have been confirmed by the European Food Safety Authority (EFSA) who issued a Scientific Opinion stating that "*a cause and effect relationship has been established between the consumption of carbohydrate-electrolyte solutions and maintenance of endurance performance [as well as the] enhancement of water absorption during exercise*" (EFSA, 2011a). Below examples of such products.

[16] This categorisation has been created by combining the intended function of sports drinks manufactured by different Food Business Operators, such as Isostar and QNT.

Energy drinks and energy shots

Energy drinks have become increasingly popular following the introduction of Red Bull in 1987 in Austria and in 1997 in the United States. Since then, the market for energy drinks has experienced an exponential growth (Reissig, Strain, and Griffiths, 2010).

Energy drinks may contain caffeine, taurine, sweeteners or sugars (carbohydrates), inositol, glucuronolactone, herbal supplements (e.g. ginseng, gingko biloba, guarana), B vitamins, trace minerals, L-carnitine, and antioxidants (Higgins, Tuttle, and Higgins, 2010; Seifert et al., 2011; BfR, 2013). Manufacturers claim that these ingredients confer one or more of the following properties: an improved general and athletic performance, an increased ability to concentrate, and a reduction of fatigue (BfR, 2013). As such, they advocate that consumption of these products is optimal before, during and following exercise, when going out, during lectures or exams, at work, as well as whilst driving or playing computer games (BfR, 2013; Red Bull website, 2014). It is interesting to take a closer look at one of the most popular energy drinks found on the market nowadays: Redbull. Although there are diverging opinions as to whether energy drinks should be classified as sports drinks (Higgins, Tuttle, and Higgins, 2010), it is clear from Red Bull's advertisement that athletes are indeed a target group. Indeed, the testimony of several world class athletes is reported on Red Bull's website, with declarations such as the following made by first-league French football player Thierry Henry: "*Red Bull keeps me focused and energized so I can compete at my best both on an off the field. It gives me the extra push needed to continually perform at top levels*" (Red Bull website, 2014).

Example of energy drinks. From left to right: Rockstar, Red Bull, burn, Monster, Full Throttle.

Energy shots have similar properties compared to energy drinks, but are sold in much smaller and more concentrated formats.

Examples of energy shots. From Left to Right: 5-hour energy, Red Bull, Monster, Full Throttle, NOS

Fortified Vitamin waters

Claimed beneficial effects of fortified mineral waters include improving endurance as well as strengthening the immune system. Both of these effects have a clear application to the realm of sports. The benefit of improved endurance during physical activity is self-evident. Also, it appears that exercise can weaken the immune system by reducing the number and activity of certain essential cells such as lymphocytes and macrophages. As such, athletes may be more at risk of developing certain infections, e.g. upper respiratory viral infections (Gani, et al., 2003; Jeukendrup and Wolfarth, 2009). The ingredients of these products being water, vitamins, minerals, sugars or sweeteners, there is no evidence of safety concerns. Nonetheless, Seifert and colleagues (2011) declare that there is no published evidence of beneficial effects stemming from the consumption of these products [17].

[17] The author has also searched for such scientific evidence, unsuccessfully.

Examples of fortified vitamin waters. Left: Glaceau Vitamin Water; Right: SoBe Lifewater

Sports supplements

Supplements intended specifically for sportspeople are called sports supplements. Given the lack of specific provisions covering sports supplements in Europe, these answer to Directive 2002/46/EC on the approximation of the laws of the Member States relating to food supplements. Article 2 of this Directive defines food supplements as "*foodstuffs the purpose of which is to supplement the normal diet and which are concentrated sources of nutrients or other substances with a nutritional or physiological effect, alone or in combination, marketed in dose form, namely forms such as capsules, pastilles, tablets, pills and other similar forms, sachets of powder, ampoules of liquids, drop dispensing bottles, and other similar forms of liquids and powders designed to be taken in measured small unit quantities*".

Sports supplements most commonly include protein supplements, amino acids supplements, and vitamin and/or mineral substances which may be associated with other food components. Sports supplements are generally composed of the following ingredients: caffeine, L-carnitine, creatine, whey protein, concentrated whey, isolated whey, hydrolyzed whey, casein, BCAA, beta-alanine, HMB, L-arginine, L-lysine, L-ornithine, L-glutamine, minerals (e.g. zinc and magnesium), vitamins (e.g. B vitamins), as well as flavouring agents.

Examples of sport supplements. From left to right: beta alanine supplement from precision engineered, BCAA from prevision engineered, superior whey from Weider, and muscle volumizer from QNT

Maughan (2004) reports that the use of sports supplements is more common among athletes (46%) than among the general population (35-40%). Of the former population group, bodybuilders and weightlifters make most use of sports supplements, with as many as 100% declaring that they use such products, this percentage varying between 80 and 100% depending on the literature consulted. Maughan, Depiesse, and Geyer, (2007) report of a worldwide survey which investigated the use and rationale for use of sport supplements among athletes, including both full-time athletes as well as workers and students. Results show that supplements were used by 85% of respondents with the supplements most frequently used being vitamins and antioxidants, minerals, creatine and protein supplements, as well as ergogenic supplements, e.g. ginseng, caffeine, enzyme Q10.

Athletes usually purchase sports supplements given their claimed beneficial effects on muscle mass and energy boost; effects for which there is solid scientific evidence in the case of certain products. However, there does not seem to be a valid rationale for the consumption of all sports supplements. This important issue in the field of sports nutrition is further discussed in chapter IV section I.

ii. Sports nutrition products classification based on their function

The Scientific Committee on Food Classification

In the Scientific Committee on Food (SCF) report of 2001, representing the latest scientific opinion regarding sport products issued on a European level, experts took the approach of categorising sports nutrition products by function. When making this classification, the SCF however stressed that "*the concept of a well-balanced diet is the basic nutritional requirement for athletes*". This suggests that the products identified by the SCF are regarded more as being convenient rather than essential. Four categories of sports nutrition products were distinguished:

Carbohydrate-rich energy food products

Given the relationship between carbohydrates, the human body's main source of energy, and glycogen stores in the liver and the muscles, it is imperative that carbohydrate intake is sufficient at all times in order to guarantee optimal performance during exercise and optimal

recovery following exercise. Foods rich in carbohydrates with a high glycaemic index[18] are recommended, e.g. rice (Glycaemic Index (GI) = 91/100), corn flakes (GI=84), and potatoes (GI=83).

Carbohydrate-electrolyte solutions (C.E.S)

Fatigue during exercise has been associated with loss of water and electrolytes through sweat. Therefore, drinks that are rich in carbohydrates and electrolytes, sodium in particular, are recommended as they improve performance.

Protein and protein components

Sportspeople often believe that there is a need for increasing their protein intake when carrying out physical activity. However, the SCF concludes that there is not enough scientific evidence to justify an increased protein intake beyond the 1.2-1.4 g per kgbw per day which are sufficient to cover the modest increase in protein requirements incurred by endurance athletes. In practice, sportspeople frequently consume 3-6 g per kgbw per day, which are largely sufficient to fulfil their needs.

Supplements

With regards to supplements, the SCF concluded that there is not enough scientific evidence to justify the intake of nutrients beyond dietary guidelines. The only supplements recognized as having a scientifically proven ergogenic effects were caffeine and creatine.

ESSNA's classification

Given that the SCF's Scientific Opinion has been issued more than a decade ago, and that the market of sport supplements has evolved greatly during this time, it is foreseeable that products currently marketed on the European market as sports nutrition products, do not necessarily correspond to the four categories that were highlighted by the SCF. Indeed, in its position paper dating from 2013, ESSNA distinguishes between the following 12 categories of sports nutrition products (ESSNA, 2013b) [19]:

1. Carbohydrate electrolytes drinks
2. Carbohydrate-energy products
3. Protein products

[18] The Glycaemic Index (GI) measures the rate at which blood glucose rises after having eaten a certain type of food. As such, the GI estimates how much an individual's blood glucose increases following the consumption of each gram of available carbohydrate in comparison to the consumption of glucose (used as the defining standards with GI =100).
Consuming a diet with low GI foods has been shown to be effective in the prevention of chronic diseases such as obesity and diabetes.

[19] When compared to the SCF classification, ESSNA does not distinguish a unique category for sport supplements, but rather differentiates between several products having diverse functions, which may be sold in the form of supplements. This suggests that the category of sport supplements has evolved greatly during the past decade.

4. Weight gainers
5. All-in-ones/multiple ingredients combinations
6. Recovery products
7. Joint health
8. Cardio health
9. Muscle buffers
10. Stimulant/anti fatigue
11. Multivitamins and minerals
12. Meal replacement products or products designed to be incorporated in conventional meal occasions.

II. Current legal arena

a. National legal provisions in Europe

Following an analysis of national legislation covering sports nutrition products in certain European Member States, it appears that Member States are generally waiting for agreement on provisions covering sports nutrition products at Community level prior to proceeding in implementing legislation at the national level. Although some European Member States (e.g. Italy, France) have instated provisions and/or guidelines covering sports nutrition products, these may be outdated, e.g. French provisions covering sports nutrition products date back to 1977. In addition, national legislation has not yet taken into account the revision of the dietetic foods frameworks that occurred at the European level, and sports nutrition products are currently viewed as dietetic foods in national legislation. Annex II gives a short overview of existing national legislation covering sports nutrition products in certain EU Member States.
Interestingly, the author has not come across any type of scientific literature which takes one of the existing examples of national legislations as a model for provisions which may be included in potential legislation implemented at the European level. This may be due to the fact that National provisions are somewhat obsolete when compared to the rapidly changing market of sports nutrition products.

b. European legislation

Article 3(1) of the TFEU stipulates that "*the Union shall have exclusive competence in the following areas: (…) the establishing of the competition rules necessary for the functioning of the internal market; (…) [and] common commercial policy*". Member States have thus conferred to the European Union the power to implement provisions in these two areas, which broadly also include food and trade policy[20].

[20] The TFEU defines three types of competences: exclusive, shared, and supporting competences, respectively laid out in Articles 3, 4, and 6 of this Treaty. Areas in which the EU has exclusive competences entail that the EU alone may adopt binding acts in these areas given that Member States have conferred their regulatory power to the Union. Shared competences foresee that Member States may adopt binding acts in these fields only in the case that the EU has not exercised its competences. Finally, supporting competences entail that the EU may only support Member States' action in these fields and does thus not have proper legislative power.

Like all other food products, sports nutrition products must comply with Regulation 178/2002 (also called the General Food Law, GFL) which lays down the general principles and requirements of food law. Indeed, sports nutrition products are foods, or "*any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans"* as defined by Article 2 of this Regulation. As such, sports nutrition products must specifically comply with Article 14 of the GFL, stipulating that "*food shall not be placed on the market if it is unsafe*", condition which is fulfilled if the food in question is neither "*injurious to health*" nor "*unfit for human consumption*".

To this end, Food Business Operators (FBOs) should be more specifically in compliance with Regulation 852/2004 on the hygiene of foodstuffs, which lays down the general rules for the "*implementation of procedures based on the HACCP* [Hazard Analysis and Critical Control Points] *principles, together with the application of good hygienic practice*", as stipulated in Article 1 (1)(d) of this Regulation. Article 5(1) of the same Regulation specifies that FBOs should "*put in place, implement and maintain a permanent procedure or procedures based on the HACCP principles*". Article 5(2) further outlines the aim of implementing HACCP principles, i.e.: to identify hazards that must be prevented, eliminated or reduced to acceptable levels in order to establish and implement effective monitoring aimed at containing risk of contamination and jeopardy to public health as thoroughly as possible.

Manufacturers of sports nutrition products also ought to comply with international standards such as those set by the WADA which foresees that certain substances should not be detected in these products given either their proven toxicity or their excessive and thus unfair enhancement of physical capacities (doping).

Moreover, the package of all foodstuffs is heavily regulated at the European level. Indeed, sports nutrition products have to be in compliance with Regulation 1169/2011 on the provision of Food Information to Consumers (also called the "FIC Regulation") which covers labelling requirements, e.g. composition, nutrition declaration, durability, conditions of use and storage, as well as allergy information. Article 7 of Regulation 1169/2011 is of particular relevance in the context of sports nutrition products as it stipulates that "*food information shall not be misleading, particularly as to the characteristics of the food and, in particular, as to its nature, identity, properties, composition, quantity, durability, country of origin or place of provenance, method of manufacture or production*". Provisions laid down in this Regulation are applicable as of 13 December 2014, with the exception of the provisions laid down in Article 9(1)(l), regarding the nutrition declaration, which apply from 13 December 2016. As such, sports nutrition products purchased on the European market today must not necessarily comply with this Regulation yet. This signifies in turn that it is so far not possible to determine the effectiveness of provisions laid down by this Regulation. In addition, sports nutrition products must comply with Regulation 1924/2006 on Nutrition and Health Claims made on foods. Accordingly, any claim appearing on sports nutrition products has to be approved by the EFSA prior to being displayed on the package of a certain foodstuff. A Community list of all approved claims may be consulted in the EU Register of Claims. Regulation 1924/2006 and its enforcement on the European market in the context of sports nutrition products is discussed thoroughly in chapter IV section II (a) and chapter V section II(e).

Sports supplements must also comply with Directive 2002/46/EC on the approximation of the laws of the Member States relating to food supplements.

III. Conclusions

Sports nutrition is the study and application of nutrition knowledge with the aim of assisting athletes and the active population prior to, during, and following sport and physical activity. Chapter III section I(d) outlined the type of products which are included under this term, as well as the complexity of classifying such foodstuffs. In the strict sense, sports nutrition products encompass sports foods, sports supplements, sports gels, and sports drinks which answer to the needs of bodybuilders and athletes. In addition, an emergent yet steady trend with regards to the target population of sports nutrition products has been observed, i.e. consumers of sports nutrition products are not anymore solely limited to athletes and bodybuilders, as was intended when these products were first manufactured in the 1940s, but also include the general population. This latter category of consumers may be physically active or simply turn to sports nutrition products out of concern and respect for their health. Interestingly, not only has the consumer base of such products widened during the years, but sports nutrition products also increasingly resemble foods for normal consumption.

Furthermore, there is currently a lack of specific provisions addressing sports nutrition products under EU legislation, meaning that there is no legal, harmonised definition covering these products. A few Member States address sports nutrition specifically as part of their national regulatory framework, but these provisions are often outdated in addition to differing among Member States. Generally, it appears that Member States may be waiting for EU action regarding more specific provisions covering sports nutrition products. At the EU level, these products fall under Directive 2009/39/EC on foods for particular uses until July 2016. Following this date, they will fall under Regulation 609/2013 which foresees that the European Commission provide a report to the European Parliament and the Council on the necessity, if any, to regulate these products at Community level by July 2015.

Having explored the state of the art of the sports nutrition market in the present chapter, the following chapter will build up upon this newly acquired knowledge to identify criteria which may be helpful in assessing the potential need for a regulatory change regarding European provisions covering sports nutrition products.

CHAPTER IV – CRITERIA DEVELOPMENT

The previous chapter identified the conditions of the sports nutrition market as well as the regulatory provisions that cover these products, both at national and at European level. It appears that the scope, composition, and distribution of sports nutrition products has evolved greatly during the past decades. In addition, national legislation seems to either be absent or to date back to the dietetic foods framework. Consequently, sports nutrition products ought to be in compliance with European food law, but are not subject to more specific provisions. In this context, Regulation 609/2013 foresees that the European Commission shall present a report to the European Parliament and the Council on the potential necessity of specific provisions covering sports nutrition products. This report may be accompanied by a legislative proposal.

When identifying criteria in order to assess the potential regulatory need for sports nutrition products in Europe, it is paramount to identify the goal of such provisions, i.e. what these potential future provisions should achieve. To this end, this chapter will depict a snapshot of the current functioning of the sports nutrition market, as well as deliberate upon criteria which may aid in assessing whether any legal change is necessary, e.g. the safety of sports nutrition products or the adequacy of the information provided to consumers.

I. Product safety: food safety as a public health priority

European regulatory bodies strive to protect the health of their citizens. Prior to the advent of food law provisions at Community level, this was reflected by provisions on foodstuffs at national level. Especially since the 1990s, initiatives targeted at promoting food safety and consumer protection at Community level have been plentiful. These initiatives were mainly a reaction to the several food safety crises which highlighted a need for comprehensive provisions covering food safety and consumer protection. As such, the White Paper on Food Safety issued in 2000 underlines that "*assuring that the EU has the highest standards of food safety is a key policy priority for the Commission"*, with "*consumer information*" and "*food safety controls*" being listed as two pathways to reach this policy priority. As a consequence of these noble resolutions, Regulation 178/2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety was adopted in 2002, with the aim of ensuring "*a high level of protection of human life and health*" (Recital 2 of this Regulation). Today, the EU has the reputation of harbouring one of the strictest food safety standards worldwide.

Indeed, food safety keeps on being a priority among Member States, as demonstrated by statements issued by national health bodies or national health representatives. For instance, Italian Minister of Health Beatrice Lorenzin[21] declared that "*food safety and the fight against counterfeiting agribusiness are my priorities;* [and that] *there will always be a zero tolerance policy against those that jeopardize citizen's health or those that market unlawful products"*[22]

[21] Beatrice Lorenzin was appointed Minister of Health by Enrico Letta in 2013 and has been reconfirmed Minister of Health by Matteo Renzi in February 2014.

[22] The English text has been translated from this declaration, in Italian, made by Minister Lorenzin: "*Sicurezza alimentare e lotta alla contraffazione agroalimentare sono mie priorità*; *nei confronti di chi mette a rischio la*

(Ministero della Salute, 2013). Another example of the importance of food safety and protection of consumer interest on the part of national regulatory bodies can be seen by the 2015 strategy of the UK Food Standards Agency (FSA). The main goals of this strategy include that "*food produced or sold in the UK is safe to eat*" and that "*consumers have the information and understanding they need to make informed choices about where and what they eat*".

II. Consumers' informed choice

a. Protecting consumer informed choice: legal provisions, rationale and challenges[23]

The many food crises and scandals that took place in the 1990s have notably resulted in a decrease in consumer trust across Europe (Grunert, 2002). As a consequence, consumers increasingly demand to be aware of the contents of the foodstuffs they consume, as well as the manufacturing process. This trend was exacerbated with the advent of new methods of production and novel technologies, such as genetic modification, which make it impossible to know what a certain product contains or how it is manufactured by merely looking at the product prior to purchase or by tasting it. Therefore, food quality is increasingly characterized by *credence qualities*, i.e. aspects that remain unknown to consumers both prior to and following purchase of the foodstuff (Grunert, 2002). With the rising presence of functional foods on the European market, of which sports nutrition products are a subcategory, the importance of credence qualities such as health-related characteristics has become more prominent (Grunert, 2002; Menrad, 2003; Siró et al., 2008). It follows that educating consumers about sports nutrition products is essential given that it is not possible to perceive the benefits of such products directly (Siró et al., 2008). Indeed, consumers are not expected to instantaneously feel healthier following the consumption of a certain product, and must thus be informed of the benefits of this product via effective communication, i.e. via the display of relevant information, such as product labels and nutrition and health claims, on food packages (Menrad, 2003; Siró et al., 2008). Current EU legislation foresees that food products have to abide to both Regulation 1924/2006 on nutrition and health claims made on foods and Regulation 1169/2011 on the provision of food information to consumers in the context of guaranteeing consumers' informed choice.

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salute dei cittadini producendo o commercializzando prodotti non conformi alle norme c'è, e ci sarà sempre, tolleranza zero."

[23] In order to acquire an understanding consumer knowledge, perceived needs as well as preferences related specifically to sports nutrition products, the author contacted several consumer organisations spread across Europe, as well as multiple companies involved in the manufacturing of these products. Unfortunately, such data seem to be hard to come by. The consumer organisations who replied stated that they are not currently dealing with sports nutrition products, and the few industries/industry representatives that were kind enough to contribute to the present work did not share consumer data per se. As such, given the limited amount of information, a specific review of consumer perception and knowledge of sports nutrition is a rather arduous task. In addition to the apparent scarcity of data regarding consumer knowledge of sports nutrition, another limitation of this brief review of the literature is that most articles mainly discuss data retrieved from non-European consumers, e.g. Australian or American consumers, which may differ from European consumers' knowledge, perceptions and opinions of sports nutrition and its products.

Specifically, Article 4(1) of Regulation 1169/2011 stipulates that food products should display "*(a) information on the identity and composition, properties or other characteristics of the food, (b), information on the protection of consumers' health and the safe use of a food; (c) information on nutritional characteristics so as to enable consumers (…) to make informed choices*". In addition, Article 7(2) of this Regulation stipulates that "*food information shall be accurate, clear, and easy to understand for the consumer"*.
Furthermore, the first Recital of Regulation 1924/2006 outlines its primordial aim, namely that "*products put on the market (…) should be safe and adequately labelled, in order to ensure a high level of protection for consumers and to facilitate their choice*". In the context of this Regulation, the main labelling issues tackled are health and nutrition claims, where claims are defined as "*any message or representation, which is not mandatory under Community or national legislation, including pictorial, graphic, or symbolic representation, in any form, which states, suggests or implies that a food has particular characteristics*" by Article 2 (2)(1) of this Regulation. Article 3 further stipulates that claims shall not "*(a) be false, ambiguous or misleading; (b) not give rise to doubt about the safety and/or the nutritional adequacy of other foods; (c) not encourage or condone excess consumption of a food; (d) not state, suggest or imply that a balanced and varied diet cannot provide appropriate quantities of nutrients in general (…), (e) refer to changes in bodily functions which could give rise to exploit fear in the consumer (…)"*. Finally, as highlighted in Recital 2 of Regulation 1924/2006, providing consumers with correct information also represents a step towards improved functioning of the internal market, by ensuring fair conditions of competition, as well as the free movement of foods.

The rationale for nutrition and health claims is that this scientifically valid and well-substantiated information should enable consumers to make informed food choices and assist them in identifying food components that are of benefit to them. For nutrition and health claims to be useful to consumers, they ought to be understandable, well-substantiated, and non-misleading (van Buul and Brouns, 2013). Specifically, successful information and communication campaigns have revealed that statements regarding the health effect of a certain product should be transferred in a relatively simple way and should be understandable to consumers (Menrad, 2003). Van Buul and Brouns (2013) researched consumers' perception of claims figuring on the package of functional foods in order to determine whether these impact consumer product choice. To this end, it is paramount to understand consumers' decision making process when purchasing a certain functional food. Prior to purchasing a certain foodstuff, consumers have identified an unfulfilled need, and thus search for solution-providing information explaining how to fulfil this need. This information is then evaluated and the most satisfying foodstuff is purchased. Finally, following consumption, consumers carry out a post-purchase assessment (van Buul and Brouns, 2013). As such, nutrition and health claims provide information which enables consumers to opt for healthier choices. Aschemann-Witzel and Hamm (2010) found that "*products with a claim are clearly preferred, but that the determining factors of choice differ between the food categories*", where consumer choice was "*positively influenced by the perception of healthiness of the product"*. More specifically, van Buul and Brouns (2013) found that claims may be more or less effective depending on the *type of claim*, i.e. whether the claim in question is a nutrition

claim or a health claim, the *consumer group* and *consumer trust* , the *carrier of the claim*, i.e. consumers may evaluate claims differently depending on the brand and packaging on which they appear, and the *wording* of the claim. It follows that nutrition and health claims may be victims of misinterpretation. Besides, even in cases in which consumers correctly understand the claim, they may still not trust the latter (van Buul and Brouns, 2013). Indeed, trust in a certain claim may vary depending on the physical, cultural, and/or academic context. The physical context refers to the location, distribution channel, product category, package, and brand of a certain product. The cultural context refers to the fact that different consumer groups, living in different countries, may have multiple interpretations for exactly the same claim. Finally, the academic context refers to the fact that health claims represent rational communication tools of a given academic society; outside of this society, the health claims in question may be misinterpreted.

As such, it appears that food business operators manufacturing functional foods in general or sports nutrition products in particular ought to pay particular attention to the claims appearing on food packages in order to adequately satisfy consumer thirst for knowledge without however providing misleading information.

b. Consumers' understanding and knowledge of sports nutrition

Bianco et al. (2011) highlight the scarcity of consumer data at European level, and looked into this research gap by analysing consumers' source of knowledge of sports nutrition and associated products, particularly protein supplements, in Southern Italy. Participants who took place in this study were gym or fitness attendees. Bianco et al. (2011) researched the source of information consumers rely upon when purchasing sports nutrition products. It appears that 34% follow the advice given by gym instructors, 18% rely upon information found on the internet, 14% consult magazines or books, 13% visit a physician, and 5% rely on the advice given by salesmen. None of the respondents declared consulting a nutritionist.

Torres-McGehee et al. (2012) investigated the nutrition knowledge held by coaches, athletes, athletic trainers, and strength and conditioning specialists, with regards to, inter alia, supplements, body composition, energy and nutrient requirements, and hydration. This study identified that athletic trainers and strength and conditioning specialists have appropriate nutrition knowledge, although a few were overconfident when giving incorrect advice. In contrast, coaches and athletes were found to have inadequate nutrition knowledge, with athletes obtaining the poorest overall scores despite proving that they understand the crucial relationship between a successful physical performance and adequate nutrition.

Similarly, Spendlove et al. (2012) researched athletes' knowledge with regards to dietary guidelines, sources of nutrients, diet-disease relationships, and choosing everyday foods. Athlete's nutrition knowledge was compared to that of a similar aged cohort taken from the general population (the control group). Both groups scored highest in the questions about dietary guidelines and lowest in questions concerning diet-disease relationships. Interestingly, it appears that athletes obtained, on average, a slightly lower score compared to the control group. Authors attributed athletes' lower nutrition knowledge to demographic factors, i.e. athletes were most likely to be male and younger compared to the control group.

In conclusion, it appears that nutrition knowledge among consumers of sports nutrition products is not optimal for consumers to be making important choices such as which products answer their specific needs in the most nutritionally adequate and risk-free manner. Therefore, at the very least, information displayed on the package of these products should be as accurate and complete as possible. Ideally, users of sports nutrition products should be advised to consult a dietician or a nutritionist when seeking for the product that would most adequately answer to their individual needs.

III. Functioning of the market and the sports nutrition industry

a. Criteria characterizing the correct functioning of the market

Several features characterize a well functioning market. These include (1) easy entry and exit of the market, (2) the absence of monopoly power, (3) the widespread availability of understandable information, (4) the absence of market externalities, and (5) achieving objectives of the public interest (Melody, n.d.). However, not all of these characteristics apply specifically to the market of sports nutrition products, but may apply to the European food market more generally. Indeed, there are no explicit barriers to the entry or exit in the sports nutrition market. As such, competition in this sector is not impeded. Similarly, the fourth and fifth characteristic outlined previously – absence of market externalities and achieving objectives of the public interest – also apply to the European food market more generally. In addition, as reviewed in chapter III section I(c), the European sports nutrition market is characterized by many different companies marketing their products. Subsequently, it is not one firm that has the monopoly of this market, thus avoiding to restrict "*the participation opportunities of smaller competitors and potential new market entrants*" (Melody, n.d.). Lastly, it is thus interesting to review the role of widespread availability of understandable information in the sports nutrition product market. Indeed, in a well-functioning market, all relevant stakeholders must be adequately informed in order to make effective choices, i.e. information asymmetries should not exist between these stakeholders. While the previous section summarized the importance of protecting consumers' ability to make informed choices, this section will further develop upon those pieces of information that the industry discloses to consumers, thus giving an idea of the pool of information that consumers may take advantage of when making decisions. In this context, it may be of interest to keep in mind that, as further discussed in chapter V section III, the sports nutrition industry is interested in fostering innovation and product development as a means of answering to consumers' evolving needs.

b. What does the sports nutrition industry convey to consumers?

The outer presentation of packages of sports nutrition products naturally varies depending on the product's function, its target group(s), and its format (e.g.: gel, bar, beverage..). The table below summarizes information that may either be required by EU legislation and/or that manufacturers of sports nutrition products deem to be most useful to consumers and thus display on the packages of sports nutrition products.

Information on the package	Sports nutrition products [24]		
	Sport foods	Sport beverages	Sport supplements [25]
Nutrition information			
Nutrition claims related to the carbohydrate/ protein/ fat content	√	√	√
Suitable for vegetarians/vegan	√		√
Gluten free 	√	√	√
Lactose content			√
Aspartame/ other sweetener added  		√	
Respect of safety/anti-doping standards			
Respect of HACCP principles 			√
Anti-doping engagement	√		√
Conditions of use			
Moment of consumption (prior, during, following physical activity)	√	√	√
Correct product use (e.g. Shake before use)	√	√	√
Serving size	√	√	√
Other information			
Flavour(s) used	√	√	√
Easy digestibility			√
pH		√	
Hypotonic/ isotonic/ hypertonic solution		√	

Given the importance that doping-related issues have had in past sporting events, it is interesting to briefly address types of initiatives taken by manufacturers in order to inform consumers about their engagement against doping. Many serious supplement manufacturers pay extreme attention to possible risks of contamination in their production line in order to guarantee the safety of their products to consumers. These manufacturers have even started to perform their own policing initiatives by flagging to national authorities other FBOs who jeopardize the reputation of the sector by putting on the market contaminated products, be it purposely or accidentally (Wilk, 2014).

Initiatives have also been taken giving athletes an assurance that they will not test positively during a doping test when consuming a certain sports nutrition product. For instance, certain

[24] If a box has not been ticked it simply means that the author did not come by any sports nutrition product belonging to that category which displays that type of information.

[25] For the sake of convenience, sport gels have been included under the category of sports supplements.

manufacturers claim to be engaged in an anti-doping philosophy, and display such engagement on the package of their products.

"Anti-doping engagement" logo on an Isostar protein bar

Other initiatives such as the "informed-sport" certification programme for sport supplements, manufacturing facilities, and food components, assures athletes that sports nutrition products bearing the informed sport logo have been tested for substances that are not allowed in sport. Specifically, the "*informed-sport registration process requires both a manufacturing quality system audit and pre-registration product testing,* [i.e] *a thorough review of quality assurance systems, raw materials and supply chain is carried out to ensure there is little risk of contamination in the finished product*" (Informed Sport, 2013).

IV. Conclusions

This chapter reviewed criteria that may potentially aid in assessing whether there is a need to supplement or change current European food legislation in order to guarantee the functioning of the market at large. At the very least, sports nutrition products sold on the European market should be safe and consumers should be given all the necessary information in order to be able to make correct decisions. The following chapter will review whether these two requirements are met in the context of sports nutrition products, and whether there are other potential obstacles to the correct functioning of the sports nutrition market.

CHAPTER V – Is there a need for a modification of current EU provisions covering sports nutrition products?

A snapshot of the present situation with regards to sports nutrition, its products, its consumers, as well as the provisions regulating this sector in Europe has been given throughout the previous chapters. Specifically, chapter IV gave an account of criteria that may be employed in order to assess whether there is a need for modifying current EU provisions covering sports nutrition products. The present chapter evaluates these criteria in the context of sports nutrition products, by discussing whether the current regulatory framework is adequate to address and tackle the current and future challenges of an evolving market such as the market of sports nutrition products.

I. Safety concerns

Certain categories of sports nutrition products may represent a health hazard which may give rise to concerns with regards to their adequacy as part of an athlete's diet. Specifically, it appears that cases of unsafe product use, product mislabelling and/or product contamination have been reported for certain sports nutrition products, i.e. sports supplements, sports gels, and beverages targeting sportspeople. These concerns seem to be less prevalent in the case of sports foods that resemble foods for normal consumption (e.g. sports bars, cake mixes..). For reasons which are elaborated upon in this section, the consequences of ingesting an unsafe sports nutrition product may be serious both as it may compromise a person's health as well as because it may jeopardize an athlete's career.

It is important to bear in mind that cases of unsafe or misused sports nutrition products are particularly alarming given that these products are currently not solely used by professional athletes but also by the general population, including physically active adults, as well as more vulnerable population groups such as adolescents, children, cancer patients and people at high risk of developing cancer, post-menopausal women, the elderly, and patients afflicted by chronic diseases (Petroczi, Taylor, and Naughton, 2011). Also, cases of unsafe or misused sports nutrition products are challenging to identify given that health care professionals are usually not told about potential consumption of such products. Indeed, it is difficult to grasp that the very substance that the consumer/patient is supposedly ingesting for health-enhancing purposes may be precisely the one that is causing distress (van der Voet et al., 2008).

Sports supplement intake may jeopardize consumer safety in multiple ways (e.g. Maughan, King, and Lea, 2004; Maughan, 2005; MacFarquhar et al., 2010; Petroczi, Taylor, and Naughton, 2011). Indeed, in addition to (1) sports supplements being at risk of excessive intake by consumers, some of these supplements have also been found to infringe EU food law provisions by being (2) mislabelled and/or (3) contaminated. *Beverages intended for sportspeople* and *sports gels* may also represent a hazard for consumers either due to their inherent characteristics, i.e. an elevated caffeine content, or due to consumers' incorrect use. The above mentioned issues, potentially compromising product safety, are hereby discussed in more detail, starting with the recapitulative scheme below which gives an overview of the matter at hand.

Sports nutrition product	Potentially unsafe product composition and/or misleading label	Product misuse from the consumer
Sports supplement	Ingredient present in reduced/excessive amounts compared to label	Excessive intake
	Ingredient present in product but not labelled → "contamination"	
Sports gel	Elevated caffeine content	Inadequate water intake in conjunction with use of sports gel
Beverages intended for sportspeople	Elevated caffeine content	Excessive and unsafe intake, e.g. energy drinks in combination with alcohol

Recapitulative table of potential reasons that may render certain sports nutrition products unsafe to human consumption

In the occasion of the 2014 London marathon, Dr. Carey, ESSNA chair, declared that *"sports nutrition products are extremely tightly regulated and the majority of the non-compliant products are currently distributed via the internet and often come from outside the EU*" (Starling, 2014). As such, although certainly present on the European market, the extent to which potentially unsafe sports nutrition products are available for purchase in Europe is uncertain. Nevertheless, given the important consequences that consumption of unsafe sports nutrition products may have, it is relevant to tackle precisely how and why athletes and the general population should be cautious when consuming these products. As such, this chapter offers an overview of potential health threats that sports nutrition products may represent, both due to their inherent composition as well as due to consumer non-respect of the conditions of use of the sports nutrition product.

a. Safety of sports supplements

i. Supplement misuse by consumers

The rationale for use of certain sports supplements is supported by scientific evidence of safety and efficacy. However, athletes may use these products inappropriately by either consuming them at an inadequate moment or in inadequate quantities (Maughan, Depiesse, and Geyer, 2007).

A study conducted by Maughan, Greenhaff and Hespel (2011) investigated athletes' most common justifications for making use of sports supplements (more than one could be given). Results show that 71% of athletes use supplements to aid recovery from training, 52% for health-related reasons, 46% to improve performance, 40% to prevent or treat illness, and 29% to compensate for a poor diet. It is arguable that some of these reasons are not fully in line with the originally intended purpose of a food supplement. Indeed, as previously discussed, experts agree that the concept of a balanced and varied diet is enough to fulfil the needs of athletes as well as the needs of the active population. It ensues that supplements should only be used in cases in which a healthy diet can not be achieved. As such, before turning to the use of sports supplements, athletes should be advised to modify their diet in order to ensure the fulfilment of their nutritional requirements (Recital 3 of Directive 2002/46/EC; Maughan,

Greenhaff, and Hespel; 2011). In addition, Article 6(2) of Directive 2002/46/EC stipulates that "*the labelling, presentation and advertising must not attribute to food supplements the property of preventing, treating, or curing a human disease, or refer to such properties"*. In other words, athletes should not per se turn to sports supplements if seeking to prevent the occurrence of a certain disease.

However, this theoretical framework does not seem to be fully applied in practice. In fact, vitamin and mineral food supplements, which are seen as beneficial and harmless, may be used on a "just in case" basis by athletes (Maughan, Greenhaff, and Hespel, 2011). Furthermore, it appears that athletes often exceed the dose recommended on the package (Maughan, King, and Lea, 2004). This may be attributed to (1) the belief that vitamin and mineral supplements are harmless and thus the more are consumed, the better; (2) peer pressure, i.e. athletes may be influenced by opponents or teammates known to use higher doses than recommended (Maughan, King, and Lea, 2004); or (3) the promotion that star performers of a certain sport carry for specific supplements, a process that Maughan (2005) refers to as *positive endorsement*. Whichever the reason for additional supplementation may be, these products are taken in order to prevent the development of any vitamin- and/or mineral-related deficiency. Although it is asserted that excessive intake of most vitamins and minerals is not harmful, there may be cases in which micronutrient supplementation may bring more negative than positive effects. One notable example is that of iron supplementation, but the same could be said about supplementation with other metallic elements (Maughan, King, and Lea, 2004). Indeed, excess of iron, or homochromatosis, may result in cellular apoptosis, tissue injury, and damage to cellular macromolecules (Papnikolaou and Pantopoulos, 2005). Consequently, iron overload has been associated with several conditions such as Alzheimer's, joint diseases, cardiovascular diseases, and even hepatocellular cancer. Therefore, athletes as well as the active population are advised to address shortcomings of their diet prior to making use of supplementation "just in case".

ii. Incompatibility with EU food labelling provisions

<u>Substances included in the product do not adequately appear on the label</u>

As previously stated, Regulations 1924/2006 and 1169/2011 lay down specific rules with regards to the presentation of a certain product e.g. regarding the claims which are allowed on sports supplements, the information disclosed on the label of these products, and the way in which this information is disclosed. Petroczi, Taylor, and Naughton (2011) argue that although Regulations 1924/2006 and 1169/2011 lay down these rules, inherent characteristics of the market of food supplements entail that enforcement of these provisions is less straightforward. A foodstuff is in compliance with Regulation 1924/2006 when it solely displays those claims that have been approved by this Regulation and are thus included in the EU Register of Nutrition and Health Claims. In addition, there are several ways in which sports supplements may not be strictly in compliance with provisions laid down in Regulation 1169/2011 (Green, Catlin, and Starcevic, 2001; Petroczi, Taylor, and Naughton, 2011):

(1) ingredients are displayed on the label but are not present in the product;
(2) ingredients displayed on the label and present in the product are the same,

although the quantities do not match;
(3a) some ingredients present in the product fail to be mentioned on the label;
(3b) ingredients present in the product and not mentioned on the label are banned. [26]

Examples of point (1) would be cases in which despite an expensive ingredient being displayed on the label, this same ingredient may not be present in the product in significant amounts, e.g. in the case of sports supplements containing gingko biloba or ginseng (Green, Catlin, and Starcevic, 2001).

Regarding point (2), it appears that certain sports supplements do not contain any measurable quantity of some of the ingredients displayed on the label, while others may contain up to 200% the dose stated on the label (Gurley, Gardner and Hubbard, 2000; Maughan, 2005; MacFarquhar et al., 2010). Manufacturers engage in this practice in order to keep consumers unjustly satisfied with their product. In fact, the consumer will be under the impression that although the content of the stimulant is fairly low, the beneficial effect of the product is high. In the best case scenario, the wrongly labelled ingredient content will not have any harmful effects on the human body or on physical performance. However, in other cases, the product containing excessive amounts of a certain ingredient may truly be injurious to health and/or unfit for human consumption. For instance, MacFarquhar and colleagues (2010) report of a supplement which contained 200% the amount of selenium that was declared on the label. The product was available online, and marketed as being suitable for the whole family, children included, in order to "*maintain energy and sustain health*". However, the consumption of this product by the general population led to an outbreak of acute selenium poisoning, with more than 200 identified cases. Indeed, although selenium is an essential mineral that ensures the proper functioning of cells, it can have toxic effects if taken in high doses, and may result in fever, vomiting, nausea, nail brittleness and discoloration, and hair loss. Furthermore, Baume and colleagues (2006) report of cases in which food supplements contained a higher amount of stimulants (e.g. caffeine) compared to that declared on the label.

Contamination

Another issue in the realm of sports supplements is that of contamination, pertaining to points (3a) and (3b) listed above, namely cases in which the supplement contains ingredients that are not labelled on the product and that may be banned and/or unsafe. Maughan (2014) declared that sport supplements containing substances such as stimulants and undeclared steroids can be extremely effective, "*not due to the stated ingredient but due to the presence of undeclared pharmaceuticals*". This is of particular importance in the context of sports and sports nutrition products, given the role that doping may play in athletic competitions. Indeed, the practice of doping goes against the spirit of sportsmanship that should characterize sporting events, i.e. a

[26] When evaluating these cases, one must keep in mind that effects of a certain supplement may be heterogeneous among a certain population due to individual variability (van der Voet et al., 2008). Factors that may play a role are: differing diets, the use of potential medication which may interact with the supplement, genetics, lifestyle factors such as smoking, and developmental stages such as infancy, or pregnancy.

true athlete practices sport passionately, in a fair play manner, and prefers to lose rather than win by unlawful means (BBC, 2014). In order to ensure fair play and a level playing field among athletes, the World Anti-Doping Agency (WADA) was created in a time in which the sporting community was drifting away from its core values[27]. WADA seeks to "*fight doping by promoting the spirit of sport*", and has established a World Anti-Doping Code that sets "*specific anti-doping rules and principles that are to be followed by organisations responsible for adopting, implementing or enforcing rules within their authority*" (WADA, 2009). Article 2.1.1 of this Code stipulates that "*it is <u>each athlete's personal duty</u> to ensure that no prohibited substance enters his or her body. Athletes are <u>responsible</u> for any prohibited substance or its metabolites or markers found to be present in their samples. Accordingly, <u>it is not necessary that intent, negligence or knowing use on the athlete's part be demonstrated</u> in order to establish an anti-doping violation*". In order to know which substances are prohibited internationally, the athlete may consult the prohibited list of substances published on WADA's website, which is updated at least once per year (WADA, 2014). The substances included in this list have been prohibited for one of two reasons: either because they represent a threat to human health, or because they confer unfair advantages to those that use it. In any case, if an athlete tests positive to any of the substances included in this list, s/he will be held accountable even if s/he was truly not aware of having ingested said substance. As Maughan (2004) underlines, it is the principle of *strict liability* that applies in this case.

There is a wealth of literature studying the issue of contamination in sports nutrition products, of which the key points are given in the following paragraph. In the literature review conducted by Petroczi, Taylor, and Naughton (2011) it appears that up to ¼ of supplements is contaminated. Most often than not, these compounds are prohibited by doping regulations of the WADA. Contamination of sports supplements may occur with stimulants such as caffeine and ephedrine, but is detected most commonly with anabolic androgenic steroids (AAS) (Maughan, 2005), compounds such as testosterone and nandrolone which have virilising and androgenic properties like promoting muscle growth. Intake of AAS may have several adverse consequences depending on the dosage; the most common being atherosclerosis, hypertension, blood clotting, hepatic cancer, as well as psychiatric and behavioural disorders (Maravelias et al., 2005).

The Cologne laboratory studies carried out in 2000 researched the extent to which contamination with steroids occurred in sports supplements. Supplements analysed in this study were legitimate supplements which did not display AAS on their ingredient list, nor were they expected to contain these compounds (Maughan, King, and Lea, 2004). No warning label stating that the athlete should be cautious when making use of the product were included on the package. Researchers tested 634 product samples which had been bought in shops, online, or by telephone order from more than 200 suppliers located in 13 different countries, i.e. the United States, Norway, Switzerland, and eleven European Member States (Schänzer,

[27] The 1998 tour de France acted as a wake-up call given that the police identified several prohibited medical substances used in order to enhance physical performance. This event thus highlighted the need for an independent international body which would set harmonised standards for provisions against doping. As a result, the WADA was established in 1999.

2000). Of the 634 supplements, at least 94 (about 15%) contained prohibited substances, with another 66 samples (10%) for which the analysis outcome was not conclusive due to matrix effects[28], meaning that the products might have contained steroids. Therefore, the risk of consuming a contaminated supplement may be as high as 25% (Schänzer, 2000).

To conclude, in addition to safety concerns, supplement contamination with AAS puts the athlete at risk of a positive result following a doping test. Given that the risk of supplement contamination may be as high as 1 in 4, there is a relatively high chance that the athlete will be found guilty of doping. Such a positive result might put on hold or even end a potentially promising athletic career (Maughan, 2005).. To prevent this from happening, some Member States have put in place lists of supplements marketed by companies who carry out extensive quality control analysis for anabolic androgenic steroids (AAS) and stimulants, e.g. the Netherlands (www.dopingautoriteit.nl/ nzvt) and Germany (www.colognelist.com) (Jeukendrup and Wolfart, 2009). In any case, it ensues that use of sport supplements should be carefully weighed given what is at stake

iii. Cases of food fraud

In most instances, contamination occurs from poor manufacturing practice (Maughan, 2005). However, there are instances in which supplement contamination has stemmed from a deliberate adulteration of these products. Researchers presume this was the case for supplements which contained high amounts of the AAS methanedieneone (Geyer et al., 2002), commonly called dianebol, an anabolic steroid known for its potential severe side-effect (Maughan, 2005). The supplements that were analysed by Geyer and his colleagues, working in a laboratory in Cologne, had been manufactured in the United States but were distributed in Europe via the United Kingdom, as well as purchasable online. Zealous users who would follow the dosage instructions could consume up to 43 mg of methanedieneone daily, an amount which greatly exceeds the maximal recommended intake for this compound (5-10 mg/day). With such a ration of methanedieneone per day, consumers might have been satisfied with the effect on muscle mass that the supplement brought, but probably also developed serious side effects such as a higher cardiovascular risk, conditions of the liver, dependence, and psychological changes. This study highlighted once more the need for production monitoring and enforcement.

b. Safety of sports gels

Another category of sports nutrition products that is at risk of misuse by athletes is that of sports gels. The danger with consuming sports gels is that they might lead to gastric distress. Indeed, the high carbohydrate content contained therein is slowly absorbed by the body and requires simultaneous ingestion of water in order to be digested adequately. Therefore, to prevent gastrointestinal issues, consumers ought to make sure that they drink enough water to absorb the carbohydrates fully. That the athlete should drink enough water is clearly stated on the back of pack of pack of sports gels, albeit in a small font. Apart from issues related to

[28] A matrix refers to a compound within a sample, which is different from the component of interest. The matrix may influence how an analysis is conducted and, therefore, the accuracy of the outcome of this analysis.

gastrointestinal distress due to the carbohydrate content as well as potential side-effects due to the high amount of caffeine that might be contained in sports gels, safety does not seem to be compromised by the use of sports gels.

c. Safety of beverages targeting sportspeople

In addition to sports supplements and sports gels being in the public eye for safety considerations, it appears that also the use of energy drinks may give rise to public health and safety concerns. Energy drinks are advertised as beverages which provide energy, and enhance endurance and performance. They typically contain caffeine, sugars or sweeteners, and other substances such as taurine and glucuronolactone (Seifert et al., 2011). In contrast to sports foods, for which there is scientific evidence that they are beneficial for the athlete under certain circumstances, there is no scientific consensus per se regarding the rationale for use of energy drinks (Higgins, Tuttle, and Higgins, 2010).

i. Unsafe use by consumers

The scope of a recent study conducted by the Bundesinstitut für Risikobewertung (BfR), the federal institute for risk assessment in Germany, was the use of energy drinks as well as energy shots. The BfR argues that although scientific evidence is inconclusive regarding side-effects in cases in which these products are taken in the recommended quantities (one bottle/can per day), the same may not be true in case of intake of larger doses and unwanted side-effects might subsequently arise. Importantly, data confirms that conditions of use may not be followed by consumers, leading to excess consumption of energy-drinks and/or energy shots (Reissig, Strain, and Griffiths, 2010; BfR, 2013).

Already in 2008, the BfR had found that adverse side-effects could ensue particularly when consuming energy drinks together with alcoholic drinks, or in combination with strenuous physical activity. These unwanted negative health consequences include cardiovascular conditions such as cardiac dysrhythmia, as well as kidney failures and even death (Seifert et al., 2011; BfR, 2013). Men aged 20 to 25 appear to be the population group that drinks the highest amount of energy drinks, putting them at particular risk of developing conditions related to the cardiovascular system due to the high caffeine content (BfR, 2013). In 2013, the BfR completed this preliminary information by collecting consumption data of energy drinks. To this end, more than 500 participants were interviewed. Respondents were recruited at sports events, clubs, music festivals, as well as LAN/gaming parties (which may last more 24 to 48 hours), and could take part in the study only if they had already drunk half a litre or more of energy drinks. Results illustrated that, on average, one litre of energy drink per participant was consumed together with alcohol at parties. During LAN parties, consumption of energy drinks, together with consumption of alcohol, may reach five litres within 24 hours. Other studies confirm that the trend of consuming energy drinks together with alcohol is increasing among adolescents and young adults (Reissig, Strain, and Griffiths, 2009; Seifert et al., 2011; Higgins, Tuttle, and Higgins, 2010). In addition to the short- and long-term health effects that energy drinks and/or alcohol may have, the danger associated with consuming these two beverages simultaneously is that symptoms of alcohol intoxication are reduced (Reissig, Strain, and Griffiths, 2009; Higgins, Tuttle, and Higgins, 2010), which may increase

the risk of incurring into alcohol-related injury, such as taking advantage of someone, being taken advantage of, and getting injured (Reissig, Strain, and Griffiths, 2009). In addition, Higgins, Tuttle, and Higgins (2010) highlight that energy drinks, particularly if taken in combination with alcohol, may lead to cases of extreme dehydration.

ii. Safety concerns due to beverages' composition

In addition to the unsafe use that consumers might make of energy drinks, there are two inherent characteristics of energy drinks that are thought to be problematic particularly for the active population. The first is that the high carbohydrate content of these products may slow down the rate of fluid absorption into the bloodstream and consequently yield to symptoms of gastro-intestinal distress (Jeukendrup and Wolfarth, 2009; Higgins, Tuttle, and Higgins, 2010). The second is related to the caffeine content of energy drinks[29]. Depending on the brand, energy drinks may contain 50 to 505 mg caffeine per can or bottle (Reissig, Strain, and Griffiths, 2009; Higgins, Tuttle, and Higgins, 2010). As a comparison, caffeinated soft drinks contain between 50 and 100 mg of caffeine per serving, while a serving of brewed coffee may contain between 40 and 150 mg per serving. As such, caffeine content may be about five times higher in one energy shot compared to a serving of Coca-Cola (Seifert et al., 2011). In addition, other ingredients such as guarana also contain caffeine which is not included in the label, thus increasing the total effective caffeine content. These elevated quantities of caffeine may lead to several worrisome symptoms related to one or more of the following physiological conditions: caffeine toxicity, dependence, and/or withdrawal. Caffeine intoxication is manifested by certain symptoms that derive directly from the consumption of caffeine; these include: insomnia, gastro-intestinal distress, tachycardia, and, albeit rarely, death (Reissig, Strain, and Griffiths, 2010). Also, caffeine is recognized as a substance which may create dependence by the World Health Organisation (WHO), which included dependence syndrome as a result of caffeine intake in its 2010 International Classification of Diseases. Finally, caffeine has been associated with withdrawal symptoms such as headache, irritability, difficulty concentrating, and muscle aches, which may start appearing 12 to 24 hours following the last caffeine dose (Reissig, Strain, and Griffiths, 2010).

iii. Sports drinks and dental erosion?

Coombes (2005) addresses the issue of sports drinks potentially causing dental erosion in athletes. He argues that sports drinks are acidic drinks that thus have the potential to cause dental erosion. However, findings on the matter are contradictory, and the author thus concluded that it would be simplistic to identify solely one food component as a causative factor for dental erosion. Nonetheless, Coombes (2005) advises that athletes should be educated regarding the possible effect of sports drinks on dental erosion and that simple actions to prevent this from happening should be taken, e.g.: reduce the time that the sports drinks remains in the mouth.

[29] An overview of the benefits and side-effects of caffeine will be given in chapter V section I(d).

d. Rationale and scientific evidence for ingredients used in sports nutrition products

This section will briefly review the scientific evidence for some of the food components most commonly present in sports nutrition products. Indeed, although the use of sports nutrition products is widespread among athletes, the effectiveness of some of these products, or ingredients used in these products, is questioned by experts in the field (e.g. Maughan, King, and Lea, 2004; FIFA 2010). Caffeine and creatine will be addressed first given that there is an overall consensus regarding their beneficial effects in a sport-specific context (e.g. SCF, 2001; Tarnopolosky, 2010). Then follows a review of other ingredients which are widely employed in sports nutrition products and for which the scientific evidence regarding beneficial effects is unclear.

What distinguishes creatine and caffeine from other compounds used in sports nutrition products is that (1) they are naturally present in certain food sources, (2) they seem to both be effective ergogenic aids and improve performance, and (3) they are currently both permitted ingredients in sports nutrition products.

i. Creatine

Creatine is a compound that is naturally found in the body given that it is synthesized in the liver and the kidneys from amino acids, i.e. glycine, methionine, and arginine (Burke, 2003; Tarnopolosky, 2010), and is primarily stored in skeletal muscle cells (Burke, 2003). In addition, creatine is present in fish and meat; there are about 1.5 to 2.5 grams of creatine in a serving of lean beef (Tarnopolosky, 2010). The precise physiological mechanism through which creatine is thought to contribute to enhanced physical performance is not clear. Experts believe that it is linked to the fact that creatine phosphate stimulates swift regeneration of adenosine triphosphate (ATP) in the cell, ATP being the body's main chemical energy source. The amount of creatine present in cells is however limited, and creatine supplementation is thought to increase the amount of available creatine in muscle cells (Burke, 2003; Maughan, King, and Lea, 2004; Tarnopolosky, 2010).

Beneficial effects of creatine on performance have been reported by several studies (Burke, 2003; Tarnopolosky, 2010; EFSA, 2011b). These beneficial effects seem to however be solely associated with physical performance during high intensity, short-term, repetitive sprinting activity with brief recovery periods, rather than endurance capacity or endurance performance. The advised dose to reach these effects, also called creatine-loading, is 5 grams of creatine four times per day or 3 grams per day for 30 days (Tarnopolosky, 2010). Studies show that improvements in high intensity cycling activities was about 1-2% following creatine supplementation (Kreider, 2003). Although 1-2% improvement in performance seems to be rather meagre, it is important to stress that, at Olympic sprinting events, the difference between the first and eighth finalist may be of only a fraction of a percentage (Tarnopolosky, 2010).

Uncertainties regarding the safety of creatine is a topic that has been discussed time and again in the context of sport nutrition. Several publications highlight the side-effects of creatine

supplementation. For instance, in a scientific article published in the Lancet in 1998, Pritchard and Kalra conclude that there is "*strong circumstantial evidence that creatine was responsible for the deterioration in renal function*" (Pritchard and Kalra, 1998). Another example is the report issued by the "Agence Française de Sécurité Sanitaire et Alimentaire"[30] (AFSSA) stating that creatine supplementation constituted a carcinogenic health risk, particularly on the long-term, for the consumer (AFFSA, 2001).

However, these negative conclusions regarding the effects of creatine have been critically evaluated by several researchers who do not necessarily support the fact that creatine supplementation is detrimental to health. Importantly, the European Food Safety Authority (EFSA) vouches for the safety of creatine supplementation, by stating that "*the safety and bioavailability of creatine (…) is not a matter of concern provided there is adequate control of purity of this source of creatine*" (EFSA, 2004). In addition, Kim et al. (2010) conclude that "*there are no real incidents of muscle cramps, gastrointestinal discomfort, muscle fibre rupture, liver and kidney impairment after regular supplementation with creatine*", specifying that the few kidney episodes are of anecdotal nature. Indeed, Tarnopolosky (2010) adds that episodes of renal failure following creatine supplementation have been recorded in patients who either had pre-existing renal failure, or in patients who were taking other compounds, such as the drug cyclosporine, which is a recognized nephrotoxic agent.

As such, one might conclude that engaging in creatine supplementation is generally safe if daily dosage and conditions of use are respected. This is of importance given that 5% of creatine consumers experience gastrointestinal disturbances following use of this compound. However, these disturbances seem to be mostly associated with not dissolving creatine properly and/or taking this substance on an empty stomach (Tarnopolosky, 2010).

As further discussed under chapter V section II(e)(i), the following health claim regarding creatine is included in the EU Register of Claims: "*creatine increases physical performance in successive bursts of short-term, high intensity exercise*".

ii. Caffeine

Caffeine seems to influence physical performance through its role on the central nervous system, the adipose tissue, and the skeletal muscle (Burke, 2003; Maughan, King, and Lea, 2004) as it is an antagonist of the adenosine receptor (Tarnopolosky, 2010). The physiological mechanism is, in short, as follows: adenosine is produced in order to slow down nerve cell activity, for example in view of going to sleep. By binding to the same receptors, caffeine inhibits the slowing action of adenosine, thus leading to increased nerve cell activity.

Caffeine was included in the list of banned substances established by the WADA until 2004. However, this ban was lifted, possibly because caffeine can be freely found in foods such as coffee, tea, and chocolate, and because low doses of caffeine, which could be obtained by consuming these foods, have an ergogenic effect.

[30] Literal translation of "Agence Française de Sécurité Sanitaire et Alimentaire": French Agency for Health and Food Safety.

Caffeine is undoubtedly a drug which can cause side-effects such as headache, gastrointestinal distress, insomnia, and stimulation of diuresis (Maughan, King, and Lea, 2004). The non-habitual consumer may also experience other dose-dependent effects, e.g. tremor, increased blood pressure, and tachycardia (Tarnopolosky, 2010). These effects seem be dependant on consumer individual susceptibility to caffeine. Caffeine has also been said to induce cardiovascular disease as well as certain types of cancer. However, studies suggest that "*the currently available evidence on coffee and risk of cardiovascular diseases and cancer is largely reassuring"* (van Dam, 2008).

Experimental studies have shown that even a low dose of caffeine, e.g. 1 to 2 milligrams per kilogram[31], can have a positive effect on performance. Specifically, caffeine seems to be efficient in improving endurance capacity and performance rather than high-intensity exercise (Tarnopolosky, 2010). As such, experts advise that there is a valid rationale for taking caffeine supplementation, but that prior to doing so, athletes should monitor whether they are subject to potential side-effects caused by this compound.

iii. L-carnitine

L-carnitine is a non-essential nutrient which can be manufactured from amino acid precursors in the kidney and the liver, but is also found in the normal diet, particularly when consuming animal foods (Burke, 2003). L-carnitine is a component of certain enzymes involved in the transportation of fatty acids to the mitochondria, the organelle in which they are oxidized. It is for this reason that L-carnitine supplementation is thought to increase fatty acid oxidation, which would be beneficial for endurance athletes, as it could potentially reduce the use of limited glycogen stores (Burke, 2003; Maughan, King, and Lea, 2004). Indeed, some studies report that additional L-carnitine intake increases fatty acid's contribution to oxidative metabolism (Maughan, King, and Lea, 2004). However, other studies show that L-carnitine supplementation only increases levels of plasma carnitine without affecting levels of muscle carnitine. This means that additional intake of L-carnitine is unlikely to result in enhanced physical activity. In addition, it does not seem that athletes are subject to L-carnitine deficiencies (Maughan, King, and Lea, 2004). As such, the scientific rationale supporting L-carnitine supplementation seems to be rather meagre.

iv. β-Hydroxy-β-methylbutyrate (HMB) and other branched-chain amino-acids (BCAAs)

All branched-chain amino acids (BCAAs) belong to the category of essential amino acids, meaning that they are not synthesized in the body and must thus be retrieved from the diet. They play an important role in protein metabolism and protein turnover, with BCAA oxidation occurring during exercise (Burke, 2003). Specifically, the BCAAs valine, isoleucine, and leucine compose more than a third of all muscle protein (Wilson, Wilson, and Manninen, 2008).

[31] To put this value into context, one may consider that a serving size of coffee contains between 50 and 175 milligrams of caffeine.

Sports nutrition products containing BCAA claim to facilitate recovery following exercise, while intake of BCAA during exercise seems to decrease the effects of central nervous system fatigue (Burke, 2003). However, scientific evidence supporting these claimed effects is contradictory. As such, the following paragraph will briefly review the literature regarding the most popular BCAA in the realm of sports nutrition: β-Hydroxy-β-methylbutyrate or HMB.

HMB is a metabolite of the amino acid leucine (Burke, 2003; Maughan, King, and Lea, 2004), which can be consumed in both animal and plant foods, e.g. catfish and grapefruit (Wilson, Wilson, and Manninen, 2008). In addition to playing a role in protein metabolism, leucine also plays an important role in glucose homeostasis and recovery from exercise (Wilson, Wilson, and Manninen, 2008). As such, HMB is used by bodybuilders and athletes as an ergogenic aid which promotes physical performance and muscle mass. However, while some studies have confirmed the ergogenic effects of HMB, others have denied them. These conflicting results may be due to inadequate sample sizes, individual variability, as well as methodological issues such as experiments of short duration (Wilson, Wilson and Manninen, 2008). Maughan, King, and Lea (2004) state that there may be a rationale for use of HMB for athletes beginning a resistance training programme. Indeed, some studies reveal that HMB supplementation seems to increase strength by 1.40% per week and lean body mass by about 0.3% per week when compared to resistance training without HMB supplementation (Nissen and Sharp, 2003). In contrast, other studies suggest that HMB does not have an effect on muscular strength, body composition (i.e. no effect on lean body mass), or performance in anaerobic exercise (Ransone et al., 2003).

Wilson, Wilson, and Manninen (2008) have carried out a review of the literature with regards to the effects of HMB. Of the 27 studies reviewed by the authors, 7 did not find any beneficial effect in the supplementation of HMB, while the majority acknowledged HMB as an effective ergogenic aid. While the authors state that more research is needed in order to determine the appropriate frequency and dose of HMB supplementation, they also conclude that current scientific evidence suggests optimal HMB intake to be 3 grams per day, taken at 3 different times. Maughan, King, and Lea (2004) conclude that the cost of HMB supplementation associated with the fact that beneficial results seem to be limited, if any, "*suggest that [HMB] may not have much to offer the athlete*" (Maughan, King, and Lea, 2004). Therefore, it appears that there is not yet a scientific consensus with regards to the effectiveness of HMB as an enhancer during physical activity. As such, the popularity of sports nutrition products containing HMB may be questionable.

e. Concluding remarks regarding the safety of sports nutrition products

It appears that sports nutrition products offer a convenient and less time-consuming alternative to foods for normal consumption, particularly in the context of carrying out physical activity. Scientific evidence has also shown that some of these products have proven ergogenic effects, e.g. creatine supplements, carbohydrate-electrolyte drinks. However, these products are not per se necessary, and athletes should firstly ensure that they are consuming an adequate diet.

When investigating the rationale for use and the safety of sports nutrition products, the focus lied primarily with sports supplements, sports gels, and beverages targeting sportspeople. In this context, it is paramount to acknowledge that although certain ingredients used in sports nutrition products are relatively safe and have proven ergogenic effects, other substances may be included in such products although there is a lack of harmonized support towards the beneficial effect of such ingredients. Subsequently, Maughan, Greenhaff, and Hespel (2011) argue that athletes should carry out a careful cost-benefit analysis prior to using food supplements in general and sports supplements in particular. On the one hand there are the beneficial effects that ensue from sports supplement use. On the other hand lie the risks and the costs. Indeed, sports supplements are an expensive practice compared to the cost of engaging in a truly balanced and varied diet. Importantly, the beneficial effects of sports supplements may not be perceived in practice, or only by certain people who may be more sensitive to a certain substance or simply engage in a physical activity for which said substance is most of use. Both the IAAF and the IOC share the cautious approach when it comes to supplement use by respectively stating that "*supplements do not compensate for poor food choices*" and that "*supplement use in young athletes should be discouraged, and the focus should be on consuming a nutrient-rich, well-chosen diet*" (International Association of Athletics Federation, 2007; International Olympic Committee, 2010). International sporting associations such as FIFA highlight that, in addition to the potentially harmful effects that supplements may have, these products may result in an unwanted positive doping test which may jeopardize the career of an athlete (FIFA, 2010).

With regards to the consumption of energy drinks, Higgins, Tuttle, and Higgins (2010) make certain recommendations which differ per type of consumers. Non-athletes are advised to limit their consumption of energy drinks to one serving daily, and to not drink energy drinks in combination with alcohol. Athletes are advised to avoid consuming energy drinks all together. Generally, consumers who suffer from underlying medical conditions, ranging from hypertension to serious cardiovascular disorders, are advised not to make use of such products (Higgins, Tuttle, and Higgins, 2010).

II. Borderline sports nutrition products and consumer informed choice

The rapid evolution of the market of functional foods, and particularly sports nutrition products, may have led to the fact that certain foodstuffs may resemble each other either due to their intended purpose or to their nutritional composition or both. As such, this chapter will review borderline products that may be misleading and potentially confusing for consumers, and thus may represent a regulatory challenge.

a. Borderline between sports nutrition products and foods intended for normal consumption

One important difference between sports nutrition products and foods for normal consumption should be, in addition to the compositional differences, that the consumption of sports nutrition products is convenient. Indeed, the nutritional requirements of sportspeople may be obtained from a balanced and varied diet, but sports nutrition products provide a fast solution to elevated energy requirements.

As displayed in chapter III section I(d), some sports foods now increasingly resemble mainstream foods, also called foods for normal consumption. Cake, pancake mixes, and pasta intended for sportspeople are now available on the market. Although these sports nutrition products may still be different in their composition compared to foods for normal consumption, the aspect of their convenience appears to be undermined given the time needed in order to consume them. This may suggest that these types of sports nutrition products may not exclusively be intended for sportspeople.

When asked about his views on the launch of the ready-to-eat pasta dish manufactured by French producer Fleury michon, the innovation insights director for Datamonitor Consumers, Tom Vierhile, declared that, in contrast to regular sports nutrition products who are mostly niche-oriented, "*this French product seems to be geared more toward the masses, and less toward hardcore athletes, and that positioning may be just what is needed to help energize sales of refrigerated ready meal products*" (Datamonitor Consumer, 2013).

However, this trend of sports nutrition products being increasingly sold to the general population may be questionable given that the high protein or high energy content in these foods may not be suitable for the diet of people that do not engage in as much physical activity as sportspeople do.

Furthermore, in this context it is interesting to determine to what extent products that are clearly intended for sports purposes may be compared to regular products from a nutritional point of view as well as from an economic standpoint, e.g. whether sports bars, which are clearly presented as foods intended for sportspeople have nutritional properties comparable to regular bars, and if so, whether they are worth it from an economic point of view.

i. Nutritional content comparison between regular products and sports nutrition products

As stated multiple times during this study, the consumer base for sports nutrition products is growing, and increasingly encompasses consumers who do not necessarily engage in physical activity, but who turn to sports nutrition products when searching for healthy alternative to other foodstuffs.

<u>High protein/reload chocolate sports bars versus regular chocolate bars</u>

The following analysis compares two types of chocolate bars, i.e. sports bars and regular candy bars. In order for the comparison to be more balanced, the content of two types of sports bars has been analysed, the first being high in protein, the second intended for recovery after exercise (reload), thus with a higher carbohydrate content compared to the first.

Values	**Composition (per 100g)**			
	Chocolate "high protein" sports bars [32]	Chocolate "reload" sports bar [33]	Mars bar	Milky way bar

[32] Specifically, nutritional content comparison was carried out with the following products: easy body high protein nutrition bar, Weider high protein chocolate flavour

Energy (kcal)	318-388	377	446-448	555
Proteins (g)	29.3-40	25	3.7-4.1	6.2
Carbohydrates (g) Of which sugars Of which polyols	20-37 2.4 17	49.5 33	68 59	54.1 53.3
Fats (g) Of which saturates	8.7-12.3 4.6	9 4.4	16.6-17.4 9.3-9.8	34.9 21.2
Fibre (g)	13	4.1	1.2	1.8
Sodium (g)	0.27	0.19	0.17	0.08
Salt (g)			0.43	
Vitamins and minerals (mg)		Calcium: 500 Magnesium: 160 Vit E: 6.2 Vit C: 37 Vit B1: 0.7 Vit B2: 0.76 Vit PP: 15 Vit B6: 1.4	0	

It appears that, for the same quantity consumed, the energy content is significantly higher in regular chocolate bars. The carbohydrate and fat content may be two times higher in regular chocolate bars when compared to sports bars. Protein and fibre content were significantly higher in sport bars, with protein content being 5-8 times higher and fibre content being at least four times more elevated. Finally, vitamins and minerals were only indicated in the case of sport bars, suggesting that regular chocolate bars do not contain micronutrients.
Therefore, from a health-conscious perspective there is a clear rationale for consuming high protein or reload chocolate sports bars instead of regular chocolate bars given the higher protein content and the lower carbohydrate and fat content of the former compared to the latter.

Cereal sports bars versus a special K cereal bar

Cereal sports bars are usually intended for high energy supply. A nutritional content comparison was carried out between fruit-cereal sports bars and the special K berry cereal bar, a well-known product, popularly viewed as healthy [34].

Values	**Composition (per 100g)**	
	Cereal sports bars [35]	Special K red berry cereal bar
Energy (kcal)	364-388	389
Proteins (g)	4.5-10.9	4.5
Carbohydrates (g) Of which sugars	66.8-74.3 27.6-33	81 36

[33] Specifically, nutritional content comparison was carried out with the following product: Isostar chocolate reload bar
[34] Chocolate cereal bars were not taken into consideration as they might bias the comparison given the higher energy content of chocolate compared to fruit.
[35] Specifically, nutritional content comparison was carried out with the following products: Weider body shaper L-carnitine Crispy deluxe, pineapple yoghurt flavour; aptonia (Decathlon) cereal bar red berries; Isostar high energy sport bar muesli flavour (with fruit); Power Bar natural long lasting energy strawberry and cranberry

Of which starch		43
Fats (g) Of which saturates	4.9-7.5 2.2-3	5 3
Fibre (g)	3.6-4.8	2.5
Sodium (g)	0.01-0.16	0.23
Salt (g)	0.48	0.58
Vitamins and minerals (mg)	Vit B1: 1.05 Vit E: 7 Vit C: 60 Vit B1: 0.84 Vit B2: 0.9 Vit B6: 1.2 Vit PP: 12.8	Iron: 5.2 Vit B1: 0.8 Vit B2: 1.1 Vit B3: 12 Vit B6: 1.1 Folic acid (Vit BP): 0.15 Vit B12: 0.0019

In contrast to the previous comparison, the nutritional content of these two types of products is less divergent. Indeed, the energy and the fat content are similar and the carbohydrate content is slightly lower in cereal sports bars compared to the special K cereal bar. However, the fibre content is about 1.5 higher in cereal sports bars. As such, although less striking compared to the previous example, there may still be a rationale for consuming cereal sports bars as an alternative to comparable mainstream foodstuffs.

Light sports drink versus light non-sports specific beverages

The nutritional content of two light beverages, the first specifically intended for sportspeople and the second intended for the general population, were compared. Specifically, one could consider that the appeal of a low calorie sports drink is that it hydrates, replenishes the body with vitamins and minerals, and has little energetic value. Thus, it is interesting to compare such a beverage with a popular low calorie alternative that is not specifically intended for sports purposes, namely Fanta zero manufactured by the Coca-Cola Company.

Values	**Composition (per 100mL)**	
	Lucozade Sport Lite orange	Fanta zero
Energy (kcal)	10	3.5
Proteins (g)	0	0
Carbohydrates (g) Of which sugars	2 1	0.7
Fats (g) Of which saturates	0	0
Fibre (g)	0	0
Sodium (g)	trace	Trace
Vitamins and minerals (mg)	Calcium: 37 Vit B12: 0.09 µg Vit B3: 0.54 Vit B6: 0.05 Vit B5: 0.2	Potassium: 6

From this nutritional content comparison, it appears that there are significantly more vitamins and minerals in the beverage specifically intended for sportspeople. Also, although the values are only minimally divergent, the energy and carbohydrate content are higher in the sports

beverage rather than the non-sports alternative. Therefore, from a sheer weight management perspective, the non-sports beverage would probably be somewhat preferable given its slightly lower energy contribution, but from a health perspective, the preferred alternative would indeed be the sports beverage given its micronutrient content.

Regular sports drinks versus functional water

Two regular (i.e.: non light or energy reduced) products were compared: sports drinks and functional water [36].

Values	**Composition (per 100mL)**	
	Sports drinks [37]	Glaceau vitaminwater orange
Energy (kcal)	19.4-62	23
Proteins (g)	0	0
Carbohydrates (g) Of which sugars	4.4-15.2 4.4-12.4	5.4 5.4
Fats (g)	0	0
Fibre (g)	0	0
Sodium (g)	0-8	1 mg
Vitamins and minerals (mg)	Potassium: 2.3 Calcium: 0.8-24 Vit B3: 0.96 Vit E: 0.72-1.8 Vit B5: 0.36 Vit B6: 0.084-0.21 Vit H: 3 µg Vit B7: 7.5 µg Vit B12: 0.375 µg Magnesium: 11.3 mg	Calcium: 18 Vit B12: 0.08 µg Vit C: 6.7 Vit E: 0.4 Vit B3: 0.4 Vit B5: 0.2 Vit B6: 0.07 Vit A: 33 µg Vit B9: 8.3 µg

It appears that the nutritional composition of these two types of products is fairly similar, with the energy, carbohydrate, and sodium content not differing significantly. Proteins, fats, and fibres were absent from both products. However, there are some differences with regards to the vitamin and mineral content between the two beverages. Although the functional water contained more vitamins and minerals (9) compared to the sports drinks (7 and 3), the quantities of these vitamins and minerals were significantly higher in the sports drinks.

ii. Price comparison between regular and sports nutrition products

Sports nutrition products are often considered to be more costly compared to foods for normal consumption (Molinero and Marquez, 2009). Therefore, experts warn athletes to carefully

[36] Both are orange-flavoured beverages in order to avoid any potential bias in the product content due to the flavour of the product

[37] Specifically, nutritional content comparison was carried out with the following products: Aquarius orange; Adelholzener orange sport; Lucozade energy melonade.

weigh the benefits (i.e. enhanced performance) and the drawbacks (i.e. costs and potential health effects or doping) prior to consuming sports nutrition products (Maughan, Greenhaff, and Hespel, 2011).

The price of several sports nutrition products was compared to the price of the most similar option available within the realm of mainstream foods. For instance, a sports chocolate cereal bar was compared to a special K chocolate cereal bar which is considered as a healthy alternative by consumers. The outcome of this exercise, is that it appears that sports foods are generally more expensive than mainstream foods for normal consumption, as can be seen in the table below.

Price of a regular product and a comparable sport food (in €, per unit)				**Cost difference***
Regular product		**Sports nutrition product**		
Special K chocolate cereal bar	0.50	Aptonia chocolate cereal bar	1.10	+120%
Fanta	1.02	Aquarius/Gatorade	1.79 / 2.00	+75% / +96%
Red bull energy drink	2.64	QNT Carboload - energy intense	2.00	- 32%
Herta pâte gateau au chocolat (550g)	4.79	Overstim gatosport (400g)	9.95	+107%
Imperial pudding au chocolat (300g)	1.99	Overstim sportdej (mix for hot chocolate/ pudding) (700g)	21.95	+1003%

** For the sake of convenience, these prices reflect the situation on the Belgian market.*

b. Borderline between sports nutrition products and foods intended for weight loss

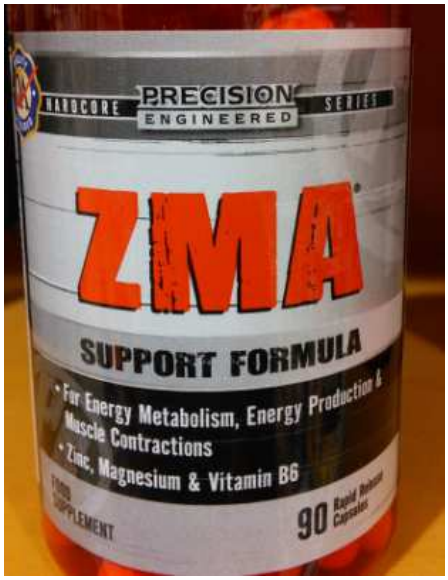
The line between products that assist sportspeople in their daily physical activity and products that help obese or overweight people in their quest for fitness seems to be increasingly blurred. Indeed, these two objectives – maintenance of current healthy weight while exercising and weight loss – seem to have become one in some stores. The picture below was taken in a Dutch store which displayed sports foods ("*sport*") and weight loss products ("*slank*" meaning slim) next to each other; practice that seems to be very diffused in European stores.

Products that are both hypocaloric and hyperproteic seem to be increasingly available on the European market. These products may be soups, cake mixes, crèpes mixes, or powdered energy drinks. Although these products are marketed by companies manufacturing sports nutrition products, their presentation and advertisement closely resembles that of products intended for weight loss. As such, brands that were initially solely devoted to sports nutrition now seem to start producing sub-brands which target exclusively weight management, e.g. the sports nutrition company QNT manufacturs the brand "*easy body"* which is intended to "*lose weight anytime*" (QNT, 2010).

Therefore, it currently appears to be difficult to distinguish between products that are intended for weight loss, and sports nutrition products. An additional difficulty in this respect may be that there are certain sports, such as rowing, which require athletes to have low body fat ratios.

c. Borderline between sports food supplements and regular food supplements

In order to illustrate the fact that it may be problematic to distinguish between sport supplements and regular food supplements, it is perhaps best to give an example of a supplement that is marketed as a "*premium sports nutrition supplement*", the sports supplement ZMA in the picture below.



ZMA sport supplement manufactured by precision engineered

ZMA is a sport food supplement which is composed of zinc, magnesium, and vitamin B6. It is used as a recovery aid, and claims to sustain "*energy metabolism, energy production and muscle contractions*". The characteristics that differentiate this product from regular food supplements are however not clear. Indeed, the European market offers magnesium, zinc, and vitamin B6 sold as three separate food supplements, or combinations of these food supplements such as magnesium together with vitamin B6, or magnesium together with zinc. As such, the ZMA supplement does not seem to be necessarily sport specific per se.

d. Relationship between sports nutrition products and functional foods

Sports nutrition products are usually considered to be under the category of functional foods (Verschuren, 2002; European Commission, 2010), despite there being no unified, legal definition neither for Sports nutrition products nor for functional foods at Community level. The European Commission (2010) refers to the following working definition for functional foods as proposed by the EC Concerted Action on Functional Food Science in Europe (FUFOSE): "*a food that beneficially affects one or more target functions in the body beyond adequate nutritional effects in a way that is relevant to either an improved state of health and*

well-being and/or reduction of risk of disease. It is consumed as part of a normal food pattern. It is not a pill, a capsule or any form of dietary supplement". Therefore, given their composition and intended use, sports nutrition products may be considered as being functional foods, however, given that food supplements do not seem to be considered as functional foods, sports supplements would be excluded from the category of functional foods.

This terminology may be confusing, and mislead the consumer as to the type of product s/he is buying or intends to buy. Indeed, there may be uncertainty/overlap with regards to the belonging of certain categories of sports nutrition products. For instance, the following product is composed of complex carbohydrates, milk protein, wheat germ, and lecithine. The front of pack states that it is a functional food as well as a highly caloric food supplement, and the back of pack states that it is "*a highly caloric nutrient suitable for intense physical activity contributing to the increase in muscle mass and muscle recovery following muscular effort*". The issue that might raise concerns is that this product is labelled both as a food supplement and as a functional food.

Sports supplement and functional food marketed in the Netherlands

e. Guaranteeing consumers' informed decision-making process

As specified in chapter III section II, the two main pieces of legislation regulating the presentation of a product entering the European market are Regulation 1924/2006 on nutrition and health claims and Regulation 1169/2011 on the provision of food information to consumers. As previously stated, most of the provisions laid down by the latter Regulation enter into force in December 2014, with the exception of provisions related to the mandatory nutrition declaration which will enter into force in December 2016. It is thus not currently possible to evaluate whether Regulation 1169/2011 truly provides consumers with the information that they need, thus effectively ensuring their ability to make informed choices. In contrast, Regulation 1924/2006 entered into force in July 2007, meaning that it is currently

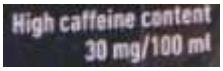
possible to evaluate whether FBOs are in compliance with the provisions laid down by this Regulation. In the context of determining whether specific regulatory provisions covering sports nutrition products at Community level would be preferable in order to inform consumers purchasing these products in an adequate manner, it is interesting to determine which claims are most often made on such foodstuffs as well as evaluate overall compliance with the nutrition and health claims Regulation, i.e. Regulation 1924/2006 which has been discussed in chapter IV section II(a).

i. Nutrition claims and their relevance in the context of sports nutrition

Article 2(4) of Regulation 1924/2006 defines nutrition claims as "*any claim which states, suggests or implies that a food has a particular beneficial nutritional properties due to: (a) the energy (…) it provides; provides at a reduced or increased rate; or does not provide; and/or (b)the nutrients or other substances it contains; contains in a reduced or increased proportions; or does not contain*".
Subsequent to the review of several products sold as sports nutrition products on the European market, the table below summarizes the nutrition claims that are most often made on sports nutrition products, together with their condition of use as outlined in Regulation 1924/2006.

Nutrition Claim	**Condition of use**
High in protein	if at least 20 % of the energy value of the food is provided by protein
Low carbohydrate/ Low sugar	if the product contains no more than 5g of sugars per 100g or 2.5g of sugars per 100 mL
Low fat	if the product contains no more than 3g of fat per 100g for solids or 1.5g of fat per 100 mL
Low lactose	- No requirements specified - Regulation 609/2013 specifies that "*labelling and compositional rules indicating the absence or reduced presence of lactose in food are currently not harmonised at Union level*".

Interestingly, European consumers are increasingly attracted by the claim "*high protein*", originally intended to promote sports foods. Specifically, 32% of consumers declare being influenced by such a claim when being given the choice between two products, one bearing this claim, the other not (Datamonitor, 2013a).
In addition, Directive 2002/67/EC on the labelling of foodstuffs containing quinine, and of foodstuffs containing caffeine is of relevance in the realm of sports nutrition given the abundant use of caffeine in these products. According to Article 2 of this Directive, beverages shall bear the statement "*high caffeine content*" in cases in which caffeine is present "*in a proportion in excess of 150mg/L*". Sports beverages bear this nutrition claim given the scientifically substantiated claimed effects that caffeine has on physical performance, e.g. the claim has been identified in products containing 30 mg of caffeine per 100 mL of product.



ii. Health claims and their relevance in the context of sports nutrition

Given its role as risk manager, the European Commission may not be the most appropriate player to assess whether a certain ingredient or food product is beneficial and safe for human consumption. Therefore, Regulation 178/2002 established EFSA which "*take[s] the role of an independent scientific point of reference in risk assessment and in so doing (…) assist[s] in ensuring the smooth functioning of the internal market*" (Recital 34). As such, the European Commission relies upon EFSA's expertise for an independent, scientific opinion with regards to statements highlighting the relationship between a specific beneficial health effect and a certain ingredient or, more rarely, a certain product. These statements are called health claims, defined by Article 2(5) of Regulation 1924/2006 as "*any claim that states, suggests or implies that a relationship exists between a food category, a food or one of its constituents and health"*. To this regard, it must be kept in mind that even if EFSA positively assesses a certain claim, the latter will not necessarily be authorised on the European market if the European Commission deems that there are unwanted political implications in doing so. If, however, the claim is authorised by both EFSA and the European Commission, it will be included in the EU Register of Claims [38].

It is interesting to review the scientific stance of the most employed substances in sports nutrition products and their related health effects. To this end, opinions issued by EFSA on food components present in sports nutrition products were evaluated with regards to health effects relevant directly or indirectly for the purposes of carrying out physical activity. Please refer to Annex III for the summary of the health relationships that have been established by EFSA with regards to food components used in the context of sports nutrition [39]. From Annex III it appears that a few health relationships have been found by EFSA between a sports food component and a beneficial physiological effect, i.e. for caffeine, carbohydrate-electrolyte solutions, creatine, and pectins. However, it is interesting to note that EFSA did not establish any cause and effect relationship between beneficial health effects and most of the ingredients used in sports nutrition products for which claims were submitted.

The following table summarizes the only health claims specifically tailored at food components included in sports nutrition products that appear in the EU Register of Claims and thus authorised on food packages marketed in Europe.

[38] The EU Register of Claims is a database which displays, inter alia, claims permitted on the European market together with their conditions of use, as well as claims that are not authorised on the European market together with the reason(s) for non-authorisation. It is accessible via the following website: http://ec.europa.eu/nuhclaims/.

[39] Nutrients researched in the EU Register of claims are the following: β-alanine, β-hydroxy β methylbutirate monohydrate (HMB), branched-chained amino acids (BCAA), caffeine, carbohydrate-electrolyte solutions, casein, creatine, conjugated linoleic acid (CLA), guarana, L-arginine, L-carnitine, L-glutamine, L-lysine, maltodextrin pectin, taurine, whey protein, and yerba mate

Food component/ product	Authorised claim in the EU Register of Claims	Conditions of use as specified in the EU Register of Claims
Creatine	- "Creatine increases physical performance in successive bursts of short-term, high intensity exercise"	- only if product provides 3 grams of creatine per day - consumers should be informed that beneficial effect obtained only with this dose
Carbohydrate-electrolyte solutions (CES)	- "Carbohydrate-electrolyte solutions contribute to the maintenance of endurance performance during prolonged endurance exercise" - "Carbohydrate-electrolyte solutions enhance the absorption of water during physical exercise"	- CES should contain 80-350 kcal/L from carbohydrates - at least 75% energy should be derived from carbohydrates which induce a high glycaemic response - CES should contain 20-50 mmol/L of sodium - Osmolality should be 200-330 mOsm/kg water
Pectins	- "Pectins contribute to the maintenance of normal blood cholesterol levels" - "Consumption of pectins with a meal contributes to the reduction of the blood glucose rise after that meal"	- claims may be used only for food which contains 10 g of pectins per quantified portion. - Consumer must be informed that beneficial effect obtained by consuming 10 g of pectins as part of the meal - Warning of choking to be given - Advice on taking with plenty of water to ensure substance reaches stomach

In addition, there are other food components, such as caffeine, glycamic carbohydrates, and glucose, which have received a positive opinion from EFSA regarding beneficial health relationships between one of these ingredients and physical activity, but that are not (yet?) included in the EU Register of Claims. These claims are specified in the table below.

Food component/ product	Claim positively assessed by EFSA
Caffeine	- "caffeine and enhancement of water absorption during exercise" - "caffeine and maintenance of endurance performance"
Glycamic carbohydrates	- "glycaemic carbohydrates and contribution to recovery of normal muscle function after strenuous exercise"
Glucose	- "glucose contributes to normal muscle function" - "glucose supports normal physical activity" - "glucose contributes to normal energy-yielding metabolism during exercise" - "glucose is metabolised within the body's normal energy metabolism" - "glucose contributes to normal energy-yielding metabolism"

iii. Claims that may potentially pose a threat to consumers' ability to make informed and fair choices

Some sports nutrition products were found to display claims or claim-like statements which may part from the strict interpretation of Regulation 1924/2006.

The nutrition claim "*high/rich in BCAA*", which appears on many sports nutrition products, may give rise to confusion given that although Regulation 1924/2006 addresses claims stating that a product is "*high in x*", it is exclusively in cases in which *x* refers to micronutrients, i.e. vitamins or minerals, BCAA being neither. In addition, EFSA assessed several claimed health effects of BCAA and did not establish a relationship between any of the claimed effects and BCAA (EFSA, 2010; Annex III). Finally, it is interesting to note that some food supplements claim that they are a "*natural source of BCAA*". The word "*natural*" in this context may lure consumers into buying such a product even though there is no scientific consensus regarding the beneficial effects of BCAA on performance, as outlined in earler in this chapter and as confirmed by EFSA's opinion (EFSA, 2010).

Moreover, although rarely, a few unregistered health claims were found on the package of some sports nutrition products, e.g. "*caffeine enhances performance and endurance*". These claims might have been allowed by EFSA, but have not been allowed for display on food products by the European Commission, and are not included in the EU Register of Claims.

Finally, statements explaining the purpose of a certain sports nutrition product may mislead consumers as well as give rise to unfair competition. Indeed, these statements may resemble health claims, but do not explicitly associate a food component with a beneficial effect. The following are some examples of these types of statements: (1) ZMA (a sport supplement, see section II(c) of the present chapter) for "*energy metabolism, energy production, and muscle contraction*"; (2) whey protein supplements "*with protein for muscle development after physical effort*" or for "*muscle building and recovery*"; (3) instant milk and egg protein supplement for "*rapid digesting and sustained release proteins*"; (4) amino acid supplement "*for muscle growth and maintenance*".

iv. Concluding remarks regarding nutrition and health claims made on sports nutrition products

In 2006, prior to the entering into force of Regulation 1924/2006, FIFA warned athletes and non-athletes alike about the following products and their relative health claims (FIFA, 2006): (1) sports supplements *claiming* that they contribute to reducing body fat levels and building muscle mass. The report states that these products are either not effective or banned; (2) sports supplement *stating* that they increase energy supply. However, "*none of these is likely to improve performance and, in spite of advertising claims, none is supported by good independent evidence"*; and (3) FIFA warned consumers against supplements claiming, without scientific substantiation, that they can boost the immune system (e.g. glutamine or zinc supplements).

Following the analysis of sports nutrition products marketed in European Member States, it appears that legislation on *nutrition claims* is generally respected with regards to the content of proteins, sugars, and fats. Nutrition claims regarding the content of lactose and BCAA

seem to lack specific provisions at the European level; such claims thus seem to be freely used by FBOs, which may lead to consumers' inadequate abilities to make informed choices.
In addition, the review of foodstuffs that are currently sold as sports nutrition products on the European market reveals that these products generally comply with the *health claims* requirements of European legislation. Specifically, the claim that was most often seen on sports nutrition products relates to the beneficial effects of creatine consumption, and is included in the EU Register of claims. Therefore, it would seem that the problematic claims reported by FIFA in 2006 are currently less present on the European market. Nevertheless, the inclusion of most substances in sports nutrition products does not seem to be scientifically substantiated as EFSA did not establish a relationship between most of these substances and a beneficial health effect (Please refer to Annex III).

f. Concluding remarks regarding consumers' informed choice

As seen in the previous sections, there are several types and subcategories of sports nutrition products. The differentiating line between these subcategories may be unclear, leading to potential misinformation of consumers. However, when purchasing foodstuffs, consumers have the right to be correctly informed about the product they are purchasing, particularly if this product is more expensive compared to traditional products. In this context, product display and particularly nutrition and health claims may play an important role.

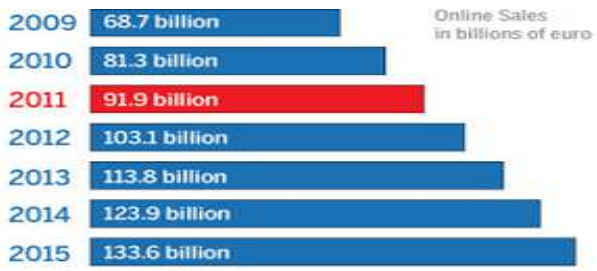
III. The industry's challenge: respecting proper functioning of the market and fostering product innovation

The industry of sports nutrition products is nowadays faced with certain challenges that are most likely a consequence of the great market evolution of these products. These challenges are related to the perceived importance of maintaining product development and innovation as well as the evolving channels through which to supply sports nutrition products.

Economic analysis concludes that active competition is an effective way to achieve (1) consumer protection, as well as (2) innovation and efficiency in supplying goods and services, which are essential characteristics of well-functioning markets (Melody, n.d.). Consumer protection has been discussed in chapter IV section II, in which European legislation protecting consumers' interests as well as consumer perceptions of these provisions were reviewed. Presently, efficiency in supplying goods and innovation will be discussed specifically in the context of sports nutrition products.

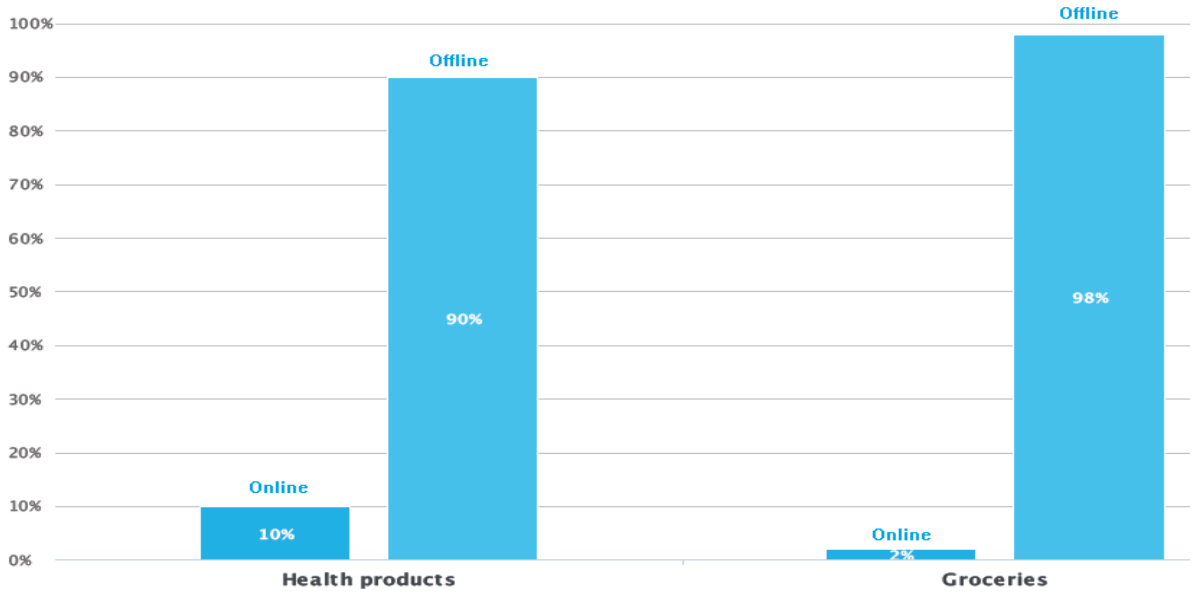
a. Obstacles to the efficient supply of sports nutrition products: online sales and unfair competition

European consumers are increasingly engaging in the practice of purchasing online. Indeed, online retail sales in Europe reached 68.7 billion Euros in 2009, and are estimated to approach 134 billion Euros in 2015 (Forrester, 2011). Please refer to the graph below for more details regarding online retail sales between 2009 and 2015 (forecasted) in Europe.



Evolution of online retail sales in Europe from 2009 until 2015 (forecasted). Adapted from Forrester, 2011.

In addition, as can be seen in the graph below, consumers belonging to the general population are more likely to purchase health products, rather than groceries, online (respectively 10% and 2% of total consumers) (Consumer Barometer, 2012). One may hypothesize that the proportion of consumers buying sports nutrition products online is between 2 and 10%, possibly leaning more towards 10% given that (1) sports nutrition products are more likely to be considered as health products rather than groceries, and (2) there is a considerable amount of websites that sell and distribute such products, translating a high consumer demand.



Proportion of European Consumers' online versus offline purchases of health products and groceries in 2012. Adapted from Consumer Barometer, 2012.

In the specific context of sports nutrition products, it appears that only 4% of elite athletes purchase these products online (Maughan, Depiesse, and Geyer, 2007). As such, one could hypothesize that of the four population groups consuming sports nutrition products, recreational and lifestyle users are most likely to purchase online. In any case, online purchasing should be carefully monitored in the case of sports nutrition products given that contamination is detected most in supplements which are ordered online as opposed to bought in pharmacies, health stores, or supermarkets (Petroczi, Taylor, and Naughton, 2011).

In addition to being a potential threat to both public health and athletic careers, online purchases may also yield to unfair competition between European and non-European manufacturers of sports nutrition products. Indeed, ESSNA reports that given the stringency of EU Food Law, some FBOs based outside of the EU and distributing their products through the internet may not comply with European provisions (Wilk, 2014). Specifically, manufacturers based outside of the EU may still be using nutrition and health claims which are not allowed in the EU as per Regulation 1924/2006. The comparatively higher presence of illegal substances in products sold over the internet is also highlighted. Moreover, the stringency of EU provisions is associated with a lack of adequate enforcement. As such, ESSNA (2013b) declares that "*many illegal/non-compliant products are entering the EU without any problem, and the number of websites clearly targeting EU consumers is growing*". This results in unfair competition for EU businesses who comply with EU law. To safeguard the good reputation of its members, ESSNA has begun to report non-compliant manufacturers to relevant regulatory authorities (Wilk, 2014) [40].

b. Functioning of the sports nutrition market and obstacles to innovation

Developing and marketing functional foods, including sports nutrition products, requires considerable research efforts. More specifically, these involve "*identifying functional compounds and assessing their physiological effects, developing a suitable food matrix, taking into account bio-availability and potential changes during processing and food preparation, consumer education, and clinical trials on product efficacy in order to gain approval for health-enhancing marketing claims*" (Siró et al., 2008). Additionally, knowledge in medical domains is required in order to prove the efficacy of functional foods, with different types of studies that may be requested for the approval of health claims, e.g. mechanistic assessments at the molecular and cellular level, or retrospective and prospective epidemiological research (Menrad, 2003). Furthermore, in order to be successful in the sports nutrition sector, companies are required to e.g. develop new markets and innovative products as well as new packaging formats. As such, this competitive landscape may place small and medium enterprises (SMEs) at a disadvantage when developing and marketing functional foods (Menrad, 2003). Indeed, it is more likely that a big international company has the necessary research and development resources as well as the financial means to remain competitive in the sports nutrition sector.

An additional challenge in the sector of sports nutrition products is represented by the current European legal framework that is in place for these products, which may not only result in an obstacle to innovation and product development, but also as a barrier to trade. Indeed, there are no harmonised provisions addressing sports nutrition products, and applicable legislation

[40] Interestingly, in addition to the supplement purchases increasingly being carried out online, it appears that athletes also buy these products in other countries than their own while travelling for competitions. Specifically, some of these athletes may head towards a certain country with the sole aim of buying a supplement that is available in that country (Maughan, 2014).

may vary between Member States. For instance, some Member States foresee certain fixed compositional requirements for sports nutrition products, which may not be the same as required by other Member States. Food business operators (FBOs) are thus required to "adjust" their products to the Member States in which they are distributing it. It is also of relevance to highlight that sports nutrition legislation may be outdated in certain Member States, e.g. provisions covering sports nutrition in France date back to 1977. As such, provisions laid down in these pieces of legislation may no longer be suited for the current market of sports nutrition products. To this regard, ESSNA representatives fear that establishing specific legislation solely covering sports nutrition products, and thus giving a fixed legal definition to these products, will be of hindrance to product development and innovation in the sports nutrition sector (ESSNA, 2013a). For instance, this may be because FBOs do not have the freedom to experiment with new ingredients, dosages, or manufacturing techniques.

c. Current and future trends with regards to consumers and product development in sports nutrition

The rise of health consciousness among European consumers together with advances in scientific processes and techniques, gives food business manufacturers the opportunity to continuously develop innovative products and food concepts (Siró et al., 2008). ESSNA highlights that many of the foodstuffs marketed today as sports nutrition products did not even exist 5 or 10 years ago (Wilk, 2014). This suggests a high product turnover in the sports nutrition market which is representative of evolving consumer demands. Indeed, these products have shifted from being solely intended for bodybuilders and athletes, to also appeal to individuals who engage in physical activity on a recreational basis (i.e. recreational users of sports nutrition products) or simply individuals who are looking for healthy and practical alternatives to regular foods (i.e. lifestyle users). In contrast to bodybuilders and athletes who continuously search for new, effective, and innovative products that will aid in enhancing muscle mass and improving performance, recreational and lifestyle users do not solely search for products having an adequate nutritional composition, but also seek for products that look appealing, have a pleasant taste, and fit their personal values and morals (e.g. by being organic) (Datamonitor, 2013a).

Nowadays, bodybuilders and athletes represent an important, but very tailored consumer group given the need for specific sports nutrition products (Datamonitor, 2013a). In contrast, health conscious consumers have very different product demands. To this regard, a gap in the sports nutrition market has been identified: although 80% of European consumers are interested in functional foods and drinks that will enhance their physical energy, only 27% of these proceed to purchasing such products. As such, manufacturers of sports nutrition products should attempt to meet the demands of the general population in order to expand their share of the market.

To this regard, Datamonitor (2013a) has identified that consumers increasingly cherish fresh and natural ingredients in their foods and beverages. Specifically, 53% of consumers in Europe who are interested in foods and drinks that enhance their physical energy have stated

that the presence of natural ingredients influences their final purchasing decision. Among consumers that already buy these products, nearly 70% seek the presence of natural ingredients. In addition to natural ingredients, freshness is another important characteristic, with more than 80% of European consumers declaring purchasing sports nutrition products that bear the claim "fresh". As such, one would expect that manufacturers of sports nutrition products increasingly develop foodstuffs which are natural and/or fresh. In practice however, only 12% of product launches in the sports nutrition category claimed to be "natural" in 2012, and merely 1% claimed to be "fresh" (Datamonitor, 2013a). This may be partly explained by the fact that consumers do not necessarily associate powders and supplements with the word "natural". In addition, consumers have started filling the need for natural and fresh sports nutrition products with certain foods for normal consumption, specifically Greek yoghurt and coconut water. Indeed, Greek yoghurt offers a healthy solution for weight management and natural sports nutrition given its high protein content, and relatively low fat and sugar content, associated with a thick and rewarding consistency. As such, the market share of Greek yoghurt has increased in recent years, both on the American and on the European market, with 12% of new yoghurt launches being Greek yoghurt in 2012. Similarly, although coconut waters are not per se marketed as a sports beverage, they compete with the latter given their "natural" characteristics and their appropriateness as a rehydration drink. As such, consumers have increasingly expressed their interest in coconut water in recent years, with a nearly 800% increase in launches of coconut water from 2008 to 2012 (Datamonitor, 2013a).

Furthermore, it appears that manufacturers of sports nutrition products are currently targeting the elderly as the next category of lifestyle consumers which may be interested in their products. Indeed, ageing is characterized by muscle wasting which results in a loss of strength, thus jeopardizing the functional ability of individuals. This is thought to be due to the ageing muscle being less sensitive to smaller amounts of protein compared to the younger muscle (Breen and Philips, 2011). Therefore, a higher amount of protein intake, coming from a protein supplement for instance, may be advisable in order to age more gracefully. For instance, products containing the source of protein Peptan™, composed of collagen peptides, are advertised both in the context of sports nutrition as "*the perfect protein to help muscle restoration after exercise*" as well as for the elderly as "*the ideal supplement to help maintain the nitrogen balance and to avoid lean body mass loss*" (Rousselot, 2013).

For the past four years, experts in the sports nutrition sector gather yearly to discuss current developments and innovative trends. Conferences are spread over two days in which speakers share their latest results and product research and/or launch. In 2014, the theme of the conference focused on industry challenges and innovation, a topic which gives a glimpse in the future of sports nutrition products. For instance, speakers discussed new cause and effect relationships between protein nutrition and muscle mass, or the potential effect of hot beverages in enhancing physical performance (Bridge2Food, 2014).

CHAPTER VI – Legal alternatives, conclusions and discussion

I. Regulatory alternatives in the context of sports nutrition products

a. Policy options

When a regulatory issue ensues, the European Commission may strive to solve it by proposing different regulatory initiatives, or policy options. Understandably, the EC must evaluate the potential social, environmental, and economic impact of such options; one of these being to refrain from modifying the current regulatory framework. Practically this consists in the analysis of every regulatory alternative that may adequately respond to the issue at hand. Such an exercise is referred to as an *impact assessment*, a tool which "*gives decision-makers evidence regarding the advantages and disadvantages of a policy choice*" (European Commission, 2014b). In this context, costs associated with each policy option are considered as being negative impacts, while benefits are considered as positive impacts. Carrying out an impact assessment thus aids decision-makers in choosing the most adequate policy option with regards to a specific matter.

The aim of this study is to determine whether the current state of affairs of the sports nutrition market as well as relevant stakeholders' opinions justify that sports nutrition products on the European market should be regulated further, query that the European Commission has to address as per Article 13 of Regulation 609/2013. As previously stated, this Article stipulates the writing of a report on the necessity, if any, of additional provisions covering sports nutrition products, which may be accompanied by a legislative proposal. As such, it seems that there are three legislative options[41] that could be envisaged in the realm of sports nutrition products:

Policy option 1: Do nothing. The current legal framework for sports nutrition products would be maintained. Sports nutrition products would thus be covered by existing horizontal legislation, e.g. the General Food Law, Regulation 1924/2006 on nutrition and health claims. A consequence of this policy option would be that provisions covering sports nutrition products would have to be considered at National level.

A similar impasse as experienced currently with sports nutrition products occurred with regards to provisions for food for persons suffering from diabetes. As outlined in Recital 32 of Regulation 609/2013, the "*Commission report to the European Parliament and to the Council of 26 June 2008 on foods for persons suffering from carbohydrate metabolism disorders (diabetes) concluded that the scientific basis for setting specific compositional requirements* [was] *lacking*". As such, an analogue conclusion may be reached in the case of sports nutrition products.

[41] Three policy options have been identified by the author as a consequence of both the functioning of the sports nutrition market as well as stakeholders' contributions. As such, there might be more/different policy options that the may be evaluated at Community level which the author did not identify.

Policy option 2: Amend current EU legislation to accommodate for specific provisions covering sports nutrition products. This would entail, for instance, that Regulation 1924/2006 on nutrition and health claims include claims with conditions of use intended specifically for the nutritional and physiological requirements of sportspeople. As outlined in Recital 32 of Regulation 609/2013, relevant claims for sports nutrition products have already been considered for authorisation in accordance with the Regulation on nutrition and health claims.

Policy option 3: Implement a new legislative Act addressing sports nutrition products specifically, e.g. laying down specific compositional and presentation requirements.

Examples of legislative Acts that exclusively address certain types of foodstuffs are plentiful in European food law, e.g. Commission Directive 2006/141/EC on infant formulae and follow-on formulae[42].

Given the limited means to assess costs and benefits of each policy option, this study summarizes stakeholders' opinions to this regard as well as conclusions drawn from the previous chapters concerning the functioning of the sports nutrition market under the current regulatory framework.

b. Stakeholder's points of view

From the three policy options outlined above, most stakeholders/experts were in favour of policy option 2, which foresees the amendment of current legislation to accommodate for provisions relevant specifically for sports nutrition products.

i. The industry's point of view: ESSNA, BSNA, IDACE, and Powerbar

ESSNA

ESSNA is in favour of placing sports nutrition products under general food legislation and withdrawing national legislation together with national notification schemes (ESSNA, 2013a; Wilk, 2014). Indeed, ESSNA argues that there is no longer a need to establish specific provisions on sports nutrition given that sports nutrition products are not intended for a particular group of vulnerable consumers, but for athletes, bodybuilders, recreational and lifestyle users. In addition, ESSNA argues that specific sports nutrition provisions had been considered in a time in which classifying sports nutrition products among the four categories defined by the SCF reflected the situation on the market. Today, the state of affairs of the sports nutrition market has evolved tremendously and sports nutrition products can no longer be limited to four categories. In parallel, European food legislation has developed immensely in the past decade, and currently includes, inter alia, Regulation 1924/2006 on nutrition and health claims which ensures adequate consumer protection. Also, ESSNA argues that international standards such as those set by the WADA currently provide an appropriate framework for sports nutrition products.

[42] Regulation 609/2013 requires the Commission to adopt specific compositional and labelling rules for infant formulae and follow-on formulae through delegated acts, which will repeal Directive 2006/141/EC. Directive 2006/141/EC may be consulted at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006L0141&from=EN.

Therefore, ESSNA members are of the view that "*the establishment of specific sports nutrition legislation is no longer necessary, and that outstanding issues can be addressed within general food legislation"* (ESSNA, 2013a), thus supporting policy option 2. Subsequently, ESSNA members support the following issues to be addressed within sports nutrition legislation: (1) product safety, (2) consumer communication regarding the intended use of a certain sports nutrition product, (3) legal certainty, (4) proportionate provisions ensuring clarity and flexibility, (5) consistency across EU food law, (6) optimal functioning of the internal market, and (7) potential for innovation (ESSNA, 2013a). ESSNA particularly highlights the importance of consistent and scientifically-based assessment of health claims by EFSA, as well as ensuring the proper functioning of the internal market. Specifically, ESSNA declares being in support of evidence-based regulation such as Regulation 1924/2006 on nutrition and health claims, the principal aim of which is to clarify potential health relationships to consumers. The Chair of ESSNA thus proposes to "*focus on the specific needs of the sports nutrition consumer*" within the nutrition and health claims regulation and that "*the wording of some claims should be amended to ensure absolute clarity*" [43] (ESSNA, 2014).

Finally, ESSNA highlights the perceived drawbacks of the first and third policy option as presented above. ESSNA's main concern with policy option 1 is that doing nothing, i.e. keeping the regulation of sports nutrition products under general provisions as well as maintaining national legislation, hinders the functioning of the market, especially with regards to economic development of SMEs. In contrast, ESSNA's main concern with policy option 3 is that establishing a tight legal definition and regulatory framework for sports nutrition products may hinder product innovation and development of the sector (ESSNA, 2013a, Wilk, 2014).

<u>BSNA</u>

The British Specialist Nutrition Association (BSNA), which represents the specialist nutrition industry in the United Kingdom, supports adapting current EU legislation to specific regulatory needs of sports nutrition products and thereby harmonising provisions regarding sports nutrition on Community level (BSNA, 2013), thus supporting policy option 2. The rationale behind this position is that sportspeople are not a vulnerable group of the population, but they admittedly have different (often increased) nutritional requirements compared to the general population. As such, it is sufficient to amend existing legislation, such as Regulation 1924/2006.

[43] The claims discussed in this statement are those on glycaemic carbohydrates and glucose, which have been approved by EFSA, but are not registered in the EU Register of Claims. ESSNA argues that the conditions of use of these claims are too strict and would not benefit – they might even mislead – the consumer of sports nutrition products.

IDACE (renamed SNE since 2013) [44]

A presentation given by IDACE in 2006 reports that the sports foods industry is in favour of a Directive harmonising the sector, provided that this Directive is "*the right Directive*", that it "*allows for innovation*", and that "*it reflects the diverse range of products currently available*" (IDACE, 2006). As such, IDACE seems to prefer policy option 3, which foresees a specific legislative act solely covering sport nutrition products. It must be kept in mind that IDACE's stance in 2006 was formulated in a time in which the adequacy of Regulation 1924/2006 as a means of ensuring the regulation of foodstuffs in general and sports nutrition products in particular had not yet been assessed.

Powerbar

Powerbar is a food business manufacturer of sports nutrition products with the aim of "*help[ing] athletes reach their goals by providing nutrition tools for optimum athletic performance*" (Powerbar, n.d.).

Powerbar shares the views of IDACE (now SNE) as outlined here above and thus sees the need for a proper, specific, sports nutrition products Directive in the case that the necessary definitions are outlined and that all sports nutrition products available on the market are included in its scope. The regulatory affairs manager at Powerbar, Mrs Beate Klein, further specifies that Powerbar does not believe that provisions on sports nutrition products can be incorporated in a comprehensive manner within other horizontal provisions at EU level such as Regulation 1924/2006 on nutrition and health claims. In addition, Powerbar is of the opinion that a specific Directive covering sports nutrition products would support innovation and sale of these products given that it will result in a harmonized legislative basis across European Member States (Klein, 2014).

ii. Consumers' point of view: BEUC

Similarly to the previous two stakeholders, the European Consumers' Organisation (BEUC) argues that because sports nutrition products are not an essential category of foodstuffs, they should not be regulated under specific EU provisions. As such, sports nutrition products should be covered by horizontal provisions and specifically considered under Regulation 1924/2006 (BEUC, 2012a; BEUC, 2012b), thus supporting policy option 2.

iii. What do experts in the field of sports nutrition have to say?

Prof. Maughan[45] is of the opinion that sports nutrition products should definitely be covered by EU provisions, but that there is no need for separate legislation. Specifically, he argues that "*all products for which either health or performance claims are made should require*

[44] SNE, or Specialised Nutrition Europe, represents the interests of the European specialised nutrition industry, of which sports nutrition products are a subcategory. Formerly called IDACE, its name changed in 2013 in order to better reflect the objectives of this association.

[45] Prof. Dr. Ron Maughan is one of the leading world experts in sports nutrition. He currently teaches Sport and Exercise Nutrition at Loughborough University in the UK. He is Fellow of the American College of Sports Medicine and worked as adviser to FIFA and UK Athletics among other sporting bodies. He was kind enough to exchange a few e-mails with the author of this thesis.

evidence of efficacy and safety – there should not be a separate category for sports products" (Maughan, 2014), thus supporting policy option 2.

c. Recommendations and regulatory advice

i. Recommendations regarding legislative initiatives in the realm of sport

As outlined in chapter II section I(b), the ratification of the Lisbon Treaty, and specifically the inclusion of Article 165, allows for legislative initiatives with regards to policies covering sport and physical activity at the European level. In chapter VI section II(b), a lack of knowledge with regards to sports nutrition was identified, also among athletes who would benefit especially from having a basic knowledge and understanding of this field. As such, it would be advisable to push for more legislative initiatives involving consumer education at Community level. For instance, sporting associations may offer courses on sports nutrition. These courses should be held by experts in the field, e.g. nutritionists, who would impart reliable and scientifically-based nutrition information, as well as outline the benefits and drawbacks of making use of sports nutrition products.

ii. Issues to consider in case of legislative undertakings in the realm of sports nutrition products

From the information gathered in this paper, it appears that the preferred policy option concerning the regulation of sports nutrition products would be that of including provisions on sports nutrition products under existing pieces of legislation (policy option 2 as outlined in section I(a) of the present chapter).

<u>Towards innovation and Europe 2020</u>

The policy option chosen for sports nutrition products may also have an impact on achieving the Europe 2020 growth targets as discussed in chapter II section I(c), where the target foreseeing more investments in R&D was found to be the most relevant in the context of sports nutrition products. Europe 2020 emphasizes that in order to achieve these targets, certain steps should be taken. Of particular relevance in this discussion is the importance to "*improve access to the single market for small businesses and to develop entrepreneurship*", as well as making sure that "*individual consumers (…) buy goods and services from other EU countries with greater ease and confidence, in particular on-line*" (European Commission, 2014a). As such, it is important that the regulatory framework for sports nutrition products (1) prevents barriers to trade or any measures having equivalent effect, and (2) protects small and medium enterprises (SMEs).

<u>Setting the scope of sports nutrition products</u>

This section covers issues that may be solved by legally clarifying the scope and/or the definition of sports nutrition products. To this end, certain courses of action that may be of relevance in the context of potential future provisions covering sports nutrition products have been identified.

The author has noticed that the term "sport" is sometimes used in the name of foodstuffs that are not intended in any way for athletes, bodybuilders, the active population or health-conscious consumers. Two examples of these foodstuffs are the famous chocolate bar "Ritter sport" [46] and the "sports mix" manufactured by Maynard, a bag of sweets made in the shape of sport-related objects. The name of these foodstuffs may be misleading as the consumer might think that because the product refers to sports, it is healthier compared to similar alternatives; e.g. the consumer might wrongly assume that these products may have been manufactured with a lower sugar content. As such, it would perhaps be advisable to restrict the use of the term "sport" to products that have reason to appeal to sportspeople or at least health-conscious consumers. However, this potential issue may already be solved by the effective entering into force in December 2014 of provisions laid down in Regulation 1169/2011. For instance, Article 7(1)(a) of this Regulation stipulates that "*food information shall not be misleading, particularly as to the characteristics of the food and, in particular, as to its nature, identity, properties, composition, quantity, durability* (…)". Consequently, food business operators may in future refrain from using the term "sport" for products that are not intended for purposes of supporting physical activity.

The issue of sports nutrition products being at the borderline with other foodstuffs available on the European market has come up time and again in this paper and was more thoroughly explained in chapter V section II. This may be at least partly explained by the lack of a legal definition covering these products at Community level. As such, there may possibly be the need to distinguish between these products in order to guarantee consumer protection as well as prevent legislative shopping. To this end, certain suggestions come to mind. For instance, the mandatory indication of a description of the product in question could be required, i.e. specifying that the product is intended to satisfy the nutritional requirements of sportspeople. Sports nutrition products may have to be accompanied by the statement "*intended for the dietary management of sportspeople*" or similar statements. In the case in which a certain sports nutrition product is not necessarily meant for sportspeople, an alternative would be to define this product as a functional food or as a food supplement, without it being labelled as intended for sports. In the case in which a sports nutrition product may be intended for both bodybuilders and athletes as well as recreational and lifestyle users, the product in question may be advised in terms of the daily reference intakes needed by these differently active consumers. In this context, the reference intake of 2000 kcal per day as foreseen by Article 32(5) of Regulation 1169/2011 may not be of relevance for sports nutrition products given the higher energy expenditure of sportspeople.

In addition, as explained in chapter V section II(c), the distinction between sports supplements and regular food supplements may be unclear given the overlap between these products. This phenomenon, coupled with the fact that a reason commonly given by sportspeople for the use of sports supplements is the prevention of disease, may also be of interest when attempting to

[46] The name of the Ritter Sport square, an institution among chocolate products, dates back to 1932, year in which Clara Ritter, co-founder of the company together with her husband, decided to "*make a chocolate that fits into the pocket of every sports jacket, doesn't break, and still weighs the same as a normal long bar of chocolate*". Accessible at: http://www.rittersport.co.uk/#/en_GB/home/

clarify the scope of and rationale for sports nutrition products. Indeed, it may be useful to further clarify the distinction between food supplement and medicinal products, in order to ensure that sports supplements specifically and food supplements more generally, are taken for the right reasons. Indeed, Article 6(2) of Directive 2002/46/EC on the approximation of the laws of the Member States relating to food supplements foresees that "*the labelling, presentation and advertising must not attribute to food supplements the property of preventing, treating or curing a human disease, or refer to such properties*". To this regard, the Partial Agreement in the Social and Public Health Field of the Council of Europe (2008) suggests to refer to the concept of homeostasis[47] in order to facilitate the distinction between food supplements and medicinal products. Specifically, the intended use of the product as well as the nature of its induced effect are paramount in making this differentiation. With regards to the intended use of the product, food supplements should be taken in view of "*maintain[ing], support[ing], or optimiz[ing] immunological, metabolic and other specific physiological parameters [and not in view of] correcting, modifying or restoring physiological functions or parameters"*. With regards to the nature of its induced effect, a suggestion would be to define the minimal therapeutic dosage to distinguish between food supplements and medicines. Indeed, if a product contains a certain substance in an amount which is lower than the minimum therapeutic dosage for a given disease, then this product may not be considered as a medicine anymore as per Directive 2001/83/EC on the Community code relating to medicinal products for human use. This product may however be considered as a food supplement, provided that its safety has been assessed.

The issues highlighted here above suggest the potential advantages of clarifying the definition of sports nutrition products at Community level. It is however paramount to keep in mind that such provisions should not be too stringent, in order to avoid that innovation is hindered by a tight legal definition of these products which would not give the necessary freedom to conduct successful product development. Given the difficulty of this task, it may be foreseeable that agreement among 28 Member States regarding one legal definition of sports nutrition products could be difficult to reach. As such, a similar approach to the definition of "food" in Article 2 of Regulation 178/2002 could be taken. This Article first gives a rather broad definition of the term "food" which includes "*any substance (…) reasonably expected to be ingested by humans*". This definition is then followed by specific substances and products which are included in the scope of the definition, as well as substances and products excluded by its scope. Employing a similar approach could clarify the sometimes ambiguous relation between sports nutrition products and other foodstuffs such as food supplements. If this approach were taken, there should be agreement at least on a relatively broad definition of the term "sports nutrition products". The following are definitions proposed by relevant sports nutrition literature and/or important stakeholders in this field. For instance, ESSNA members define sports nutrition products as "*formulated products that aim to support their target audience in achieving consumption of the right amount of nutrients at the right time and in a convenient format, while also providing accurate and truthful information on its intended use,*

[47] The Partial Agreement in the Social and Public Health Field (2008) defines homeostasis as "*the status of a person whose physiological parameters function within the limits considered as normal"*

so that the target audience can make informed choices" (ESSNA, 2013a). Murray (2000) defines sports nutrition products in the encyclopaedia of sports medicine as "*any food, beverage, tablet, gel, concentrate, powder, capsule, gelcap, geltab or liquid droplet purported to affect body structure, function or nutritional status in such a away as to be of value to physically active people"*. Finally, Burke (2003) distinguishes between sports foods and sports supplements, the latter being defined as a category on its own. The author gives two definitions of sports foods, one based on their form and the other based on their intended function. By taking the former approach, sports foods are characterized as "*tak[ing] a more traditional form of energy-containing bars drinks and other edible products*"; the latter approach defines sports foods as "*products containing nutrients in amounts found in everyday foods to meet known nutritional needs"* or as "*energy-containing products manufactured in a food-like form (e.g. bars, drinks, gels or modified versions of everyday foods"* [48] (Burke, 2003). It appears that there are several different approaches taken to define sports nutrition products. However, there seem to be certain minimum requirement for a possible legal definition of sports nutrition products, i.e. to clarify the scope of such products and their intended use as much as possible without throttling innovation in this sector. In any case, it remains to be seen whether a definition for these products is actually needed, or whether potential shortcomings of the sports nutrition market may be addressed by adding to existing legislation provisions which specifically tailor sports nutrition products.

II. Conclusions and discussion

This research paper consisted both of a snapshot of the current functioning of the sports nutrition products market, as well as a review of the opinion of relevant stakeholders in this field in order to identify whether further provisions covering sports nutrition products are needed on the European market. The principal findings of this study are summarized under the three research questions formulated in the introduction to this paper.

a. Answers to the introductory questions

1. What is the scope of sports nutrition and sports nutrition products nowadays?

Sports nutrition is the study and application of nutrition knowledge with the aim of assisting athletes and the active population prior to, during, and following sport and physical activity. Sports nutrition products are referred to as "*food intended to meet the expenditure of intense muscular effort*" in Regulation 609/2013. Chapter III section I(d) outlined the type of products which are included under this term, as well as the complexity of classifying such foodstuffs. In the strict sense, sports nutrition products encompass sports foods, sports supplements, sports gels, and sports drinks which answer to the needs of bodybuilders and athletes. However, due to a rapidly evolving market, subcategories of sports nutrition product are sometimes not clearly distinguishable. In addition, the consumer base for these products is

[48] For the sake of completeness, Burke (2003) refers to sports supplements based on their form as "*pills, potions, capsules or powders*", while based on their function they "*target the provision of nutrients or other compounds in supra-physiological amounts*".

widening, and presently also includes recreational and lifestyle users (i.e. health conscious consumers).

2. What is the current stance of the regulatory framework covering sports nutrition products in Europe? Is this framework respected?

Currently there are no specific provisions addressing sports nutrition products under EU legislation, meaning that there is no legal, harmonised definition for these products. There are a few Member States who address sports nutrition specifically in their national regulatory framework, although most Member States seem to be waiting for EU action regarding specific provisions for sports nutrition products. The lack of harmonised legislation covering sports nutrition products at Community level entails that these products may be subject to different requirements from one Member State to the other. This may result in a barrier to trade, notwithstanding the fact that National provisions may be outdated.

At EU level, these products fall specifically under Directive 2009/39/EC on foods for particular uses until July 2016. Following this date, they will fall under Regulation 609/2013 on food intended for infants and young children, food for special medical purposes, and total diet replacement for weight control. This Regulation foresees that the European Commission has to provide a report to the European Parliament and the Council on the necessity, if any, to regulate these products at Community level by July 2015.

In addition, sports nutrition products must comply with horizontal pieces of EU legislation such as (1) those guaranteeing the safety of such products and (2) those ensuring that consumers are adequately informed. Specifically, there are cases in which sports nutrition products appear to be unsafe and unfit for human consumption, thus infringing Article 14 of Regulation 178/2002. Cases of unsafe sports nutrition products have mainly been reported for sports supplements, sports gels, and beverages intended for sports people, as discussed in chapter V section I. The increasing popularity of online purchases among European consumers plays an important role in this context given that unsafe products are more likely to have been purchased online rather than in stores. In addition, the sports nutrition market seems to generally have adjusted to provisions foreseen by Regulation 1924/2006 on nutrition and health claims. A few exceptions pertain mainly to statements made regarding substances that have not been positively evaluated by EFSA[49]. These may resemble claim-like statements which may be potentially misleading for consumers.

3. What is the position of relevant stakeholders, i.e. regulatory authorities, consumers, and the industry, in the field of sports nutrition products?

Regulatory authorities are concerned with ensuring the functioning of the market at large, while guaranteeing product safety and adequate consumer information in particular. Consumers' needs and perceptions of sports nutrition products must thus be taken into account. This is most likely to be ensured via information conveyed via the food package,

[49] Annex III provides an overview of substances included in sports nutrition products and whether health relationships involving these substances have been assessed by EFSA.

notably nutrition and health claims. As such, it is paramount for regulatory authorities to guarantee that current legislation safeguards consumers' informed decision-making process. The industry mainly strives to ensure that potential future legislative undertakings do not hinder product development and innovation given that the sports nutrition sector is a growing market that holds promise for the food industry.

As such, issues of particular concern when discussing potential future policies covering sports nutrition products are consumer protection both from the standpoint of product safety and adequate information, as well as safeguarding product innovation. These will be discussed further in the section below.

b. Points of discussion

This research paper identified policy option 2, i.e. placing provisions covering sports nutrition products under existing pieces of legislation (as outlined in Chapter VI section I(a)), as the preferred option among relevant stakeholders. It is interesting to presently discuss whether this would indeed be an effective solution.

The sports nutrition market at the dawn of 2014 was evaluated in this study. The most flagrant issue in this context is perhaps the uncertainty that seems to surround the term "sports nutrition products". Indeed, the lack of a harmonized definition at Community level coupled with the rapid evolution that this sector has been subject to in the past years, both regarding its expanding consumer base (i.e. from solely bodybuilders and athletes to also including recreational and lifestyle users) and the increasing subcategories of foodstuffs included under the category of sports nutrition products, may lead to a malfunctioning market. In addition, it appeared that Regulation 1924/2006 on nutrition and health claims is generally respected, with the exception of a few claim-like statements which may be misleading for consumers. These mostly pertain to substances the beneficial effects of which have not been confirmed by EFSA. Furthermore, it appears that although reports of unsafe sports nutrition products seem to be sparse with regards to products manufactured in Europe, the same may not be said for products manufactured outside of Europe. This may potentially be problematic given the increased practice of purchasing non-European products online. Finally, another major issue of concern is that of throttling innovation in the sports nutrition market by applying stringent provisions. Indeed, tight legal definitions may halt the rapid evolution that this market sector has experienced in the past years.

Three policy options were identified in chapter VI section I(a) which may successfully address the above mentioned issues. *Policy option 1* consisted in refraining from taking any further action at Community level. As such, if deemed necessary, provisions covering sports nutrition products would have to be implemented at National level. In chapter II section II(a) it appeared that, when in place, national legislation (1) was often outdated, and (2) had differing legal requirements between Member States. Therefore, an important drawback of this policy option would be the likelihood of Member States implementing provisions (e.g. on composition of sports nutrition products) which differ among each other, thus potentially leading to both possible restrictions on trade as well as negative impacts on product

innovation. *Policy option 3* consisted in creating a new legislative Act specifically addressing sports nutrition products. This policy option would foresee that a definition for sports nutrition products could be laid down, thus clarifying the scope and subcategories of sports nutrition products and perhaps their intended target population. However, a legal definition of sports nutrition products as well as other provisions covering these products may result as being too stringent and thus impeding product innovation. *Policy option 2* consisted in addressing provisions covering sports nutrition products under existing pieces of legislation. An advantage of this policy option over policy option 3 would be that the scope and subcategories of sports nutrition products would most likely be less stringent, thus decreasing the likelihood of resulting in a hindrance to product innovation in the sports nutrition sector. However, it must be kept in mind that the author is unable to tell whether, and if so, how, these products would be addressed. In any case, with the current knowledge of the functioning of the sports nutrition market, it seems that policy option 2 may be a good, and perhaps the most realistic, option. Indeed, there has not been a major event that would ensure that stakeholders and Member States would now agree upon the scope of potential future legislation covering sports nutrition products, the number of subcategories, compositional requirements, and the impact that specific provisions on sports nutrition products would have on product development and innovation. Therefore, disagreement on one or more of these matters is likely to arise during potential negotiations regarding future specific provisions covering sports nutrition products. As a consequence, agreeing on a specific legislative Act as suggested by policy option 3 may require time and resources that could be allocated in a more efficient way.

The arguments given here above, together with relevant stakeholders' opinions, are summarized in the table below:

	Policy option 1	**Policy option 2**	**Policy option 3**
Advantages	- MS would not need to negotiate to find a compromise with regards to definitions and composition	- Harmonized legislation at Community level	- Harmonized legislation at Community level
Drawbacks	Heterogeneous legislation among MS which may lead to negative impact on innovation	Unable to determine if/how/where sports nutrition products would be defined. However, more regulatory freedom is expected compared to policy option 3.	Too stringent legislation may lead to negative impact on innovation
Stakeholders' general support	-	+ + +	+

c. Limitations and future research

The limited time and modest economic means bind this paper to merely being a review of (1) certain aspects of the functioning of the sports nutrition market and (2) of relevant stakeholders' opinions with regards to potential further provisions covering sports nutrition products. As such, a proper impact assessment, evaluating the quantitative advantages and disadvantages of each policy option was not carried out, due mostly to the limited resources that could be employed in this research.

In addition, due to a lack of answers or a lack of information, it was not possible to include the opinion of all contacted stakeholders. Certain sections of chapter VI give a larger space to the industry's opinion rather than to the other stakeholders' given that sports nutrition industry representatives provided the author with first hand data, while the opinion of other stakeholders was mostly extracted from public statements or other public sources. Particularly, first hand consumer data was particularly hard to come by, and this aspect should definitely be the subject of further research if time and economic means allow. Therefore, this study may possibly only represent a few brush strokes on a much more complicated canvas.

Future research could look into the details of policy options 2 and 3, assuming that policy option 1 is not a contender given that (1) the author has not come across stakeholders supporting this alternative and (2) this policy option would have difficulties addressing certain issues faced by the sports nutrition market which ask for measures leaning towards more rather than less harmonization.

Now it will be interesting to follow what the report on sports nutrition products to be submitted by July 2015 by the European Commission to the European Parliament and the Council will conclude.

ANNEX I – Relevant EU provisions in the realm of sports nutrition products

Directive 2002/46/EC of the European Parliament and of the Council of 10 June 2002 on the approximation of the laws of the Member States relating to food supplements. Available at: http://old.eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:183:0051:0057:EN:PDF

Directive 2009/39/EC of the European Parliament and of the Council of 6 May 2009 on foodstuffs intended for particular nutritional uses. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:124:0021:0029:EN:PDF

Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:031:0001:0024:EN:PDF

Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:139:0001:0054:en:PDF

Regulation (EC) No 1924/2006 of the European Parliament and of the Council of 20 December 2006 on nutrition and health claims made on foods. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:012:0003:0018:EN:PDF

Regulation (EU) No 609/2013 of the European Parliament and of the Council of 12 June 2013 on food intended for infants and young children, food for special medical purposes, and total diet replacement for weight control and repealing Council Directive 92/52/EEC, Commission Directives 96/8/EC, 2006/125/EC and 2006/141/EC, Directive 2009/39/EC of the European Parliament and of the Council and Commission Regulations (EC) No 41/2009 and (EC) No 953/2009. Available at : http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:181:0035:0056:EN:PDF

Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:304:0018:0063:EN:PDF

ANNEX II – Overview of national legislation in certain Member States

Belgium

Belgium does not have provisions intended for sports nutrition products specifically. Instead, the Royal Decree of the 3rd of March 1992 covers the placing on the market of nutrients and foods to which nutrients have been added. This Decree has last been modified in 2006.

Finland

The Finnish Ministry of Agriculture and Forestry issued Decree 121/2010 covering the group of formerly called dietetic foods, which include sports nutrition products. In addition, these products must comply with labelling provisions covered by Decree 1084/2004. For instance, as for all food products, labels must be both in Finnish and in Swedish. Therefore, although Finland has provisions on the national level covering sports nutrition products, there is not one specific piece of legislation covering solely these products (Evira, 2013).

France

French national legislation covering sports nutrition products dates back to 1977 and is specified in Articles 49 to 54 of the "*Arrêté du 20 juillet 1977 pris pour l'application du décret du 24 Juillet 1975 sur les produits diététiques et de régime*" [Decision of the 20th of July 1977 implementing Decree of the 24th of July 1975 on dietetic and weight loss products] [50]. Specifically, this legislation classifies sports nutrition products as being "*produits diétetiques de l'effort*" [dietetic products for the effort (of physical activity)].

This legislation specifies the macronutrient energy source for sports nutrition products, i.e. 13-17% energy from proteins, 50-60% from carbohydrates, 27-33% from fats. Also, it gives details concerning the dimension of characters that should be used for labelling and claim purposes. Such claims may include the following:

- Specifying that the sports nutrition products may be used as a meal replacement in circumstances in which a normal diet cannot be followed;
- In the case of sports nutrition products with increased carbohydrate or fat intake, specifying that the product is intended to meet the needs of an immediate muscular effort (e.g. during a competition).

Germany

Sports nutrition products in Germany appear under the "*Verordnung über diätetische Lebensmittel*" [Regulation on dietetic foods] [51] of the 28th of April 2005. In this Regulation, foods intended for intense muscular effort, especially for sportsmen, are listed as foods for particular nutritional purposes for which specific provisions will be developed. Certain German court decisions regarding sports nutrition products are of help in the clarification of the scope of sports nutrition products.

Italy

Sports nutrition products are classified as dietetic foods in Italy. On the 5th of November 2009, the Ministry of Labour, Health, and Social Policy issued provisions regarding sports

[50] Please refer to the following link in order to view the "Arrêté du 20 Juillet 1977": http://www.legifrance.gouv.fr/affichTexte.do;jsessionid=BB996C083756ABE6576BBFFD33D906A9.tpdjo02v_1?cidTexte=LEGITEXT000006073187&dateTexte=&categorieLien=cid

[51] Please refer to the following link in order to view the "Verordnung über diätetische Lebensmittel" : http://www.gesetze-im-internet.de/bundesrecht/di_tv/gesamt.pdf

nutrition products, which amended legal requirements of circular No. 3 of the 30th of November 2005. Currently, Italy is waiting for provisions at Community level in order to revise their national regulatory framework on sports nutrition products.
Specifically, the Ministry has issued Guidelines on the composition, labelling, and advertising of products intended for an intense muscular effort, especially for sportsmen. The key points of this Guideline are the following:

- The composition of sports nutrition products must be adequate for the nutritional requirements of sportsmen.
- Interestingly, substances that are manufactured as capsules, tablets, vials and the like answer to the legislative area of food supplements.
- Doping substances, even in minimal amounts, should not be present.
- There are four main categories of sports nutrition products:
    - Energy products
    - Concentrates of proteins and amino acids in order to fuel nitrogen demand
    - Products intended to restore electrolyte balance following profuse sweating
    - Other specifically adapted products, including which are evaluated *au cas par cas* on the basis of their composition.

Poland

Poland does not have provisions intended for sports nutrition products specifically. Sports nutrition products are recognized as dietetic products under Ordinance No 1094 which dates from 2004.

The United Kingdom

The UK does not seem to have specific legislation covering sports nutrition products. As such, these foodstuffs answer to the Food Act of 1984 and to requirements concerning food supplements covered by The Food Supplements Regulation of 2003.

ANNEX III – Health relationships evaluated by EFSA involving food ingredients used in sports nutrition products

Beta-alanine [52]

EFSA has issued an opinion on health claims related to beta-alanine and several claimed effects, **none of which have been established**. These include:

- Increase in physical performance during short-term high intensity exercise
- Increase in time exhaustion
- Increase in muscle carnosine stores

β-hydroxy β-methybutyrate monohydrate (HMB) [53]

EFSA has issued an opinion on health claims related to HMB and several claimed effects, **none of which have been established**. These include:

- Reduction of muscle tissue damage during exercise
- Increase in lean body mass
- Increase in muscle strength
- Increase in endurance performance
- Skeletal muscle repair
- Faster recovery from muscle fatigue after exercise

Branched-Chain Amino Acids (BCAA) [54]

EFSA has issued an opinion on health claims related to BCAA and several claimed effects, **none of which have been established**. These include:

- Growth or maintenance of muscle mass
- Attenuation of the decline in muscle power following exercise at high altitude
- Faster recovery from muscle fatigue after exercise
- Reduction in perceived exertion during exercise
- "healthy immune system"

Caffeine [55] [56]

Relationships that **have been established** by EFSA:

- Caffeine and enhancement of water absorption during exercise
- Caffeine and maintenance of endurance performance
- Caffeine and increased alertness
- Caffeine and increased attention

Relationship that **have not been established** by EFSA:

- Caffeine and reduction in rated perceived exertion/effort during exercise
- Caffeine and increased fat oxidation leading to a reduction in body mass
- Caffeine and increased energy expenditure leading to a reduction in body weight

[52] As reported in The EFSA Journal 2010;8(10):1729
[53] As reported in The EFSA Journal 2011;9(6):2227
[54] As reported in The EFSA Journal 2010;8(10):1790
[55] As reported in The EFSA Journal 2011;9(4):2053
[56] As reported in The EFSA Journal 2011;9(4):2054

Carbohydrate-electrolyte solutions[57]

Relationships that **have been established**:

- "Carbohydrate-electrolyte solutions and enhancement of water absorption during exercise"
- "Carbohydrate-electrolyte solutions and maintenance of endurance performance"

Relationships that **have not been established**:

- "Carbohydrate-electrolyte solutions and reduction in rated/perceived exertion/effort during exercise"

Casein [58]

EFSA has evaluated the following health relationships which **have not been established**:

- "Casein and growth or maintenance of muscle mass"
- "Casein and increase in endurance performance"
- "Casein and faster recovery from muscle fatigue after exercise"

Creatine [59]

Relationships that **have been established** by EFSA:

- "Creatine and increase in physical performance during short-term, high intensity repeated exercise bouts"

Relationships that **have not been established**:

- "Creatine and increase in endurance capacity"
- "Creatine and increase in endurance performance"

Conjugated Linoleic Acid (CLA) [60]

EFSA has issued an opinion on health claims related to CLA and several claimed effects, **none of which have been established**. These include:

- "Conjugated linoleic acid and contribution to the maintenance or achievement of a normal body weight"
- "Conjugated linoleic acid and increase in lean body mass"

Glycaemic carbohydrates [61]

Relationship that **has been established** by EFSA:

- "Glycaemic carbohydrates and contribution to recovery of normal muscle function after strenuous exercise"

Glucose [62] [63] [64] [65] [66]

Relationships that **have been established** by EFSA:

- "Glucose contributes to normal muscle function"
- "Glucose supports normal physical activity"

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[57] As reported in The EFSA Journal 2011;9(6):2211
[58] As reported in The EFSA Journal 2011;9(6):2213
[59] As reported in The EFSA Journal 2011;9(7):2303
[60] As reported in The EFSA Journal 2010;8(10):1794
[61] As reported in The EFSA Journal 2013;11(10):3409
[62] As reported in The EFSA Journal 2012;10(5):2698
[63] As reported in The EFSA Journal 2012;10(5):2695
[64] As reported in The EFSA Journal 2012;10(5):2697
[65] As reported in The EFSA Journal 2012;10(5):2694
[66] As reported in The EFSA Journal 2012;10(5):2696

- "Glucose contributes to normal energy-yielding metabolism during exercise"
- "Glucose is metabolised within the body's normal energy metabolism"
- "Glucose contributes to normal energy yielding-metabolism"

Guarana [67]

EFSA analysed whether there is a health relationship between guarana as a natural antioxidant and the protection of DNA, proteins, and lipids from oxidative damage. A cause and effect relationship **had not been established**.

L-arginine [68]

EFSA has issued an opinion on health claims related to L-arginine and several claimed effects, these include:

- Growth or maintenance of muscle mass: EFSA concluded that a cause and effect relationship **had not been established** between consuming L-arginine and the claimed effect, apart from the recognized role of protein on growth/maintenance of muscle mass.
- "Physical performance and condition": EFSA deemed this health effect to **be insufficiently defined**.

L-carnitine [69]

EFSA has issued an opinion on health claims related to L-carnitine and several claimed effects, **none of which have been established**. These include:

- "L-carnitine and faster recovery from muscle fatigue after exercise"
- "L-carnitine and increase in endurance capacity"
- "L-carnitine and maintenance of normal blood LDL-cholesterol concentrations"
- "Energy metabolism"

L-glutamine [70]

EFSA has issued an opinion on health claims related to L-glutamine and several claimed effects, **none of which have been established**. These include:

- "L-glutamine and growth or maintenance of muscle mass"
- "L-glutamine and faster restoration of muscle glycogen stores after strenuous exercise"
- "L-glutamine and skeletal muscle tissue repair"
- "L-glutamine and increased attention"
- "L-glutamine and gut protein synthesis"
- "L-glutamine and stimulating immunological responses"

L- lysine[71]

EFSA has issued an opinion on health claims related to whey protein and the following claimed effect, which was **not established**: "L-lysine and contribution to normal protein synthesis".

[67] As reported in The EFSA Journal 2010;8(10):1752; ID 2663
[68] As reported in The EFSA Journal 2011;9(6):2227
[69] As reported in The EFSA Journal 2011;9(6):2212
[70] As reported in The EFSA Journal 2011;9(6):2225
[71] As reported in The EFSA Journal 2011;9(4):2063

Maltodextrin [72]

EFSA has issued an opinion on health claims related to Maltodextrin and several claimed effects, **none of which have been established**. These include:

- "Maltodextrin and reduction of post-prandial glycaemic responses"
- "Maltodextrin and maintenance of normal blood LDL-cholesterol concentrations"
- "Maltodextrin and maintenance of normal (fasting) blood concentrations of triglycerides"
- "Maltodextrin and changes in bowel function"

Pectin [73]

EFSA **has established** the following health relationships with regards to pectin:

- "Pectin and reduction of post-prandial glycaemic responses"
- "Pectin and maintenance of normal blood cholesterol concentrations"

EFSA **has not established** the following health relationship:

- "Pectin and increase in satiety leading to a reduction in energy intake"

Taurine [74]

The following health relationship that **has not been established**:

- "Taurine and contribution to normal cognitive function"

The following claimed effects were deemed as **general and non-specific**:

- "Taurine and immune system protection"
- "Taurine and metabolism processes"
- "Taurine and maintenance of normal cardiac function"

Whey protein [75]

EFSA has issued an opinion on health claims related to whey protein and several claimed effects, **none of which have been established**. These include:

- "Whey protein and increase in satiety leading to a reduction in energy intake"
- "Whey protein and contribution to the maintenance or achievement of a normal body weight"
- "Whey protein and growth or maintenance of muscle mass"
- "Whey protein and increase in lean body mass during energy restriction and resistance training"
- "Whey protein and reduction of body fat mass during energy restriction and training"
- "Whey protein and increase in muscle strength"
- "Whey protein and increase in endurance capacity during the subsequent exercise bout after strenuous exercise"
- "Whey protein and skeletal muscle tissue repair"
- "Whey protein and faster recovery from muscle fatigue after exercise"

Yerba mate [76]

EFSA has evaluated the following health relationships which **have not been established**:

- "Yerba mate and renal elimination"
- "Yerba mate and organism draining"

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[72] As reported in The EFSA Journal 2011;9(4):2070
[73] As reported in The EFSA Journal 2010;8(10):1747
[74] As reported in The EFSA Journal 2011;9(4):2035
[75] As reported in The EFSA Journal 2010;8(10):1818
[76] As reported in The EFSA Journal 2010;8(10):1742

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[77] A summary report in English can be found at : http://www.bfr.bund.de/en/press_information/2014/05/people_consuming_high_amounts_of_energy_drinks_ignore_the_pick_me_up_risk-189287.html

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* *References marked with an asterisk have been sent personally to the author by stakeholder contacts within the contacted companies/representatives/experts. Any material that was kindly provided to the author is copyrighted information.*

[81] Katarzyna Wilk works at whitehouse consulting which puts the general public in contact with ESSNA. The author had several queries for ESSNA (e.g. ESSNA's position on the regulatory need for sports nutrition products, the emergence of specific trends concerning these products..) to which the whitehouse consulting replied promptly and in a satisfactory matter.