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## Developing a sports nutrition formulary for the Academy of Nutrition and Dietetics Sports Nutrition Care Manual®

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## ACCEPTANCE

This thesis, Developing a sports nutrition formulary for the Academy of Nutrition and Dietetics Sports Nutrition Care Manual®, by Stephanie Vera was prepared under the direction of the Master's Thesis Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree Master of Science in the Byrdine F. Lewis School of Nursing and Health Professions, Georgia State University. The Master's Thesis Advisory Committee, as representatives of the faculty, certify that this thesis has met all standards of excellence and scholarship.

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## ABSTRACT

Developing a sports nutrition formulary for the Academy of Nutrition and Dietetics

Sports Nutrition Care Manual®

by

Stephanie A. Vera

**Background:** Since the invention of Gatorade, the sports nutrition market has expanded rapidly. While the market has expanded, a way to catalogue these sports nutrition supplements (SNSs) has not followed. This lack of centralized information creates a problem for dietitians and other health professionals who need to make informed recommendations for their clients using SNSs.

**Objective:** The objective of this project is to assess the need for a sports nutrition supplement (SNS) formulary and develop a formulary based on need.

**Method:** The need for the formulary was assessed by creating and distributing a survey to dietitians and other health professionals who subscribe to the Nutrition Care Manual or Sports Nutrition Care Manual (SNCM). After the responses were collected, supplement categories and product manufacturers were identified for inclusion. Data collection began by visiting manufacturers' web pages and recording nutrition information into a standardized form provided by the web developers at the SNCM. These completed forms were then sent to the Online Publishing Manager at the Academy of Nutrition and Dietetics. This information was then published into a formulary accessible through the SNCM.

**Results:** The survey yielded 111 respondents. The respondents indicated a personal (71%) and client (64%) need for a sports nutrition formulary. The respondents also

indicated that they are very likely (51%) or somewhat likely (40%) to use a sports nutrition formulary if it were created. Based on these responses, a formulary was created and published through the SNCM.

**Conclusion:** Version 1.0 of the Sports Nutrition Formulary was published to the SNCM on April 15th, 2013. This formulary offers the ability for dietitians and other health professionals to make the most informed, up to date decision regarding the best SNS for their client.

Developing a sports nutrition formulary for the Academy of Nutrition and Dietetics  
Sports Nutrition Care Manual®

by  
Stephanie A. Vera

A Thesis

Presented in Partial Fulfillment of Requirements for the Degree of

Master of Science in Health Sciences

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2013



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## ABBREVIATIONS

The Academy - The Academy of Nutrition and Dietetics

SNCM - Sports Nutrition Care Manual

BMI - Body Mass Index

SNS - Sports Nutrition Supplement

SNSs – Sports Nutrition Supplements

NBJ - Nutrition Business Journal

DRI - Dietary Reference Intakes

AMDR - Acceptable Macronutrient Distribution Range

USDA - United States Department of Agriculture

NND - National Nutrient Database

g/kg - Grams per kilogram of body weight

## CHAPTER I

### Introduction

The market for sports nutrition supplements (SNSs) has grown over the years, though a method of cataloguing these supplements and their nutrition information has not followed. The purpose of this project is to conduct an in-depth analysis to both assess and resolve this nutrition problem. It is proposed that this problem can be resolved by creating a formulary containing databases of SNSs. This formulary will be made available to nutrition and health professionals through professional resources, such as the Academy of Nutrition and Dietetics Online Sports Nutrition Care Manual.

Nutrition Care Manuals are reference resources for nutrition and other health professionals working with patients or clients. These care manuals are available both online and in print, and provide specific guidelines and recommendations for various health conditions that have a nutrition component. Online care manuals provide additional resources, such as printable education materials for patients experiencing different conditions, and formularies containing databases of various nutritional products. In September of 2011, the Academy of Nutrition and Dietetics (The Academy) published its first Online Sports Nutrition Care Manual (1). Before the Sports Nutrition Care Manual (SNCM) became available, the main reference resource available from the Academy for sports nutrition is the book, *Sports Nutrition: A Practice Manual for Professionals*, 5<sup>th</sup> edition (2). This practice manual serves as a comprehensive

literature review on sports nutrition to give the practitioner evidenced based recommendations for athletes. The SNCM differs from the Sports Nutrition Practice Manual by presenting specific nutrition recommendations based upon the information compiled in the Sports Nutrition Practice Manual. It also provides patient education, meal plans, and practitioner tools including, but not limited to, calculators for body mass index (BMI), healthy weight, and energy expenditure, which are not available in the practice manual. The SNCM also provides information on energy metabolism and substrate utilization specific to an active population. The SNCM has separated nutrition recommendations for endurance, strength, and team sport athletes, which is important because the nutritional needs of athletes differ based on activity (3,4). The sports nutrition supplement industry has expanded to meet a variety of needs of athletes, however, the industry started with a basic electrolyte enhanced sports drink.

One of the first beverages marketed to both professional and recreational athletes was Gatorade, which was introduced in 1965 (5). The market for sports drinks and other SNSs has grown significantly in the ensuing years. In December 2011, sport drink sales increased 11.3%, with dollar sales increasing \$4.1 billion (6). Sale of supplement powders, including protein powders, have increased sales in conventional stores and in natural food stores by 6.9% and 18.8%, respectively (7). However, a system in which these sports nutrition beverages and supplements are catalogued has not been developed. This presents a challenge for dietitians and other health professionals who work with athletes. With products entering and leaving the market regularly, it becomes difficult for a health

professional to deliver accurate, up-to date information on the most suitable SNSs for their clients.

A solution to the current lack of sports nutrition supplement information is to create a formulary including databases of SNSs that are currently on the market. Because the sports supplement market is broad, an assessment of interest in these supplements among nutrition professionals is necessary. It is likely that the most sought after information will be those SNSs that are most commonly used, such as sports drinks (carbohydrate and electrolytes), recovery beverages (carbohydrate, protein, and electrolytes), weight gain formulas, and foods such as gels or chews. A formulary will offer basic nutrition information, such as calories, macronutrient distribution, and ingredients for various SNSs. A formulary will be designed to be searchable, and will offer the ability for users to compare supplements within a sports nutrition supplement (SNS) category database. A comprehensive SNS formulary is the key to providing important nutrition information to those nutrition and other health professionals who work with athletes and desire more sports nutrition resources.

## CHAPTER II

### Review of Literature

#### *Introduction to the Sports Nutrition Market*

Gatorade's invention in 1965 was in response to the University of Florida's football coach, Dwayne Douglas, who questioned the weight loss and lack of urination of football players during football games (8). Douglas posed this question to Dr. Robert Cade, a kidney disease specialist at the University of Florida. The answer to Douglas's question led the University of Florida School of Medicine's Renal and Electrolyte Division to take a closer look at the physiology of athletes during periods of intense exercise, such as a football game. They discovered that the players were losing large amounts of sodium and potassium in sweat, upsetting the chemical balance in the body. This discovery created the market for sport performance nutritional products. Since then, the market has grown steadily. In a survey of market growth performed by the Nutrition Business Journal (NBJ), the sport drink category grew 10.5% from 2005 to 2006 (9). The NBJ also reported that, as of 2007, Gatorade continued its several year control of over 80% in the sports drink industry (9). As of 2011, Gatorade and Powerade lead the market with their various beverages comprising the top ten selling sports beverages (10). However, electrolyte enriched beverages are only a portion of the SNSs in today's sports nutrition market. Protein enriched powders and ready-to-drink (RTD) beverages are also major pieces of the SNS market. After ten years in operation, CytoSport received the award for Small Company of



the Year in 2009 at the 16<sup>th</sup> annual Beverage Forum for their success, largely attributed to the marketing and high sales of the RTD beverage Muscle Milk® (11). Part of CytoSport's success is attributed to their Muscle Milk marketing campaigns, which may be responsible for the increased sales among non-elite athletes and fitness enthusiasts (12). Beyond these products, the sports nutrition market has expanded to include weight gaining supplements, energy drinks, and non-drink items such as gels, beans, and chews. The safety of energy drinks after long term use or use in athletes remains uncertain (13,14). Due to uncertain safety, energy drinks will not be included in this project.

#### *Supplement Use Prevalence*

A review of supplement use in elite athletes revealed that, aside from multivitamin and mineral supplements, protein supplements including creatine and amino acid blends are the highest used supplements (15). Yet elite athletes are not the only users of SNSs; marketing of sports supplements has expanded to the general population (16). A cross sectional investigation of 1,102 recreational athletes and fitness enthusiasts who regularly attended gyms were surveyed on supplement usage (17). Nearly 37% reported using various supplements. The three most common supplements used were protein/amino acid supplements (38%), isotonic (equivalent mineral concentration of human cells) beverages (32%), and carbohydrate beverages (23%). Sports gels containing carbohydrate and electrolytes are also increasing in popularity, likely based on research suggesting their effectiveness in endurance performance (18,19).

### *Potential Benefit of SNSs*

The potential benefits of appropriate nutritional supplementation in athletes are well documented. Hottenrott et al. (2012) performed a randomized crossover study and discovered that endurance athletes who participated in a science based nutrition strategy during exercise performed significantly better during an endurance bike ride than those with self-selected nutrition strategies (20). The first group of athletes participated in a science based nutrition strategy, which included the selection of a specific supplement as well as timed ingestion of 250 mL of carbohydrate-electrolyte fluid every fifteen minutes. The second group of athletes self-selected their own supplements and ingestion rate, which were both recorded. The participants with the science-based nutrition strategy had faster trial times and higher maximal output than those with self-selected nutrition strategies. Those with a science-based strategy consumed more fluid, energy, and electrolytes than their self-selecting counterparts. Another recent study showed a significant decrease in ten mile run times of approximately one minute for runners who consumed prescribed amounts of carbohydrate-electrolyte beverages versus those who did not (21). The study separated subjects into three groups: no-drinking, ad-libitum, and prescribed drinking. During a ten-mile run, participants from each group were stopped at two-mile increments, where ad-libitum groups were allowed unlimited access to a beverage, and prescribed drinkers were instructed to drink a specified amount. Run times decreased for the prescribed drinkers, who had a higher fluid and carbohydrate intake than their no-drinking and ad-libitum counterparts. This study re-enforces what many studies

have shown: athletes can enhance endurance capacity by consuming adequate carbohydrate electrolyte beverages versus those who do not (18,22–26).

Endurance athletes include athletes performing for one hour or more, including cycling, running, or other sports such as tennis. One study showed significantly enhanced skill in tennis players consuming carbohydrate beverages versus those who did not. Half of the twenty-two tennis-playing subjects consumed 6.4% carbohydrate beverages while the other half consumed a placebo-matched beverage with no carbohydrates. There was a significant increase in accuracy in both serves and returns in tennis players who consumed a carbohydrate beverage versus their skill-matched counterparts who consumed a placebo (27). In addition, two recent reviews of supplementation and athletic performance concluded that, in the appropriate amounts, nutrient supplementation can increase both performance and mental acuity in sports such as alpine skiing and team sports involving intermittent periods of endurance activity(15-16). Aside from the performance enhancing effects, an appropriate nutrition strategy can also enhance recovery. It is known that carbohydrate ingestion after exercise is vital for the replenishment of muscle glycogen. More recently the relationship between recovery and a carbohydrate-protein solution has been researched. Studies show that ingestion of both carbohydrate and protein together after exercise can enhance recovery (30–34). One way in which this combination may enhance recovery is by stimulating the insulin response which results in increased muscle-glycogen replenishment (30–32). Furthermore, the ingestion of carbohydrate and protein after exercise can also stimulate muscle protein

synthesis, inhibit protein breakdown, and increase muscle accretion (32). Since the utilization of appropriate nutrition in athletes is well documented, it can be concluded that dietitians and other health professionals working with athletes can confidently make SNS recommendations to their clients. Therefore, a formulary of these supplements can help dietitians and other health professionals make a well-informed decision on the best supplement(s) to enhance their client's athletic performance and recovery.

#### *Nutrition Recommendations for Athletes*

Nutrient suggestions for an athlete depends on many factors, such as age, gender, weight, height, and activity. For example, the carbohydrate needs of a high-intensity/ short duration athlete are estimated to be 5-8 g/kg of body weight, with protein recommendations of 1.2-1.7 g/kg of body weight, compared to an endurance athlete who requires 5-7 g/kg of body weight of carbohydrate and 1.2-1.4 g/kg of body weight of protein (35). Most athletes are also encouraged to maintain adequate hydration status wherein a 2% weight change or less is considered acceptable (35). Guidelines for nutrition recommendations based on individual sport can be found in the SNCM. The proposed formulary creates an excellent companion to these sports specific guidelines.

#### *Supplement Categories*

Today's SNS market can most clearly be divided into several major marketing sections. These marketing sections include but are not limited to carbohydrate electrolyte or 'pre/during-workout' beverages, recovery beverages, weight gainers, and food items such as gels, beans, and chews. A joint position

paper on nutrition and athletic performance by the American Dietetic Association, Dietitians of Canada, and the American College of Sports Medicine details recommendations for the athlete (36). These recommendations describe the athlete's needs and potential application for SNSs from the aforementioned marketing categories.

#### *Pre-Workout Beverages*

Carbohydrate-electrolyte or 'pre/during workout' beverages typically contain carbohydrates, sodium and potassium. Recommendations for pre-workout beverages are to provide adequate fluid and carbohydrate within four hours before exercise (36). Recommended sports beverages for endurance athletes contain 6%-8% carbohydrate, 500-700 milligrams sodium per liter and 800-2,000 milligrams per liter of potassium. A beverage with a carbohydrate concentration of 6%-8% is shown to be the most effective to enhance intestinal absorption of carbohydrates, supply adequate energy, and produces an ideal rate of gastric emptying (37,38). Sodium and potassium are the main electrolytes lost in sweat, and therefore are important components in a sports beverage. Sodium also stimulates thirst to encourage hydration. Pre-workout drinks are also used during endurance activities to ensure replenishment of fluid, electrolytes, and energy throughout activity. During a workout, fluid and 30-60 grams of carbohydrate per hour for blood glucose maintenance is recommended, especially for endurance athletes who are rapidly expending energy (36).

### *Recovery Beverages*

Recovery beverages typically include electrolytes, protein and carbohydrate. Post workout recommendations include replenishing fluid, electrolytes, and calories (36). Carbohydrates replenish glycogen stores in the muscle, while protein provides amino acids to repair and build muscle. The consumption of both carbohydrate and protein together may also optimize the replenishment of glycogen stores (39). The timing of protein intake post-exercise is also important, with literature indicating optimal lean muscle gains when consumption of protein is within one hour of activity (40,41). Chocolate milk, which is composed of carbohydrates, protein, and electrolytes, has been researched for its role as a recovery beverage. Research has shown chocolate milk to be an effective recovery aid (39,40,42–45).

### *Weight Gainer Supplements*

Weight gainer supplements are calorically dense and may contain fat and/or protein with carbohydrate. These calorie dense supplements are designed to help athletes meet or exceed their daily energy requirements in order to increase body mass. Overfeeding has been shown to increase body mass in athletes, especially those participating in resistance training (46–48). There is no criterion for the classification of a ‘weight gainer’ nutritional supplement, although it is common for a single serving to exceed several hundred calories in order to achieve overfeeding. Many weight gainers include both carbohydrate and protein. It is not uncommon for weight gainers to provide protein in amounts that exceed the daily need for some consumers, even those with increased protein

needs. Exceeding daily need of protein is not shown to enhance muscle synthesis (48). It is likely that some weight gainers contain large amounts of protein because it is a popular belief that large excesses of protein are required for muscle gain.

#### *Gels, beans, and chews*

Gels, beans, and chews are those supplements that provide restore carbohydrates or electrolytes when hydration is already adequate (18,19). They can be beneficial when used before or during exercise. These products are viable options for endurance athletes because they are light, easy to carry, and can be quickly consumed. It should be noted that adequate hydration is assumed when using these products, as they typically contain very little fluid. The composition of carbohydrate and electrolytes make these supplements very similar to pre/during-workout beverages and can be used to meet the recommendations outlined in that section for carbohydrate and electrolyte consumption.

#### *Current Issues and other Resources*

While many dietitians have accepted that SNSs are a viable nutritional option, it becomes difficult to make the most informed decision without a catalog of products with their nutrient composition. This issue is compounded, as both the number of supplements and their users continue to grow. In a recent study of dietitians regarding recommendations to their clients for supplementation, 97% of the surveyed dietitians reported recommending supplements of some type to their clients, and 46% reported an interest in expanding their sports-related supplementation education (49). Part of expanding sports-related supplementation

education should include knowledge about the breadth of current supplements available in today's market. However, no formulary or database of these supplements exists at this time. When considering the growing market and established usage of SNSs, it is important that dietitians have up-to-date, comprehensive information on current products to aid their recommendations to clients.

Currently, the United States Department of Agriculture (USDA) has the most comprehensive, publically accessible database of nutrient information in their National Nutrient Database for Standard Reference (NND) (50). While the USDA NND includes some supplements, such as Gatorade, Powerade and Muscle Milk, the selection of SNSs is limited. According to David Haytowitz, a nutritionist for the USDA and contributor to the USDA NND, major inclusion/exclusion criteria are consumption data and market sales of products, as well as the manufacturer's desire to provide this information to be included in the database. While this limited product list in the USDA NND is unfortunate, it creates an opportunity to design a specialty database to fill the gap in nutrient information for SNSs.

### *Conclusion*

Gatorade's debut introduced an opportunity to a growing market in sports nutrition. It is known that supplement use is prevalent among both elite and recreational athletes. The benefits of appropriately consumed SNSs range from increased endurance and mental acuity, to enhanced recovery. Nutrition and other health professionals have many resources to aid in evidenced-based



recommendations, such as the Academy of Nutrition and Dietetic's Sports Nutrition Practice Manual, and the SNCM. At this time, there are no known formularies or databases that provide any significant range of SNS products with accompanying nutrient information. Due to the prevalence of and documented benefits of appropriate SNS use, the creation of a formulary is the logical next step for nutrition and other health providers to have information on sports supplements.

## CHAPTER III

### Methods

The purpose of this project was to design a formulary containing major SNSs marketed to athletes for inclusion in the SNCM as a new feature for dietitians and health professionals.

#### *Survey*

To evaluate the need for information on SNSs, a survey was designed. The survey was developed with input from the author, a thesis committee member, and Cathy Iammartino, Director of Books and Resources for the Academy of Nutrition and Dietetics. The survey addressed interest in a sports nutrition formulary, the likelihood of using the formulary, what types of products to be included, desired information on products, and the functionality of searching the formulary. A survey was created and distributed to SNCM subscribers (~470 subscribers) and a link to the survey was posted on the home page of each NCM. One hundred and eleven surveys were returned. Several questions were not specific to this project and served to provide information to the NCM about various other topics. This survey specifically collected information for this project on the following:

- current health profession
- nature of practice and clientele
- interest in sports nutrition

- need for client education
- desirability of a sports nutrition formulary
- a ranking of the types of supplements to be included
- nutrition information provided for each supplement

The survey also addressed the specifics of the database by assessing the importance of functionality, e.g., the importance of the formulary to be searchable by brand, nutrient, and customizable ranges of nutrients such as a defined number of carbohydrates, protein, or any other listed nutrient. A copy of the survey and responses can be found in Appendix 1. The results of this survey will be discussed in the results section.

#### *Category Creation*

For organizational purposes, the formulary needed to be separated into categories. Manufacturers of SNSs frequently address the nature of the beverage on the beverage description or instructions, indicating to the user if it is a supplement to be consumed before activity, after activity for recovery, as a meal replacement or addition (weight gainers), or other. It was decided that the most user friendly method of category separation was to select basic, pre-existing retailer and manufacturer categories of pre-workout beverages (carbohydrate-electrolyte beverages), recovery beverages, weight gainer beverages, and gels, beans, and chews.

#### *Product Selection*

A list of selected manufacturers and their products can be found in Appendix 2. A limited product selection was selected for inclusion. EAS was

chosen because of its manufacturer, Abbott Nutrition. Abbott Nutrition has many medical nutrition supplements that are already included in other NCM formularies and is a trusted manufacturer among health professionals. Gatorade and Powerade were chosen for their popularity and success in the market. Cytosport's Muscle Milk is perhaps one of the most recognizable SNSs. Cytosport, is well known among athletes, exercise enthusiasts, and health professionals and has received accolades for their success in the market (11). It will also be included in this formulary. Other products and manufacturers, such as Boost and Ensure, will also be included due their existence in other NCM formularies and their multipurpose uses as a recovery beverage and weight gainer. Gels, beans, and chews are a growing market, but GU, Jelly Belly, and PowerBar have been on the market for the longest, with GU developing the first gel in 1991 and PowerBar introducing their gel in 1996 (51,52). Jelly Belly was the first to market their existing jelly bean candies with added electrolytes and vitamins as sports beans. All three companies have been in business for over 20 years (51–53). In the future, product selection is expected to expand.

#### *Database Compilation and Design*

After the categories were determined and products were selected, data compilation began by contacting major SNS manufacturers. Contacted manufacturers indicated that all product information including nutrition facts and ingredients are kept up to date on their respective websites.

Manufacturer web pages were visited, and nutrition information was recorded in its entirety, including ingredient and mixing instructions into an Excel

spreadsheet provided by the web developers at the SNCM. This spreadsheet can be viewed in Appendix 3. Spreadsheets were sent to Carissa Vardanian, the online publishing manager for the Academy. The sheets were delivered to the SNCM web developers for publication.

## CHAPTER IV

### Results

#### *Results*

There were 111 responses to the survey distributed to NCM and SNCM users. The complete survey with responses is presented in Appendix 1.

#### *Demographics*

Results for demographic questions can be view in Table 1. The survey results indicated that the majority of the respondents were not currently subscribers to the SNCM but were registered dietitians working in clinical nutrition. Only half of the respondents reported working with athletes, recreational athletes, or active individuals who sought information on nutrition performance. A quarter of the respondents reported working with athletes including high school, collegiate, elite and/or recreational athletes.

<b>Table 1: Demographics*</b>	
<b>n=111</b>	
<b>Subscription to NCM's</b>	<b>%</b>
NCM	93.70
Sports NCM	10.80
Pediatric NCM	45.90
<b>Work with athletes, recreational athletes, or active individuals</b>	
Yes	50.50
No	49.50
<b>Working Title</b>	
Registered dietitian (RD)	90.80
Dietetic technician (DTR)	0.00
Student	6.10
Educator	1.00
Health professional	2.00
<b>Description of Practice</b>	
Clinical nutrition	78.60
Private Practice	14.30
Food Service	6.10
Community Nutrition	16.30
Academia/Education	7.10
Other	8.20
<b>Primary Clientele</b>	
High School Athletes	32.10
College Athletes	17.90
Elite Athletes (Professional)	3.60
Recreational Athletes	92.90

\*Some survey responses may be above or below 100% due to the option to skip questions or select more than one answer.

### *Interest in a Sports Nutrition Formulary*

Results for questions gauging interest and opinions on a sport nutrition formulary can be found in Table 2. The majority of respondents were either personally interested or had clients or patients that showed interest in sports nutrition. When asked how likely the respondents would be to use a sports nutrition formulary, the majority responded that they would be very likely or somewhat likely to use a sports nutrition formulary.

<b>Table 2: Interest in a Sports Nutrition Formulary</b>	
<b>Need for sports nutrition information</b>	<b>%</b>
Personal Interest	71.10
Client Interest	63.90
<b>Likelihood to use a sports nutrition formulary</b>	
Very Likely	50.60
Somewhat Likely	40.00
Somewhat Unlikely	8.20
Very Unlikely	1.20

### *Formulary Specifics*

Results for questions gauging the importance of formulary specifics can be found in Table 3. Items considered "very important" to be included into the formulary are energy or sports bars, sports beverages, high protein beverages, sports gels, protein power supplements, high carbohydrate supplements, electrolyte supplements, glutamine supplements, branched-chain amino acids supplement, creatine supplements, and caffeine supplements. The majority of the respondents indicated that general information such as calories, carbohydrates, protein, and fat would be helpful in a sports nutrition formulary. Other leading categories indicated to be helpful were macronutrient information, macronutrient source, and time specificity. The functional properties of the formulary considered to be most important to respondents include the ability of the formulary to be searchable by brand name.



<b>Table 3: Formulary Specifics</b>			
<b>Importance of item inclusion</b>	<b>%</b>		
	<b>Very Important</b>	<b>Somewhat Important</b>	<b>Not Important</b>
Energy or Sports Bars	71.6	23.5	4.9
Sports Beverages	77.8	17.3	4.9
High protein beverages	74.1	22.2	3.7
Sports Gels	40.0	40.0	20.0
Protein powder	72.5	22.5	5.0
High carbohydrate supplements	49.4	40.7	9.9
Electrolyte supplements	56.8	33.3	9.9
Glutamine	47.5	38.8	13.8
Branched-chain amino acids	45.0	40.0	15.0
Creatine	52.5	36.3	11.3
Caffeine	50.0	38.8	11.3
<b>Categories considered helpful to be included into formulary</b>			
Macronutrient information	93.80		
Micronutrient information	78.80		
Macronutrient sources	92.50		
Food allergens or intolerances	63.80		
Soy	62.50		
Dairy	61.30		
Gluten	65.00		
Lactose	61.30		
Time specific	86.30		
Other	8.80		
<b>Importance of sport nutrition formulary functionality</b>			
	<b>Very Important</b>	<b>Somewhat Important</b>	<b>Not Important</b>
Searchable by brand name	68.4	30.4	1.3
Searchable by macronutrient	69.6	27.8	2.5
Sortable by category	53.2	39.2	7.6
Sortable by customizable nutrient ranges	47.4	39.7	12.8

## CHAPTER V

### Discussion

The purpose of the survey was to gauge the interest and need for a sports nutrition supplement formulary. While most of the respondents were not currently subscribers to the SNCM at the time of the survey, the majority of respondents indicated that they were interested in a sports nutrition formulary. Because the SNCM is a new addition to the NCM family, it is likely that the number of subscribers to the SNCM will increase over time; therefore access to a formulary will also increase. Since many dietitians already report recommending nutrition supplements to clients (49), the availability of a formulary may even increase the attractiveness of a SNCM subscription, thereby increasing subscriptions.

The outcome of this thesis project is a sports nutrition formulary published in the SNCM that includes several leading SNS brands. Each product in the formulary includes all information provided by manufacturers, including serving sizes, ingredients, and macro and micronutrient information. The formulary is searchable by manufacturer or product name, and individual products can be compared in pairs.

When beginning this project, it was assumed that all products currently on the market in the selected SNS categories would be included. However, this presented a problem due to the extraordinary number of manufacturers, products, and the high turnover of products entering and leaving the market regularly.

Because of this, it was decided that familiar and reputable manufacturers would be selected to be represented in the first version of the formulary, as described in the methods sections. After selecting products, the formulary's layout was discussed. Since the formulary is published by the SNCM, the web development team ultimately controlled the layout of the formulary, which mimics the layout of the NCM's MNT formulary. However, the layout and navigability of future databases can be guided by the results of the survey.

#### *Current Nutrient Data Availability*

The development of a sports nutrition formulary satisfies a large gap in nutrition information. Currently, consumers and professionals alike must go directly to manufacturer or retailer websites in order to obtain nutrition information for SNSs. For example, the USDA's NND, as discussed in the literature review, is lacking information for SNSs outside of a select few products (50). Some nutrition websites, such as CondeNet's Self NutritionData ([www.nutritiondata.self.com](http://www.nutritiondata.self.com)) compiles a large amount of information in addition to what is included in the USDA NND. The information contained on their website is provided from the USDA NND as well as restaurants and manufacturers who choose to provide information. While this website contains more nutrient data than the NND, it still fails to provide SNS information. Finally, websites such as MyFitnessPal ([www.myfitnesspal.com](http://www.myfitnesspal.com)) do include nutrient information for SNSs. However, a significant portion of the nutrient data contained on the website is user generated, leaving some uncertainty as to the accuracy of this information. A sports nutrition formulary that includes leading

SNSs compiled by nutrition professionals is a necessity that is satisfied through this thesis project.

### *Limitations*

The largest limitation to this project was the large number of sports nutrition manufacturers and products. Both the number of current products and the turn over these products are high, making product inclusion difficult. The specific format required by the web developers at the SNCM also posed a problem regarding the number of products currently on the market, as it is time consuming to enter nutrient data into the web developer's requested format (detailed in the Methods section). At the start of this project, 130+ products were identified for inclusion. It became apparent that including too many products from too many manufacturers may create two problems. First, it would require an amount of time that would exceed the deadline for the SNCM update in which the formulary was to be released. Second, it would include products from manufacturers that have not been in business for a long. These issues and limitations created a need to selectively narrow down the SNSs to be included into the formulary, thus, the number of products in this first version of the formulary is limited.

Another limitation is the SNCM's web development budget. Because the SNCM is fairly new, budgets did not allow for web development of the desired formulary format. Instead, the SNS formulary's format is identical to the NCM medical nutrition therapy formulary for enteral nutrition products. While this format still satisfies the need for a unified database of products, it requires users

to click individual products to see nutrient information, does not allow sorting based on macro or micronutrient content, and only allows the comparison of two products at a time. These are functions that will be considered important for future versions of the formulary as the SNCM's membership grows.

The final limitation is the maintenance of the formulary. Due to the turnover of these products, a new task is created in order to maintain the formulary. It will require that manufacturers provide information on new products entering or leaving the market, or an individual who will periodically review manufacturer websites for product information.

### *Conclusions*

While the SNS formulary satisfies a need for nutrition and other health professionals, further work will be required in future versions of the formulary to increase its viability in practice. The current formulary represents Version 1.0. This version serves as the basic framework for the formulary for which future expansions and improvements can be made. Examples of Version 1.0 can be found in Appendix 4. In the future, more manufacturers, more products, and more categories that the survey results indicated as important (allergens, caffeine content, etc.) should be included. The functionality of the formulary should also be enhanced as to provide the ability to sort by different categories and to compare more than two products at a time. A key factor in formulary improvement is increasing revenue for the SNCM in order to create a budget for formulary enhancement and upkeep. Regardless of future enhancement, this current formulary will be useful to those nutrition and other health professionals

who subscribe to the SNCM and require up to date and complete SNS nutrient information for clients.

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## Appendix 1

1. Which of the following NCM products have you purchased? (Check all that apply)		
<i>Answered</i>	111	
<i>Skipped</i>	0	
	Response Rate	Response Count
NCM	93.70%	104
Sports NCM	10.80%	12
Pediatric NCM	45.90%	51
2. In your practice do you work with athletes, recreational athletes, or active individuals who seek information on nutrition for performance?		
<i>Answered</i>	99	
<i>Skipped</i>	12	
	Response Rate	Response Count
Yes	50.50%	50
No	49.50%	49
3. Which of the following best describes you?		
<i>Answered</i>	98	
<i>Skipped</i>	13	
	Response Rate	Response Count
I am a registered dietitian (RD)	90.80%	89
I am a dietetic technician (DTR)	0.00%	0
I am a student	6.10%	6
I am an educator	1.00%	1
I am a health professional (other*)	2.00%	2
4. Please indicate which of the following best describes your practice?		
<i>Answered</i>	98	
<i>Skipped</i>	13	
	Response Rate	Response Count
Clinical nutrition	78.60%	77
Private Practice	14.30%	14

Food Service	6.10%	6
Community Nutrition	16.30%	16
Academia/Education	7.10%	7
Other (please specify*)	8.20%	8
5. Which of the following best describes your need for sports nutrition information? I need sports nutrition information because:		
<i>Answered</i>		97
<i>Skipped</i>		14
	Response Rate	Response Count
I am personally interested in sports nutrition	71.10%	69
I have patients/clients that are interested in sports nutrition	63.90%	62
6. My clients are primarily (Please mark all that apply):		
<i>Answered</i>		28
<i>Skipped</i>		83
	Response Rate	Response Count
High School Athletes	32.10%	9
College Athletes	17.90%	5
Elite Athletes (Professional)	3.60%	1
Recreational Athletes	92.90%	26
7. Do you have a need for client education handouts?		
<i>Answered</i>		96
<i>Skipped</i>		15
	Response Rate	Response Count
Yes	88.50%	85
No	11.50%	11
8. What topics would you like to see available in client education handouts?		
<i>Answered</i>		76
<i>Skipped</i>		35
		Response Count
Free Response*		76
9. How likely would you be to use a sports nutrition formulary? A sports nutrition formulary is a searchable listing of sports beverages, sports bars and gels, protein recovery beverages, etc. with basic nutrition information.		
<i>Answered</i>		85
<i>Skipped</i>		26

	Response Rate	Response Count	
Very Likely	50.60%	43	
Somewhat Likely	40.00%	34	
Somewhat Unlikely	8.20%	7	
Very Unlikely	1.20%	1	
10. Please rate how important it is to you that the following items be included in a sports nutrition formulary on a scale of 1-4, where 1= Very Important, 2= Somewhat Important, 3= Somewhat Unimportant, and 4=Very Unimportant:			
<i>Answered</i>		81	
<i>Skipped</i>		30	
	Somewhat Important	Not Important	Response Count
1. Energy or Sports Bars	23.5% (19)	4.9% (4)	81
2. Sports Beverages (such as Gatorade)	17.3% (14)	4.9% (4)	81
3. High protein beverages (such as Muscle Milk)	22.2% (18)	3.7% (3)	81
4. Sports Gels	40.0% (32)	20.0% (16)	80
5. Nutritional Supplements: Protein powder	22.5% (18)	5.0% (4)	80
6. Nutritional Supplements: High carbohydrate supplements	40.7% (33)	9.9% (8)	81
7. Nutritional Supplements: electrolyte supplements	33.3% (27)	9.9% (8)	81
8. Nutritional Supplements: glutamine	38.8% (31)	13.8% (11)	80
9. Nutritional Supplements: branched-chain amino acids	40.0% (32)	15.0% (12)	80
10. Nutritional Supplements: creatine	36.3% (29)	11.3% (9)	80
11. Nutritional Supplements: caffeine	38.8% (31)	11.3% (9)	80
11. Which of the following categories would you find helpful in a sports nutrition formulary? Check all that apply:			
<i>Answered</i>		80	
<i>Skipped</i>		31	
General Information, such as calories, carbohydrate, protein, fat (saturated and unsaturated), cholesterol	93.80%	75	
Micronutrient information (vitamins and minerals, including sodium, potassium etc...)	78.80%	63	

Macronutrient sources, i.e. carbohydrate sources, protein sources, etc...	92.50%	74	
Food allergens or intolerances such as: (mark all that apply)	63.80%	51	
a) Soy	62.50%	50	
b) Dairy	61.30%	49	
c) Gluten	65.00%	52	
d) Lactose	61.30%	49	
Time specific (Before/during/after performance)	86.30%	69	
Other (please specify*)	8.80%	7	
12. Please indicate the importance of the following when considering the use of a sports nutrition formulary:			
<i>Answered question</i>			79
<i>Skipped question</i>			32
	Somewhat Important	Not Important	Response Count
1. The formulary is searchable by brand name	30.4% (24)	1.3% (1)	79
2. The formulary is searchable by macronutrient (ie, carbohydrate, protein or fat) content	27.8% (22)	2.5% (2)	79
3. The formulary is sortable by category (Macronutrient content, food allergens, etc)	39.2% (31)	7.6% (6)	79
4. The formulary is sortable by customizable nutrient ranges (i.e. "Supplements with 4-6g protein" or "Protein formulas that have 30% or less protein to be compliant with NCAA regulations for college athletes)	39.7% (31)	12.8% (10)	78

## Appendix 2

<b>Pre-Workout Carbohydrate-Electrolyte Beverages</b>
CytoMax Sport Fast Twitch
Cytomax Sports Performance
Gatorade G2
Gatorade Original
Powerade Ion4
Powerbar Perform
<b>Recovery Beverages</b>
CytoCarb
EaAS BetaGen
EAS Myoplex
EAS Recovery Protein
Gatorade Recovery Shake
Gatorade Recover
Chocolate Milk
<b>Gainers</b>
Cytosport Cyto Gainer
Cytosport Monster Amino
Cytosport Monster Mass
Cytosport Monster Milk
Cytosport Muscle Milk
EAS Muscle Armor
EAS Myoplex Powder
EAS Phos Force
Boost
Ensure
<b>Gels, Beans, Chews</b>
Cytomax Energy Drops
Gatorade Prime Energy Chews
Gu Energy Chomps
Gu Energy Gel
Gu Sports Roctane
Jelly Belly Sport Beans
PowerBar Performance Energy Blasts
PowerBar PowerGel

## Appendix 3

<b>Manufacturer:</b>		
<b>Serving Size:</b>		
<b>Number of Servings</b>		
<b>Ingredients</b>		
<b>Mix Instructions</b>		
<b>Kilocalories</b>		Kcal
<b>Protein</b>		G
<b>Carbohydrate</b>		G
<b>Fiber, total dietary</b>		G
<b>Total fat</b>		G
<b>Saturated fat total</b>		G
<b>Cholesterol</b>		Mg
<b>Sodium (mEq if available)</b>		Mg
<b>Potassium (mEq if available)</b>		Mg
<b>Vitamin A</b>		IU
<b>Beta-Carotene</b>		G
<b>Vitamin C (Ascorbic acid)</b>		Mg
<b>Thiamin</b>		Mg
<b>Riboflavin</b>		Mg
<b>Niacin</b>		Mg
<b>Calcium (mEq if available)</b>		Mg
<b>Iron</b>		Mg
<b>Vitamin D</b>		IU
<b>Vitamin E</b>		IU
<b>Vitamin B6</b>		Mg
<b>Folic Acid</b>		Mcg
<b>Vitamin B12</b>		Mcg
<b>Phosphorus</b>		Mg
<b>Iodine</b>		Mcg
<b>Magnesium</b>		Mg
<b>Zinc</b>		Mg
<b>Copper</b>		Mg
<b>Biotin</b>		Mcg
<b>Pantothenic acid</b>		Mg
<b>Vitamin K</b>		Mcg
<b>Choline</b>		Mg
<b>Chloride (mEq if available)</b>		Mg
<b>Manganese</b>		Mg
<b>Selenium</b>		Mcg



## Appendix 4

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Sports Nutrition | Client Ed. | Calculators | **Formulary** | Resources | SITE MAP | CONTACT | ABOUT | HELP

Energy | Conditions | Nutrition Care | Equations | References | Lifecycle | Nutrition FAQs For Clients

**Formulary**

- Carbohydrate-Electrolyte Drinks
- Gels, Beans, and Chews
- Oral
- Recovery Drinks
- Weight Gainers
- All
- Formulary Calculator
- Compare Solutions

Search Formulary Database

✓ This symbol means that this solution is currently being used by your facility.

Weight Gainers Solutions - 6 Item(s)

Name	Manufacturer	View
CytoGainer Chocolate Malt	CytoSport	<a href="#">View</a>
CytoGainer Vanilla Shake	CytoSport	<a href="#">View</a>
Monster Amino Fruit Punch	CytoSport	<a href="#">View</a>
Monster Mass Chocolate	CytoSport	<a href="#">View</a>
Monster Milk Vanilla Crème	CytoSport	<a href="#">View</a>
Muscle Milk Vanilla Crème	CytoSport	<a href="#">View</a>

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**Formulary**

- Carbohydrate-Electrolyte Drinks
- Gels, Beans, and Chews
- Oral
- Recovery Drinks
- Weight Gainers
- All
- Formulary Calculator
- Compare Solutions

Search Formulary Database

✓ This symbol means that this solution is currently being used by your facility.

Gels, Beans, and Chews Solutions - 8 Item(s)

Name	Manufacturer	View
Carb Energy Chews Orange	Gatorade	<a href="#">View</a>
CytoMax Energy Drops Tropical	CytoSport	<a href="#">View</a>
Energy Blasts Raspberry	PowerBar	<a href="#">View</a>
Energy Chomp Lemon	GU	<a href="#">View</a>
Energy Gel Plain	GU	<a href="#">View</a>
Power Gel Green Apple	PowerBar	<a href="#">View</a>
Roctane Gel Cherry-Lime	GU	<a href="#">View</a>
Sport Beans Fruit Punch	Jelly Belly	<a href="#">View</a>

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Energy | Conditions | Nutrition Care | Equations | References | Lifecycle | Nutrition FAQs For Clients

- Formulary**
- Carbohydrate-Electrolyte Drinks
  - Gels, Beans, and Chews
  - Oral
  - Recovery Drinks
  - Weight Gainers
  - All
  - Formulary Calculator
  - Compare Solutions

Search Formulary Database

Logout | Home

**NCM**

Search Formulary Database

✓ This symbol means that this solution is currently being used by your facility.

Carbohydrate-Electrolyte Drinks Solutions - 7 Item(s)

Name	Manufacturer	View
CytoCarb II	CytoSport	<a href="#">View</a>
CytoMax Fast Twitch Power Punch	CytoSport	<a href="#">View</a>
CytoMax Sports Performance Cool Citrus	CytoSport	<a href="#">View</a>
CytoMax Sports Performance Tropical Fruit	CytoSport	<a href="#">View</a>
Gatorade G2 Blueberry-Pomegranate	Gatorade	<a href="#">View</a>
Gatorade Thirst Quencher Berry	Gatorade	<a href="#">View</a>
ION4 Fruit Punch	Powerade	<a href="#">View</a>

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Sports Nutrition | Client Ed. | Calculators | **Formulary** | Resources | SITE MAP | CONTACT | ABOUT | HELP

Energy | Conditions | Nutrition Care | Equations | References | Lifecycle | Nutrition FAQs For Clients

- Formulary**
- Carbohydrate-Electrolyte Drinks
  - Gels, Beans, and Chews
  - Oral
  - Recovery Drinks
  - Weight Gainers
  - All
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✓ This symbol means that this solution is currently being used by your facility.

Recovery Drinks Solutions - 5 Item(s)

Name	Manufacturer	View
CytoCarb II	CytoSport	<a href="#">View</a>
Gatorade Recover Strawberry	Gatorade	<a href="#">View</a>
Gatorade Recovery Shake Vanilla	Gatorade	<a href="#">View</a>
MYOPLEX® ORIGINAL READY-TO-DRINK - Choc...	EAS	<a href="#">View</a>
NESQUIK® Calcium-Fortified Low-Fat Chocolat...	Nestle	<a href="#">View</a>