

Dietary Supplement Company Evaluation

An Interactive Qualifying Project Report

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By:

Matthew Simpson

Brooke Cotta

Samuel Francois

Christopher Martineau

Dr. Brian Cotter, Newton Square Chiropractic, Sponsor
Professor Chickery Kasouf, Major Advisor

Abstract

Due to the lack of clear regulations, and the excessive amounts of subjective marketing, it is difficult to determine which dietary supplement companies are producing quality products, making recommending companies challenging for healthcare professionals. Dr. Brian Cotter and his team from Newton Square Chiropractic in Worcester, MA help patients improve their quality of life through a variety of services, including nutritional counseling. This project will help local healthcare professionals and everyday consumers make confident decisions when recommending or purchasing dietary supplements. The results emphasize the importance of accessible scientific factors to select good quality products.

Executive Summary

Many people consume dietary supplements, and each person has their own reason for doing so. Some reasons include losing weight, increasing vitamin intake, meal replacements and muscle growth. One problem is that the guidelines surrounding dietary supplements are not clearly defined. Today, dietary supplements can be purchased almost anywhere; common places include GNC, Vitamin World, online marketers, and whole food stores. While dietary supplements can be useful, they can also be detrimental. It all begins with the procurement of proper information.

Dr. Brian Cotter specializes in areas including Chiropractic care, corrective exercise, lifestyle advice, nutritional counseling, massage therapy, and spinal and postural assistance. Dr. Cotter has requested a list of the best dietary supplement companies to enhance the area of his practice that deals with nutritional counseling. He currently refers his clients to Standard Process, Doctor's Pride, and Metagenics. While these are three good companies, he would like to find out what others are out there and also see where those three companies rank in the supplement world.

This project provided Dr. Cotter with 28 dietary supplement companies. The companies were ranked according to guidelines designed to assess quality, effectiveness, and health safety. Local individuals with experience in the supplement field were interviewed to determine the best companies on the market. Once these companies were identified, research included assessment of clinical tests, manufacturing standards, serving size ratio, FDA Warning letters, and customer reviews for each company. Each of these criteria carried a certain percentage, together totaling 100%. The weight was determined based on the importance of the criterion. Manufacturing standards and FDA warning letters carried the most weight followed by serving size ratio, clinical tests, and customer reviews.

With 28 companies, the work was distributed throughout the group. Each member researched their assigned companies and completed an individual scorecard for the company. After each company received its

score, they were reviewed by other members of the group. Once research was complete, a final list was constructed followed by a final scorecard with every company and their final scores.

At the end of the project, the group identified Reservage Organics, Standard Process, and Natrol as the top companies. The group learned that Standard Process, a company that Dr. Cotter currently recommends, was in those top three. This means that Dr. Cotter was off to a positive start in his product recommendations. We were successful in our efforts to find who the highest quality dietary supplement companies are.

Looking ahead, this project leaves the potential for future projects. Groups could take this initial list and expand it to include more companies. They could also create a cost analysis and factor that into the equation. Making this information public knowledge could also be a future product. A program could be created to aid individuals searching for a specific dietary supplement and then receiving a list of the best companies based on their search.

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1 Introduction

The dietary supplement industry could be compared to the “Wild West” due to the loose regulations placed on their manufacturing facilities as well as their responsibility to produce effective products. Some companies use advertising to trick customers into believing products are of higher quality than they actually are. Dietary supplements fall under different guidelines than food and drug products. Since they are not drugs, supplement companies are not permitted to make untested health claims. Companies are allowed to make claims with nutrients that have proven results. For example, if a company is selling vitamin C they are allowed to say that the product can improve immune health. However, they are also not foods because they alter the chemical composition of your body. A company that is marketing dietary supplements is not required to prove that their products are safe or effective. Instead it is the responsibility of the U.S. Food and Drug Administration (FDA) to disprove the company’s claim if the claim has not been scientifically tested (FDA, 2006). The FDA cannot tackle all of the companies so it is common to see “contamination, false labeling, and incomplete labeling” (Pharmacother. 2003; 37(6):893-8). This has caused consumers and providers to be misled by product quality.

Our group worked for Newton Square Chiropractic to determine which dietary supplement companies are producing quality products. In order to complete the objective, our group interviewed local individuals who are familiar with the supplement industry and one individual who is a certified nutritionist. Prior to meeting with the individuals, our group created a list of questions for interviews. The responses of these individuals directed the research to focus on a smaller subset of companies. Once we completed those steps briefly described above, the next process was to research recommended companies and review their claims. Through reviewing the companies’ websites, we determined the quality of product, reliability of claims and production procedures. The results were a ranked list of quality companies.

From the list of well-respected and appropriately labeled companies, requested by Dr. Cotter, our group assisted him in serving his patients most effectively. With our help, Dr. Cotter can now provide a quality list of dietary supplement companies he currently uses. Our IQP is helping Dr. Cotter, his patients and some local

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consumers save time and money by making well informed decisions in choosing the highest quality dietary supplements.

The Interactive Qualifying Project (IQP) graduation requirement from Worcester Polytechnic Institute (WPI) requires students to complete a project involving applied research that connects science or technology with social issues and human needs. This is a valid IQP because the confusion surrounding dietary supplements addresses the social issues and the human needs portion of an IQP. In addition, the gathering of information from medical experts and dietary supplement vendors addresses the applied research portion of an IQP.

2 Background

The FDA defines a supplement as, “products (other than tobacco) intended to supplement the diet that bear or contain one or more of the following dietary ingredients:

- a. A vitamin;
- b. A mineral;
- c. An herb or other botanical;
- d. An amino acid;
- e. A dietary substance for use by man to supplement the diet by increasing the total dietary intake; or
- f. A concentrate, metabolite, constituent, extract, or combination of any ingredient mentioned above.”

(FDA, 2009, III).

They can be used to supplement a diet lacking in nutrients such as vitamin D, improve training results, aid in recovery or to stimulate a person to maintain alertness. Used correctly, supplements can have a substantial impact on our lives by ensuring that the body receives essential nutrients. Over the last decade, the dietary supplement market has experienced tremendous expansion, growing 7% over the last year alone (Nutrition Business Journal, 2012). This chapter will break dietary supplements down into three sections: FDA regulations; economic market; and effects of dietary supplements.

2.1 FDA Dietary Supplement Regulation

In 1906 the Pure Food and Drug Act laid the groundwork for the Food and Drug Administration (FDA). The FDA was created to help monitor the quality of food and prevent false claims. In 1906 a number of jam manufacturers were filling their product with less expensive materials to cut down the cost of each jar. This situation called for an increased regulation to protect the consumer. The legislation that passed would eventually become the template for the FDA. The modern FDA was born when Congress unanimously passed the Kefauver Harris Drug Amendments of 1962. This act was passed after a sedative used during pregnancy was

linked to birth defects, showing Congress the need for an organization regulating food and drug companies. This new legislation tightened control over prescription drugs and required drug manufacturers to provide doctors with a complete list of the benefits as well as the risks. "It was recognized that no drug is truly safe unless it is also effective, and effectiveness was required to be established prior to marketing (Janssen, 2011).

Since the Drug Act of 1962, hundreds of prescription drugs have been removed from the market because they failed to prove that they were safe and effective. FDA powers have continued to grow since their creation in 1976, when legislation was passed to insure the safety and effectiveness of medical devices. Since then the FDA's powers and responsibilities have continued to grow, and currently their mandate includes assuring the safety and effectiveness of human and veterinary drugs, biological products, medical devices, the nation's food supply, cosmetics, and products that emit radiation (FDA, 2012). In order to meet their objectives, the FDA requires companies to abide by guidelines and procedures that they establish. Guidelines have been established concerning manufacturing practices in the production of ingested products.

These guidelines are called Good Manufacturing Practice, or GMP, and provide companies with manufacturing standards to ensure that their products are not contaminated and maintain a high quality. The FDA also requires that companies meet label claims and has the authority to impose fines on companies that fail to do so. Most importantly, the FDA monitors the process of bringing a new drug to the market and ensuring that a product is safe and effective before it can reach the market. Recently, the Dietary Supplement and Nonprescription Drug Consumer Protection Act, passed in 2006, gave the FDA power to oversee aspects of the dietary supplement market.

Foods

- safety of all food products (except for most meat and poultry products, which are regulated by the U.S. Department of Agriculture)
- labeling
- bottled water
- food additives
- infant formulas

Dietary Supplements

Human Drugs

- product approvals
 - OTC and prescription drug labeling
 - drug manufacturing standards
- #### **Vaccines, Blood Products, and Other Biologics**
- product and manufacturing establishment licensing
 - safety of the nation's blood supply

- research to establish product standards and develop improved testing methods
- Medical Devices**
- from simple items like tongue depressors, to complex technologies such as heart pacemakers
 - premarket approval of new devices
 - manufacturing and performance standards
 - tracking reports of device malfunctioning and serious adverse reactions
- Electronic Products**
- products that give off radiation, such as microwave ovens and X-ray equipment
 - radiation safety performance standards for microwave ovens, television receivers, diagnostic
- x-ray equipment, cabinet x-ray systems (such as baggage x-rays at airports), laser products,
 - ultrasonic therapy equipment, mercury vapor lamps, and sunlamps
 - accrediting and inspecting mammography facilities
- Cosmetics**
- safety
 - labeling
- Veterinary Products**
- livestock feeds
 - pet foods
 - veterinary drugs and devices
 - veterinary biologics not regulated by USDA are considered new animal drugs
- Tobacco Product**

Figure 1. What Does the FDA Regulate? (FDA.gov, 2012)

2.1.1 Dietary Supplements FDA Regulatory History

The FDA regulates food and drug products listed in Figure 1. However, Dietary Supplements (DS) fall into their own category, exposing a loophole. Dietary supplements are not conventional foods, nor are they synthetic drugs, which can make clinical claims. Drugs are defined by the FDA as chemical compounds that can treat the effects of health conditions, alter any chemical part of the body, improve the quality of life, or cure ailments and diseases. Dietary Supplements are herbal supplements which use natural compounds to supplement an individual's diet in order to improve the quality of life. They normally contain vitamins, minerals, herbs, or amino acids and are designed to supplement an individual's diet, not as a replacement for food or medicine. This allowed DS to remain unregulated until congress passed the Dietary Supplement Health and Education Act (DSHEA) of 1994.

“Under the Dietary Supplement Health and Education Act of 1994 (DSHEA), the dietary supplement or dietary ingredient manufacturer is responsible for ensuring that a dietary supplement or ingredient is safe before it is marketed. FDA is responsible for taking action against any unsafe dietary supplement product after it reaches the market. Generally, manufacturers do not need to register their products with FDA nor get FDA approval before producing or selling dietary supplements. Manufacturers must make sure that product label information is truthful and not misleading. Under the FDA Final Rule 21 CFR 111, all domestic and foreign

companies that manufacture, package, label or hold dietary supplements, including those involved with testing, quality control, and dietary supplement distribution in the U.S., must comply with the Dietary Supplement Current Good Manufacturing Practices (cGMPs) for quality control. In addition, the manufacturer, packer, or distributor whose name appears on the label of a dietary supplement marketed in the United States is required to submit to FDA all serious adverse event reports associated with use of the dietary supplement in the United States.” (FDA, 2012)

DESHEA required dietary supplement manufactures to update all of their manufacturing facilities to meet every GMP standard. It also placed the burden of assuring product safety onto the manufacturers of supplements. However, unlike pharmaceuticals, DS are allowed to enter the market without FDA approval. It is the responsibility of the FDA to prove that a DS is unsafe before it orders a product to be pulled from the market. Under DESHEA, companies were not required to report adverse effects from their products to the FDA. This was changed when congress passed the 2006 Dietary Supplement and Nonprescription Drug Consumer Protection Act (NDCPA), which required manufactures of supplements to report serious adverse events. These reports must be submitted to the FDA so they can track trends and make determinations on the safety of the product in question. Requiring companies to report these serious adverse events holds manufactures responsible for their product. The table below shows the history of dietary supplement regulation.

Table 1. Key Events in the Regulation of Dietary Supplements Year (Shames, 2009)

	Key event
1990	The Nutrition Labeling and Education Act of 1990 amended the Federal Food, Drug, and Cosmetic Act to require most foods, including dietary supplements, to bear nutrition labeling.
1994	DSHEA amended the Federal Food, Drug, and Cosmetic Act to create a new regulatory category, safety standard, labeling requirements, and other rules for dietary supplements. Under DSHEA, dietary supplements are generally presumed to be safe.
2002	The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 amended the Federal Food, Drug, and Cosmetic Act to require all food companies, including dietary supplement companies, to register with FDA no later than December 12, 2003, to provide information on the name and address of the facility and, to some extent, the types of products they manufacture or sell.
2004	FDA was successful in banning ephedra after thousands of adverse events, including a number of deaths, and a lengthy legal process.
2006	The Dietary Supplement and Nonprescription Drug Consumer Protection Act amended the Federal Food, Drug, and Cosmetic Act to require dietary supplement companies that receive a serious adverse event report to submit information about the event to FDA.
2007	FDA finalized its Current Good Manufacturing Practice regulations to establish

	quality control standards for dietary supplements. The final rule became effective on August 24, 2007, but companies have 10, 22, or 34 months from the effective date of the rule to comply, depending on company size.
2007	Serious adverse event reporting requirements for dietary supplement companies became effective on December 22.

2.1.2 FDA Regulations on Dietary Supplement Claims

One of the responsibilities of the FDA is to monitor label claims made by manufacturers. The FDA mandates that manufacturers can only make certain claims when advertising and labeling their products. Dietary supplements are not classified as drugs, but instead as “supplements.” Due to this classification, they are not allowed to make the same health claims as drugs. The FDA defines a health claim as a statement with “two essential components: (1) a substance (whether a food, food component, or dietary ingredient) and (2) a disease or health-related condition. A statement lacking either one of these components does not meet the regulatory definition of a health claim.” (FDA, 2003, I). To be considered a health claim, the labeling must relate the ingredients to improving the quality of life, either the prevention or curing of a condition.

Manufacturers are allowed to make certain health claims that have been approved by the FDA because they have been scientifically proven. One example of an authorized health claim is, "diets high in calcium may reduce the risk of osteoporosis" (FDA, 2003). Claims that have been authorized by the FDA can be displayed on the product packaging as long as they meet certain requirements set by the FDA. These claims require written notification to the FDA of the manufacturer’s desires to make certain claims on the packaging.

Companies can also make Qualified Health Claims “when there is emerging evidence for a relationship between a food, food component, or dietary supplement and reduced risk of a disease or health-related condition” (FDA, 2003, I). These claims are not considered to be fully scientifically proven and thus require a warning label to be placed on the packaging indicating that this is the case.

Another type of claim made by supplement manufacturers is a structure/function claim. These claims describe the role of a nutrient or dietary ingredient to affect change in the human body. One example is "calcium builds strong bones". They may also describe how a dietary ingredient can maintain body functions such as, "fiber maintains bowel regularity." These claims may also describe benefits of taking supplements to prevent or cure nutrient deficiency disease such as vitamin C and scurvy. In the case of structure/function claims, the manufacturer is responsible for ensuring the accuracy and truthfulness of the claims made. These are not approved by the FDA, but must be truthful and not misleading. Also, these claims must include a disclaimer on the packaging stating that the FDA did not evaluate the claim and that it is not intended to diagnose, treat, cure or prevent any disease (FDA, 2003). Through this system of classifying claims, the FDA attempts to ensure that dietary supplement manufacturers are truthful and do not misinform their customers about their product. Table 2 lists examples of approved claims.

Table 2. FDA Modernization Act (FDAMA) Health Claims (Health Claims Authorized Based on an Authoritative Statement by Federal Scientific Bodies) (FDA, Guidance for Industry: A Food Labeling Guide, 2009)

Approved Claims	Food Requirements	Claim Requirements	Model Claim Statements
Whole Grain Foods and Risk of Heart Disease and Certain Cancers (Docket No. 1999P-2209)	Contains 51 percent or more whole grain ingredients by weight per RACC, and Dietary fiber content at least: 3.0 g per RACC of 55 g 2.8 g per RACC of 50 g 2.5 g per RACC of 45 g 1.7 g per RACC of 35 g Low fat	Required wording of the claim: "Diets rich in whole grain foods and other plant foods and low in total fat, saturated fat, and cholesterol may reduce the risk of heart disease and some cancers."	NA
Potassium and the Risk of High Blood Pressure and Stroke (Docket No. 2000Q-1582)	Good source of potassium Low sodium Low total fat Low saturated fat Low cholesterol	Required wording for the claim: "Diets containing foods that are a good source of potassium and that are low in sodium may reduce the risk of high blood pressure and stroke."	NA
Fluoridated Water and Reduced Risk of Dental Caries (Docket No. 2006Q-0418)	Bottled water meeting the standards of identity and quality set forth in 21 CFR 165.110 Meet all general requirements for health claims in 21 CFR 101.14 with the exception of the minimum	Required wording for the claim: "Drinking fluoridated water may reduce the risk of [dental caries or tooth decay]".	NA

	nutrient contribution (21 CFR 101.14(e)(6)), Total Fluoride: >0.6 to 1.0 mg/L Excluding bottled water products specifically marketed for use by infants		
Saturated Fat, Cholesterol, and Trans Fat, and Reduced Risk of Heart Disease (Docket No. 2006Q-0458)	Low saturated fat Low cholesterol Bear quantitative trans fat labeling Contain less than 0.5 g trans fat per RACC Contain less than 6.5 g total fat	Required wording for the claim: "Diets low in saturated fat and cholesterol, and as low as possible in <i>trans</i> fat, may reduce the risk of heart disease."	NA

The FDA also requires that certain information be displayed on labels. Manufacturers are required to display nutrition facts and a list of ingredients ordered by decreasing weight. Because dietary supplements are considered to be more similar to a food, they are required to label their package with nutrition information as well as the ingredients of the product. Figure 2 is a sample of the types of information appearing on the packaging of dietary supplements.

Supplement Facts		
Serving Size 1 Tablet		
	Amount Per Serving	% Daily Value
Vitamin A (as retinyl acetate and 50% as beta-carotene)	5000 IU	100%
Vitamin C (as ascorbic acid)	60 mg	100%
Vitamin D (as cholecalciferol)	400 IU	100%
Vitamin E (as dl-alpha tocopheryl acetate)	30 IU	100%
Thiamin (as thiamin mononitrate)	1.5 mg	100%
Riboflavin	1.7 mg	100%
Niacin (as niacinamide)	20 mg	100%
Vitamin B ₆ (as pyridoxine hydrochloride)	2.0 mg	100%
Folate (as folic acid)	400 mcg	100%
Vitamin B ₁₂ (as cyanocobalamin)	6 mcg	100%
Biotin	30 mcg	10%
Pantothenic Acid (as calcium pantothenate)	10 mg	100%

Other ingredients: Gelatin, lactose, magnesium stearate, microcrystalline cellulose, FD&C Yellow No. 6, propylene glycol, propylparaben, and sodium benzoate.

Figure 2. Sample Supplement Label (FDA, Chapter IV. Nutrition Labeling, 2005)

2.1.3 FDA Regulations on Dietary Supplement Manufacturing

The Good Manufacturing Practice (GMP) is a standard for the production of medical products. GMP sets standards for the environment in which products can be produced, how they are stored, and testing procedures to ensure they meet quality standards. GMP standards apply to medical devices, bandages, pharmaceuticals, dietary supplements, food products and any medical or ingested product. GMP exists to ensure that the public has access to products that are manufactured in a clean environment, free of dust, bacteria and other contaminants. It also requires that products will be tested to ensure that they meet quality standards and will perform to the manufacturer's specifications. GMP also mandates how raw materials, as well as finished products, will be stored such that they will not expire and are not being unnecessarily introduced to possible contaminants.

Companies are required to meet these specifications but are not regularly audited by the FDA. Typically, a company does not get audited by the FDA until there are complaints or a problem with a particular product. For this reason some associations offer GMP certifications which can ensure that that product meets all GMP standards. The NPA (National Product Association) offers a triple GMP certification program where companies willingly submit to a third party audit of their manufacturing procedures to ensure that they are meeting GMP standards (NPA) . If this audit is successful and no infractions are found, the company is allowed to display a logo of a GMP certification program, and that product is most likely a higher quality product than those produced by companies that do not submit to voluntary audits. Figure 3 lists an example of the GMP procedures:

Building and Facilities

1. Floors, walls and ceilings are constructed of smooth, easily cleanable surfaces and are kept clean and in good repair.
2. Fixtures, ducts and pipes are installed in such a manner that drip or condensate does not contaminate cosmetic materials, utensils, cosmetic contact surfaces of equipment, or finished products in bulk.

3. Lighting and ventilation are sufficient for the intended operation and comfort of personnel.
4. Water supply, washing and toilet facilities, floor drainage and sewage system are adequate for sanitary operation and cleaning of facilities, equipment and utensils, as well as to satisfy employee needs and facilitate personal cleanliness.

Equipment

1. Equipment and utensils are cleaned and stored in clean room environments. Cosmetic contact surfaces of equipment are also covered, in a manner that protects them from splash, dust or other contamination.
2. Utensils, transfer piping and contact surfaces of equipment are well-maintained and clean and are sanitized at appropriate intervals.
3. Equipment and utensils used in processing, holding, transferring and filling are of appropriate design, material and workmanship to prevent corrosion, buildup of material, or adulteration with lubricants, dirt or sanitizing.

Personnel

1. The personnel supervising or performing the manufacture or control of the product has the education, training and/or experience to perform the assigned functions.
2. Persons coming into direct contact with materials, finished products in bulk or cosmetic contact surfaces, to the extent necessary to prevent adulteration of products, wear appropriate outer garments, gloves, hair restraints etc., and maintain adequate personal cleanliness.
3. Consumption of food or drink, or use of tobacco is restricted to appropriately designated areas.

Raw Materials

1. Raw materials and primary packaging materials are stored and handled in a manner which prevents their mix-up, contamination with microorganisms or other chemicals, or decomposition from exposure to excessive heat, cold, sunlight or moisture.
2. Containers of materials are labeled with respect to identity, lot identification and control status.
3. Materials not meeting acceptance specifications are properly identified and controlled to prevent their use.

Figure 3. Example GMP Procedures (FDA, Good Manufacturing Practice (GMP) Guidelines/Inspection Checklist, 2008)

2.2 Effects of Dietary Supplements

2.2.1 Recommendations & Purchasing

A study performed in 1998 by eleven poison control centers in the United States showed that 66% of 572 respondents, family or friends were the main influence in consuming supplements. The study also showed physician referrals for supplements are fairly low, 7% in the study, next to herbalist

recommendations, at 5% (Palmer, Everson, Nelson, Dodd-Butera, Bartlett & Landzberg, 2003). This shows how many do not look to experienced individuals for advice. These studies also discovered that about one half of all dietary supplement purchases were made at places similar to pharmacies, grocery shops and mail order or internet sources, while the rest were made at health food stores (Palmer, Everson, Nelson, Dodd-Butera, Bartlett & Landzberg, 2003). These popular choices for purchasing supplements are generally not the best because the staff is uninformed about the supplement industry causing consumers to make uneducated decisions.

2.2.2 Downside to Supplement Usage

Supplement use has been on the rise and potentially negative side effects are becoming more evident with increased usage. Adult use of supplements has increased over the past decade from 33.8% in 1990 to 42.1% in 1997. These are mostly unregulated in the United States and it is the FDA's responsibility to prove that a supplement is harmful. One example is ephedra, a plant known for the treatment of asthma, hay fever and the common cold. It has severe adverse effects as well as bioactive effects and has just recently been banned by the FDA. There are supplements similar to ephedra, synephrine for example, which are equally dangerous and still available on the market. (Wilson, 2006)

Dietary supplements have been linked with adverse effects that range from minor injury to death. It is difficult to correlate the effects ingredients have on the body. This is due to products having more than one ingredient and also due to incomplete information systems (Wilson, Klein, Sesselberg, Yussman, Markow & Green, 2006). In addition, adverse effects can only be recorded through voluntary reporting making unsafe products hard to detect by the FDA (Palmer, Everson, Nelson, Dodd-Butera, Bartlett & Landzberg, 2003).

There are also concerns with sports and dietary supplements. An athlete must be careful when it comes to supplement intake. Many supplements available are against sport organization regulations. (Maughan, King & Lea, 2004). Sometimes banned substances are ingested accidentally. "The

supplement industry is essentially unregulated, and supplements often contain ingredients that are banned for athletes.” Banned substance can also be placed into products inadvertently during the manufacturing process. Athletes considering taking some kind of supplement should be educated and aware and consult their coaches and trainers prior to taking it. (Huggins, 2012).

2.2.3 Improper Usage

“Scientific research has shown that a lot of people who take supplements in addition to their normal diet know about the proper intake of supplements.” (Baltrusch, 2010). Uniformed decisions can be detrimental. For example, in an article from the Office of Dietary Supplements, National Institutes of Health, “getting too much vitamin A can cause headaches and liver damage, reduce bone strength, and cause birth defects. Excess iron causes nausea and vomiting and may damage the liver and other organs” (Dietary Supplements: What You Need to Know, 2011). This is just one of several issues that can occur from the improper intake of a supplement.

Teens and adolescents have also begun using supplements. Many are too young to understand the effects these supplements can have on their bodies and do not completely understand that by taking more than the recommended dose, the effects do not become greater but become detrimental (Wilson, Klein, Sesselberg, Yussman, Markow & Green, 2006). This is the same case for uneducated adults who are looking for a quick and easy fix.

One case of adverse supplement side-effects is a 45-year-old man who developed liver disorders while receiving over-the-counter vitamin and mineral supplements for his overall health. For approximately one year, he had been taking nine supplements totaling thirty individual ingredients where a most of the recommended daily allowances were exceeded. He suddenly had body pain, nausea, jaundice, asthenia and anorexia. His liver enzymes were elevated and his gallbladder was thickening, along with many other illnesses. After six weeks of halting intake, his symptoms disappeared and most of his levels were normalized (Minerals/heavy metals/vitamins overdose, 2010). Many

overdose when having a deficiency of an essential nutrient, without realizing the results are far more beneficial when taken in combination with an increased intake of a food containing that nutrient (Maughan, King & Lea, 2004). It is important to consult with a healthcare provider and experienced individuals before taking supplements.

2.2.4 Upside to Supplement Usage

Supplements can be used to improve many aspects of the user's health and perhaps improve the quality of life and longevity. Nutritional supplements can assist athletes by allowing for a better recovery and therefore enabling them to train harder and longer. Proteins and amino acids, β -Hydroxy- β -methylbutyrate, trace elements, prohormones and related compounds and herbal supplements can all be used to improve strength and power, by promoting tissue growth and repair. Generally, these increase amino acid availability, stimulate hormone release, increase the number of cells or allow adaptation for training, all linked to the supplements connection to synthetic pathways. (Maughan, King & Lea, 2004). Dietary supplements can also help reduce the risk of disease but are not intended to treat, diagnose, prevent or cure them. (FDA, Dietary Supplements, What You Need to Know, 2006)

Weight and fat loss is another reason supplements are used. Overall, this will make people healthier and able to live longer. The main additive to achieve this affect is carnitine. Carnitine is present in red meat and dairy products making it more crucial for those with a vegan diet, who are most likely deficient. Carnitine can also be synthesized from lysine and methionine in the liver and kidney. There are published reports that suggest carnitine supplementation promotes the use of body fat stores by increasing the rate of fatty acid oxidative metabolism. (Maughan, King & Lea, 2004). There are also products that have been shown to promote weight loss, such as Qsymia and Xenical, but contain prohibited drugs by the sport associations National Collegiate Athletic Association (NCAA) as well as the World Anti-Doping Agency (WADA) banning collegiate and professional athletes from ingesting them.

These include caffeine (sometimes as guarana), ephedrine, and aspirin (NCAA, 2012) (WADA, Prohibited List, 2013).

Some supplements promote immune function and resistance to illness and infection. Zinc is another popular supplement that is believed to afford protection against the common cold and other infectious illnesses when taken within twenty-four hours of onset of symptoms. Antioxidants have been becoming more popular in the industry, which have been shown to protect the body. Glutamine is seen as a fuel for immune system cells. Some studies performed on athletes who over train show a low circulating glutamine concentration causing chronic fatigue symptoms. Supplements made with various plant and plant parts of the genus Echinacea have seen claims to increase general immune system function, as well as treating and preventing the common cold, flu and upper respiratory tract infections (Maughan, King & Lea, 2004). Other antioxidant nutrients that promote immune health include vitamins C and E, which may be responsible for protecting cells from the negative effects of highly reactive free radicals created from the rate of oxygen consumption in the mitochondria during exercise. (Harvard Medical School, 2013).

As the average life expectancy increases, there are more problems with overuse and inflammatory conditions, making joint health more essential. There are numerous antioxidants, essential fatty acids, herbs, botanicals and animal extracts being promoted as treatments. Taken from cartilage tissues of animals, glucosamine and chondroitin, have been reported to assist with the components of cartilage building as well as preventing progression of disease and reducing the severity of symptoms. (Maughan, King & Lea, 2004)

Some supplements that cause effects on the central nervous system are known as stimulants. There have been cases of fatalities associated with these supplements. Stimulants increase heart rate and can put the body in cardiac arrest. (Men's Running, 2013). This category includes traces from agents such as cocaine being found in low doses in cough medicines and herbal tonics. (Maughan, King & Lea,

2004) Caffeine is found in a large range of beverages and food products, but in high doses can cause insomnia, headaches, gastrointestinal irritation and bleeding. It can also result in increased energy and endurance (WebMD, 2013).

Many adults utilize supplements to improve and maintain cognitive health. Some examples of these supplements include Gingko biloba, vitamins B6, B9, B12, vitamin E, omega 3 fatty acids, vitamin D, phospholipids and ginseng. However, there have also been multiple adverse effects associated with these supplements. For example, although vitamin E has shown improvement in older adults newly diagnosed with dementia, as well as helping prevent heart disease, it has also been associated with having negative effects. (Gestuvo & Hung, 2012). Some examples include an increased risk for hemorrhagic stroke as well as reacting with vitamin C to cause severe sun sensitivity. There is no evidence yet available to prove whether these other supplements might not be beneficial. (Strauss, 2011).

The main reasons to use supplements are in combination with specific foods and also for occasions when food intake or choice is restricted, as well as a short-term remedy for when a deficiency syndrome exists. Some supplements in bar and drink form are also used as meal replacements for individuals pressed for time or athletes that needs quick fuel. (Zelman, 2003).

2.3 Dietary Supplement Market

Dietary Supplements are widely available. Dietary supplements can be found online, at grocery stores, drug stores/pharmacies and practitioners' offices. There are two marketing categories: one where the company's supplements are only sold to specialists and the other which the supplements are available to the general public.

The first category includes supplements available to all consumers. Supplements can be purchased over the internet without restriction; GNC.com and BSNOnline.net are two examples. The website navigation of these are generally user friendly and allow the product list to be broken down into

categories to best suit the consumer's needs. These vendors also have stores where their supplements can physically be purchased. This increases the level of ease for acquiring certain dietary supplements. These companies generally make no mention of their quality or manufacturing standards for their supplements. It is easy for their customers to obtain their products, but not their manufacturing information.

The second subgroup of dietary supplement vendors consists of company websites that only sell to an exclusive group. This makes it difficult for any consumer to obtain the companies supplements. Companies in this subgroup will only sell to practitioners and specialists. Dr. Brian Cotter, from Newton Square Chiropractic, has indicated that he receives the majority of his dietary supplements from a company called Metagenics. Metagenics.com can be quickly identified as a member of the second subgroup of supplement websites. The website navigation was difficult and the supplements are not for sale on the website, but must be purchased through a select group of practitioners. Vendors in this subcategory also provide information about manufacturing standards and dietary supplement quality. These vendors make the purchase of their dietary supplements exclusive, but highlight the quality and manufacturing of their products. By making a promotional ploy, it creates an illusion of exclusivity.

The most common physical dietary supplement stores are classified as part of the first category. Some examples include: Rite-Aid Pharmacy; CVS Pharmacy; and Wal-Mart. These companies carry a wide variety of products, but their staff is generally unknowledgeable and unable to recommend products. The products are well organized and easily accessible, but the manufacturing standards and quality of the product is not displayed.

The number of dietary supplement companies has been on the rise along with the supplement sales. There is evidence as early as 2002 that recognizes the success of dietary supplements in the market.

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“Last year it was the only OTC category to garner sales in excess of \$1 billion in the drug class of trade (analgesic tablets and powders came in at \$984 million, based on Information Resources Inc. 2002 full-year data). Currently, dietary supplement sales are tracking at \$1.4 billion for the 52 weeks ended June 22, up 5 percent versus the same period one year ago.” (Johnsen, 2003)

Growth in supplement sales has been consistent over many years. “For the tenth year in a row, the sales trajectory across both natural products and mass market channels has been decidedly upward. The proof is in the (organic) pudding, specifically a 3.3% increase in total dietary supplement sales for 2010” (Finn 2011). The most recent evidence of dietary supplements’ success in the market shows a large spike in sales: “Supplement sales across the U.S. have shown strong, steady growth in the face of economic uncertainty, posting a 7% gain in 2012, according to a new report” (Schultz, 2012). The positive trend in dietary supplements’ sales is a result of their ability to appeal to many different groups.

This consumer population splits into several subgroups including athletes, medical patients with specific conditions, and everyday consumers. Athletes tend to take dietary supplements to improve their overall health and performance in their appropriate sport. Many athletes rely on protein supplements to increase muscle mass. Some dietary supplements tend to target a consumer group with certain illnesses. Although, dietary supplements do not guarantee cures for disease or other medical conditions, they often imply the potential for improvements in everyday life. A good example of a targeted group would be individuals suffering from diabetes. “Many supplements are used in the treatment of diabetes and its complications” (Campbell, 2010). Some examples are Alpha lipoic acid, bitter melon, chromium supplementation, cinnamon supplementation, fenugreek supplementation, and gymnema supplementation. The everyday consumer often uses a multivitamin such as a “one-a-day” to support general health. Figure 4, below, is a graph posted in an article from Acupuncture Today regarding current supplement intake in America:

Most popular reasons for taking supplement:

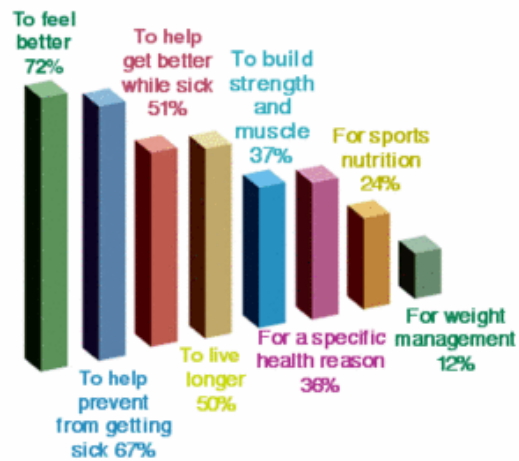


Figure 4. Popular Supplement Usage Reasons (Devitt 2001)

There are several different types of supplements available today. Common supplements come in the form of pills, powder, or liquid. Certain supplements are taken for certain desired outcomes. For example, there are nutritional supplements which provide additional intake of vitamins and minerals, herbs, amino acids, and enzymes. In addition to nutrition, there are supplements for weight loss, protein, body mass increase, energy enhancers, mood enhancers, and so much more. It is possible that the different forms of supplements and the different goals of supplements may conflict and lead to dangerous complications. Therefore, considering the abundant amount of resources for acquiring the supplements and the wide variety of supplements, it is important to identify and speak with a dietary supplement experts before consumption.

2.4 Dietary Supplement Professionals

When it comes to sports and dietary supplements there are people that can be classified as experts in the field. These individuals can include scientists, supplement company workers, etc. Since it was not possible to sit down with a chemist and dissect a supplement, for example, we considered someone an expert based on history and experience, as well as on knowledge. Individuals that have been around the supplement world and have knowledge of different products from different companies

were most easily accessible in our case. For example, when comparing two weight loss supplements from two different companies, a knowledgeable individual should be able advise which product is better and why without a biased opinion to a certain company. People who have experience in health were also considered experts in our case because of their knowledge on how a person's body can adapt to a certain supplement. For example, a personal trainer might know whether or not to take a certain supplement because of its general effect on the human body. Although true experts in the industry do exist, we considered people with extensive experience who know a lot about different products and manufacturers in the supplement world experts.

There are advisors from whom a consumer can seek recommendations prior to purchasing and using supplements. Such individuals include weight trainers who are properly educated, doctors, and nutritionists. Some weight trainers pride themselves on their background in human health and muscle training. Such people are highly educated on the pros and cons behind certain supplements as explained by the National Athletic Trainers' Association (National Athletic Trainers' Association, 2012). Nutritionists are also educated on certain supplements and can recommend them on a case-by-case basis to their clients. Doctors, who tend to specialize in a certain medical area, may not know a great amount about certain supplements. However, if a person has the intention of taking a supplement they should "Let [their] health care providers (including doctors, pharmacists, and dietitians) know which dietary supplements [they're] taking so that [they] can discuss what's best for [their] overall health" (Office of Dietary Supplements, 2011). The reasoning for this is so doctors have some knowledge regarding supplements and can advise people on whether or not to take a certain supplement based on one's medical history.

3 Methodology

The dietary supplement industry is not required to adhere to strict regulations on marketing, R&D and manufacturing and this has allowed some companies to produce inferior products. Newton Square Chiropractic requested that research be conducted to evaluate which companies are producing high-quality products. The steps outlined below indicate the process taken to answer the question posed by Dr. Cotter and Newton Square Chiropractic.

3.1 Step 1: Collect a List of Companies

We selected and contacted four individuals to interview regarding sports and dietary supplements. The purpose of interviewing these individuals was to not only benefit from their expertise on the subject, but to inquire about the companies that produce supplements. The team discovered the best companies that produce supplements. Many different factors were considered in this process. Factors that needed to be taken into consideration consisted of quality, quantity, availability, etc.

The four individuals have a great deal of experience in supplements and nutrition. Not all of them have degrees and/or formal training, but in the supplement world, experience and practical knowledge can be very important and useful qualities. The four individuals with whom we met with are Mike Rochette, Jim Herrick, Steve Davis, and Amy Aubertin. Mike Rochette has extensive experience with supplement products. He is a vendor for friends and family and understands the pros and cons of certain products and companies. Jim Herrick and Steve Davis are both personal trainers who are very knowledgeable about the human body and muscle development. They both have extensive knowledge of nutrition and the human body. Amy Aubertin is nutritionist from Newton, Massachusetts. She specializes in eating disorders and therefore knows a great deal about the nutrition of supplements. We chose these four individuals because they can identify the right direction for further research.

A list of companies was generated from the interviews. Our group then researched the companies using websites and company contacts to answer a series of questions. The purpose was to

discover the pros and cons among these manufacturers and identify which companies deserve higher ratings than their competitors. Interviews were chosen rather than a survey because of the type of research that was required. The production and marketing quality of dietary supplements was researched, so it was best to focus on a small group of knowledgeable individuals.

3.2 Step 2: Review Companies' Quality of Product

In order to determine the quality of the companies identified in the first step, a series of questions was designed for each company to determine the quality of the company and its products. They were answered by using publicly available information on the internet. A blank company scorecard is included in the Appendix, and explains the score ranges for each category in detail. This information assisted Newton Square Chiropractic in choosing companies and products that they should recommend to their patients.

1. What are the reviews by customers?

Product reviews provide insight on how the product works. If customers consistently complain about the product, this indicates that the product is not meeting label claims and/or has serious side effects. These problems could include manufacturing defects or indicate that false information is being provided. By evaluating product reviews, information on the effectiveness and quality of products can be obtained.

2. Does the company conduct clinical studies of products?

There is no better way to test a medical product than clinical studies. The best way to determine how users will react to a product is to conduct trials using multiple subjects. If a company regularly conducts clinical trials before it releases a product, then the effectiveness of the product and side effects are already known before the product is released to the general public. Companies that conduct clinical trials on their products will produce products of greater quality and have a better understanding of the positive effects as well as the negative reactions and side effects.

3. What is the substance to serving size ratio?

Many products contain filler that make them taste better, seem cheaper or make production faster or easier. These additives make the product less effective and more costly for the consumer. “Some common fillers include stearic acid, magnesium, stearate and gelatin” (eHow, 2013).

3.3 Step 3: Evaluate Manufacturing Standards

To evaluate a company’s manufacturing standards two questions were answered. These answers indicated if the company is following GMP (Good Manufacturing Practice) when producing their products. If a company is not following GMP procedures, then contaminants could be introduced into their product, potentially causing a variety of health concerns as well as impede the effectiveness of the product. The answers to the questions listed below helped determine if a company’s manufacturing facilities are producing high quality products.

1. Does the company have a GMP certification?

The FDA does not regularly audit companies to ensure that they are meeting manufacturing standards. Instead, companies govern themselves until problems are discovered by the FDA, such as a rise in adverse events caused by the release of contaminated products. If a company possesses a GMP certification then they submit regularly to independent third party audits of their manufacturing processes. By achieving GMP certification, a company gains the right to print a symbol on their products ensuring their customers that they are receiving a high quality product.

2. Has the company been audited by the FDA or received a warning letter?

If the FDA detects a rise in adverse events from a particular company, an investigation will be launched to discover the cause of the problem. If the company is determined to be at fault for the rise in the adverse events, then the company will receive a warning letter from the FDA. The warning letter starts the process of the FDA reviewing the company’s procedures. If significant problems are discovered during this review, the company will be forced to enter a constant decree in which

companies agree to a legally binding agreement to improve their GMP procedures or risk being shut down. Looking at the FDA's records to determine if a company has been entered under a constant decree in the past assisted evaluating the quality of the company's products.

3.4 Step 4: Compile Results and Make Recommendation of Top Companies

Once all interviews and company research concluded, we needed a method to rank the supplements. We chose weighted average to organize and present the data to determine the best dietary supplement company. Weighted average is defined as the process "that takes into account the proportional relevance of each component, rather than treating each component equally" (InvestorWords.com, 2013). There are a lot of variables to consider when comparing dietary supplement companies so weighted average was the most useful approach. Weighting qualities most vital to a good product higher, it was easy to see which company was of high quality versus those just popular for marketing. Weighted average allowed us to consider important information about dietary supplement companies rather than fall victim to propaganda.

For the scope of this IQP, we thoroughly investigated twenty-eight companies', clinical tests, manufacturing standards, substance to serving size and customer reviews. The data was evaluated based on the attributes Dr. Cotter felt was most important. From our research, we gave each company criterion scores ranges. An example criterion would be customer reviews. Amazon.com contains reviews of a large range of products. The highest rated supplement received the highest score in the customer review section; however, the weights prevented the highest rated supplement from instantly ranking the best.

Table 3. Weighted average Company Scorecard

Top CATERGORY Dietary Supplement Vendors									
	Clinical Tests	Manufacturing Standards	FDA Warning Letters	Filler to content ratio	Customer Reviews		Raw score	Weighted Score	Rank
Weights	15%	30%	30%	20%	5%		100%		
Reservage Organics									
Standard Process									
Natrol									
Nordic Naturals									
New Chapter									
Doctors pride									
Isagenix									
Sunwarrior									
American Health									
Country Life									
Muscletech (Iovate)									
Natural Organics Laboratories/ Nature's Plus									
Metagenics									
Mega Foods									
Inter Armor									
Vitamin Shoppee									
Natures Way									
GNC brand									
Body Tech (Vitamin Shoppe)									
Hero Nutritionals									
Optimum Nutrition									
NBTY/Vitamin World/Met-rx									
Next Protiens									
Garden of Life									
Bio-Engineered									
Gaspari									
USP Labs									
Syntrax									
Cytosport									

In summary, our group reached out to local connections in the dietary supplement world for suggestions on which companies to pursue. We chose twenty eight, with our sponsor, to pursue. We then researched those companies asking consistent questions about measurable and definitive information. Table 3 above is an example of how we compared and ranked the companies based on the information. Our sponsor helped us adjust the weights and the criteria as he saw best for himself, his practice and his patients.

3.4 Weighting Explanation

The weights were assigned to each category based on how important the category was in making a determination on the quality of products that company was producing. This process was very similar to how a professor grades a class. In a typical class, the highest weight is placed on the exams because they show whether a student understands the material covered in class. Therefore, exams should receive the greatest weight. In the world of dietary supplements it was not clear as to which categories should receive the highest weight. Weights were established based on our interviews, and

input from Dr. Cotter as to what was important to him. The categories that were given the highest weights were manufacturing standards and FDA warning letters and customer reviews, being the most subjective, received the lowest weight.

If a company has received a warning letter from the FDA, they were caught doing something wrong. Whether it was violating GMP procedures, mislabeling products, or making false claims, the company was acting in a way that could negatively impact consumers. FDA warning letters were also a clear way to compare companies because all the warning letters are public knowledge and obtainable through the FDA's web page. This category was an objective way of ranking companies as well as an indicator of whether the company was producing a quality product. Manufacturing standards were equally weighted with FDA warning letters.

Manufacturing standards were given a 30% weight because how a company manufactures their products is significant to the quality of the product. If a company does everything perfectly but does not manufacture their product well, contaminants such as heavy metals can be introduced to the product. The product can also become less effective if the raw materials that enter the plant are not evaluated for quality before they are introduced to the batch. This could potentially lead to a less effective product when the batch is complete. The FDA mandates that these companies adhere to strict GMP procedures for a reason and if a company is not following these procedures, then they are not producing a quality product. This area was also fairly objective because the companies were evaluated by whether they had a GMP certification or if there was mention made to manufacturing standards on their webpage. The full evaluation criteria can be found in the blank score card appendix. Manufacturing standards are important to producing a quality product and was a fairly objective evaluation.

The next highest weight was given to the filler to content ratio. The amount of filler in a product is a good measure of the quality of the supplement being produced. When you go to the store and buy protein you expect to receive a product that contains mostly protein not sugar and other fillers. The

individuals that were interviewed also indicated that they compare companies by how much filler is in their products. A company that puts a lot of filler into their product should rank lower than a company that puts very little additives in their products. To evaluate this category, for example, a protein product would be selected from the company being evaluated and the protein present would be divided by the serving size. This would give a percentage and the company would be scored based off of the percentage. This was an objective way of ranking the companies except for when a product could not be found where the serving size versus the content could be compared. In this condition the company was given the default value of 3. The serving size was important to individuals that were interviewed in this project as to Dr. Cotter, so it received a weight of 20% percent because it does not matter if the company is introducing contaminants into the product because their manufacturing standards are not compliant with GMP standards.

Clinical tests were given a weight of 15% because it was less important than the other categories. This was established from the results of our research and through discussions with Dr. Cotter. The clinical test category was probably the hardest category to get information because many of the companies made no mention to clinical studies. Out of the 28 companies evaluated 15 received a 0 for clinical tests because no information could be found to prove they conducted clinical tests. Dietary supplements are not considered drugs, so the companies that manufacture new supplements are not required to conduct clinical tests before marketing their products. It is not always necessary to conduct clinical tests if the active ingredient did not change and only the content that changes the taste of the supplement did. This makes it difficult to assign weights in this category because some companies may not need to conduct clinical test to determine if the product is safe or effective. Due to the lack of information and that every product does not require clinical tests it was given a 15% weight. This weight gives the companies that make mention of their clinical testing an advantage over companies who received a 0 for this category.

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The last category and the lowest weighted category were customer reviews with a 5% weight. Customer's reaction is an important aspect of determining the quality of a product because if the customer does not find that the product is effective then it is not a quality product. Customer reviews are very subjective and supplements affect people in different ways. Where one person can have great success with a supplement, another person could have severe side effects. Do to the subjective nature and unreliably of customer reviews, this category was given the lowest weight.

The weights were chosen after analyzing the information we received from the research conducted and through discussions with Dr. Cotter. The weights were chosen to reflect the importance of each category in determining which companies are producing high quality products.

4 Results

The research began with a total of four interviews and field work such as visiting supplement stores. The first step was to complete the interviews. The first person to be interviewed has been in the supplement world for thirty-two years. When purchasing supplements this individual looks for effectiveness, price, and quality. Before selling a supplement, he researches the products and the company. As a supplement distributor, he asks for feedback from his customers, who are close friends and relatives. The clientele has given those supplements a good review. However, the type of review depends on the product's purpose. For fat burners, different reviews come from different people, due to varying results. For proteins and vitamins, he generally receives the same review. His feelings towards the GNC supplement store and brand were negative. He mentioned that GNC is overpriced and the sales representatives are unfamiliar with the supplement world. When he walks into a supplement store he wants to see someone "who looks in shape." He said that Whey protein is the best protein to use because it has more vitamins and nutrition. Some of his favorite supplement companies are Optimum Nutrition, Inner Armor, Metrix, Muscle tech, and Gaspari.

The second interview was with someone who has studied sports fitness and personal training for years. He does not advocate supplements but he would recommend vitamins with USP (United States Pharmacopeia). When purchasing vitamins he would ask questions like "what do you do" and "show me your scientific validation." As far as he is concerned, quality does not matter without the proper safety certifications. His feelings towards supplement retailers such as GNC and Vitamin World are that they are "interesting." GNC has undereducated employees and he found they did not have nutritionists working in the stores; therefore he feels there is no safety guarantee. When someone is trying to better their health through dietary change he said to look for the lowest amounts of sugar and to not obsess over fat content. One of his favorite supplement companies is Sunview.

The third person was a personal trainer. He used to take supplements consistently and now only consumes protein and consults individuals regarding supplements. When someone is choosing a supplement, he explains the most important things to consider are one's current state of health, safety, effectiveness, and cost. His favorite supplement is Prograde. Fitness Revolution, one of his franchises, told him about Prograde. He has heard from at least twenty different trainers that Prograde is a quality company. This interviewee has trained a few hockey players who are now playing at the professional level. Those hockey players have recommended a product called First Green Powder. He considers Whey Isolate the overall most effective because it absorbs the fastest. Raw whey protein and a sugar packet releases insulin so cells absorb it faster post workout. Repair time after a workout is essential. His favorite company is Prograde and his favorite product is Whey Isolate.

The fourth interviewee is a nutritionist who specializes on eating disorders, but also works with athletes and other individuals without eating disorders. She has experience through private practice, information from clients and also personal experience from taking vitamin supplements. She investigates recent scientific research and has believes that there is not enough good quality research on sports supplements. Sometimes she attends conferences for nutritionists. The supplement companies that show up at these events must have a good record because the audience consists of doctors and nutritionists who ask in depth questions. Her feelings toward supplement retailers are based on her profession. Since she works with people who have eating disorders she is familiar with food supplementations. She feels as if GNC has people who enter the store and are inexperienced, they do not know what they need or do not need. Those individuals spend too much on non-necessities and she does not send people to these stores.

She refers individuals in need of vitamins to whole food stores and CVS to buy generic brands. As for protein powder she recommends basic Whey isolate protein. Her feeling about supplements prior to purchasing them is that you are paying for something that you are told is fantastic, when in reality it is

not. She believes that if it is “too good” to be true, then it probably is false. People can get good nutrition through just foods instead of supplements. She stated that sometimes herbal supplements may be helpful. She recommends speaking to someone with more experience and expertise with a brand of interest before purchasing any products. Some of her favorite products are Omega 3 brands, Nortic Naturals and Carlsons.

Once the interviews were completed, the list of companies was generated. The company websites were able to provide the proof of clinical tests, serving size ratio, and manufacturing standards. To search for FDA issued warning letters we had to look at the U.S. Food and Drug Administration website. To get consumer reviews we looked on Amazon. This website sells virtually all supplements and products, and there is an excess of customer comments and reviews making the results more accurate. Some companies required more research than others to confirm factors such as clinical tests and manufacturing standards. The full results can be located in Appendix B. Company Evaluations.

Upon the completion of the scorecard the three best companies are Reserpage Organics with a weighted score of 94, Standard Process with a score of 92 and Natrol with a score of 91.5. All three companies had examples of clinical tests which gave them all scores of 5, the highest possible score. Reserpage Organics was GMP Certified which gave them a manufacturing standard score of 4. Standard Process and Natrol are triple GMP certified so they both received a score of 5. None of the three companies have received warning letters from the FDA so they all received a score of 5. Reserpage Organics has a serving size ratio greater than 85% so they received a score of 5 where Standard Process and Natrol received a 3 because they both had serving size ratios between 55%-70%. Reserpage Organics and Standard Process were given scores of 5 for customer reviews because they have been given a 5 star review. Natrol was given a 4.5 star review so they received a score of 4.5. For a breakdown of the serving sizes see the chart in the appendix.

Table 4. Dietary Supplement Scorecard

Top CATERGORY Dietary Supplement Vendors								
Weights	15%	30%	30%	20%	5%	100%		
Company Name	Clinical Test	Manufacturing Standards	FDA Warning Letters	Filler to content rat	Customer Review	Raw score	Weighted Score	Rank
Reserve Organics	5.00	4.00	5.00	5.00	5.00	24	94	1
Standard Process	5.00	5.00	5.00	3.00	5.00	23	92	2
Natrol	5.00	5.00	5.00	3.00	4.50	22.5	91.5	3
Nordic Naturals	5.00	5.00	5.00	3.00	4.50	22.5	91.5	3
New Chapter	5.00	5.00	5.00	3.00	4.00	22	91	5
Isagenix	2.50	5.00	5.00	4.00	4.00	20.5	87.5	6
Doctors pride	2.50	4.00	5.00	5.00	4.00	20.5	85.5	7
GNC brand	4.00	4.00	5.00	3.00	4.00	20	82	8
American Health	2.50	4.00	5.00	4.00	3.00	18.5	80.5	9
Country Life	0.00	4.00	5.00	5.00	4.00	18	78	10
Muscletech (Iovate)	2.50	4.00	5.00	3.00	4.00	18.5	77.5	11
Natural Organics Laboratories/ Nature's Plus	0.00	5.00	5.00	2.00	4.50	16.5	72.5	12
Metagenics	5.00	5.00	0.00	4.00	5.00	19	66	13
Mega Foods	0.00	1.00	5.00	4.00	5.00	15	57	14
Inter Armor	0.00	1.00	5.00	4.00	4.50	14.5	56.5	15
Vitamin Shoppee	0.00	1.00	5.00	4.00	4.50	14.5	56.5	15
Sunwarrior	0.00	0.00	5.00	5.00	4.00	14	54	17
Natures Way	2.50	4.00	0.00	4.00	4.50	15	52	18
Cytosport	0.00	5.00	0.00	4.00	3.50	12.5	49.5	19
Hero Nutritionals	0.00	0.00	5.00	3.00	4.00	12	46	20
Optimum Nutrition	0.00	4.00	0.00	4.00	5.00	13	45	21
Garden of Life	0.00	4.00	0.00	4.00	4.00	12	44	22
NBTY/Vitamin World/Met-rx	0.00	4.00	0.00	3.00	4.50	11.5	40.5	23
Next Protiens	0.00	5.00	0.00	1.00	4.50	10.5	38.5	24
Bio-Engineered	0.00	4.00	0.00	2.00	4.00	10	36	25
USP Labs	2.50	0.00	0.00	3.00	4.00	9.5	23.5	26
Syntrax	0.00	1.00	0.00	3.00	4.00	8	22	27
Gaspari	0.00	0.00	0.00	2.00	3.00	5	11	28

When determining which company is the best from a retail perspective, two stores came to attention. GNC and Vitamin World are two large vendors of dietary supplements. In the interview process, one of the questions asked the interviewee about their feelings toward these two stores. A reoccurring theme was GNC carries a lot of big name products and a wide variety of products, but with no regulation; this means anyone can buy them. The employees who work at GNC tend to be teens and young adults who do not know much about the products and are most likely there for the employee discount and status of working at a supplement store. GNC is also found to be drastically overpriced. Vitamin world on the other hand is similar to GNC in terms of price and variety of product. The difference is when both stores were visited GNC had a young man who did not know much about the products when asked, whereas at Vitamin World there was a body builder who knew a great deal about almost every product. He also added that he would recommend products that are cheaper if he believes they are better.

5 Conclusions

In Conclusion, Dr. Cotter's discomfort and uneasiness about his dietary supplement recommendations are appropriate. There is a lot of confusion between good marketing and important information when considering dietary supplements. Our team sifted through the media and other forms of marketing. Using the science available, each dietary supplement company was thoroughly evaluated. Expert interviews and communication with Dr. Cotter helped generate a list of companies to research. After completing research and weighted average, Reserve Organics, Standard Process and Natrol ranked the highest. The companies Dr. Cotter currently uses are Standard Process, Doctor's Pride and Metagenics. Final results showed that all of Dr. Cotter's companies prior to this project remained in the top 50% of our results, one of those ranking in the top three.

While ranking these companies, some common trends for specific subgroups became clear. Supplement companies that focus primarily on Sports Nutrition tend to have the lowest scores. These companies consistently earn low scores because they tend to have a lack clearly identified clinical tests. In addition, the sports companies usually have websites full of pictures of "strong people" rather than facts. The sports companies have little information in general on their websites which made researching them difficult. In contrast, the supplement companies that work to be organic tend to rank well. This is because those companies are generally open about their tests, manufacturing standards, and products. The only difficulties with organic companies involved calculating the substance to serving size ratio. The reason for this came from the types of products being tablets and capsules rather than powder mixtures with defined weights.

Some difficulties that arose consisted of determining the most efficient way of finding the best dietary supplement company. If given unlimited resources such as speaking to a chemist, chemical engineers, manufacturing engineers and other individuals with related skill sets would have helped with evaluating companies and products. Given the time frame and accessibility to experts, the focus was

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directed towards individuals who are familiar with supplements through years of experience in the field. Our experts, whom are not as knowledgeable as expert scientists, served a key role in the completion of this project.

There are many possible approaches to move forward. If Dr. Cotter wishes to continue this project in the future, there are a few things to consider. One would be performing a cost analysis of the top companies. Cost was not a factor in the weighted average but it may provide more insight on the best company now that the highest quality companies have been identified. Also, with smart phones being as popular as they are now, a phone application or a website could be developed to display all these findings. In addition to displaying the findings, these technology additions could allow customers to add in their favorite companies to the database providing more insight on dietary supplement companies.

Dr. Cotter can now take the results and look at the companies which ranked the highest and make a more informed decision when making recommendations.

Appendix A. Blank Company Score Card

Clinical Tests (%):

No clinical tests = 0 points

Some reference to clinical tests = 2.5 points

Examples of clinical tests = 5 points

Manufacturing Standards (%):

No standards = 0 points

Some unclear reference to standards = 1 point

Quality Assured = 2 points

3rd party Quality Assured = 3 points

GMP = 4 points

USP = Triple GMP = 5 points

GMP Certification Links:

<http://www.npainfo.org/NPA/EducationCertification/GMPCertifiedCompanies.aspx>

<http://www.usp.org/usp-verification-services/usp-verified-dietary-supplements/participating-companies>

<http://www.nsf.org/Certified/GMP/Listings.asp>

FDA Warning Letters (%):

No Warning Letters = 5 points

>= 1 Warning Letter = 0 points

Substance to serving size ratio (%):

X >= 85% = 5 points

85% > X >= 70% = 4 points

70% > X >= 55% = 3 points

55% > X >= 40% = 2 points

40% > X >= 25% = 1 points

25% > X >= 0% = 0 points

Customer Reviews (%):

0 Stars = 0 points

1 Stars = 1 point

2 Stars = 2 points

3 Stars = 3 points

4 Stars = 4 points

5 Stars = 5 points

Appendix B. Company Evaluations

Garden of Life Inc.

<http://www.gardenoflife.com/>

Clinical Tests:

The Garden of Life Inc. had no references to or any evidence of domestic or third party clinical tests; therefore, the Garden of life received a score of 0 in the clinical tests section of the score card.

Manufacturing Standards:

The Garden of Life Inc. made claims of Current Good Manufacturing Practices (cGMP): “we have a Quality Department that oversees cGMPs.” The garden of life even claimed to have several third party companies review their manufacturing standards.

However, when checking the NSF’s website and the other Triple GMP websites we have been using, Garden of Life is not one of the listed companies.

Despite not being on the websites we used their claims are very direct and can even have their own checklist to defend their claims:

The Garden of Life Inc.’s claims and personal score card are enough pieces of evidence to justify a score of 4 for the Manufacturing Standards section of the score card.

FDA Warning Letters:

On May 11, 2004, one of the Garden of Life Inc.’s facilities received a FDA warning letter from the Florida District office for making claims that technically qualified their products as unapproved drugs with potentially false claims rather than dietary supplements. For receiving a FDA warning letter The Garden of Life Inc. earns a 0 for the FDA warning letter section of the score card.

Substance to serving size ratio:

According to the supplement label, one recommended serving size is approximately 4 table spoons or 22 grams of powder. Each serving contains 17 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is actual the protein that a

customer wishes to consume. $(17\text{grams} / 22 \text{ grams}) \times 100\% = 77\%$. With 77% of the serving being the intended product, Garden of Life Inc. earns a score of 4 for this section of the score card.

Customer Reviews:

The Garden of Life Inc. products on amazon mostly receive 4 stars which earns a score of 4 for the customer review section of the score card.

Metagenics

<http://www.metagenics.com/>

Clinical Tests:

Metagenics website states “Clinical studies and individual case management studies are conducted at our Functional Medicine Research CenterSM (FMRC)”. There were also several articles on clinical tests. In addition to articles and claims about clinical tests, Metagenics encourages its customers to sign up to participate in clinical tests. Metagenics has clear examples of its clinical test trials; however, to review the results in depth, Metagenics requires that customers create an account. The preliminarily evidence presented is more than enough to justify Metagenics receiving a score of 5 for the clinical test section of the score card.

Manufacturing Standards:

On the webpage Metagenics Claims to be “The Only Triple GMP-Certified Company”. That claim is false because Metagenics is one of many GMP- Certified Companies. Despite the slight inaccuracy of the claim, Metagenics is on the NSF’s list of Triple GMP certified companies. Holding a spot on the NSF’s list earns Metagenics a score of 5 for the manufacturing standards section of the score card.

FDA Warning Letters:

On October 3, 2003, Metagenics received a warning Letter from Los Angeles District of the FDA for several of its products being labeled as “Medical Food” when they did not meet the requirements of medical foods. Receiving that letter earns Metagenics a score of 0 for the FDA Warning Letters section of the score card.

Substance to serving size ratio:

Metagenics's Unipro's Perfect Protein serving size is 1 scoop or 23 grams of powder. Each serving contains 16 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is actual the protein that a customer wishes to consume. $(16\text{grams} / 23\text{ grams}) \times 100\% = 70\%$. With 70% of the serving being the intended product, Metagenics. earns a score of 4 for this section of the score card.

Customer Reviews

The majority of Metagenics's products on Amazon received 5 stars, which earns Metagenics a score of 5 for the customer review section of the score.

Muscle Tech (owned by Iovate)

<http://www.iovate.com>

<http://www.muscletech.com/research/index.shtml>

Clinical Tests

MuscleTech is not clear on whether it conducts clinical tests or not. There are some reference about research on their web page which suggests some type of work: "A portion of every dollar spent on MuscleTech® supplements is allocated towards funding scientific research to discover new and more effective ways to help increase lean muscle mass and strength, reduce body fat and improve athletic performance."

Iovate Health Sciences is not too clear about its clinical testing either; however, there is some reference to clinical tests: "Many millions of dollars have been invested in the company's Product Development activities, in areas that include academic/university research, clinical studies, technology development, and formulation research." (Iovate, (2013))

Due to the unclear references and lack of specific examples, Iovate/MuscleTech earn a score of 2.5 for the clinical tests section of the score card.

Manufacturing Standards

Iovate Health Sciences mentions GMP manufacturing standards: "This is achieved by ensuring that each of our manufacturing locations follows and are compliant with current Good Manufacturing Practices. An exhaustive series of industry-leading internal and external Quality Assurance procedures are

conducted on our raw materials as well as our finished products. These strict Quality Assurance practices are adhered to for every brand that Iovate offers.” (Iovate, (2013)) MuscleTech has no reference to any sort of manufacturing standards. Despite the inconsistency, neither MuscleTech or Iovate Health Sciences is on the NSF’s list or any of the lists of Triple GMP certified companies that we have been reviewing. The clear mention of GMP on Iovate Health Sciences’ page justifies a score of 4 for the manufacturing section of the score card.

FDA Warning Letters

As of February 13, 2013, MuscleTech and Iovate Health Sciences have not earned any FDA warning letters which deserves a score of 5 for the FDA warning letter section of the score card.

Substance to serving size ratio

MuscleTech's Nitro Tech serving size is 1 scoop or 36 grams of powder. Each serving contains 30 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is actual the protein that a customer wishes to consume. $(30\text{grams} / 36\text{grams}) \times 100\% = 83\%$. With 83% of the serving being the intended product, MuscleTech earns a score of 4 for this section of the score card.

Customer Reviews

On Amazon the majority of MuscleTech’s products averaged 4 stars, which earns a score of 4 for the customer review section of the score card.

Natural Organics/ Nature’s Plus

<http://www.naturesplus.com/index.php>

Clinical Tests

Nature’s Plus had no references to clinical tests which earns a score of 0 for the clinical test section.

Manufacturing Standards

Nature’s Plus claims to have very sophisticated and unique manufacturing standards: “Unlike many distributors who represent numerous manufacturers of varying reputations, Nature's Plus develops, manufactures, distributes and supplies our own line of products. As industry-leading natural vitamins

and nutritional supplements manufacturers, we guide the entire process from research and development to shipment to your health food store.” (Nature’s Plus, 2013). Nature’s plus also appears on the NSF’s list of triple GMP certified companies. The slot on the list and their claims earn Nature’s Plus a score of 5 for the manufacturing standards section of the score card.

FDA Warning Letters

As of February 13, 2013, Nature’s Plus/ Natural Organics have not received any FDA warning letters which deserves a 5 in the FDA warning letter section of the score card.

Substance to serving size ratio

Nature's Plus's Spiru-Tein serving size is 1 scoop or 32 grams of powder. Each serving contains 16 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is actual the protein that a customer wishes to consume. $(16\text{grams} / 32\text{ grams}) \times 100\% = 50\%$. With 50% of the serving being the intended product, Nature Plus earns a score of 2 for this section of the score card.

Customer Reviews

On Amazon Nature’s Plus had a lot of products with 4 stars and 5 stars as well as some 4.5 star products. The small range of ratings averages out to 4.5 stars which earns Nature’s Plus a score of 4.5 for the customer review section of the score card.

Natures Way

<http://www.naturesway.com>

Clinical Tests

Nature’s Way boasts about its sophisticated European and clinically proven products: “We were the first to bring clinically proven, European phytomedicines to the U.S. market that had long been recognized as effective, but were new to many in this country.”(Naturesway, 2013). Despite the boasting, there is no evidence of any clinical tests which earns Nature’s way a score of 2.5 for the clinical test section of the score card

Manufacturing Standards

Nature's way's manufacturing standards are not on the NSF's List or the other lists for triple GMP standards. Nature's way does claim to have GMP standards though: "We have a state-of-the-art, pharmaceutically licensed, industry-recognized GMP manufacturing facility, and invested in it well before it became more common to do so." (Naturesway, 2013). The reference and claim to GMP earns Nature's Way a score of 4 in the manufacturing standards section of the score card.

FDA Warning Letters

Nature's way received 4 FDA warning letters:

1. On November 18, 1998 Nature's way received a FDA warning letter from the Center for Devices and Radiological Health for certain devices such as ear candles.
2. On March 22, 2000 Nature's way received a FDA warning letter from the Center for Food Safety and Applied Nutrition for food labeling.
3. On December 14, 2004 Nature's way received a FDA warning letter from the Denver District office for adulterated food.
4. On January 25, 2008 Nature's Way received a FDA warning letter from the Denver District office for Dietary Supplements/ food/ new drug/ adulterated/ misbranded.

These 4 warning letters earn Nature's way a score of 0 in the FDA warning letter section.

Substance to serving size ratio

Nature's way does not have its own brand of protein supplement powder which makes it difficult to evaluate however, substance to serving size ratios can be determined with other products.

Nature's Way's Zinc Chelate serving size is 1 capsule. Each serving contains 30milligrams of zinc. Dividing the serving size weight by the amount of zinc will determine how much percent of each serving size is the actual zinc that a customer wishes to consume. $(30\text{milligrams} / 30\text{milligrams}) \times 100\% = 100\%$. With 100% of the serving being the intended product, Nature Way earns a score of 5 for this section of the score card.

Customer Reviews

On Amazon there are a lot of Nature's Way products with scores of 4 or 5 stars. The average is 4.5 stars which earns Nature's Way a score of 4.5 for the customer Review section.

Next Proteins

<http://www.nextproteins.com/>

Clinical Tests:

There was no reference to clinical tests anywhere on the website. Due to the lack of information, Next Proteins earns a score of 0 on the clinical test section of the score card.

Manufacturing Standards:

Next Protein did not provide any information on manufacturing standards which earns a score of 0 for the manufacturing standards section of the score card.

FDA Warning Letters

Next Proteins has not received any FDA warning letters, therefore Next Proteins earns a score of 5 for the FDA warning letters section of the score card.

Substance to serving size ratio:

For this product and the information presented above, it is near impossible to figure out the amount of substance to serving size ratio. However, it is unreasonable to poorly mark down this company because the nature of the product is different from most others. The only reasonable thing to do is give Next Proteins an average score which should not help nor hinder the final score: With that reasoning Next Proteins earns a 3 in this section of the score card.

Customer Reviews:

The Customer reviews on amazon were all 4 or 5 stars which earns Next Proteins a score of 4.5 on the customer review portion of the score card.

Nordic Naturals

<http://www.nordicnaturals.com/consumers.php>

Clinical Tests

Nordic Naturals conducts a lot of research at prestigious universities and also conducts clinical tests.

“Nordic Naturals is a research leader in demonstrated product efficacy. Nordic Naturals fish oils are regularly chosen by leading research institutions and universities such as Harvard University, Columbia

University, National Institutes of Health (NIH), Stanford University, Duke University, UCLA, and the Cedars-Sinai Medical Center for their independent research. With 25 published studies, including 15 clinical studies, and more than 30 in progress, Nordic Naturals is the brand of choice for omega-3 research worldwide.” (Nordic Naturals, 2013). The 15 clinical studies earns Nordic Naturals a score of 5 in this section of the score card.

Manufacturing Standards

Nordic Naturals holds itself to a gold standard and goes into detail about how their manufacturing procedures produce quality products: “We use nitrogen to minimize exposure to oxygen at every stage of manufacturing—beginning immediately after catch. The importance of this cannot be overstated: only by using nitrogen can the fish and oil be protected from the oxidative rancidity that leads to fishy smell and taste, as well as to free radical formation in the body.” (Nordic Naturals, 2013).

Nordic Naturals is also on the NSF list for GMP certified companies. With all this information, Nordic Naturals earns a 5 for this section.

FDA Warning Letters

As of February 13, 2013, Nordic Naturals has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio:

Nordic Naturals does not produce anything in which the substance to serving size ratio can be properly evaluated. To avoid helping or hindering Nordic Naturals overall score, it is appropriate to give Nordic Naturals a score of 3 for this section.

Customer Reviews:

The customer reviews on Amazon averaged out to about 4.5 stars which earns Nordic Naturals a score of 4.5 for this section of the score card.

American Health

<http://www.americanhealthus.com/>

Clinical Tests

America Health quality assurance team performs a series of tests on their products, but they fail to mention specifics; this is why the company receives a 2.5.

Manufacturing Standards

American Health indicates that they have testing procedures in place at their manufacturing facilities to ensure that their products are meeting a high quality standard. “Our products are subject to stringent testing before, during and after manufacture, including analysis by High Performance Liquid Chromatography, Gas Chromatographs, Fourier Transform Infrared Spectroscopy, Thin Layer Chromatography, Ultraviolet/ Spectrophotometry, Wet Analysis and Near Infrared Spectrophotometry.” (American Health, 2013). American indicates that they have SOP in place for ensuring that their producing a quality product American Health receives a 4 for manufacturing standards.

FDA Warning Letters

As of February 13, 2013, American Health has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

A majority of the products this company sells have a combination of vitamins and at a high dosage compared to other supplements. For these reasons this product receives a 4.

Customer Reviews

The customer reviews on Amazon averaged out to about 4 stars which earn American Health a score of 4 for this section of the score card.

Bio-engineered

<http://www.bsnonline.net>

Clinical Tests

This company makes no reference to clinical tests and therefore receives a 0.

Manufacturing Standards

This company is certified in:

- NSF International Dietary Supplement GMP and GMP for Sport Registrations

- BSN has completed the GMP for Sport registration (confirms the distribution facility is free of banned substance contamination)
- International Society of Sports Nutrition
- American Herbal Products Association

Bio-engineered has a GMP certification as well as test their products for banned substances therefore they receive a score of 5.

FDA Warning Letters

This company has a warning letter for Dietary Supplements/Labeling Misbranded. For this reason they receive a score of 0.

Substance to serving size ratio

Syntha-6 (their protein powder) serving size is 47.2 grams. Each serving contains 22 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(47.2 \text{ grams} / 322 \text{ grams}) \times 100\% = 40\%$. With 40% of the serving being the intended product, Bio-engineered earns a score of 2 for this section of the score card.

Customer Reviews

The customer reviews on Amazon averaged out to about 4 stars which earns Bio-engineered a score of 4 for this section of the score card.

Country Life

<http://www.countrylifevitamins.com>

Clinical Tests

There was no reference to clinical tests anywhere on their website. Due to the lack of information, Country Life earns a score of 0 on the clinical test section of the score card.

Manufacturing Standards

This company claims to be NNFA GMP certified and operates NSF GMP certified manufacturing and distribution facilities so country life receives a 5 for manufacturing standards.

FDA Warning Letters

As of February 13, 2013, Country life has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

Country Life Whey Protein Powder Vanilla serving size is 30.3 grams. Each serving contains 20 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(20 \text{ grams} / 30.2 \text{ grams}) \times 100\% = 66\%$. With 66% of the serving being the intended product, Country Life earns a score of 4 for this section of the score card.

Customer Reviews

The customer reviews on Amazon averaged out to about 4 stars which earns Country life a score of 4 for this section of the score card.

Hero Nutritionals

<http://heronutritionals.com/>

Clinical Tests

There was no reference to clinical tests anywhere on their website. Due to the lack of information, Hero Nutritionals earns a score of 0 on the clinical test section of the score card.

Manufacturing Standards

This company makes no reference to standards so receives a 0 for manufacturing standards.

FDA Warning Letters

As of February 13, 2013, Hero Nutritionals has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

This product does not contain a large amount of mg per dose; however most of the company's products are made for kids and they do not offer a product which the serving size could be compared. Therefore, this company receives the default value of 3.

Customer Reviews

The customer reviews on Amazon averaged out to about 4 stars which earns Hero Naturals a score of 4 for this section of the score card.

Mega Food

<http://www.megafood.com/>

Clinical Tests

This company makes no reference to clinical tests so receives a 0.

Manufacturing Standards

This company makes an unclear reference to standards. A doctor reviews the supplements which are all made from farm fresh foods, but they are not GMP certified so receive a 1.

FDA Warning Letters

As of February 10, 2013, Mega-Foods has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

This company does not make a product with the serving size could be easily compared so they receive the default value of 3.

Customer Reviews

The customer reviews on Amazon averaged out to about 5 stars which earns Hero Naturals a score of 5 for this section of the score card.

New Chapter

<http://www.newchapter.com/>

Clinical Tests

New Chapter performs clinical tests on some of their products to ensure their effectiveness one example of clinical trials is the Wholemega study.

“The purpose of this study was to perform a double-blinded randomized placebo-controlled study on New Chapter's fish oil product Wholemega TM, to explore general as well as specific markers of cardiovascular health.” (New Chapter, 2013). New Chapter publishes the results of at least one of their studies earning them a score of 5 for clinical trials.

Manufacturing Standards

This company is GMP certified by NSF International so they receive a 5 for manufacturing standards.

FDA Warning Letters

As of February 12, 2013, New Chapter has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

This company does not make a product with the serving size could be easily compared so they receive the default value of 3.

Customer Reviews

The customer reviews on Amazon averaged out to about 5 stars which earns New Chapter a score of 5 for this section of the score card.

Optimum Nutrition

<http://www.optimumnutrition.com/>

Clinical Tests

This company makes no reference to clinical tests so they receive a 0 for this category.

Manufacturing Standards

This company manufactures their products in a GMP Registered Plant with Current Good Manufacturing Practices (cGMPs). They have also evaluated Consumer Reports and received a strong manufacturing quality review. “Two Optimum Nutrition products were evaluated in the article, both of which tested **well below** the proposed U.S. Pharmacopeia limits for heavy metals in dietary supplements, even

at the 3 serving level. These 2 ON supplements were Platinum Hydrowhey (Velocity Vanilla flavor) and Gold Standard 100%” (Optimum Nutrition, 2013). The company claims to be a register facility but they do not appear on the GMP certified companies but have received good reviews for their manufacturing so they will receive a 4 for manufacturing standards.

FDA Warning Letters

They received a warning letter on May 7, 2002 for Dietary Supplements/Adulterated/Misbranded so receive a 0 in this area. This warning letter was issued because a few of their products were miss branded and not meeting label claims.

Substance to serving size ratio

Optimum Nutrition’s 100% Whey Gold standard serving size is 30.4 grams. Each serving contains 24 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(30.4 \text{ grams} / 24 \text{ grams}) \times 100\% = 79\%$. With 79% of the serving being the intended product, Optimum Nutrition’s earns a score of 4 for this section of the score card.

Customer Reviews

The customer reviews on Amazon averaged out to about 5 stars which earn Optimum Nutrition a score of 5 for this section of the score card.

Standard Process

<https://www.standardprocess.com/Home>

Clinical Tests

This company has a group dedicated to designing, conducting and funding human trials. These trials are conducted with academic, medical or contracted research organizations. Double-blind, placebo-controlled studies are performed. Some examples include “Effect of Cyruta, A-F Betafood, and Soybean Lecithin on Cardiovascular Health,” “Standard Process 21-Day Purification Program Supports Cardiovascular Health,” and “Epimune Complex: Effective and Comprehensive Support for Immune Function.” This company receives a 5 because they conduct clinical on their products.

Manufacturing Standards

This company is regulated and inspected by:

- The Food and Drug Administration (FDA)
- The United States Department of Agriculture (USDA)
- Wisconsin Department of Agriculture (WI-DA)
- Occupational Safety and Health Administration (OSHA)
- Midwest Organic Services Association (MOSA)
- Wisconsin Department of Natural Resources (DNR)

They are not certified by any groups that currently offer third-party GMP certification. However, they are licensed and regulated by the FDA and WI-DA and inspected at least annually for both. Therefore, they receive a 5.

FDA Warning Letters

As of February 12, 2013, Standard Process has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

This company does not make a product with the serving size could be easily compared so they receive the default value of 3.

Customer Reviews

The customer reviews on Amazon averaged out to about 5 stars which earn Standard Process a score of 5 for this section of the score card.

Inner Armor

<http://www.innerarmour.com/index.php>

Clinical Tests

This company makes no reference to clinical tests so they receive a 0 for this category.

Manufacturing Standards

The company's web page indicates that inner Armor performs tests to ensure that their products do not contain banned substances for athletes. The companies testing procedures are outlined in the following citation.

"In the event the laboratory finds a banned substance in the sample, BSCG will immediately notify the manufacturer and take steps to remove the product from the marketplace. The manufacturer will not be able to claim Certification nor use the BSCG seal on that batch or any other batch of the product still under the manufacturer's control. The product will not be eligible for future BSCG Certification, except in rare circumstances where the manufacturer can prove to the satisfaction of BSCG that it bore no responsibility and that sufficient affirmative steps have been taken to ensure its products are free of banned substances." (Inner Armour, 2010)

Inner Armor ensures that their products are free of banned substances but they do not give any information about GMP standards. The company performs some checks on their products so they will receive a 1 for manufacturing standards.

FDA Warning Letters

As of February 12, 2013, Inner Armor has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

Inner Armor Nitro Peak Protein Chocolate serving size is 36 grams. Each serving contains 24 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(36 \text{ grams} / 24 \text{ grams}) \times 100\% = 67\%$. With 67% of the serving being the intended product, Inner Armor earns a score of 4 for this section of the score card.

Customer Reviews (%): (class participation)

The customer reviews on Amazon averaged out to about 4 to 5 stars which earn Inner Armor a score of 5 for this section of the score card.

Isagenix Score Card

<http://isagenix.com/us/en/home.dhtml>

Clinical Tests

The company employs quality insurances teams that check each new product to ensure it meets a certain standard. *“When each product is ready for launch, our Quality Assurance and Control Teams align with manufacturing to ensure that all operations are in accordance with Food and Drug Administration guidelines for Good Manufacturing Practices, as well as Standard Operating Procedures”* (Isagenix International, 2012). Before their products are released they are also submitted to third party testing to evaluate their safety and testing. Their webpage does not indicate what tests are conducted so Isagenix will receive a score of 2.5 because specific tests are not mentioned.

Manufacturing Standards

“During each step of production and packaging, strict quality control and safety standards are meticulously followed for everything from ingredient purity to stability. To ensure consistency and utmost quality of each product, we also continuously strengthen our quality control measures through internal and third-party testing and audits.” (Isagenix International, 2012)

The company indicated on their webpage that they submit to third party audits of their manufacturing facilities. But they do not appear on any of the three triple GMP certified companies list of certified companies. Because they have not been the subject of a warning letter they will be given the benefit of the drought and scores a 5 for manufacturing standards.

FDA Warning Letters

As of February 12, 2013, Isagenix has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

Isagenix IsaPro Whey Protein Vanilla serving size is 23 grams. Each serving contains 18 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(23 \text{ grams} / 18 \text{ grams}) \times 100\% = 78\%$. With 78% of the serving being the intended product, Isagenix earns a score of 4 for this section of the score card.

Customer Reviews

The customer reviews on Amazon averaged out to about 4 stars which so Isagenix will receive a score of 5 for this section of the score card.

Natrol

<http://www.natrol.com/default.aspx>

Clinical Tests

Talked to a company representative and all their products undergo testing before release. Natrol funds research and buys innovation but do not do much R&D of their own instead they buy innovative products and then test their effectiveness before marketing a product. Their openness to discuss their procedures and their indication of testing procedures for a product is released earns them a 5 for clinical tests.

Manufacturing Standards

“Finished Product Testing: All manufactured products undergo final analytical testing to ensure their safety, purity, and activity levels. Final testing includes physical and chemical analyses and microbiological testing to guarantee each Natrol product meets all quality specifications. Sensitive analytical testing is also performed to ensure that our products are below the legal limit (California Proposition 65) for heavy metals (Lead, Cadmium, Arsenic, and Mercury).”(Natrol, 2012). They have a GMP certification from the NPA. They also mention manufacturing standards on their web and indicate that they test for contaminants. Natrols GMP certification earns them a 5 for manufacturing standards.

FDA Warning Letters

As of February 12, 2013, Natrols has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

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Could not locate a product that Natrol manufacture's where the serving size could be compared. The company mainly produces extracts and natural products so they will receive the default value of 3.

Customer Reviews

The customer reviews on Amazon averaged out to about 4 to 5 with mostly 5 stars so Natrol will receive a score of 4.5 for this section of the score card.

NBTY Score card

<http://www.nbty.com/phoenix.zhtml?c=85635&p=irol-irhome>

Clinical Tests

“(xx) the absence of clinical trials for many of NBTY's products; (xxi) sales and earnings volatility and/or trends for the Company and its market segments;” (NBTY, 2005). The company admits to not conducting clinical tests on many of their products in a yearly statement to investors. NBTY scores a 0 for clinical tests because they admit not conducting them for some products.

Manufacturing Standards

They do not claim to have any GMP certifications program. The company was also audited by the FDA and they received a warning letter but they were able to quickly mitigate the FDA concerns and allowed to continue manufacturing. The CEO also apologized for the companies mistakes and ensured that their SOPS have been changed to never allow the problem to occur again. They also submit to USP (U.S Pharmacopeial Convention) for product testing. NBTY scores a 4 for manufacturing standards because they quickly solved the problem outlined in the warning letter and they end their products out for tests.

FDA Warning Letters

A NBTY NJ manufacturing site received a warning On October 13, 2010 for not correctly handling the raw materials entering the plant. Because the company received a warning letter they will receive a 0 but a warning letter may be normal considering how many products the company manufactures.

Substance to serving size ratio

NBTY Met-rex Engineered Nutrition Meal Replacement Cake Batter serving size is 72 grams. Each serving contains 38 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(72 \text{ grams} / 38 \text{ grams}) \times 100\% = 53\%$. With 53% of the serving being the intended product, NBTY earns a score of 3 for this section of the score card.

Customer Reviews

Looking under two of their third party companies they both received a half way decent score on Amazon for customer reviews. The average numbers of stars were approximately 4.5.

SynTrax

http://www.si03.com/reg_index.htm

Clinical Tests

This company makes no reference to clinical tests so they receive a 0 for this category.

Manufacturing Standards

SynTrax States on their webpage indicate that they are “Fully Good Manufacturing Practice(GMP) compliant”. The company does not have any GMP certifications and only state that they are following GMP procedures they will receive a 1 for manufacturing standards.

FDA Warning Letters (%):

They received a warning letter on March 11th 2004 for mislabeling a package and using an ingredient that is not considered a dietary supplement. The full letter can be found on the FDA webpage. Because they received a warning letter they receive a score of 0.

Substance to serving size ratio

Syntrax Matrix 2.0 Sustained-Release Protein Blend Mint Cookie serving size is 35 grams. Each serving contains 23 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(35 \text{ grams} / 23 \text{ grams}) \times 100\% = 66\%$. With 66% of the serving being the intended product, Syntrax earns a score of 3 for this section of the score card.

Customer Reviews

The company's reviews on amazon seem to average about 4 stars. Overall people seem to be satisfied with the product and its performance.

USP Labs

<http://usplabsdirect.com/>

Clinical Tests

"The first five of the following studies involve products that contain DMAA. The 6th & 7th involve DMAA by itself and also in conjunction with caffeine (a common synergistic combination)."(USP labs, 2005)

They did mention that they conducted research into their products before releasing them onto the market. The company also conducted research into the effects of using DMAA in supplements. USP lab conducts trials when they deem it necessary and not on every new product about to be launched which earns them a 2.5 for clinical trials.

Manufacturing Standards

No mention of GMP procedures and they do not have any GMP certifications which results in a score of 0 for manufacturing standards.

FDA Warning Letters

USP labs was issued a warning letter on April 24th 2012 which relates to their use of DMAA which the FDA does not consider a dietary supplement but instead a drug. USP labs were issued a warning letter so they will receive a 0.

Substance to serving size ratio

Could not locate a product that USP Labs manufacture's where the serving size could be compared. The company mainly produces extracts and natural products so they will receive the default value of 3.

Customer Reviews

On amazon their products had mostly 3 to 4 stars. Their reviews were fairly positive and people seemed to find their products effective and are generally satisfied with the products performance so they will receive a score of 4.

Vitamin Shoppe

http://www.vitaminshoppe.com/store/en/vitamins_minerals/index.jsp

Clinical Tests

“Some of the country’s most prominent retailers of workout supplements have shunned a recent warning by the FDA to get certain particularly dangerous items off of their shelves. Both GNC and Vitamin Shoppe, despite a warning letter sent by the FDA last week, have continued to sell products containing the supplement DMAA.” (Jonathan Macri, 2012)

The FDA asked them to stop using certain substances in their products (DMAA) and they refused to stop. The FDA has evidence of the products negative side effects but GNC and Vitamin Shoppe still refused to remove the product from their shelves. Because the FDA has research that DMAA is not healthy for an individual and the company ignored their suggestion they receive a score of 0 for clinical tests.

Manufacturing Standards

“The health, safety and peace of mind of our customers are The Vitamin Shoppe’s top priorities. All Vitamin Shoppe products are manufactured in compliance with the Food and Drug Administration’s Good Manufacturing Practices for food and highest industry standards” said Tom Tolworthy, company CEO. “In order to assure that we have all of the information needed, we have asked our contract manufacturer and an independent scientific lab to conduct separate tests. Our efforts to more fully investigate these allegations have been hampered by the unwillingness of the company making the allegations to share its complete results and testing methodology with us. Using a scientifically valid testing methodology is absolutely necessary to achieve reliable results.” (Steven Fink, 2007)

They have no mention of manufacturing standards on their site. They have received a bunch of awards for business and customer service but no GMP certifications. In 2007 consumerlabs.com found that there were high levels of lead in “Especially for Women”. In response to this allegation the Vitamin Shoppe CEO stated that they follow all GMP procedures and regularly test their products. They have

no direct mention of GMP procedures other than the CEO saying that they are fully GMP compliant which earns them a 1 for manufacturing standards.

FDA Warning Letters

As of February 12, 2013, Vitamin Shoppe has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

Vitamin Shoppe 100% Soy Protein serving size is 30 grams. Each serving contains 26 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(30 \text{ grams} / 26 \text{ grams}) \times 100\% = 87\%$. With 87% of the serving being the intended product, Vitamin Shoppe earns a score of 4 for this section of the score card.

Customer Reviews

The customer reviews on Amazon averaged out to about 4.5 stars which earn Vitamin Shoppe a score of 4.5 for this section of the score card.

Cytosport

<http://www.cytosport.com/>

Clinical Tests

This company makes no reference to clinical tests so they receive a 0 for this category. A quote from Diet spotlight review on CytoSport indicates that the company does not conduct clinical studies “this product should have a dedicated website with clinical trials proving the effectiveness of the product and customer testimonials” (Diet Spotlight, 2013).

Manufacturing Standards

CytoSport has been given an NSF GMP certification this earns them a 5 for manufacturing standards because their facilities have been reviewed and are subjected to random audits.

FDA Warning Letters

On June 29 2011 CytoSport received a warning letter for misbranding products. They used the term muscle milk as the name of one of their products but the product does not contain any amount of milk.

The FDA issued this warning label because they found it to be misleading to the consumer. Because CytoSport received a warning letter they receive a score of 0.

Substance to serving size ratio

CytoSport Complete Whey serving size is 22 grams. Each serving contains 18 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(22 \text{ grams} / 18 \text{ grams}) \times 100\% = 82\%$. With 82% of the serving being the intended product, CytoSport earns a score of 4 for this section of the score card.

Customer Reviews

The customer reviews on Amazon averaged out to about 3 to 4 stars which earn CytoSport a score of 4.5 for this section of the score card.

Doctors Pride

<http://www.doctorspride.com/>

Clinical Tests

By browsing Doctors pride catalog the product descriptions are backed up by statements of numerous clinical studies suggest that the company use substantial research to ensure that their products are effective. Doctors Pride does some research into their products before releasing them onto the market so they will receive a 2.5 for clinical tests.

Manufacturing Standards

"Our Production Facilities Are GMP Certified. Our products are produced in pristine facilities that often exceed GMP requirements. Standard Operating Procedures are in place to insure that products are produced and packaged properly and to the utmost highest standards" (Doctors Pride, n.d.). The company says their GMP certified but did not appear on any of the GMP certification lists so they will be given a 4 because their GMP certification could not be verified.

FDA Warning Letters

As of February 10, 2013, Doctors Pride has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

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Could not locate a product that Doctors Pride manufacture's where the serving size could be compared so they will receive the default value of 3.

Customer Reviews

The customer reviews on Amazon averaged out to about 4 stars which earn Doctor Pride a score of 4 for this section of the score card.

Gaspari

<http://www.gasparinutrition.com/>

Clinical Tests

This company makes no reference to clinical tests so they receive a 0 for this category.

Manufacturing Standards

No mention of GMP procedures and they do not have any GMP certifications which results in a score of 0 for manufacturing standards.

FDA Warning Letters

The FDA audited the Gaspari manufacturing facilities and issued them a warning letter on March 2, 2011 for major GMP violations. The company has received a warning letter for violating GMP procedures so they receive a score of 0.

Substance to serving size ratio

Garspari MyoFusion ProBiotic Series serving size is 39 grams. Each serving contains 24 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(39 \text{ grams} / 24 \text{ grams}) \times 100\% = 62\%$. With 62% of the serving being the intended product, Garspari earns a score of 3 for this section of the score card.

Customer Reviews

The customer reviews on Amazon averaged out to about 3 stars which earn Doctor Pride a score of **3** for this section of the score card.

GNC Brand

<http://www.gnc.com/home/index.jsp>

Clinical Tests

*“Each nutritional supplement sold by GNC is printed with the GNC Quality Commitment. This commitment describes how GNC begins the process of developing a nutritional supplement by creating a formulation based on quality. All of the raw ingredients used in GNC nutritional supplements are guaranteed for quality, consistency and potency. Both the ingredients and finished products are rigorously tested at third-party, FDA-registered laboratories (Fitnesshealth101, 2013)”. This Article suggest that GNC does conduct tests before releasing the product out onto the market but this information was obtainable through the GNC website this earns GNC the score of **4**.*

Manufacturing Standards

*“GNC believes that product development and quality assurance go hand-in-hand. The introductions of innovative, high-quality, clinically-proven, superior-performing products are key drivers for our business. We maintain excellent products by holding ourselves to rigid FDA and international standards and by following “Current Good Manufacturing Practices” (cGMP). All GNC products are subjected to 150 quality tests and every lot of every raw material that enters our facilities is tested. By holding ourselves to such high standards we are able to provide our consumers with products they can trust.” The company indicates that they are following all GMP procedures so they will receive a **4** for this category because they do not have a GMP certification.*

FDA Warning Letters

As of February 12, 2013, GNC Brand has not received a FDA warning letter, which earns a score of **5** for this section.

Substance to serving size ratio

GNC Pro Performance 100% Whey Protein, Naturally Unflavored serving size is 33 grams. Each serving contains 24 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(33 \text{ grams} / 24 \text{ grams}) \times 100\% = 62\%$. With 62% of the serving being the intended product, GNC earns a score of 3 for this section of the score card.

Customer Reviews

The customer reviews on Amazon averaged out to about 3 stars which earn Doctor Pride a score of 3 for this section of the score card.

Reserveage Organics

<http://www.reserveage.com/home.php>

Clinical Tests

“Scientific research and independent laboratory tests have shown that muscadine grapes are up to 40 times stronger than other grapes. Independent laboratory tests of muscadine grapes reveal that they contain one of the highest levels of antioxidants in any food product tested. Additionally, the muscadine grape seed has one of the highest levels of Resveratrol, and thanks to an extra electron, the muscadine grape is even more vigorous in its fight against the harmful effects of free radicals.” (Reserveage Company, 2011) The company shows some examples of clinical trials so they will receive 5 for this section.

Manufacturing Standards

“Reserveage Organics’ stringent and rigorous standard adheres to the International Pharmaceutical Standards as well as Current Good Manufacturing Practices Standards (CGMP’s). Independent laboratories test all of Reserveage Organics’ raw ingredients and materials, ensuring freshness, purity, potency and when applicable, organic integrity.” They follow all GMP procedures but do not have a GMP certification so the company receives a 4 for manufacturing standards.

FDA Warning Letters

As of February 12, 2013, *Reserveage Organics*' has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

Could not locate a product that USP Labs manufacture's where the serving size could be compared. The company mainly produces extracts and natural products so they will receive the default value of 3.

Customer Reviews

The customer reviews on Amazon averaged out to about 5 stars which earn *Reserveage Organics*' a score of 5 for this section of the score card.

Sun warrior

<http://www.sunwarrior.com>

Clinical Tests

This company makes no reference to clinical tests so they receive a 0 for this category.

Manufacturing Standards

No mention of GMP procedures and they do not have any GMP certifications which results in a score of 0 for manufacturing standards.

FDA Warning Letters

As of February 12, 2013, *Sun Warrior* has not received a FDA warning letter, which earns a score of 5 for this section.

Substance to serving size ratio

Sun Warrior Protein Raw Vegan serving size is 21 grams. Each serving contains 17 grams of protein. Dividing the serving size weight by the amount of protein will determine how much percent of each serving size is the actual protein that a customer wishes to consume. $(21 \text{ grams} / 17 \text{ grams}) \times 100\% = 81\%$. With 81% of the serving being the intended product, GNC earns a score of 4 for this section of the score card.

Customer Reviews

The customer reviews on Amazon averaged out to about 4 stars which earn *Sun Warrior* a score of 4 for this section of the score card.

Appendix C. Interview Questions/Notes

Interview Questions

1. What experience do you have with supplements?
2. When choosing a supplement for a customer what factors do you consider?
3. How would you rank them?
4. On a scale from 1 to 10 how important is the manufacturing quality to you?
5. Do you have a favorite supplement company or distributor? If so, why are they your favorite?
6. How do you purchase these supplements?
7. What kinds of reviews have you received from users of the supplements?
8. What are your feelings on supplement retailers (i.e. GNC, Vitamin World, etc.)?
9. Which company do you use supplements from, if any?
10. When someone is trying to better their health through dietary change, what are some types of supplements one can use for meal replacement (i.e. protein, other nutritional meal replacements)?
11. What type of protein would you consider to be overall most effective?
12. Before someone chooses to take a supplement or use a protein, what factors should they consider in products and which manufactures/vendors are reliable?

Interview #1

1. From personal intake, starting taking at 17 and is now 49. Has been selling for 15 years + and has been taking them for about 32 years off and on
2. He looks for effectiveness, price, quantity
3. Based off ranked overall based off age of customer, reputation of product, results.
4. Definitely 10
5. USA Sports & AFW Wholesale (in Worcester) are two wholesale places, get directly from companies, only sell to people with a license.
6. Calls companies and is a member of their wholesale club, gets catalogues and chooses based on prior customer reviews.
7. Generally positive because he researches before he buys. For fat burners gets different reviews from different people, proteins and vitamins gets generally the same review from customers. Personal experience gives you better suggestions and knowledge.
8. GNC is overpriced and sales representatives are unknown to supplement world, they are very broad in product. When you walk into a store, "person who looks in shape". GNC has a high markup reputation. Ex. Hydroxicut retails at GNC for \$80 and he sells it for \$45 and still makes a profit. Vitamin world is better than GNC pricewise

9. Optimum Nutrition, BSN, Inter Armor, Metrix, Muscle Tech, UPX, Gaspray
10. EAS, Metrix, Labrado Nutrition- these companies contain protein and meal replacement powders
11. Whey Protein – because more vitamins and nutritional
12. Lactose Intolerant (have to get lactose free), if take fat burner consider medical history

Interview #2

1. Studied sports fitness and personal training.
2. Does not advocate supplements but he would advocate vitamins with USP (United States pharmacopeia). Would ask questions like “what do you do” “show me your scientific validation”
3. No answer
4. Quality didn’t matter without proper safety certifications (meaning USP certifications)
5. EAS Sports nutrition because they have evidence and support for claims on their products
6. No answer, doesn’t purchase
7. No answer, doesn’t sell
8. “Interesting” GNC has undereducated employees, he finds revealing that they did not have nutritionists working in the stores, and without nutritionists there’s no safety guarantee
9. In terms of vitamins any general vitamin shop provided the products are USP tested. Ex. Sunview Fish Oil
10. Looks for the lowest amounts of sugar and does not obese over fat content
11. Meat, no powder, natural protein, organic shelf at vitamin world. Milk after workouts, for nutritional post workouts the best to use is Accelerate. Accelerate because has a 4:1 mixture Carbs to Proteins
12. Who has scientific evidence on their side (that means USP and journal research)

Additional Information

- Phosphame, EAS, works like crazy to put on size
- Branched Chain Amino Acids
- Supplement companies do not have to be approved by the FDA

- USP- samples from companies are submitted to them for testing to confirm what they claim is in their products is actually in their products and proves legitimacy.

- If someone comes and asks you about supplements?
 - Give me the label and avoid stimulants.

Interview #3

1. High School Weight gain, college, experimented with vitamins and creatine. Currently just take protein. 15 years of research based on trainees.

2. In ranked order. Need (skinny don't need to take metabolism enhancer), Safety, Effectiveness, Cost
3. See above.
4. 10
5. Prograde- everyone in franchise recommends them (Fitness Revolution). Told about it from at least 20 different athletic trainers.
6. Online sites, bodybuilding, could see them in his training center but chooses not to.
7. Does not sell, but has heard First Greens Powder from two professional hockey players that he trained.
8. Better place without them (should just get rid of them), they push useless products at a high markup.
9. ProGrade- based off opinion of professional hockey players. Witnessed it work first hand. Ex. Pro player was in training center working out and was sick one day and started taking prograde and felt better after a day or two.
10. Last resort based on need, work schedule 3-8, power bars for dinner, no time to eat big meals, whole foods, pre and post workout, demanding work schedule. A nutritional study shows best combo is whey isolate with sugar packs.
11. Whey protein isolate, absorbs fastest, is raw whey protein and a sugar packet releases insulin so cells absorb it faster post workout. Repair time after a workout is essential.
12. Do they need supplements? And if you do need it, refer back to need, safety, effectiveness, cost (number 2).

Interview #4

1. Professional nutritionist who deals specifically with eating disorders and also works with athletes and people without eating disorders. Experience through private practice and through information through clients. She also has personal experience from taking vitamin supplements. She investigates recent scientific research and has concluded that there is no great research on sports supplements. She attends some conferences for nutritionists and there will be supplement companies there and they must have a good record because the audience consists of doctors and nutritionists who will ask several in depth questions.
2. What the product is? For multi-vitamins, any generic big name brand is good as long as the company has a positive reputation. For sports supplements such as pre-workouts and fat burners, one does not know what they are getting into. Some brands she mentioned consists of Omega 3 brands, Nortic Naturals, and Carlsons.
3. No Answer
4. 10
5. Emerson Ecologic of Bedford, NH.
6. No Answer
7. More calcium supplement reviews over sport supplement reviews such as natural proteins. Due to bone issues.
8. Since she works with people who have eating disorders she is familiar with food supplementations. She feels as if GNC has people who go into the store and are inexperienced

and do not know what they need/don't need they spend too much on non-necessities. She does not send people to these stores. She sends people in need of vitamins to whole food stores and CVS to buy generic brands. As for protein powder she recommends basic Whey isolate protein.

9. No Answer

10. Any of the basics. If they like it and only in a pinch. She prefers people to eat regular meals if possible. (Lara bar, gluten free)

11. No Answer

12. If you are paying for something they think they're getting but are not. If it is too good to be true then it probably is. They can get it through foods instead of supplements. Sometimes you may need herbal supplements. If you know someone who knows supplements then ask brand names before you order anything.

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