Nutrition Review for Hockey Players: Enhancing Performance through Nutrition

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With the advancement of sports medicine in the past decade, hockey players all over the world are always trying to find a competitive edge through nutritional education and proper eating. It is very common to find young junior players looking to make the jump into the professional game always trying to find ways to get bigger and add lean muscle mass, likewise, there are always players looking to drop a few pounds while keeping their muscle mass. Research has proven that through proper education and lifestyle, players can achieve their goals using nutrition as a positive impact.

Data was collected and analyzed, with the purpose to give education analysis of nutritional topics for players to use to enhance their careers.

Once the data was collected, it was put into a review and menu format. The review portion includes in depth analysis on issues and topics concerning; proper calorie intake, protein, carbohydrates and fat consumption. As well as muscle glycogen restoration and electrolyte balances within the body pre and post exercise. The menu portion of the data collected, was done with the purpose to give proper meal and portion sizes with the idea of, each meal is designed to properly fuel, and refuel the player before and after exercise.

The findings were that in terms of food, players do get enough of protein, carbohydrates, and fats, but where a lot of players lack adequate education is proper timing of meals as well as hydrating. Data has found that most players do not eat proper foods post exercise thus delaying the action of muscle glycogen restoration, making it almost impossible for players to recover fast and properly. Data has also showed that, most athletes in North America come to practice already in a state of dehydration, thus, again making it impossible for players to perform at the maximal capacity, which can lead to negative habits, reduce performance, and delay athletic improvement.

**Keywords**
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1 Introduction

This research was done with specific goals looking to be achieved. The primary goal was to give hockey players regardless of age or calibre the information needed to use nutrition as an advantage towards career goals. Regardless of how talented a player is, he or she can always choose what is being put into his or hers body’s. Proper food at the proper time, will give the player a better chance at performing up to his or her capacity. Likewise, improper foods at improper times will take away from performance.

Critical issues such as what foods to eat, at what times were research analyzed and discussed. Eating the proper foods at the proper time is the best way for players to get the most out of their performance. Eating adequate amounts of carbohydrates, fats and proteins pre and post exercise will ensure muscle glycogen levels are always at capacity and muscle tissue repair is always happening. Staying hydrated throughout the day is the proper way to ensure players always have proper amounts of electrolyte balances within the body.

This research focuses on several key topics focused on improving performance such as; Proper amounts of daily carbohydrates, fats and proteins, along with secondary topics such as; vitamin and minerals consumption and the safe and proper use of supplements.

How the body handles and converts food into energy is also research and broken down into steps, so the reader is able to identify the importance of the timing of meals. Only food that is digested, may be used as energy, all other food will sit in the gut until digested.

The final and practical component of this research is a guided menu. The menu consists of six main topics, breakfast, lunch and dinner, as well as menu options for pre, during and post-game nutrition. All options include the nutritional breakdown so players can identify if these meals are complying towards their daily needs and intake levels.
2 Physical Demands of Hockey

The physical demands of hockey players will require elements of speed, strength, stamina, agility and balance. Hockey is a high intermittent interval sport, where players are required to use short burst of energy for a small periods at a time. A player will usually be required to take anywheres between 10-30 shifts per game, and a shift can be any wheres between 30 – 45 seconds in length. Typically forwards play between 10 – 17 minutes per game, while some defenceman may play upwards towards 25 minutes per game. The reason being, typically forwards are required to do more skating at higher speeds. A game will last 60 minutes with a 12 – 15 break following the first and second periods. Younger players, usually player one or two games per week, while practicing three or four times per week, usually each practice is an hour on length. Professionals will play anywheres between 60 – 82 games in a season (not counting playoffs) and will practice everyday. Being a professional hockey player, demands a 24/7 commitment from the player, as they are usually on the ice everday for multiple hours.

The body will draw from it’s energy from a good working coorliation between the anaerobic and aerobic energy systems. During short burts of energy, the body will use the anaerobic energy system, within this structure, the body use adenosine triphospahte (ATP) in the from of glucose (sugar), which helps in the body in the from of carbohydrates (Bonci, 2009, 5). The body will use the anaerobic system until there is a build up of oxygen within the muscle, which will then tirgger the aerobic snergy system (Bonci, 2009, 5). The aerobic energy system is designed to work, where there is a prolonged periods of exercise ongoing. The aerobic system needs oxygen to work and will draw from two sources of energy carbohydrates and fats (Jeukendrup, Gleeson, 2010, 79). Players who take longer shifts (one minute), put themselves in a dangerous position, of building up lactic acid within the muscle. Once lactic acid builds up in the muscle, research has shown that a 40 -60 % decrease in performance can be expected (Jeukendrup, Gleeson, 2010, 79).
3 Basic Nutrition Requirements

Each day, athletes will need to provide their body with enough energy to meet the demands of their daily athletic lifestyle. Three basic macronutrients (carbohydrates, fats and proteins) will compose of an athlete’s diet (Bonci, 2009, 10). With the macronutrients, the player must also consume micronutrients (water and minerals) to balance out a healthy diet (Blake, 2010, 9). Within the macronutrients, the body receives units of energy called kilocalories, or more commonly known as calories. Each macronutrient is broken down and measured in kilocalories per gram. In one gram of carbohydrate provides 4.2 calories, fat 9.4 calories and protein 5.65 calories per gram (Jeukendrup, Gleeson, 2008, 82).

The average person for a healthy balanced diet should consume on average around 2,000 – 2400 calories per day (Blake, 2010, 9). From the calories, a certain percentage should come from each major macronutrient each day. The majority of the diet (60 % or 300g) should come from carbohydrates, 30 %, 65g should come from fat and 10 %, or 50 g should come from protein (Blake, 2008, 457). Players should try to follow the 60, 30, 10 guideline as much as possible, to keep a well-balanced diet. The more active the player is, there will be a greater need to consume more energy. Some adult professional hockey players have been reported to need around 4,000- 5,000 calories per day depending on the schedule (Burke, 2007, 1). While, that is not the case for all hockey players, younger males (9-13) will need around 1800 – 2200 calories, 14 – 18 year old males will need anywhere between 2400 and 3200 per day depending on their training schedule (Blake, 2008, 457).

Macronutrients are sub-categorized into food groupings, depending on the country. The Canadian and American classifications have six basic food groups, dairy, breads, meat, vegetables, fruits and fats (Jeukendrup, Gleeson, 2010, 33). Based on a average calorie diet of 2400 calories per day, players should try to hit a target number of servings per day. On average, for a healthy diet, players should have 8oz of grains (Wheat, rice, oats, barley, etc.) three cups of vegetables (frozen, canned, fresh, dried), two cups of fruit (fresh, frozen), seven table spoons of oil (vegetable oil, corn oil, olive oil, fish
oil, nuts), three cups of milk (yoghurt, cheese, milk) and 6.5 oz of meat. (U.S. Department of Agriculture, www.MyPyramid.com)

Since the human body is over 60% water, and water makes up 65% of the muscle tissue, water is an extremely vital part to any athletic and healthy lifestyle (Burke, 2007, 21-23). Human being can only go a few days without water before extreme conditions set in and detrimental effects would begin to set in on the body, even death. Thus, players are encouraged and it is necessary for performance to drink adequate water per day. Since, it is possible but hard, to consume too much water, there is really not too much a player can drink thought the day, especially if the training demand is high. Adult males are recommended to drink 13 – 16 cups per day, and females, 12 cups per day (Blake, 2008, 264). Daily water intake will depend on a few variables; how active the player is and the training demand. The more intense the training, the more energy force the player will use. The condition of the training circumstances will also play a factor, especially the temperature of the playing condition; will have a factor into body temperature. On average players should range between two and two and a half litres per day (Jeukendrup, Gleeson, 2010, 19).

For highly active players research has proven that players should drink one ml per calorie burned of exercise (Jeukendrup, Gleeson, 2010, 19). Some foods contain water, (fruits and plant based foods), and they will contribute towards the daily water count as well. All fluids count towards the daily intake of water, except alcohol. Alcohol is the only liquid that is a true diuretic, which actually takes water away from the body, causing dehydration (Cardwell, 2006, 80).

Eating a regular balanced diet and targeting all the major food groups, is (see attachment 1 for food ratings) a great way to start on the correct path to a positive athletic diet. Players should eat regularly (3 solid meals and 2 – 3 snacks) roughly every two or three hours to keep blood glucose (sugar) levels proper (Jeukendrup, Gleeson, 2010, 343) and to ensure the body’s metabolism always working, which will allow the body to keeping producing energy all through the day and function properly (Blake, 2008, 11).
4 Digestion

Digestion is critical process towards athletic performance. Only food that is fully digested and absorbed can be used as a source of energy (Cardwell, 2006, 88). Digestion breaks down food into components that the body can convert into energy, using the gastrointestinal track which consists of the mouth, esophagus, small and large intestine (Blake, 2008, 64). Along with the breaking down and absorption of food, the digestion process must also make sure that, when food is absorbed into the body, that there are no harmful microorganism that enter the body when food is consumed, the body has the amazing ability to absorb 92 – 97% of all nutrients from the food that is consumed (Blake, 2008, 64).

There are two ways, which the body breaks down food, mechanical and chemical (Blake, 2008, 64). The mechanical process involves the chewing action of the mouth and the chemical part involves the process of the body’s chemical reactions breaking down food inside the body (Blake, 2008, 65).

The first step into digestion is a mechanical action, and probably the most obvious step because of its visibility to the human eye would be the mouth. Once food enters the mouth, teeth begin to break down the food, to help the saliva (a water-based fluid that will help breakdown and relax food) do its job. Once the teeth have broken down the food, saliva begins to lubricate the food to help facilitate in the swallowing process as, it also starts the digestion of carbohydrates. (Cardwell, 2006, 89).

The next step into the digestion process is the stomach, since the stomach is inside the body, this is now a chemical action. Although little digestion actually happens in the stomach, food must past through in a safe manner in order for the body to function properly. Fully mature adult’s stomach can hold upwards to approximately 1,200ml of food (Cardwell, 2006, 91). Although seen as more of a storage area for food, the stomach does have two major functions, that the food must go thought in order for digestion to occur properly. The first major role of the stomach is to add or mix hydrochloric acid to the food with the main purpose being to kill the bacteria that has been consumed and absorbed with the food. Secondly, since the small intestine (the next step)
can only deal with liquids, the stomach must liquefy all the material that is in the stom-
ach so the small intestine can handle it

The time it takes for food to get digested and absorbed into the blood depends on the
type or identity of the food being consumed along with the amount or caloric density
of the food. A high fatty meal, has been reported to take up to four hours to exit the
stomach (Cardwell Glenn 2006, 93). Meals that are carbohydrate based will travel
through the stomach quicker than foods that are more fat and protein orientated
(Blake, 2008, 67). The digestive enzymes in the stomach work much faster on diluted
food as compared to food consumed with little or no water. When the stomach is over
loaded with food, the body reacts poorly because it is extremely uncomfortable to have
heavy amounts of food setting in the stomach, for a prolonged period. As athletes, the
need of transition from food to the small intestine has to be a quick and easy so that
the nutrients are converted into energy and the body is ready to use as soon as possi-
ble.

There are a few things athletes can do to speed up the digestion process, really for ath-
letes or for the health of people, in general it’s not optimal to have food sitting in the
stomachs for any prolonged period of time. Food’s with a high concentration level and
that is less natural in from its original state (modified) will take longer to empty from
the stomach, thus making the body work harder to process and breakdown the food.
(Caldwell, 2006, 94). Drinking water not only helps keep the body stay hydrated (dehy-
dration slows down digestion) but it also helps break down or dilute food (calories) in
the stomach. Eating lighter meals and food that is its natural state along with drinking
water is the best way to ensure digestion is going at the fastest rate that it possibly can
(Caldwell, 2006, 96).

The next step towards the digestion of food would be the small intestine. Once the
food has been liquefied and broken down, the digestion (converting into energy) proc-
ess can take place. The majority of the food being digested happens in the first portion
of the small intestine or “duodenum.” The food will then continue to be broken down
into smaller molecules, some of the smaller molecules that are being broken down and
transformed are; starch into glucose, sugars are being broken into three groups, glu-
cose, fructose and galactose. Protein is being broken into amino acids and fat is being broken into fatty acids, where it will then enter the bloodstream, of the body.

Sometimes food can be far too concentrated for the small intestine to use in which it will add water to help dilute the remaining components. There is really two ways in which the small intestine can add more water; the first way is simply drink more water with meals (especially when eating a high-concentrated meal) or the intestines will borrow some water from the blood to help with the dilution process. Obviously, it is recommended to drink adequate amounts of water through the day and especially with meals so that the body will not have to borrow water, when water is borrowed from blood, it puts the body into a temporary state of dehydration. (Cardwell, 2006, 93).

The liver and large intestine are the final two steps in the digestion process. The liver has many responsibilities but in discussing about digestion and using food for energy its main role is to store extra glucose (sugar). The glucose will then be released into the blood stream when required for energy use.

The final step of digestion is the large intestine. The large intestine deals mainly with indigestible components (fibre and some protein and starch that could not be broken down for useful energy. The large intestine is roughly five feet long and produces mucus and helps water down cells to help protect them from fecal matter (Blake, 2008, 70).

It is imperative that players properly understand the timing of meals they are consuming, and always take into consideration, the type of food that is being consumed and how long until a game or practice is left before a meal is consumed. A easy to follow rule is, the closer to a game or training session it is, the smaller the meal should be. Tapering the meals beforehand is an extremely important way to ensure optimal fuel is ready to use in the body. In some cases, players may eat an acceptable meal just at an inappropriate time. Consuming a heavy loaded carbohydrate meal (chicken pasta and rice) 30 minutes before exercise will leave, the player feeling bloated and may even cause sickness. Although they ate proper foods for performance, it was eaten in a poorly timed fashion and was not even useful towards any kind of performance en-
hancement for the athlete, since it was just sitting in the stomach, and had not even had time to begin to digest.
5 Macronutrients

5.1 Protein

Protein is made up from carbon, oxygen, hydrogen and nitrogen and is the primary building blocks for muscle growth and tissue repair. Protein is found in many common foods, quality sources of protein are found in foods such as; meat and beans, fish and milk products (Blake, 2010, 187).

The foundation of protein comes from amino acids. Amino acids are join or bond together to create a set of unique sequence each designed with a specific purpose in the body (Blake, 2010, 172). There are nine amino acids that the body cannot reproduce on its own; these are called essential amino acids. There are also 11 nonessential amino acids that the body can reproduce on its own. Although, you can consume these foods in nutrition, it is not necessary as the body can resynthesized on their own (Blake, 2010, 173).

Research has shown that most athletes and hockey player do require slightly increased levels of protein that sedentary people (Burke, 2007, 6). Active athletes, and players who are in a training programs (strength training, muscle building or cutting weight) will need on average between .6 - .9 grams per lb. of body weight. (Example – 180lb male needs roughly 155 grams of protein). Research has also indicated that athletes who consume more than .9 grams per pound of body weight will have no additional benefit towards enhancing athlete performance (Lemon, 1995, 129). Further research in this subject has also indicated eating excessive amounts (over .9 g / per lb.) can have a negative effect on performance, such as dehydrating the body, increasing in body fat stores which can lead to fatigue (usually high protein diets lack sufficient carbohydrate levels). Protein should not be used as a primary source of energy, as it is the least sufficient source of energy the body can use. A dietary protein intake that represents about 15% on the total energy intake with energy a healthy diet covering all sufficient daily requirements should cover the requirements of protein athletes for most endurance athletes (Burke, 2007, 8).
5.2 Fat

Fats are important for any athletic diet. In addition to being a necessary component, they also enhance athletic performance. They provide athletes with an extremely important and usable source of energy. Within the structure of the muscle, there is already fat components called essential fatty acids (Marber, 2008, 90). The body uses these fatty acids as a good source of energy, and once they are burned for energy, they must be replaced, thus making fat, an important part of an athletic or normal healthy diet. Fat main responsibility is to work when the energy demand is low or moderate (less than 75 % of the players VO2 max) (Blake, 2010, 393). When the body requires the use of fat, it will draw from previously stored fat first. When the body coverts fat into energy, it is converted into fatty acids and enters through the blood stream, where it is then changed into a useful source of energy (Blake, 2010, 393).

Fats have been mislabelled by the general media and public, and have been given a bad reputation. It is widely thought that by eating fat, makes people fat, which is far from the truth. Consuming more calories than is burned in the duration of a day makes fat. Fat does have a high caloric density (each gram of fat is equal to 9 calories), so it is easy to understand why a misinformed person would be under the assumption that, fats are bad. The Dietary Guidelines for Americans 2005 (USDHHS & USDA 2005, 20) research has found that athletes and people should be consuming 20 – 35 percent of their daily calorie intake from fats, putting that into numbers looks like this- 180lb male consumes 3000 calories per day. If hitting the target range of 20-35 % of daily calories come from fat and now knowing one gram of fat equals 9 calories. The breakdown looks like the following: example: 180 (pounds ) X .45 (number of grams of fat per day) =  81 g of fat.81 g X 9 (calories per gram) = 729 calories of fat.

If the athlete is consuming 3000 calories per day, take 3000 and divide by 729 which equals 24.3 % of daily calorie intake was coming for fats, which is on par with the recommended acceptable levels.
There are four categories of fats (Saturated, Unsaturated, Polyunsaturated, and Trans. All fat(s) or oils are scientifically called “lipids” and are all made from carbon, hydrogen and oxygen, depending on how the molecules link together and bond will determine which classification the fats are put into.

Saturated fat(s), the carbon molecules are joined by single bonds. The bonds then are attached to hydrogen. These types of fats tend to be solids, and when eaten in excess can lead to weight gain and obesity. Common types of saturated fats are; Butter, Cheese, Cream, Ice Cream.

Mono unsaturated fat(s) are joined by what is classified as a single double bond. Athletes can find these types of fats in; Nut and nut butters, Olives, Oils, Seeds (Flaxseed, Sunflower).

Polyunsaturated is joined by two double bonds. There are two types of polyunsaturated fats “Omega 3“ and “Omega 6”. Both omega fats are found in common day-to-day foods. Research in omega 3 fat has found that it has a positive effect on the long-term health of people. Research has shown that eating a proper balance of omega 3 can help with the brain and nervous system functions. They also help with mental disease such as depression (Marber, 2009, 92). More research has also proven that, eating the proper amount of omega 3 helps control cardiovascular disease and can help lower fat levels within the blood (Marber, 2009, 92). Sources of omega 3 can be found in foods such as; Fish, flaxseed, soybean oil.

Trans fat(s) are a type of polyunsaturated fat due to the fact the hydrogen atoms that surround a double bond are in opposite sides of the carbon chain (Bonci, 2009, 19). Trans fats are commonly known as the “bad“ fat, or fats to “avoid“, and it’s true. Trans fats are sometimes naturally occurring in foods, but in most cases, they have been modified into the food in some way, which makes them unproductive from an athletic standpoint. These types of fats are commonly found it “fatty“ foods such as; baked goods, doughnuts, ice creams or dressings and icings ( see attachment two for classification and fat food groupings).
5.3 Carbohydrates

Carbohydrates are the body’s primary source of energy. Carbohydrates when used in the body as a source of energy are broken down into glucose, which is a type of sugar. There are four different types of sugars that are found in carbohydrates that the body will use as energy. Glucose is blood sugar. Fructose is sugar that the body gets from fruit, Lactose is sugar from milk, and Maltose is sugar from starch foods. The primary reason why carbohydrates are so important is they effect directly on the brain’s activity level and response time (Blake, 2010, 88).

The types of sugars are then put into two separate classifications, either simple or complex. Eating a proper balance of both types (simple and complex) is recommended for competing athletes. Simple carbohydrates are usually found in the form of a sugar based food (fruit, honey, dairy products) and complex carbohydrates are predominantly found in heavier foods such as, rice, legumes, wheat, and tubers (Bonci 2009, 11).

If carbohydrate levels are not kept high enough then the body’s glycogen (sugar) levels will drop and the body will run out of glycogen (sugar) during exercise when the body needs it the most. When this happens the body will then in turn to muscle protein and body fat as sources of energy which as second tier sources of energy and are less efficient sources (Cardwell 2006, 32-34)

Majority of the population believe that carbohydrates tend to be fattening, since the glycemic index was published in 1980. The glycemic index scale, rates food in which carbohydrates are broken down into glucose and released into the bloodstream (Gallops, Richards 2003, 13-15). The higher the glycemic rating (100) the quicker the food breaks down into the bloodstream. When carbohydrates are consumed in the body, the body’s blood glucose levels rise (blood sugar) which sets off the release of insulin within the body. Insulin is used within the body to lower the body’s blood sugar levels off after a meal. The body also has ways of regulating it’s self should blood sugars levels drop to low, the body produces a hormone called glucagon to raise the levels back
to normal (Cardwell 2006, 31-35). Another proven misconception is that insulin turns carbohydrates into fat. Research has shown that insulin helps with the storage of glucose as muscle and liver glycogen instead of fat. Insulin also helps amino acids in assistance with muscle replacement and helps provide fat for energy during times of aerobic exercise (Cardwell 2006, 34). Excess carbohydrates is stored in the body as a form of extra energy, when the body needs energy it will burn the excess carbohydrates first with it’s the primary source of energy for the body to use (Burke 2007, 13).

Just like protein consumption, athletes are left wondering how much carbohydrates they should be consuming in a day. Research has proven that, depending on the training schedule and the intensity of the training the amounts of carbohydrates will vary from situation too situation. Research has shown that there is a minimum amount of carbohydrates that the body needs per day to perform normal healthy functions, which is 130g daily (Blake, 2010, 99). For players who are overweight and trying to lose some pounds with a very light training schedule carbohydrates amounts of three – five grams per day has been documented to be enough. For players who are training at high-level pace for one hour per day, five – seven grams per kilogram of body weight is enough. And for those players who are training at a high level for one – three hours per day, 7 – 12 grams per kilogram of body weight is deemed to be enough (Burke, Kiens, and Ivy 2004, 9) (See attachment three for daily carbohydrate guidelines).

5.4 Water and Minerals

A study performed in 2006, found that over 50 percent of high school athletes in American came to practice or games already dehydrated! (Stover, Zachwieja et al. 2006, 48). Thus making it impossible for players to perform up to their maximal capacity! Studies and research has also proven that dehydration has extremely detrimental effects on sports related performance as well as normal day-to-day functions. A study done by Dr. Lawrence Armstrong, from Ball State University found that the speed of runners was affected by up to seven percent with only two percent loss in fluid from the body. The study also went on the find that, with only a small loss in water levels in the body,
(one percent), that can affect running performance in upwards excess to 17 seconds in a 1500 meter race (Armstrong, Costill and Fink 1985, 73).

Another study performed in 2007, found that some athletes who lose two percent of their body weight due to fluid loss, can affect top performance (speed, strength and stamina) up to eight percent (Bonci 2009, 48).

An accepted rule that has been determined by professors that have studied dehydration and athletic performance, is that; for every one percent that is lost in the body of water, that affects performance in sport related activity up to five percent capacity (Cardwell 2006, 69-75).

Since water, makes up the majority of the human body, and accounts for over 60 percent of the human body weight it is important to know how to regulate fluid levels in the body and to always makes sure players are adequately hydrated. Proper water and fluid levels are directly linked towards, performance, body temperature, recovery speed and brain activity (Burke 2007, 21-23). To ensure player’s athletes are always at proper hydration levels, it takes a proper balance of proper food and liquids. Athletes can up their water intake by eating water base fruits and vegetables. All water consumed through either food or liquid will help account to keep the athlete hydrated. Although some sources are better than others, it gives the athlete relief from the mental side that they do not just have to drink water all day. Alcohol (which will be discussed later) is the only liquid that does not account towards the daily fluid intake for athletes. Alcohol is classified as a diuretic (causes increased urine output) and has negative effects towards athletic performance. (Bonci 2009, 165)

The National Athletic Trainers Association has adapted a general guideline or checklist that players and coaches can use to help regulate players fluid levels. These guidelines will not work for every player, but is a good general starting point. 1) Drink 20 ounces or 0.6 liters of fluid one hour before a training session. 2) Depending of the athlete, players intake of fluid per hour of exercise should range between 14 – 40 ounces or 420ml – 1.2 liters. 3) Upon completion of the training session regardless of game or
practice players should drink 24 ounces or 480 ml of fluid for every pound they lost during exercise (National Athletic Trainers Association 2000, 50).

The absolute main purpose to drinking before and after sports in relation towards performance, is to move water (fluid) as fast as possible from the gut (stomach) to the muscles (Bonci 2009, 45-50). Water and sports drinks do this in the most effective and healthy way.

There has been much debate in recent years about the use of sport drinks relating to positive effect of athletic performance. The general rule of acceptance over the past 20 years based on scientific research and studies has shown and proven that sport drinks have a positive effect on athletic related performance, it terms on replacing fluid lost in the body as well as replacing muscle glycogen levels. Research has also indicated that while sports drinks have the most benefit towards endurance sports, they can also be an added feature to short, high octane intensity sports, which happen to be most team sports (Cardwell 2006, 76.-77). The science behind saying that they have a positive effect is, because when athletes sweat they are lowering the fluid levels in the body. In sweat, there are minerals most predominate are sodium and potassium (Potassium is used for the breakdown of proteins, also it plays a part in the process of converting energy from glucose). When these minerals leave the body, they must be replaced, the longer the athlete competes in the game or practice, without replacing the minerals or commonly known as electrolytes (electrolytes send electrical messages in the nervous system which helps with muscle contraction and the nervous system), they are slowly decreasing their performance capacity. In sports drinks, (the proper ones) there are adequate levels of carbohydrates (sugar) which help keep blood glucose (sugar levels in the blood) up as much as possible, so the body is always using the carbohydrates are the primary source of energy. Research performed by the University of Iowa in the United States found that drinks with two of more types of sugars (carbohydrates) will trigger a quicker response of water absorption compared to drinks with only one type of sugar (Cardwell 2006, 77). Also further research has proven that sport drinks with more than eight percent of carbohydrates will, when consumed will actually take longer to pass through the stomach and provide the body with essential nutrients at a
lower rate, so in turn it is recommended to keep carbohydrates percentage below eight percent (Cardwell 2006,77-79).

Sodium or more commonly known as salt is added to sports drinks with a purpose of enhancing athletic performance. Sodium has been mislabelled, as being added only because it taste good, which is true, yes, but at the scientific level, sodium has levels must be replaced by athletes. Sodium has two main functions in relations to sport drinks. First, it helps to speed up all the liquid that is being absorbed from the stomach and intestine (Cardwell 2006, 78). Secondly, is it keep a proper balance of plasma volume within the body, to fully recover after a training session, all sodium levels must be replaced (Cardwell 2006,78-79).
6 Supplements

6.1 Protein Supplements

One of the most common supplement young athletes encounter or hear about are protein supplements. Protein supplements, will usually be consumed in either, powder or in pill form, those are the two most common types athletes will encounter, most athletes, on average consume more protein than is actually required (Clark 2008, 22). Therefore, the use of adding any extra protein to the diet, either by supplementation of by the use of natural food, does not seem to enhance athletic performance.

A misconception commonly heard around athletics is, protein from food and from supplements is the same thing, which is not true. Protein from food will have numerous amino acids, vitamins, minerals and fats, whereas protein in a powder form may only have a limited selection of amino acids and minerals (Bonci 2009, 100). Protein supplements are deemed safe, and are not banned under the Olympic committee drug standards. It is important to keep in mind that players should always try to use natural food as their first source of protein, and try to limit supplementation use, to when there is situations where food is not available.

6.2 Creatine

Creatine is a naturally occurring composite found in the body (Clark 2008, 208), and just like most supplements, creatine can be obtained through natural food (Beef, chicken, pork, fish). The naturally occurring amino acids in these foods are the stepping stones for the first step in the process of creatine synthesis, once this happens it onsets the process of creatine phosphate which produces adenosine triphosphate, (ATP), which is the primary source of energy within the body (Bonci 2009, 105-106).

There are a few reason why players would want to take `extra `creatine. The main reason would be to gain size and strength. In order to do that, creatine maximizes the cells capacity making it bigger, therefore causing the cell to hold or retain more water than normal., which can be misleading to some athletes as they may appear to `look `bigger, but really the added size or girth to the muscle can just be due to water reten-
tion. Added weight can, have an effect on athletes, as it may cause discomfort with agility coordination and speed.

Research shows muscle creatine will vary between people depending on age, gender, and fibre type. The average western (meat) diet provides the body with approximately two grams of creatine per day. (Burke, 2007, 57-58). Creatine is produced and helps process three major organs in our bodies; kidneys, liver and pancreas, also it comes from the amino acids; arginine, glycine and methionine. Studies have proven that creatine will work best with sports where there are intermittent intervals, where short bursts of energy lasting up to ten seconds is required and weight lifting. Athlete who are exercising for an extended duration of time, eventually their muscles will tire out, and there will be a slight depletion of muscle creatine phosphate when muscles fatigue. If creatine levels were full, the creatine phosphate level could remain full and work up to its maximal potential for the duration of the task being performed (game, practice, weight lifting). This research is why creatine supplements have been proven effective with hockey players; because the stimulant is responsible to make sure levels are full all the time.

Response to Creatine supplements may be related to initial Creatine stores, that pre-exist in the body, where the lowest levels showing the greatest response (Burke, Chilibeck, et al 2003, 57-58). Athletes with already existing stores of creatine that levels are close to threshold levels are unlikely to show additional benefit towards the use creatine supplementation (Burke, 2007, 57-58). Once the body reaches its Creatine threshold by either method of food or supplement, all excess creatine that is in the body will be eliminated from the body, therefore making it complete useless (Bonci 2009, 105-106).

6.3 Caffeine

Is a naturally occurring supplement that is found in numerous plants. It is more common to find caffeine leaves, nuts, and seeds. Despite the common misconception, caffeine does not dehydrate the body; the only fluid that dehydrates the body is alcohol. Caffeine is a stimulant and not an energy source (Bonci 2009, 107-108), and also di-
rectly effects the central nervous system of the body. Any stimulant that affects the central nervous system will have some sort of impact on the body. Some studies have shown that, when caffeine is consumed, it can provide the body with an added energy source for endurance sports, due to the fact that, when entered into the body, caffeine causes fatty acids to be released early, therefore using that as a source of energy first, so the body can preserve the carbohydrates to later use (Bonci 2009, 107-108). Whereas, other studies have reported that, side effects can occur if more than 400 milligrams is consumed per day. Some of the reported effects were, rapid heartbeat, increased blood pressure, anxiety, loss of focus, easily irritable, and loss of ability to focus (Burke 2007, 59-61).

In January 1st, 2004 WADA (World Anti-Doping Agency) took caffeine off the list of banned substances, thus allowing athletes to freely use caffeine as a supplement to help boost performance enhancement, without any sort of supplementary discipline. (Cardwell 2006, 114). Previous to January 1st 2004, WADA had a rule in place that athletes could not have more than 12 mg per liter of caffeine in their bodies at a time. There have been many studies both positive and negative against the use of caffeine as part of a of athletes exercise diet program, but because of WADA and due to the fact it is overruled it’s standpoint on caffeine of the banned substance list, caffeine use is now on the rise among athletes in both youth and professional sport.

Over the past years, research has started to prove that this is some, but little benefit towards the use of caffeine as a positive stimulant for athletic performance. Research for the positive effective of caffeine has found caffeine to have a slight marginal impact for the following; Short –duration, high intensity events (1-5 minutes), Prolonged high-intensity events (20-60 minutes), Endurance events (>90 minutes continuous exercise), Ultra endurance events (> 4 hours), Prolonged intermittent sprint events and effects on strength and power sprints (Burke, 2007, 59-61). Other studies have shown that there is little to no benefit towards the use of caffeine. In fact, studies have begun to show that the effect of caffeine on glycogen sparing during sub maximal exercise is short-lived and contradictory (Graham 2001a and 2001b, 59). Another study found the following evidence, when examining the use of coffee as a positive stimulant to better enhance sport performance, it found that coffee is not an ideal source of caf-
feine for supplementation use, due to the fact that the variability and unpredictability
of the caffeine content purchased in stores or homemade (Desbrow et al in press, 199-
214).

Research has also proven, that when dealing with the contradictory issue of elevating
the heart rate, studies showed the following. At increased levels of consumption, it is
probable that caffeine can cause increases in heart rate, impairments or alterations to
ones fine motor control and technique, and over arousal (interfering with sleep and
recovery). Caffeine can cause impairment of technique that may affect the outcome
and effort towards performance and towards sport. Over arousal may cause a distur-
bance in the ability to recovery between training sessions. These concerns make it ex-
tremely critical to finding the lowest level that one person can tolerate of caffeine, that
can be used to achieve a performance enhancement (Burke, 2007, 59-61).

The universal compromise among many sport dieticians worldwide is that caffeine use
is generally up to the individual. Because every athlete is different, the use will generally
be on an athlete- athlete basics. A general common safe rule would be to try exercising
without caffeine at first and then try it during a practice. Generally, if caffeine has
never been consumed in the body before, than a notable difference may be felt. Con-
sume only two – three milligrams per kilogram of body weight at a time and it is safe
to drink more than 500 milligrams per day of caffeine.

6.4 Alcohol

From an athletic standpoint, there is not a lot of good things to report about alcohol.
Small amounts have been linked to reducing the risk of heart disease, but that is only
around 10 – 20g. There are plenty of reasons why high consumption of alcoholic bev-
erages should be limited by use of athletes. First, Alcohol is very dehydrating and is
the only true diuretic form of liquid. When alcohol is consumed in the body, the hor-
mone that works in the body (ADH) is very limited its ability to function properly
(Cardwell 2006, 80). Antidiuretic (ADH) is responsible for regulating urine outcome
within the body, which leads to dehydration.
Second reason to watch alcohol consumption is that it drastically slows down the recovery process. When consumed in the body, Alcohol will enlarge the diameter of the blood vessels. Once this happens, the recovery time in the body will be slowed immensely. Injury’s will bleed more and may even swell even more (Burke 2007, 10-12). In addition, research has proven that alcohol is a depressant which will cause slowed reaction time, impaired hand eye coordination, and drastic changes to stability movement (Burke 2007, 10-12).

Heavy alcohol consumption 24-48 hours per event is seemed to be determinate to a players chances of playing at his or her highest calibre, and any alcohol consumed post exercise is seen to be highly detrimental to one’s recovery process.

Use of alcohol has both long term and short-term effects, and in general most of the effects have negative consequences. Consumed in large amounts, over time, alcohol can increase triglycerides (blood fats), which can lead to obesity, stroke cardiovascular disease and high blood pressure.
7 Logistical Challenges Players May Face

A hockey player's schedule is very hectic on its own, add on to it, the player's lifestyle and there will be many obstacles the player must overcome to eat properly and on a regular basis. Albeit school or extracurricular activities, or even jobs, sometimes players will not have access to the resources to sit down and prepare a proper meal. Planning ahead and preparing meals ahead of time is the best way to avoid eating improper foods or even skipping meals altogether. Players cannot control life obstacles, but they can control how prepared they are for them. Packing and planning ahead is the best way to ensure players are always prepared. When planning ahead and packing foods, always make sure to pack foods that provide the body with energy and foods that will repair muscle glycogen levels and help replace lost electrolyte levels.

Proper fuelling and recovery foods (foods that provide the body with proper amounts of carbohydrates, fats and proteins) are: Packets of oatmeal, trail mix, peanut butter or nut butter and crackers, fruits, dried fruit, dry cereal, pasta, pasta salad, chicken and rice, canned beans, baked potato, sweet potato, sports bars, gels, honey packets, sport powder drinks.

Another issue players at the semi pro or collegiate level may face would be a heavy off season training program, where elongated training sessions are held, multiple resistance training sessions that are held in the same day, with the main focus would be to increase lean muscle mass and gain weight. Players need to be aware of the food they are eating and to make sure they are eating to meet the demands of the required workouts. One study done on collegiate football players during their off season found that when they were on their 10 week training cycle, the control group or group that had no nutritional monitoring did not make in positive progress when it came to measuring body mass, strength or power, compared to when they first started (Pearson et al. 1995, 193).

During the off-season, where the demands are usual set, to get bigger, stronger and faster, players need to prioritize their eating. The player must make sure to supply his or herself adequate fuel for all the training sessions as supply the body with the proper
timing of needed nutrients post work out, if done, this will maximize the potential of the player as well as the training session (Burke, 2007, 199). Some research has indicated the time timing of the meals pre and post training session may be more or just as important as meeting the total requirements needs, the study also goes on to say that further research is needed to prove this point more, but in general, the timing of pre and post workout meals is extremely imperative to a players success (Burke, 2007, 199).
8 Eating Pre- Exercise

Eating before an ice session or a work out is the last chance the athlete has to properly fill his body with the proper nutrients to maximize performance from a nutritional point of view, eating pre exercise is not just the last meal the athlete eats before the game or practice, it can also be what the athlete eats the day of or even 24 hours before the game. Eating a healthy pre game meal, or eating properly just the day of a game or practice cannot over compensate for a poorly balanced diet or lifestyle. What the player eats on a daily or monthly basic will have more of an impact how the player performs on a particular day. Eating the correct foods on a daily basis over the season will always lead to better results than eating properly on game days or training days.

8.1 Pre Game Meal

Depending on the time in which the game or practice is held will really depend on when the pre-game meal is had. Usually, when possible, players will tailor their meals into three or four pre game meals before a game or training session. The major pre-game meal, should be consumed roughly three – four hours before game. Players eating their pre- game meal (3 – 5 hours) regardless of the time of their game should try to consume between 140-330g of carbohydrates, for the average adult male (Har-greaves et al. 2004). Two or three hours for a lighter meal, one – two hours for a snack and a shake and less than an hour for a top up or filler snack. Male players, on average during game days will need roughly five to seven g per kg of body weight for carbohydrates to provide adequate energy levels (Jeukendrup, Gleeson, 2008, 133). Every player is different when it comes to portion size, but using those rules as a guideline will help in the digestion processes.

The following guidelines have been research and proven to be the best advice for athletes when they are planning a pre-game meal. Players must make sure, that during the season; they are eating an adequate amount of carbohydrates at every meal (for the body type and training schedule) so that will allow for proper and sufficient use of en-
ergy for the player. Since carbohydrates are the number one source of energy in the body, levels needs to remain at a premium.

For lighter training days, or easier skating days, choose foods that are lighter to digest and more comfortable in the stomach (Banana, toast, oatmeal, granola bar) high-carbohydrate, low fat food are the best choices. Players should be aware of training sessions or practices going longer than one hour in duration, where they know there will be no time for a food break. Players should eat all essential power foods (carbohydrates, proteins, and fats) to propel them through the workout. Oatmeal with yogurt, toast with peanut butter and jam, nuts and nut butters are good choices. Players should be made aware of the foods that take a longer period to empty from the stomach, and often end up taking much longer to digest and tend to leave people with a sick or nauseating feeling. High fat sources of protein are usually not smart choices and rarely lead to an enhancement in performance, and often lead to lackadaisical habits due in part to the feeling in the players stomach. Greasy hamburgers, French fries, fried chicken, pancakes, and most fried food should be avoided.

Younger players, who are generally still growing and being introduced to the world of athletics should avoid tampering with foods that are higher in sugar, pre exercise. Although they (high sugar foods) have been reports that give some merit to eating foods higher in sugar pre exercise, younger players may get side effects in the spike of blood sugar within their bodies. Light – headiness and some fatigue are typical symptoms, which will lead to a decrease in performance.

The type of training or intensity of the exercise should be taken into consideration as to how heavy or light the pre-game meal will be. Higher intensity practices will require more blood flow in the stomach. Any foods sitting in the stomach may cause players to feel sick.

Players who have morning or noon-hour games, and who experiences with the “butterfly” feeling or who get overly nervous and find it hard to handle food in the morning, should eat a larger snack or even a meal before they go to bed the night before, that will help subsidize the lack of the food in the morning. A good meal that is about
two-thirds carbohydrate (chicken and pasta, stir-fry with chicken and vegetables, vegetable pizza or cereal with fruit and nuts) and an extra two or three glasses of water, would provide enough fuel for the player to help with the lack of proper fuelling in the morning

It is recommended that players stick with foods that they are familiar with for pre-game meals. When tinkering with new foods, players can run the risk of cramps, stomach acid, poor settling, and heartburn. Always, make sure to drink plenty of water the night before the game, as well as to keep topping up leading into game time.

8.2 Eating During The Game

Eating during a game (in between periods) gives the player a good chance to rehydrate and keep energy stores as high as possible. Eventually, towards the end of a game or long training session, no matter how well trained or how properly the player has eaten, he or she will eventually begin to fatigue, but eating and drinking the proper foods and liquids can help prolong the athlete playing close to their maximal capacity.

One of the main goals for eating during a game is to keep blood glucose (sugar) levels high. Eating carbohydrates during exercise will ensure blood glucose levels high, providing glucose for muscle energy.

There is not a magical food that can be eaten in between periods that will replenish everything being lost but it is rather a combination of foods that will provide the best benefit for the player. Since there is not enough adequate time in between periods to properly digest and absorb solid food (only food that is digested and absorbed can be used as energy), a better option is to use liquids or lighter sources of food as sources to refuel and rehydrate. Players first priority, when given a break is to rehydrate (150 – 250 ml per 15 minutes of exercise) (Cardwell, 2006, 97-101). In addition, players need to consume between 30 – 60 grams of carbohydrates per hour of exercise (Bonci 2009, 42). This simply, cannot be done with just water, sport drinks have been proven to provide players with an adequate form to liquid rehydration that targets player’s spe-
specific needs. Having said that, sports drinks alone, do not provide enough fuel for players, high-octane foods such as, gels (carbohydrate gel packs- single serving portions of carbohydrates) honey packs or sticks, jellybeans, sliced fruit will provide the body with quality source of carbohydrate as well as topping up glycogen levels within the body.

Due to the fact sugars use different transporters, you can absorb more carbohydrate and have more fuel to support your endurance exercise, and if you mix your intake rather than just getting all your nutrients from one source (Jentjens et al 2006). A study was conducted of trained cyclist (women) who did two hours of moderately hard endurance cycling, when the girls drank a beverage that gave them 60 grams (240 calories) of glucose per hour, that resulted in the highest amount of carbohydrate being used. When the women used a beverage with 90 grams of glucose (360 calories ) per hour, the findings found that, they did not perform any better- likely because, the fuel sat in the stomach unabsorbed and contributed to intestinal distress. With the lower carbohydrate intake, only a few of the women that were tested, said they were feeling sick or bloated (Wallis et al 2007, 185).

8.3 Eating Post- Game

Eating after the game is just as important, as all the planning and preparation athletes do before the game. Eating post exercise, players should take the same amount of time to properly plan prepare a proper meal. Players should focus on two major topics after training: Replace all fluids that were lost, and replace muscle glycogen levels.

Players should eat and rehydrate as soon as possible post exercise, the body is most supporting for liquid and food directly after exercise (0 -3 hours) due to the fact that, the muscles have the most need for glucose directly after exercise. Average glycogen resynthesize rates post exercise are 3-4 mmol per weight per hour. In the two or three hour time period directly after exercise the window opens to around five or six mmol per hour, allowing the player to recover faster (Jeukendrup, Gleeson, 2008, 144). Carbohydrate consumption is essential for proper recovery, without adequate carbohydrate intake post practice, proper muscle glycogen levels will not be fully restored.
Various studies and reports by sports dietician’s, have found that 50 grams of carbohydrate post exercise is a proper way to start the recovery process (Bonci 2009, 42).

A study done in 2002, found that eating protein with carbohydrate after exercise or training will provide the body with a more efficient way to recover properly because specific amino acids in protein (Glutamine and Arginine) have been linked to speeding up the ability of the body to resynthesize muscle glycogen levels after exercise (Levenhagen et al. 2002, 43). Another study done in 1992 also found that eating protein after exercise had a positive benefit as well. When participants consumed a liquid supplement containing roughly 50 grams of protein and 160 grams of carbohydrate (half directly after exercise and the other half two hours later) the results proved that, the athlete was able to store and replace one and a half times more glycogen than before (Zawadski, Yaspelkis and Ivy 1992, 104). Another report support to this theory found that, players who consume protein with carbohydrate directly after exercise after exercise 0.4 g per kg of body weight) they had higher recovery rates of glycogen resynthesis than players who did not consume protein after exercise (Jentjens et al. 2001).

To make sure players are properly hydrated after games, practices, training sessions etc., there have been proven methods that players can do by themselves to self-check hydration. Color is usually a good indication of the players’ fluid level. Clear will usually indicate hydrated and dark or yellow is usually an indication of dehydration (Cardwell 2006, 103-104). Sodium, is lost during sweat, and that can also affect the color of urine. A player may see their urine as being clear after a game or practice, and think they are hydrated when in fact, that due to the loss of sodium in the body, it is producing clear urine. Only when all fluid levels are replaced, sodium included can the player become fully hydrated again (Cardwell 2006, 78).

Another, proven method to help players self-check themselves is to weight themselves pre and post exercise. For example, if a player weights 150 lbs. before the game and then 147 lbs. after the game, they have lost three lbs. of fluid that will need to be replaced. As players are rehydrating, some liquid will be lost due to urine output, so play-
ers should actually drink more liquid than they lost, to properly ensure fluid levels have been replaced.

9 Project Planning

Once the original goal of the project was decided, the next stage was to gather as much data as possible. Data was collected from the 80’s 90’s as well as modern data from 2000-2009, was also included. Data from all topics was compared and analyzed to give the players the most accurate results possible.
10 Implementation of The Project

Once all the data was collected and analyzed, the data could then be broken down into main categories players will need. Breakfast, Lunch and Dinner are the three main times players will eat during a day, as well as, Pre-game meal, Post-game meal and during game food options are the most critical times a player will need food when it comes to exercise.
11 Description and Results of the Project

The end product was a dietary guidebook broken down into six components. The components were then broken into three chapters. Breakfast, Lunch and Dinner were the first three chapter. In each chapter, there are 10 acceptable choices of food athletes may have, with a nutritional breakdown of each. The final three chapters contain, 5 pre-game meal options, 5 in game food options and 5 post game menu options with a nutritional breakdown for each meal.
12 Summary and Conclusion

Using nutrition for athletic advancement, will take time and dedication by the player, but all that is needed is some minimal effort on their part to plan ahead, cook proper meals ahead of time, and choose proper foods instead of more popular unhealthy foods while eating on the road. These are all choices the player is in control of, and can decide what he or she puts into the body.

Players must make sure to keep muscle glycogen and energy levels topped up at all times, so that there is an sufficient energy level within the body to draw from at all times to meet the daily demand of being a hockey player. A good way to do this is to hit the target range of consuming between 7-12 g per kg of body weight and consuming 50-100g of carbohydrates directly after intense exercise. Players should always be aware of replacing and repairing lost muscle tissue after exercising and training sessions, keep protein intake around 1.0 grams per kg of body weight will make sure muscle growth and tissue repair is always happening. Research has shown that there is no added benefit of consuming more than 1.2 grams per kg of body weight of protein.

Fat intake should account for no more than 20-35% of a players daily edit. Players should get most of their fats from proper sources via; Fish, nuts, nut butters and oils. Fat provides the body with energy and overall health of the body. It is also important for players to keep vitamin and mineral consumption up to daily recommendations.

Rehydrating after training sessions is critical to players short and long term health. Not only does it allow the player to rehydrate, it provides the athlete with a quick way to start the process of recovery and muscle repair, which help with the overall strength and conditioning of the player. Consuming fluids (minimum 500ml – 1 L) either via water or sports drink with carbohydrates (two types of sugar attacks the muscle the quickest), proteins, sodium and potassium will help kick start replacement of lost electrolytes.

Further research is needed on the effect of carbohydrate replacement and the hydration strategies on prolonged intermittent exercise. There is little research to support,
that when muscle glycogen levels drop during a game and fluid loss occurs, how much brain activity and central nervous response time is slowed. Hockey offers a great opportunity for cognitive thinking and decision making is a critical part, there has to be more research and understanding to find out how much brain activity is slowed compared to when levels are normal through the body. Research has showed that when blood glucose levels drop in the brain, the brain is severely aggravated and its ability to send and process signals is severely altered. Further research is needed to prove what particular foods are best to increase this brain activity back to normal levels as well as a measurable number to give players a clear understanding as to how much playing ability they are losing when they become dehydrated and muscle glycogen levels drop in the body.
**Bibliography**


Cardwell, Glenn, 2006, Gold medal nutrition 4th ed, Human Kinetics, New Zealand

Tarnopolsky, Clinical Sports Nutrition, 3rd ed. 2006


## Attachment 1 Ratings for Food Choices

<table>
<thead>
<tr>
<th>Carbohydrates</th>
<th>Protein</th>
<th>Fat</th>
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<tr>
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<tr>
<td>Whole-grain breads</td>
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(Data from Bonci, Leslie 2009, *Sports Nutrition for Coaches*)
## Attachment 2 Guidelines for Protein Intake

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<thead>
<tr>
<th>Population</th>
<th>Estimates of maximum protein need for males (g/kg per day)</th>
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<tbody>
<tr>
<td>Sedentary people</td>
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</tr>
<tr>
<td>Recreational people</td>
<td>0.8-1.0</td>
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</tr>
<tr>
<td>Serious resistance trained athletes: established training program</td>
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<tr>
<td>Serious endurance athlete</td>
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<td>Female athletes</td>
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(Data from Lemon 2000; Tarnopolsky 2006)
**Attachment 3 Carbohydrate Needs**

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<thead>
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<td>1</td>
<td>Very little aerobic activity as possible</td>
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<tr>
<td>2</td>
<td>Sleeping, watching TV, sitting</td>
</tr>
<tr>
<td>3</td>
<td>Daily Chores</td>
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<td>4-5</td>
<td>Walking, moderate exercise, recreational sports, fitness programs</td>
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<tr>
<td>5-7</td>
<td>Serious amateur sports, football, rugby, bodybuilding, weight training</td>
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<td>7-9</td>
<td>Serious professional sports, endurance sports, marathons, Training 10+ hours per week</td>
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<td>10+</td>
<td>Full-time athletes, Ultra – endurance, Ironman events, Olympic athlete, Training 15+ hours per week</td>
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</table>

(Cardwell, Glenn, 2006, *Gold medal nutrition 4th Ed*)
Nutrition Menu Plan
For Hockey Players
2011

Chris Bursich

Haaga-Helia University Of Applied Sciences

5/10/2011
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Introduction
Eating properly is a great way to add to a great set of technical skills in the game of hockey. Eating properly and having a well-balanced athletic diet, will lead to an increase in physical performance both on and off the ice. Eating well, allows the body to recover properly and help with the development of muscle tissue and growth. Eating properly also, shows scouts and coaches a mature side of development, and speaks highly to how one cares for their body and will do the things it takes to become a winner. Having great skills, work ethic and well-balanced lifestyle are ammunition for a successful career and healthy life. This guide will look a practical look at foods that help players fuel for energy and recovery and how to implement them into everyday eating.

Foods That Fuel:

1. Carbohydrates
   WHAT ARE THEY? - They provide the body with the best source of energy and delay fatigue when consumed throughout exercise. There are two types of carbohydrates (simple and complex). Not all carbohydrates are good for players; typically, simple carbohydrates (made up of one or two types of sugar) are digested very quickly within the body and are very simple in structure. Simple sugars are made up of either two classifications of sugar, monosaccharide’s (glucose, galactose and fructose) and disaccharide’s (which are two chemically linked monosaccharide’s) and are typically found in lactose, maltose and sucrose. Simple carbohydrates usually provide the body with little nutrient value and provide a quick burst of energy followed by a heavy down period.

   Types of Simple Carbohydrates:
   - Fruit
   - Milk
   - Yogurt
   - Candy
   - Table Sugar
   - Pop
   - White bread
   - White Rice
- Normal Pasta
- Refined Sugars
- Fruit Juices
- Unnatural Cereal
- Chips
- Pastries

Acceptable Forms of Simple Carbohydrates:
- Fruit
- Milk
- Yogurt
- Potato
- Pasta
- Rice
- Honey
- Vegetables

Complex Carbohydrates: Are foods which are composed of more than two types of sugar, which provide the body with sustained periods of energy and take longer to digest, thus providing for the body with longer periods of energy.

**Best Sources of Carbohydrates for Players**
- Oatmeal
- Whole Grain Products
- Whole Wheat pasta
- Brown Rice
- Vegetables
- Fruits
- Barley
- Baked potato
- Quinoa

**How Much Per day?**

Players intake of carbohydrates will vary from each individual player. The amount is usually based on the physical demands that are being put on the player and usually
by the weight of the player. Typically, hockey players will need 5-10 g per kg of body weight to meet the demands of hockey.

<table>
<thead>
<tr>
<th>Carbohydrate ( g per KG of body weight per day)</th>
<th>Activity Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very little aerobic activity as possible</td>
</tr>
<tr>
<td>2</td>
<td>Sleeping, watching TV, sitting</td>
</tr>
<tr>
<td>3</td>
<td>Daily Chores</td>
</tr>
<tr>
<td>4-5</td>
<td>Walking, moderate exercise, recreational sports, fitness programs</td>
</tr>
<tr>
<td>5-7</td>
<td>Serious amateur sports, football, rugby, bodybuilding, weight training</td>
</tr>
<tr>
<td>7-9</td>
<td>Serious professional sports, endurance sports, marathons, Training 10+ hours per week</td>
</tr>
<tr>
<td>10 +</td>
<td>Full-time athletes, Ultra – endurance, Ironman events, Olympic athlete, Training 15+ hours per week</td>
</tr>
</tbody>
</table>

(Cardwell, Glenn, 2006, Gold medal nutrition 4th Ed)

Protein

What is Protein? - Protein is not a great source of energy, in fact it’s the last source of the body turns to after carbohydrates (1st) and fats (2nd), but protein is instrumental in the rebirth and resynthesize of muscle tissue repair and muscle growth. Every day the body is constantly breaking down muscle tissue, even if players do not train or exercise every day, and they need to consume adequate protein per day to keep the resynthesize of muscle tissue to continue their development.

Proteins are made up of Amino Acids, some are called essential amino acids (which the body cannot produce and must get from food)
Most westernized diets provide athletes with more than enough protein than they typically need on a daily basis for performance.

**Foods with protein: (All acceptable)**
- Chicken
- Turkey
- Meat products
- Fish / Fish products
- Tofu
- Nuts
- Nut butters
- Eggs
- Milk
- Yogurt
- Beans
- Lentils

**Best Sources of protein:**
- Meat products
- Fish products
- Eggs
- Soy Products

**How Much protein Per Day?**
- Protein intake will vary per day, typically players are shooting for the following:
- Measurements are in g /per kg of body weight

<table>
<thead>
<tr>
<th>Population</th>
<th>Estimates of maximum protein need for males ( g/kg per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary people</td>
<td>0.8-1.0</td>
</tr>
<tr>
<td>Recreational people</td>
<td>0.8-1.0</td>
</tr>
<tr>
<td>Serious resistance athletes: early phase of training</td>
<td>1.5-1.7</td>
</tr>
<tr>
<td>Serious resistance trained athletes: established training program</td>
<td>1.0-1.2</td>
</tr>
</tbody>
</table>
Serious endurance athlete 1.2-1.6
Adolescent athlete 1.5-2.0
Female athletes 15% lower than males
(Data from Lemon 2000; Tarnopolsky 2006)

Fats

What is fat?
- Fat is an extremely intricate part of an athletic diet. Fat provides the body with energy (behind carbohydrates) and provide the body with many daily functions needed to optimize natural health of daily living.
- There are four different types of fat (saturated, monounsaturated, polyunsaturated and Tran’s fat), how they gets their classification depends on their chemical structure.

- How much Fat per day?

Players should get most of the daily intake of fat from, monounsaturated and polyunsaturated sources. Their daily intake of fat should only consume 20-35% of their daily caloric intake.

Good Sources of Fat:
- Avocados
- Nuts
- Nut butters
- Fish
- Fish oil
- Hemp seeds
- Tofu
- Flax seed
- Oils

Fats to Avoid
- Creams
- Butter
- Ice Cream
- Fried Foods
- Fat on meat
- Doughnuts and baked goods
- Fatty salad dressing

**Hydration**

**How?**
- Keep drinking! All liquids (except alcohol) account for the daily intake of liquids. A great way to ensure players are getting enough liquids is to carry around a water bottle each daily and refill it as much as needed. It is hard (but possible) to consume too much water in one day, but it is very rare seen in hockey players, in fact, most players do not consume enough daily water and come to games or practices already dehydrated. When players are dehydrated, their performance is decreased severely; some studies have shown that when players lose as little as two pounds during a workout, their performance (brain activity - speed, strength and stamina) can be effected up to 8%.

**How much to drink?**

- Players will find it hard to drink too much liquid, although possible, it would be hard. The national athletic trainers association in 2000, produced the following for hydration guidelines:
  - 1) Drink 20 ounces or 0.6 liters of fluid one hour before a training session.
  - 2) Depending of the athlete, player’s intake of fluid per hour of exercise should range between 14 – 40 ounces or 420ml – 1.2 liters.
  - 3) Upon completion of the training session regardless of game or practice players should drink 24 ounces or 480 ml of fluid for every pound they lost during exercise
- Another tip players can use to weight themselves after a game or practice, usually lost weight (1 or 2 lbs. etc...) can be put back on through proper hydration after.

**How to hydrate after ice or training sessions?**

- Keep drinking periodically throughout the rest of the day.
- Do not drink so much, that sickness sets in, but continue until the end of the day.
- Look for symptoms that rehydration has set back in (weigh back to normal, urine color, headaches are gone)

**Acceptable liquids for players**

- Water
- Coffee
- Tea
- Natural Juices
- Milk
- Chocolate Milk

**Liquids to avoid**

- Alcohol beverages
- Soda Pop
- Energy drinks
- Sugary drinks

**Eating Before a Game or Practice**

**How?**

- The pregame meal is NOT just the meal eaten before the game; it can be broken down into three or even four meals prior to the start of the game.

**When to Eat?**

- The larger pregame meal can be eaten 4 or 5 hours before the game is ready to start. Because this is the largest meal, this will usually take the longest for the body to digest and have the food ready to use for energy. All three major components (Carbohydrates, fats and proteins) should be consumed at every meal, but the portion sizes will change for each.

- The major meal should be 2/3 carbohydrates, with other half portions consisting of fat and protein. As the game time approaches, the portion sizes should get smaller, so the body is able to digest it in time to be able to have it converted into energy. A small meal just prior to a game could be a nut butter and jelly sandwich on whole or multi grain bread with a glass of water.
Example –

**Large Meal** = Whole grain pasta with olive oil, chicken and cheese.

**Smaller Meal** = Nut butter sandwich with a piece of fruit

**Snack prior to game** = Shake or trail mix

3. **Eating In Between periods**

**Why?**

- To keep energy levels topped up and to stay hydrated.

**How much to eat?**

- That will depend on the player, everyone will be different, and many factors will depend on how much to eat in between periods. Some players may be extremely hungry, while some may only require a small bite of something and a small drink. Listen to your body, it will tell you how much to eat, do not eat so much that you will be sick, have a light snack to replace muscle glycogen levels and to replace lost electrolytes.

**What to eat?**

- Since there is not enough, time to properly digest solid food a combination of things may be used to replace everything. Sport drinks with fruit may be good choices or replacement gel packs or honey sticks may also be acceptable options for some players as well.

**Good Choices of foods**

- Fruit
- Sport Drinks
- Gel Pack
- Honey Sticks
- Trail Mix
- Piece of homemade pizza or vegetarian

**Avoid**

- Greasy food
- Alcohol
- Over eating (feeling full)
- Milk or dairy (may make some players sick)

Eating After the Game

Why?

- Eating after the game is just as important as eating before the game. Players need to after the game to replace muscle glycogen levels (carbohydrates) and replace muscle tissue (proteins). In addition, it is extremely important for players to re-hydrate and replace lost electrolytes (sodium and potassium) and put them back into proper balance. Electrolytes help conduct and promote nerve and muscle functions within the body. The human body cannot function properly without proper electrolyte balances within the body.
- 3 main goals of post exercise nutrition
  - 1) Replace muscle glycogen levels (Carbohydrates)
  - 2) Repair damaged muscle tissue (Protein)
  - 3) Rehydrate (water / water based foods)

What to eat?

- Water
- Sports drinks
- Broth based soups
- Pretzels
- Pizza (homemade)
- Meat with rice
- Fruits
- Starchy(sugar) carbohydrate with protein source(chicken, meat, tofu, etc..)
- Yogurt with organic granola and fruit
Problems Players Face
Players do not always live in the perfect lifestyle, families, school, work; other commitments contribute to a player’s lifecycle and availability to have access to food. Here a few easy solutions players can do to ensure they are eating regularly (every 2-3 hours) and properly.

- Plan ahead/ make meals before go to school or on a road trip
- Always eat breakfast
- Eat regularly (5 – 6 meals per day)
- Drink water all day
- Read the labels of food products before purchase or consumption
- Eat before and after exercise
- Consume enough carbohydrates to meet energy demands
- Eat natural foods
- Avoid refined sugars
- Avoid alcohol

Menu Breakdown:
Per day athletes, need a certain amount of macro and micronutrients. Since is necessary for healthy living. Since hockey players intake are more than the average person, the following menu guide is for players aged 14-19. Daily breakdown will look like the following:

Servings per day

Milk – 3-4

Vegetables and Fruit – 7-8

Grain products – 7

Meant and Alternatives – 3

What makes a serving?

Vegetables and Fruits = 1 piece of fruit, ½ cup fresh or frozen, 1 cup raw

Grain – 1 slice of bread, ½ pita, ½ cup cooked rice or pasta

Milk – 1 cup of milk or, 1 and ½ oz. of cheese, ¾ cup of yogurt
Meat and Alternatives – 2 eggs, 2 tablespoons of peanut butter, ½ cup cooked lean meat

Energy

Calories: 1g of carbohydrates – 4.2
1g of protein – 5.65
1g of fat – 9.4

Calories per day – 2400 – 3200

Carbohydrates per day – 300 – 400 g or 60 % of daily calorie intake
Proteins per day – 50 – 60 g or 10 % of daily calorie intake
Fats per day – 60 – 70 g or 20 – 30 % of daily calorie intake

Water – 13 – 16 cups per day or 2.7 liters day

To get a more accurate calculation use these guidelines

15 – 20 calories per pound of body weight

Carbohydrates – 5 – 10 g per kg of body weight
Proteins – 0.8 – 1.2 g per kg of body weight

Fats- 3 tablespoons of “oils” per day

Major Goals for Eating Through the Day

- Maintain energy level
- Stay hydrated
- Keep glycogen levels full
- Continue to rebuild and re synthesize muscle tissue all day
Based on the guidelines the following are acceptable options, for breakfast, lunch and dinner. As well as pre, post and during game options.

**Breakfast Options:**

1) **Banana bread (2) slices with nut butter and 2 eggs.**

   Calories per slice: 190
   
   Fat: 11g
   
   Protein: 6g
   
   Carbohydrates: 24g
   
   Eggs (per egg)
   
   Calories: 80
   
   Fat: 6g
   
   Protein: 7g
   
   Carbohydrates: 1g

2) **Honey Nut Granola (whole grain) with Greek yogurt**

   Per ½ cup = Calories: 360
   
   Fat: 15g
   
   Protein: 15g
   
   Carbohydrates: 55g
3) **Natural rolled oatmeal with blueberries and almonds**

Per ½ cup = Calories: 430  
Protein: 7g  
Fat: 20g  
Carbohydrates: 45g

4) **Natural Oatmeal Pancakes with Blueberries**

Per 2 pancakes = Calories: 330  
Fat: 7g  
Carbohydrates: 5g  
Protein: 10g

5) **Fruit Salad (Blueberries, Strawberries, Banana) with Greek yogurt**

Per 1 cup = Calories: 225  
Carbohydrates: 40g  
Protein: 7g  
Fat: 1g
6) All Bran Natural Cereal with fruit (Blueberries, Strawberries, Banana) and honey (1 tablespoon)

**Per 1 cup:**

- Calories: 500
- Carbohydrates: 80g
- Protein: 20g
- Fat: 2g

7) Fruit Smoothie (Banana, blueberries, Strawberries and Kiwi) with natural plain yogurt (1 cup + 1 cup of ice) - add nut butter to yogurt and mix with smoothie

**Per Smoothie:**

- Calories: 400
- Fat: 10g
- Protein: 10g
- Carbohydrates: 55g

8) Organic Granola with hemp Seed and Greek Yogurt

**Per 1 cup:**

- Calories: 600
- Fat: 25g
- Protein: 20g
- Carbohydrates: 45g
9) Blueberry French toast (Whole grain) with reduced sugar maple syrup

**Per Slice:**
- Calories: 450
- Fat: 12g
- Carbohydrates: 25g
- Protein: 17g

10) Egg White Omelets with cheese with toast and nut butter

**Per omelet,** use 3 egg whites, 3 slices of cheese, 2 pieces of whole grain toast, and 1 tablespoon of nut butter:

**Per omelet:**
- Calories: 580
- Protein: 26g
- Carbohydrates: 25g
- Fat: 15g

**Lunch Options**

1) Whole Grain Lasagna (10 strips) with Vegetarian Salad (spinach, broccoli, tomato)

**Per Serving:**
- Calories: 600
- Fat: 16g
- Protein: 35g
Carbohydrates: 60g

2) Vegetarian Lasagna (pine nuts 1 cup, ½-cup spinach, 9 dried tomatoes)

Per Serving: Calories: 450

Fat: 17g

Protein: 21g

Carbohydrates: 53g

3) Egg White (3) stuffed baked potato

Per Potato: Calories: 335

Fat: 10g

Protein: 18g

Carbohydrates: 53g

4) Homemade Egg McMuffin (whole grain bread with 1 egg and 1 egg white) Add 3 cheese slices with 1 tomato and sliced onion and mushrooms

Per McMuffin: Calories: 400

Fat: 10g

Protein: 15g
5) Grilled Salmon (100g) with 1 cup Brown rice and House Salad (Lettuce, Tomato, Cucumber, Croutons, Hummus dressing)

Per Serving: Calories: 400

  Protein: 25g

  Carbohydrates: 20g

  Fat: 15g

6) Turkey Burger (Whole grain bun) with brown Rice (1 cup)

Per Serving: Calories: 375

  Fat: 7g

  Protein: 25g

  Carbohydrates: 10g

7) Sautéed Chicken (2 pieces) with mushrooms and sweet potato

Per serving (1 chicken, 1 potato) Calories: 500

  Fat: 15g

  Protein: 45g

  Carbohydrates: 40g
8) Chicken Sub Sandwich (tomato, lettuce, cucumber, hummus dressing,) Multi Grain Bun

Per Sandwich: Calories: 520

  Protein: 25g
  Fat: 6g
  Carbohydrates: 20g

9) Whole Grain Pasta with Olive Oil and Tomato

Per 1 Cup: Calories: 320

  Protein: 12g
  Carbohydrates: 62g
  Fat: 5g

10) Chicken Brest with Whole Grain Spaghetti (1 cup)

Per Serving: Calories: 560

  Fat: 10g
  Protein: 40g
  Carbohydrates: 70g
Dinner Options

1) Shrimp Pasta (6 oz. of pasta) with 250g of steamed shrimp

**Per serving:**  Calories: 550

- Carbohydrates: 50
- Protein: 40g
- Fat: 12g

2) Chili (lean ground beef, tomato, black beans, tomatoes)

**Per serving:**  Calories: 275

- Protein: 24g
- Fat: 13g
- Carbohydrates: 64g

3) Tofu (½ cup) and Brown Rice (1 cup)

**Per serving:**  Calories: 300

- Fat: 20g
- Protein: 20g
- Carbohydrates: 40g
4) Homemade Pizza (whole grain bread, cheese, tomato, spinach, chicken, and pineapple)

Per Slice: Calories: 250

Fat: 8g

Protein: 10g

Carbohydrates: 22g

5) Tuna Melts with steamed vegetables (3 cups)

Per Slice and cup of vegetables: Calories: 210

Protein: 12g

Fat: 3g

Carbohydrates: 20g

6) Bean Salad with tomatoes (Black, Kidney, Soy, Chickpeas)

Per Cup: Calories: 180

Protein: 13g

Fat: 5g

Carbohydrates: 22g

7) Homemade Hamburgers (Extra Lean ground beef with whole grain bun and hummus dressing)

Per Hamburger: Calories: 245
Protein: 20g
Fat: 3g
Carbohydrates: 16g

8) Stir fry (Whole grain rice, chicken, pineapple, tomato, broccoli, lentils)
Per 1 cup: Calories: 400
Protein: 13g
Carbohydrates: 30g
Fat: 6g

9) Roast Beef (lean 450g) with Sweet Potato (1 cooked)
Per Serving: Calories: 450
Protein: 18g
Carbohydrates: 14g
Fat: 3g

10) Extra lean Ground Chicken (½ cup) with Steamed Vegetables (Corn, Peas, Broccoli, and Spinach) and 1 cup of barley
Per 1 cup of meal: Calories: 275
Fat: 8g
Protein: 30

Carbohydrates: 80g

Pre-Game Options

Major Goals
- Provide the body with enough energy for the game (130-300g of carbohydrates)
- Provide body with adequate water to help prolong dehydration (liquids, water)
- Allowing proper time for food to digest and be absorbed
- Kick start protein synthesis

1) Scrambled eggs (3) with 2 pieces of whole grain toast with nut butter and jelly

Meal: Calories: 400

Fat: 31g

Protein: 33g

Carbohydrates: 45g

2) Yogurt ½ cup + Whole grain bagel with Jelly

Meal: Calories: 280

Fat: 15g

Protein: 14g

Carbohydrates: 50g
3) Chicken Breast with Sweet Potato

**Per 100g of chicken and 100g of sweet potato:**

- Calories: 310
- Fat: 12.56g
- Protein: 27.6g
- Carbohydrates: 20.1g

4) Chicken Fajitas with Brown Rice

**Per 100g combined of each:**

- Calories: 600
- Fat: 14g
- Carbohydrates: 70g
- Protein: 30g

5) Grilled Chicken Sandwich with Yams

**1 Sandwich + 100g of Yams:**

- Calories: 758
- Protein: 28g
- Fat: 12.2 g
- Carbohydrates: 77.3

**During The Game Options**

Major Goals
- Prevent fatigue through carbohydrate intake (70g of carbohydrates per hour)
- Delay dehydration through replacement of electrolytes (¾ - 1 and ½ cups per hour)
- Replace muscle tissue damage

1) Endura Sports Gels

Per 1Pack Calories: 106.2

Carbohydrates: 26g
Fat: 0.1
Protein: 0.1

2) Nabisco Graham Cracker Honey Sticks

Per 1Stick Calories: 130

Carbohydrates: 24g
Fat: 3g
Protein: 2.0g

3) Clif Bar

Per Bar Calories: 240
Fat: 5.0
Carbohydrates: 43.0
Protein: 9.0

4) Piece of Fruit + Handful of Almonds

Per Serving and 100g of Almonds: Calories: 578
Fat: 51g
Protein: 21g
Carbohydrates: 20g

5) Bagel with Jelly

Per Serving: Calories: 450
Fat: 4g
Protein: 7g
Carbohydrates: 40g

Post-Game Options

Major Goals
- Recovery as fast as possible (eat within the hour)
- Replace muscle and liver glycogen levels (30-60g of carbohydrates within the first hour)
- Continue the process of protein synthesis (1 serving of protein)
- Rehydrate and replace lost electrolytes (24 oz. per pound lost post exercise)

1) Trail mix (chocolate chips, unsalted nuts, natural granola, hemp seeds)

Per 100g: Calories: 707
          Fat: 47g
          Protein: 26g
          Carbohydrates: 66g

2) Fruit Smoothie (berries, strawberries, kiwi, mango) with yogurt and milk

Per 1 cup: Calories: 200
          Protein: 8g
          Fat: 3g
          Carbohydrates: 25g

3) Granola with Greek Yogurt

Per 1 cup: Calories: 250
          Fat: 20g
          Protein: 15g
Carbohydrates: 25

4) Sports Recovery Drink + Bagel with jelly

1 Sports Drink + 1 Bagel = Calories: 250

Fat: 3g

Protein: 8g

Carbohydrates: 40g

5) Recovery Bar

Per 1 bar: Calories: 260

Fat: 10g

Protein: 12g

Carbohydrates: 30g
Sources


Cardwell, Glenn, 2006, Gold medal nutrition 4th end, Human Kinetics, New Zealand
