



Nutrition for Basketball

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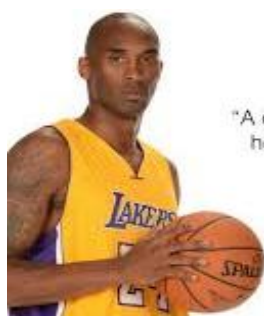
Abstract

How the muscles are able to provide the energy needed to play basketball at a high level and how nutrition plays an essential role in providing the fuels the muscles need to make sure energy provision is optimal in all situations and never runs out! The brain also benefits from proper nutrition and is heavily influenced by what an athlete eats and drinks. Therefore, nutritional guidelines and goals have been established for stop-and-go sports like basketball, which give the athletes, athletic trainers, nutritionists, coaches, and other team personnel general guidelines to follow, realizing that each player is an individual and will need one-on-one attention.

Keywords: Energy, Carbohydrates, Fuel

Introduction

Basketball is a demanding stop-and-go sport where the energy demands of the player are constantly changing. Players could be completely stopped during time-outs, stoppages in play and foul shots, or could be walking or jogging on the court at low exercise intensities. On the other hand, players may be hustling down the court or back on defense at a fast pace, or going full out in sprint-like fashion for a short period of time when driving the basket, attacking, or defending on a fast break. The skeletal muscles that allow athletes to move in the ways needed to effectively play basketball are most impressive in their ability to handle this spectrum of energy demands.



"A diet that's bad for your overall health can't be good for your performance."

-Kobe Bryant

❖ Where Do Basketball Players Get Their Energy?

Skeletal muscles continually produce a compound called adenosine triphosphate (ATP), which is the immediate source of energy for muscle contraction and ultimately movement. The muscles do this in two main ways. The first is referred to as oxidative or "aerobic" energy production, which occurs in the cellular compartments called mitochondria where oxygen is used to burn fat and carbohydrate for fuel. The second is via processes in the cell that do not need oxygen and fall under the category of "anaerobic" energy production. The two main sources of anaerobic ATP production are:

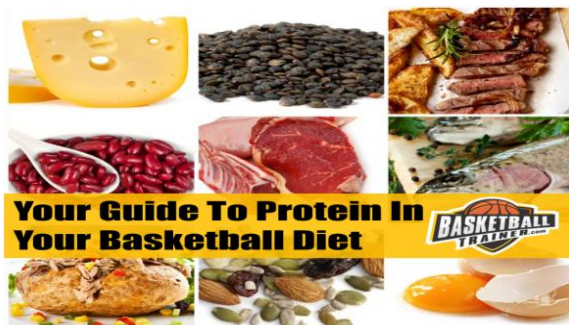
- 1) The glycolytic pathway (called anaerobic glycolysis) with the use of carbohydrate as a fuel and
- 2) By using phosphocreatine (PCr) that is stored in the muscles.

Aerobic energy production is the default energy production system and can provide ATP for long periods of time at quite a high rate. This system responds to exercise training and the capacity for ATP production can increase by 20%—50% in most people, depending on where they are starting from. The system can be compromised if the individual runs out of fuel, meaning not enough carbohydrate (CHO) or fat. This system also takes some time (~60—120 s) to fully turn on when beginning exercise or transitioning from low to higher exercise intensities. So, it could be argued that this system has some limitations when playing a stop-and-go game like basketball, as it is a game of transitions. That's where the anaerobic energy systems come in to help.

To summarize, the ability to play basketball at a high level requires both a high aerobic capacity and a high capacity to produce anaerobic ATP. The aerobic system produces continual amounts of oxygen requiring energy, while the anaerobic system supplements during transitions to higher intensities and when athletes sprint, burst, or jump, where the energy need is too much for the aerobic system. In most basketball situations, other than stoppages in play, both systems are working together to produce the required energy. It is not a scenario where the aerobic system works alone or the anaerobic system works alone, as they work together in most instances.

There are some additional points that need to be made. The first is that CHO is the fuel of choice for the aerobic system during intense exercise. At 50% of a person's maximal oxygen uptake (VO₂ max), fat and CHO contribute about equally to fuel provision, but as the intensity climbs to ~80% VO₂ max and beyond, CHO and specifically muscle glycogen becomes the dominant fuel. This has been shown in well-

trained males and females. Carbohydrate is also the fuel of choice for sprinting, as the glycolytic pathway can only use CHO as a fuel and not fat or protein. So, if a basketball player is running the court at a high aerobic intensity and already using mainly CHO as a fuel, a sudden sprint will require more CHO, along with some PCr, to produce additional anaerobic energy. CHO provides a lot of energy when used for aerobic energy production (~36 mol ATP/mol CHO), but considerably less when used for anaerobic energy production (only 3 mol/mol CHO). So, sprinting, bursting, and jumping costs a lot of CHO in exchange for the ability to produce energy quickly on the court.



❖ The Importance of Carbohydrate as a Fuel for Basketball Players

Carbohydrate is the fuel of choice for stop and-go sports like basketball. The members attending the IOC Consensus Conference on Sport Nutrition concluded, “In stop-and-go team sports, performance is limited by energy, and particularly carbohydrate intake”.⁵ Because of this important role, trained players store a large amount of carbohydrate (as glycogen) in the muscles they use to play the sport. There is also a large amount of glycogen stored in the liver in a well-fed player. The liver’s job is to release CHO in the form of glucose into the blood to maintain a blood concentration of about 5 mm at all times. During exercise, the contracting muscles take up a lot of glucose from the blood, and the liver has to match this by replacing the used glucose. If unsuccessful, the person’s blood glucose drops, and they feel hypoglycemic, as the brain also relies mainly on glucose and is not happy when the level drops below normal. When exercise is intense and prolonged, the athlete can assist the liver in maintaining the blood glucose level by drinking a sports drink that has glucose or other forms of CHO. The ingested CHO quickly gets into the blood and can be used by the muscles, heart, and brain. There is also strong evidence that the ingestion of CHO during exercise stimulates the CHO receptors in the mouth to activate brain motor activity and reward centers, which may reduce the perception of fatigue and increase alertness and focus. Mouth rinsing has also been shown to improve running performance.

A similar situation exists with fat—trained people store a significant amount of fat directly in the muscles as intramuscular triacylglycerol or triglyceride. Muscles can also take up fat in the form of free fatty acids from the blood, as it is released from adipose throughout the body. However, fat only plays a significant role as a fuel at low to moderate aerobic exercise intensities and at rest, and is not a fuel for

anaerobic energy production. Protein can also be used as an aerobic fuel, but this does not occur to any great extent in well-fed athletes. Protein plays major roles in assisting with CHO and fat energy metabolism during exercise and stimulating muscle protein synthesis during recovery from exercise. In summary, given the importance of CHO as a fuel for basketball players, it comes as no surprise that there are general guidelines for CHO intake in the days and hours leading up to a training session, or game, during the activity itself, and also following the training session, or game. Numerous studies using dietary recall techniques with basketball players suggest that athletes do not always reach these goals. The recovery phase after exercise is also the beginning of preparation for the next session as elite players are training or playing most days and often several times a day in tournaments

Conclusion

Playing basketball at a high level requires large amounts of energy provision by the skeletal muscles. Well-trained basketball players have high capacities to produce energy from both the aerobic and anaerobic energy systems. A high aerobic capacity (VO₂ max) also speeds up recovery during the numerous periods of jogging or walking on the court and the stoppages in play during training and games. Carbohydrate is the fuel of choice for basketball players, as it serves as a fuel for both the aerobic and anaerobic energy producing systems. Fat is also used at lower intensities and during stoppages in play as an aerobic fuel. Clear guidelines are available for maximizing the availability of carbohydrate before, during, and after training and games. A small amount of protein ingestion following activity is also important to speed muscle recovery.

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