

## Energy Systems

This is one of the most misunderstood concepts in training today and it can have a profound impact on how the athlete trains and conditions. There are three parts to the energy system; **ATP-PC, Lactic Acid and the Oxygen**. The difference between the three energy systems is two factors: **intensity and duration**. The higher the intensity, the shorter the duration because all the energy the body can supply to work at a high level is used up quickly. If the duration is longer, the intensity is less so the body can supply enough energy to keep going.

ATP-PC<sup>1</sup> energy system is a very limited supply that is used immediately, and is the most powerful of the three systems. The energy for this system is stored in the muscles and lasts approximately 6 seconds. When the muscle contracts it uses the glycogen as fuel to work. After the ATP is used it turns to ADP (Triphosphate to Diphosphate, one phosphate is used up) which quickly combines with a PC (phosphocreatine) to change back into ATP; thus the name ATP-PC energy system. This cycle can only last approximately 0-6 seconds before it needs to be completely replenished. If the athlete rests for 25-30 seconds, the system will be replenished and the cycle starts again. If the activity continues, the next energy system takes over and the level of intensity goes down.

Lactic Acid energy system starts to feed the muscle energy if the activity is longer than 6 seconds but less than two minutes. The body goes through a chemical process called glycolysis (breaking down of carbohydrates into glycogen) which is a way of producing energy for the muscles so they can continue working. When the glucose is broken down, a bi-product called Lactic Acid is also produced which accumulates in the muscle and causes fatigue. Between breaking down carbohydrates that the body has stored to replenish the glycogen for the glycolysis processes and ridding the lactic acid build up, the body must slow down its intensity. Due to these two factors this system does not provide the same level of power as the ATP-PC system but it is still more powerful than the Oxygen system. Examples of events that occur in the Lactic Acid system would be the 400 in track, swimming 300 meters or lifting 6-15 repetitions.

Oxygen system provides energy to the muscles indefinitely however it is not a powerful system. If the athlete continues to work for more than 2 minutes then carbohydrates and fats are turned into glucose by a chemical process called the Krebs cycle. If the body can clear the byproducts (lactic acid & carbon dioxide) then it will continue to work through the Krebs cycle to produce the energy needed to work.

If I am playing soccer / basketball / lacrosse and running continuously then I must be using the Oxygen system. NO this is a false assumption many coaches and players make. If you go from a sprint to a jog / walk / or standing still which is how the game is played, then the body has a chance to replenish its glycogen stores by the Lactic Acid system. This is why interval training is so effective, it trains the body to clear lactic acid and replenish the glycogen stores quickly.

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