Lactate Metabolism and the Myth of Lactic Acid Muscle Fatigue

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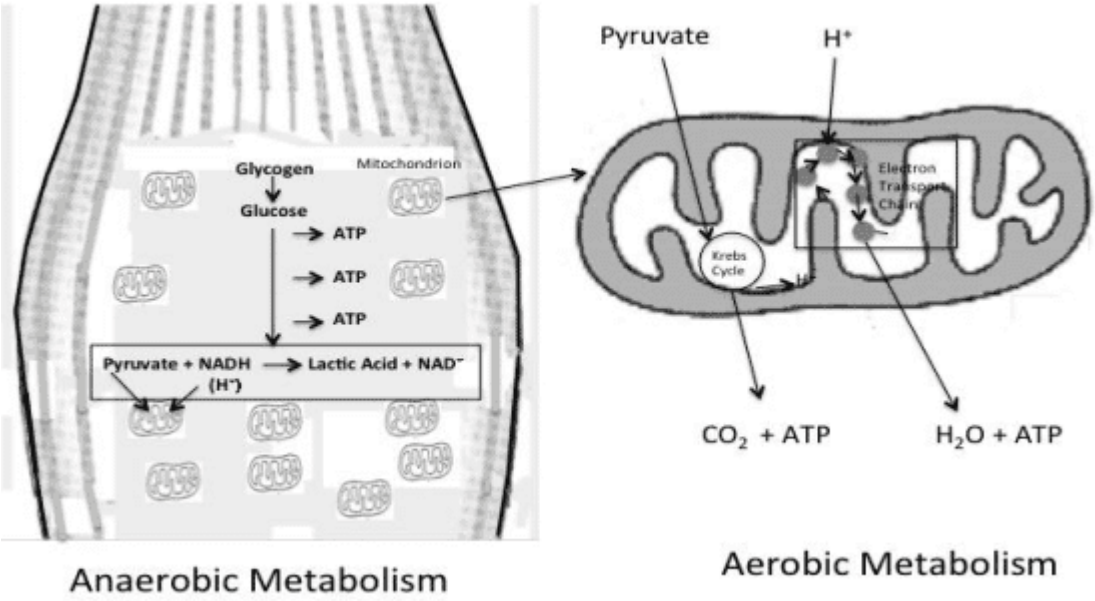
Lactic Acid and Muscle Fatigue Misconception

It was a common belief and perception that one of the reasons for muscle fatigue was the accumulation of lactic acid in the body. During exercise, the body of an individual produces a harmful substance called lactic acid, which is one of the primary reasons why the muscles and, by extension, the entire body feel pain and soreness. However, this false perception has been debunked by research that has recently been carried out. On the contrary, lactic acid is not a harmful byproduct of intensive exercise; instead, the adverse effects of lactic acid are minimal.

Formation of Lactate During Exercise

The concept that many people have been harboring for a long time that lactic acid is produced when an athlete exercises is a false belief. As a matter of fact, lactic acid is not necessarily produced by the muscle; rather, a compound that is somewhat akin to lactic acid, ‘lactate,’ is produced. Lactate is not a waste or a byproduct, as it was once thought to be. Lactate is the linkage between the two types of metabolism, i.e., anaerobic and aerobic. The fundamental difference between the two metabolisms is that anaerobic metabolism does not require oxygen, but aerobic metabolism cannot take place without the presence of oxygen. The fatigue in the muscles because of lactate, or in simple terms, lactic acid, is only caused when intensive exercise is done by a person and that lactate is unable to be transferred to the mitochondria to save the body from any fatigue. Mitochondria are the organelles where metabolism takes place in the presence of oxygen, which is aerobic metabolism. It is in the mitochondria that the breakdown of glucose and other fats takes place to produce energy. The failure of the body to transport the hydrogen ions and pyruvate safely into mitochondria is due to the fact that there is not enough oxygen to bring about the process. The hydrogen ions and pyruvate combine to form lactic acid.



Anaerobic Glycolysis and Energy Production

There is also a false perception that lactic acid is the waste product of anaerobic glycolysis, in which glucose is transferred to lactate, even when oxygen is present in small quantities in the body. It helps to provide energy for a very limited period of time, mostly lasting for two or two and a half minutes. However, the research done in 2008 made us aware that the removal of lactic acid from the muscles is very much possible. The conversion of lactic acid back to glucose is possible, and the storage place for glucose is the liver, which can be utilized for future use (Wilmore, Costill, & Kenney, 2008).

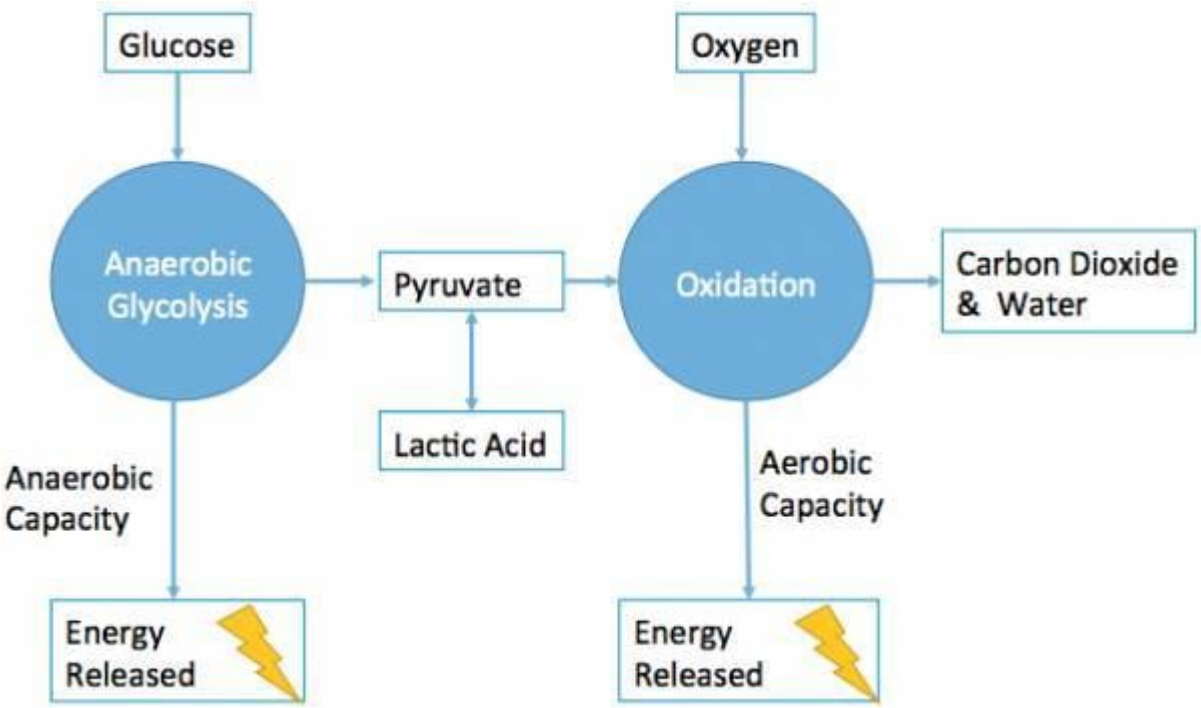
Historical Development of the Lactic Acid Theory

A.V. Hill, a Nobel Prize winner in 1924, presented his idea of the contraction and fatigue of muscles due to lactic acid. He proposed that it was because of the lack of oxygen during intensive exercise that the body was not able to remove the lactic acid, and it accumulated in the muscles, and that is the main reason for muscle contraction and fatigue, which is felt by an individual after exercising (Hill, Long, & Lupton, 1924). This model was mostly used by early researchers, who based their theories and research on this concept. But in 1995, it was stated in a report that lactic acid was not found to interfere with the contraction and fatigue of muscles (Pate et al., 1995). The examination of lactic acid forced many researchers to carefully inspect and revise the role of lactic acid in muscle contraction.

Physiological Role of Lactate in Exercise

Performance

Another common misconception about lactic acid is that people believe it plays no role in exercise performance. As discussed earlier, Mitochondria help in the breakdown of glucose, give energy during exercise, and improve the performance of an athlete. People also believe that most athletes produce less lactic acid, which is why they are better than others, but that is not the case. The low production of lactic acid in their bodies is due to the fact that they utilize much more of it than ordinary people, which is why their exercise duration is longer than that of normal people. There were many misconceptions about lactic acid being dangerous for the body, but recent research proves otherwise.



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