How Muscles React to Exercise

When undergoing exercise it is your muscle fibers that are enabling most of the movement. These fibers enable energy stored up in chemical compounds to be released during physical movement.

Coordinated firing of electrical impulses down the nerves to the effector organs i.e. the muscles allows movement of a body part. The more you develop particular athletic movements the better concentrated the coordination of the impulse shots, and therefore the more highly tuned/ efficient the result.

If you are able to understand the functioning of muscles you are in a better position to then target the muscles you require most, in your every day workouts. Whether the activity you most frequently do involves predominantly short bursts of power, slow muscle contraction or more lengthy low intensity movement, different muscle types and biochemical reactions are necessary in order to produce the power that is needed.

3 main muscle types exist in our bodies:

Skeletal muscle is the muscle that is easily seen and felt. As its name implies, this muscle is attached to your skeleton and operates in pairs. Each muscle mass enables an opposing body movement to the other muscle mass, through muscle contraction. These muscles tend to be able to do the full variety of muscle movements required, i.e. bursts, continuous low intensity or slow contraction, in a voluntary fashion (moved consciously/ voluntarily).

Cardiac muscle, only located in the heart, is especially efficient at contracting consistently over a lifetime. Contractions are involuntary, the force exerted is the same as with skeletal muscle, at a fast speed.

Smooth muscle is used in blood vessels, airways, the uterus, bladder and digestive system. This type of muscle is able to stretch and remain contracted for protracted periods of time. As with cardiac muscle contraction is controlled involuntarily by the central nervous system.

Skeletal muscles are often the muscles people want to produce or loose fat to then be able to see. Frequent exercise benefits the other muscles, notably creating larger and stronger heart muscles. Fast contracting skeletal muscle functions anaerobically, slow contracting skeletal muscle works in an aerobic environment.

Adenosine tri-phosphate (ATP) is the main form of energy currency in your body. Energy is released for use in mechanical movement of the body's various limbs by the removal of a phosphate to form Adenosine di-phosphate (ADP). ATP is created via a series of biochemical pathways, when a muscle is used the following reaction occurs:

ATP in combination with the muscle proteins actin and myosin lead to the formation of actomyosin, a single phosphate, ADP and the all important energy.

ATP is a limited resource in you body. More needs to be created to enable sustained exercise. This extra ATP comes from one of three enzyme mediated reactions:

1. When seeking strength in your muscles creatine phosphate (CP) reacts anaerobically with ADP to produce ATP and creatine. Creatine phosphate stores are typically used up within a few seconds, explaining why your maximum strength is generally for a very limited amount of time.

2. Anaerobic glycolysis enables short sharp bursts of muscle energy. A single molecule of glucose in an anaerobic environment is converted to two ATP molecules and two lactate molecules. When needing to constantly use muscles in this fashion aerobic respiration is needed, since the glycogen only lasts so long. With persistent aerobic exercising you can condition your body to last longer than two minutes of maximum exertion.

3. If you are in an endurance situation, ATP for your muscles can come from the metabolism of carbohydrates, proteins and fats in an anaerobic environment. Fats produce the most energy at 130 ATP molecules per oxidized fatty acid. Carbohydrates produce 36 ATP molecules for the one glucose molecule, proteins single constituent amino acids each producing 15 ATP molecules.

Carbohydrates, largely glucose, are stored in your muscles and liver, ready to be released for these metabolic reactions. The required oxygen comes directly, and constantly, from any nearby blood in the vascular system. Glycogen stored in the liver and muscles lasts on average for two hours. The

time you are physically able to continue with endurance exercise is able to be extended gradually with repetition. Once your glycogen reserves are used up the body starts breaking down your fat, a painful process that many sportsmen call "hitting the wall". Fat breakdown is inefficient, your body at this point typically massively reducing its overall strength and endurance capabilities.

Depending upon what kinds of activities you participate in, your muscles develop and/ or change. If the majority of your actions involve frequent strength/ bursts of power your muscle fibers become larger, largely due to increased muscle fiber contents necessary for the type of work involved e.g. an influx of protein fibers. A predominance of aerobic exercise acts to increase the effectiveness of your body to deliver oxygen via the blood, in combination with other essential actions e.g. carbon dioxide removal etc. The result here is that a large amount of blood vessels form throughout your muscles.

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About the Author

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