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EXPLORING THE MUSCULAR TISSUE AND ITS TYPES IN HUMAN BODY

Georgette Hardy
Department of Microbiology, Sabaragamuwa University of Sri Lanka, Balangoda, Sri Lanka
Email: Hardygeorge.g@gmail.com

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ABOUT THE STUDY

The muscular system is a group of organs that includes skeletal, smooth, and cardiac muscle. It allows the body to move, maintains posture, and circulates blood throughout the body. The nervous system controls the muscular systems of vertebrates, though some muscles are completely autonomous. It forms the musculoskeletal system in humans, along with the skeletal system, and is responsible for body movement.

Types

Muscle is classified into three types; skeletal muscle, cardiac or heart muscle, and smooth (non-striated) muscle. Muscles provide the body with strength, balance, posture, movement, and heat to keep it warm. The human body's muscular system is divided into three types of muscle tissue. Skeletal muscle, which is attached to bones and allows movement, is the first type of muscle tissue. Skeletal muscle is under voluntary control and can be contracted or relaxed consciously. The cardiac muscle, which is found in the walls of the heart, is the second type of muscle tissue. The striated cardiac muscle contracts involuntarily, allowing the heart to pump blood throughout the body. Smooth muscle, which is found in the walls of organs and structures such as the digestive tract and blood vessels, is the third type of muscle tissue. Smooth muscle is also involuntary, contracting in a rhythmic pattern to transport substances throughout the body. Understanding the various types of muscle tissue is critical for overall health and wellness. The human body contains over 650 muscles. Each muscle is made up of a type of elastic tissue that is made up of thousands or tens of thousands of small muscle fibres. Each fibre is made up of many tiny strands called fibrils, and nerve cell impulses control the contraction of each muscle fibre (Kanakry et al. 2016).

Skeletal

Skeletal muscle is a type of striated muscle that is made up of muscle cells called muscle fibres, which are made up of myofibrils. Sarcomeres, the basic building blocks of striated muscle tissue, make up myofibrils. Skeletal muscles perform a coordinated contraction by shortening each sarcomere when stimulated by an action potential. The sliding filament model of muscle contraction is the best proposed model for understanding contraction. Actin and myosin fibres overlap in a contractile motion towards each other within the sarcomere. Myosin filaments have club-shaped myosin heads that project towards actin filaments and serve as attachment points on actin filament binding sites. The myosin heads swivel towards the center of the sarcomere, detach, and then reattach to the nearest active site of the actin filament. This is known as a ratchet drive system.

This process uses a lot of Adenosine Triphosphate (ATP), the cell's energy source. The cross-bridges between myosin heads and actin filaments are bound by ATP. The swivelling of the myosin head is powered by the release of energy. When ATP is used, it converts to Adenosine Diphosphate (ADP), and because muscles have limited ATP storage, they must constantly replace the discharged ADP with ATP. Muscle tissue also stores a fast-acting recharge chemical, creatine phosphate, which can help with the rapid regeneration of ADP into ATP when needed (Kärre et al. 1986).

Each cycle of the sarcomere requires calcium ions. When a muscle is stimulated to contract, calcium is released from the sarcoplasmic reticulum into the sarcomere. This calcium reveals actin-binding sites. When the muscle no longer needs to contract, calcium ions are pumped from the sarcomere and returned to the sarcoplasmic reticulum for storage.

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Cardiac

Cardiac muscle is a type of muscle that can only be found in the heart. It is in charge of the heart's involuntary contraction and relaxation, which is essential for pumping blood throughout the cardiovascular system. Unlike skeletal muscle, which is controlled by voluntary movements, cardiac muscle is controlled by involuntary movements. Cardiac muscle tissue is striated, which means it appears striped under a microscope, and is composed of interconnected cells called cardiomyocytes. These cells are capable of generating electrical impulses that coordinate the heartbeat and ensure proper heart function. Understanding the structure and function of cardiac muscle is critical for diagnosing and treating a wide range of heart conditions. Heart muscle is striated muscle, but it differs from skeletal muscle in that the muscle fibres are connected laterally. Furthermore, they move involuntarily, just like smooth muscles. The sinus node, which is influenced by the autonomic nervous system, controls the heart muscle (Hsu et al. 2002).

Smooth muscle

Smooth muscle is a type of muscular tissue found in internal organ walls such as the digestive tract, blood vessels, and bladder. Smooth muscle, in contrast to skeletal muscle, cannot be controlled consciously and thus acts involuntarily. It is non-striated, which means it lacks the striped appearance of skeletal and cardiac muscle. Smooth muscle cells are spindle-shaped with a single nucleus in the center (Rammal et al. 2017).

Smooth muscle is in charge of expanding and contracting the vessels and organs that carry blood and other fluids. It also participates in involuntary movements such as peristalsis, which aids in the movement of food through the digestive tract. Smooth muscle is made up of thick and thin filaments that are not arranged in a regular pattern like those found in striated muscle. Understanding the structure and function of smooth muscle is critical for treating a variety of smooth muscle-related medical conditions. The autonomic nervous system, hormones, and local chemical signals control smooth muscle contraction, allowing for gradual and sustained contractions. This type of muscle tissue can also adapt to different levels of stretch and tension, which is necessary for proper blood flow and material movement through the digestive system (Faure et al. 2002).

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