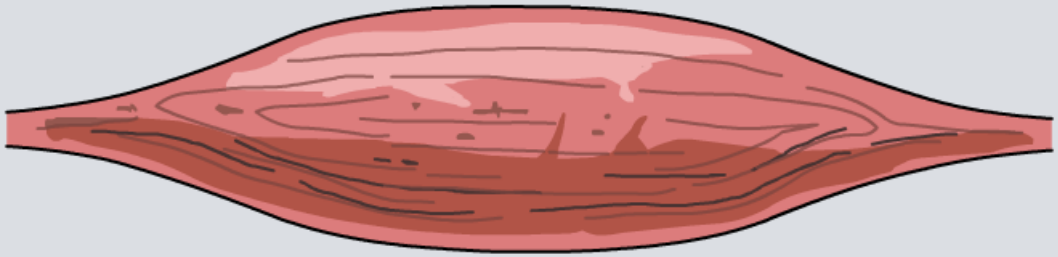
Types of Muscles



Muscles

Muscle tissue is made up of cells that can contract, generating a pulling force.

Muscle tissue makes up about 40% of the body's mass.

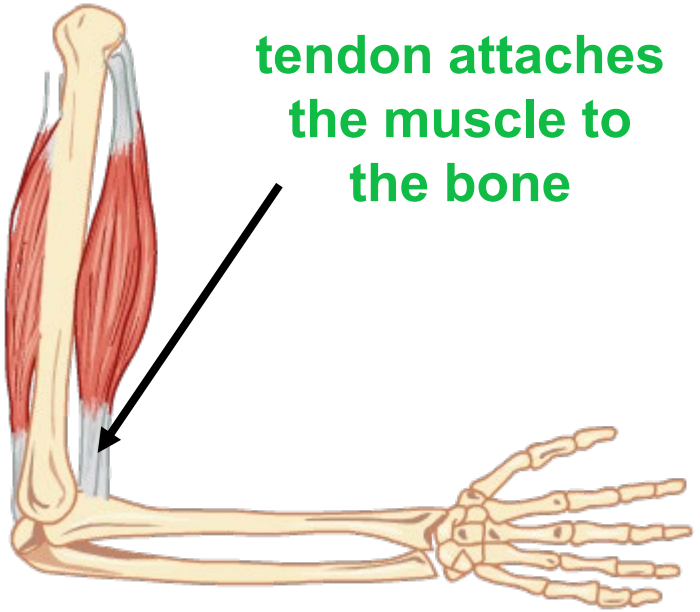
There are three different types of muscle tissue:

- **cardiac muscle**
- **smooth muscle**
- **skeletal muscle.**

Skeletal muscle

Skeletal muscle is essential for voluntary movement, but is also constantly used for maintaining posture. It covers the skeleton and allows bones to be moved relative to one another.

Muscles are usually attached to bones by a form of inelastic tissue called a **tendon**.



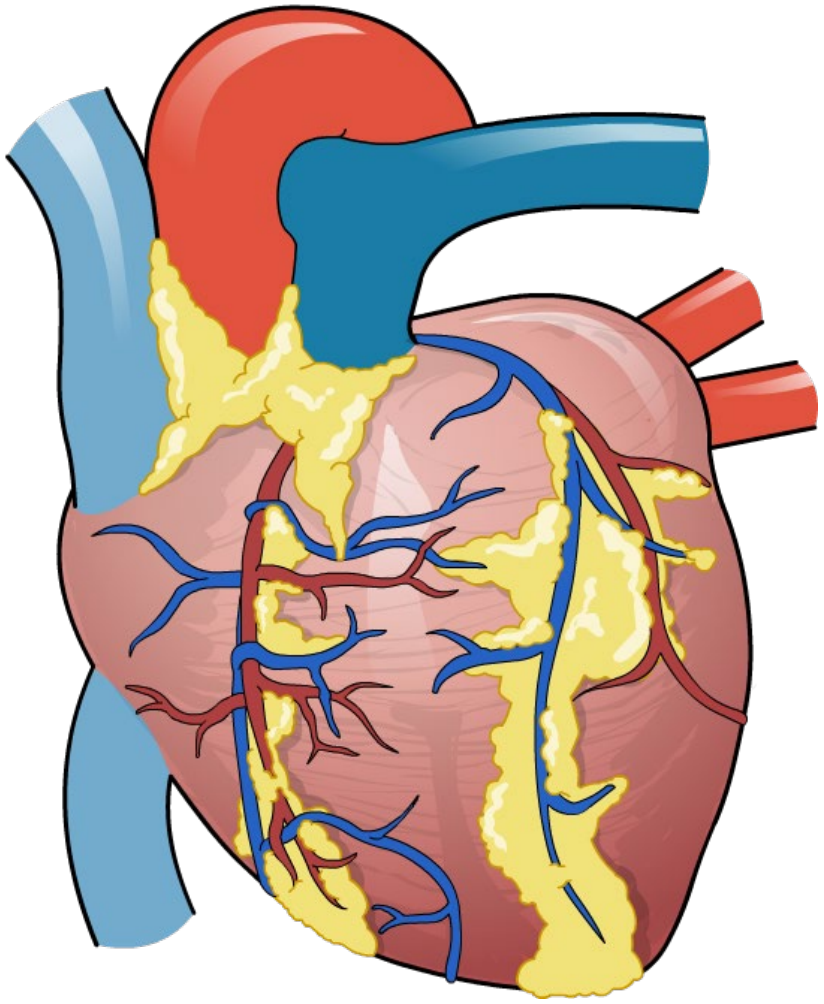
The **voluntary nervous system** controls skeletal muscle by sending messages from the central nervous system to the muscle tissue.

Cardiac muscle

Cardiac muscle is only found in the ventricle and atrium walls in the heart.

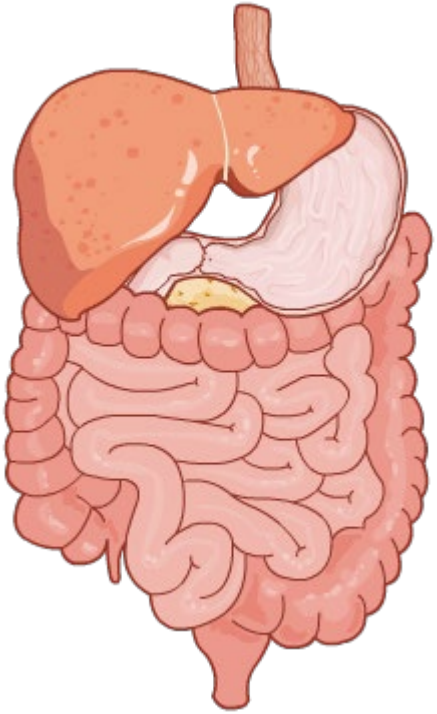
Cardiac muscle contracts rhythmically throughout its lifespan and does not become fatigued.

Cardiac muscle is **myogenic**. The impulses that cause the muscle fibers to contract are initiated within the heart itself.



Smooth muscle

The lining of some internal organs contains **smooth muscle**.



Smooth muscle is particularly important in the digestive system. Its rhythmic contractions help to move food along the digestive tract.

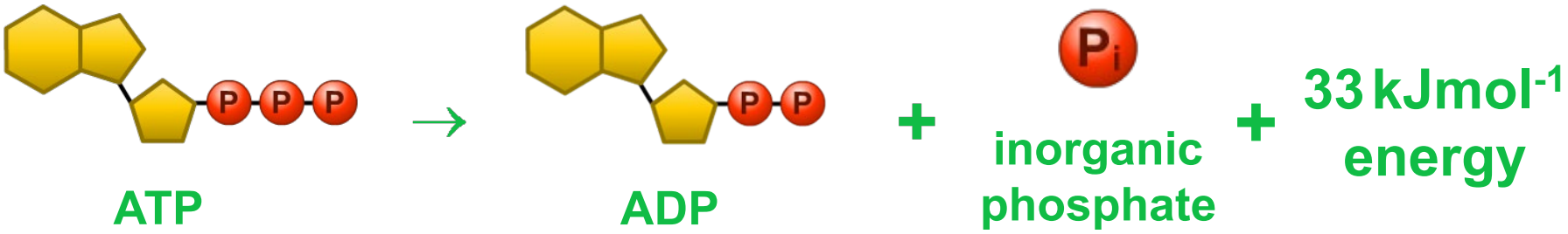
Smooth muscle is slow to fatigue and is controlled by the **autonomic nervous system**.

Smooth muscle is often called **involuntary muscle** because it is not controlled consciously. However, with training, humans can learn to control some smooth muscles.

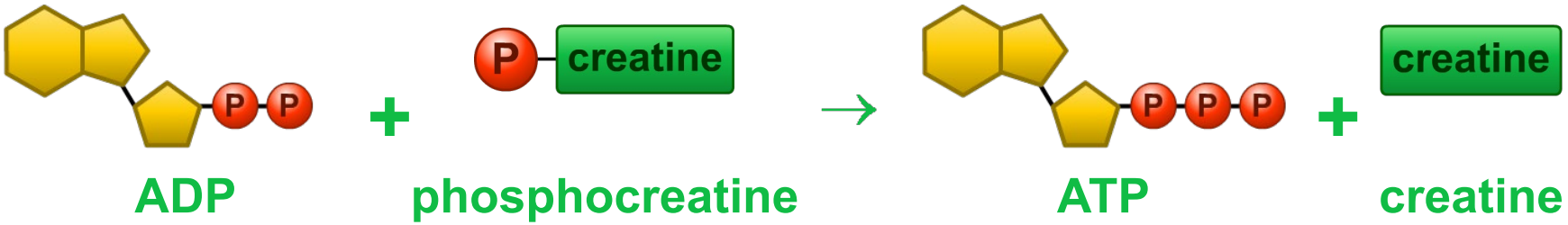
Muscle cells

The role of ATP in muscle contraction

The hydrolysis of **ATP** (adenosine triphosphate) provides the energy required for muscle contraction.



Most muscle fibers store **phosphocreatine**, a chemical that phosphorylates **ADP** to ATP. This reaction maintains the muscle's supply of ATP during vigorous exercise.



Fast twitch fibers

Skeletal muscle contains two different types of muscle fiber: **slow twitch** and **fast twitch**.

Fast twitch fibers are used for short bursts of activity because their contractions are powerful and quick.

Fast twitch fibers respire **anaerobically** and store a large amount of **phosphocreatine** in their cytoplasm. This provides a quick source of ATP during sudden exercise.

The **lactate** produced as a byproduct of anaerobic respiration cause fast twitch fibers to become fatigued quickly.

Slow twitch fibers

Slow twitch muscle fibers are used during endurance activities because they contract slowly and can work for long periods of time.

These fibers have:

- a large number of mitochondria
- a high concentration of **myoglobin**
- an excellent blood supply.

These adaptations help to maintain aerobic respiration in the tissue, making slow twitch fibers very slow to fatigue. However, their ATP generation is slower than in fast twitch fibers, making the contractions of slow twitch fibers weaker.

Fast twitch or slow twitch?