The body works as a holistic system where all its parts have different functions that support each other... Almost like a machine, with different parts working together. Except, unlike a machine, the body has a fantastic ability to adapt and heal!

But, every day thousands of people injure themselves beyond their natural ability to heal!

Tissue Engineering can assist the body in the event of extensive tissue damage such as shattered bones, severe burns, heart attacks (damaged heart muscle) and spinal cord injuries.

When tissue damage occurs, the body tries to replace it with new tissue by producing young cells. These young cells - also called stem cells - travel through the body to the damage site and create new tissue. At the same time, the body builds new tiny blood vessels, called capillaries, to nourish the young cells. However when the damage is too extensive, the body must rapidly replace the large damaged area with scar tissue, which is usually weaker, not as organized, and ultimately less functional than the original tissue.

Where the body’s natural healing ability ends, regenerative medicine steps in!

The scaffold is a support structure. Normally a scaffold supports the cells of every tissue. It is composed of proteins found outside the cell and is called the extracellular matrix. For bone it is hard, for heart it is flexible. Doctors can patch up a damaged tissue using an engineered scaffold that mimics the natural one.

Growth factors are proteins that the body naturally produces. They are signals that tell young cells how to develop. They can guide cellular development towards the kind of cell needed to heal the injured tissue.

Stem cells are young cells. These young cells have the potential of growing into many different kinds of tissues. With Regenerative Medicine, doctors will be able to supply additional young cells to the injury site.

Tissue Engineering and Regenerative Medicine use scaffolds, stem cells, and growth factors!
Stem cells have the potential to become any kind of cell in the body.

The heart is made of a special kind of muscle, called the **cardiac muscle**. When different parts of the heart contract in proper order, the heart beats and blood is pumped through the body.

Where do stem cells come from?

One place Doctors can collect young cells is from a patient’s own bone marrow. The bone marrow is naturally a cell factory where young cells - stem cells - are created to become new blood, bone, liver, ...

Bone needs blood to survive, to supply it with calcium and other important nutrients, as well as oxygen. So, bone is richly covered in capillaries.

Heart muscle needs a lot of oxygen from arteries and capillaries. Along the inside wall of arteries and capillaries, ‘bad cholesterol’ can form clumps with cells and calcium showing up as bumps or plaques. If these plaques rupture, your body reacts as if your artery is bleeding and forms a clot. The problem is the clot stops blood flow in a part of your heart. That part of the muscle can’t work properly and your heart beats arrhythmically; a heart attack!

Cardiac muscle is characterized by very long muscle cells called **cardiomyocytes**. The cardiomyocytes are fed by tiny capillaries.

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