Tissue Engineering

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Tissue engineering is a very complex process and is many stages are still in experimentation. There are basically three different ways to go about tissue engineering. The first way, growing cells in a lab taken from a patient and actually transplanting them once they have matured. A skin graft is a great example of how this process works. Specific cells are taken from a host and grown in the lab until they can be transplanted to a patient replacing the diseased or destroyed tissue. The second process involves mixing cells with specific growth factors and transplanting them in the body so they can regenerate. The biomaterial used to promote bone re-growth is a cell culture, which is then given to a patient. The third major approach to tissue engineering is to design a specific device that is used either inside or outside the body, replacing and functioning for some tissue.

When thinking about tissue engineering, shape is very important especially when growing organs in the lab. They must have the perfect shape or they would not be able to function. As of right now, there is one company, Synthecon, which has created certain products used in the development of 3 dimensional tissues. This product actually suspends the tissue culture in an orbit preventing it from touching the sides of the container. This system prevents damage to the culture that is usually caused by pressure from oxygenation and suspension. This system has no propellers, airlifts, bubbles, or agitators.
Because of the position of the tissue, it is able to grow in all directions and the tissue is able to differentiate.

An artificial liver has been created that is external from the body and used temporarily to filter a patients blood. The ELAD Artificial Liver is very complex, and what makes it so amazing is the fact that there are cartridges attached to the machine. These cartridges have living liver tissue inside, that have gown for a certain period of time before it could be used. This system pumps blood out of the patient and delivers nutrients, detoxifies, metabolize amino acids, and produce proteins and clotting factors.

A bio- artificial pancreas has been created which is living tissue and also non-living tissue. It is very complex and not really in the completed state. The Islets of Langerhans are part of the pancreas which sense glucose and secrete insulin. This new type of pancreas has a non- living layer that surrounds the islets, preventing destruction from a diabetics body. The two ways to cover the islets are by a sheet layer and by a capsule. The problems with this new idea are that the body senses the implanted islets as an antigen and block nutrients that the cells need to survive. Oxygen also has a hard time penetrating the core of the device so many of the cells die.

There are hundreds of experiments that deal with tissue engineering and two more quick topics are the bio-eye, and nervous tissue. The bio-eye is a specific type of coral that the body accepts and bonds with. And nervous tissue has been successfully implanted with great results.