Biocompatibility

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Abstract – Biomedical engineering is a combination of two of the most advanced fields there are today. It combines the organic delicate structures of biology with the problem solving skills of engineering. Biocompatibility is the science of bringing together foreign materials in order to work naturally and effectively with the body. Rejection is a common term in medicine. It refers to when the body identifies something as foreign and dangerous, and causes the body to attack and destroy, essentially reject whatever that object or tissue may be.

I. Introduction

Today's advanced field of medicine uses many different techniques to improve healthcare. Replacement parts can come from pre-existing living organisms, such as a pig heart valve, or a donated kidney. Materials can also be artificially grown in a lab, such as bone matrix scaffolding, or skin grafts. Some materials can even be completely synthetic, such as a titanium hip replacement joint, or a silicone implant. However, all of these materials have to be biocompatible in order to work successfully with the body. Whenever introducing a foreign material to the body, there is always a chance of rejection.

II. Method

Biocompatibility of xenotransplantation and allotransplantation- Xenotransplantation is using living materials from another species, while allotransplantation is using materials from the same species. Because these materials come from other living organisms, they have a good chance of successfully working with the body. However, these tissues have to be matched for tissue antigens, just like how certain blood types can only receive blood with the same antigens. No two people have the exact same tissue antigens, which is why immunosuppressant drugs are given to prevent the immune system from attacking the new tissue.

Biocompatibility of Tissue-engineering products- Bioengineered tissues are tissues grown in matrix scaffolding using stem cells or cells from the recipient. This creates a tissue that is compatible with the body, and has the same cellular functions as the real tissue. This process has been used to create bladders, grow new skin, and bone matrix, even cartilage. Because these tissues can be grown using the patient's own cells, these tissues can be a very compatible with the body. The only downside is the time required to grow tissue.

Biocompatibility of synthetic materials- Synthetic materials don't have antigens the same way real tissue does. However, not all materials are compatible with the human body. Some people have metal or material allergies, and some materials can cause harm to the body. This is why anything that is used in the body must be made of quality implant grade materials regulated by the American Society for Testing and Materials Standard.

III. Results

All materials have the possibility of rejecting, and they each have their pros and cons. As Biomedical engineers, it's our job to understand all options, and asses what materials suit which applications best.

References

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