Introduction to Biomaterials

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LEC (1)

Evolution of Biomaterial Science & Technology

- 1st generation (since 1950s)

  Goal: Bioinertness
- 2nd generation (since 1980s)

  Goal: Bioactivity
- 3rd generation (since 2000s)

  Goal: Regenerate functional tissue

Some application of biomaterials

Application	Types of Materials
Skeletel system	
Joint replacement(Hip, knee)	Titanium , Stainless steel, PE
Bone plate	Stainless steel, Co-Cr alloy
Bone cement	PMMA
Artificial tendon and ligment	Hydroxylapatie Teflon, Dacron
Dental implant	Titanium, alumina, calcium phosphate
Cardiovascalar sysem	
Blood vessel prosthesis	Dacron, Teflon, Polyurethane
Heart valve	Reprocessed tissue, Stainless steel, Carbon
Catheter	Silicone rubber, teflon, polyurethane
Organs	
Artificial heart	Polyurethane
Skin repair template	Silicone-collage composite
Artificial kidney	Cellulose, polyacrylonitrile
Heart-lung machine	Silicone rubber
Senses	
Cochlear replacement	Platium electrodes
Intraocular lens	PMMA, Silicone rubber, hydrogel
Contact lens	Silicone-acrylate. Hydrogel
Corneal bandage	Collagen, hydrogel

What is a Biomaterial?

A material intented to interface with biological systems to evaluate, treat, augment or replace any tissue, organ or function of the body.

Biomaterials

- Polymeric biomaterials
- Bioceramics
- Metallic biomaterials
- Biocomposite
- Biologically based (derived) biomaterials

Biocompatibility

- Biocompatibility: The ability of a material to perform with an appropriate host response in a specific application.
- Host response: the reaction of a living system to the presence of a material

Biocompatibility

- $B=f(X_1,X_2.....Xn)$
- Where X: material, design, application etc.

Medical Device

- It does not achieve its principal intended action in or on the human body by pharmacological, immunological or metabolic means, but it may be assisted in its function by such means.