Medicine Science and Research

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Research

• Effectively create safe products
• Real world testing in an austere environment
• Nature works in a way that lets things fail and succeed.
Articular Cartilage

• Smooth, white tissue that covers the ends of bones where they come together to form joints.
• Contain Proteoglycan (sponge like)
• Contain Collagen (wraps Proteoglycan)
• Half life- 114 years.
• Very strong and dependent on health
Bone Biology

• Calcium and Phosphate ions
• Ca and P main components of hydroxyapatite (bone mineral that strengthens mechanical resistance to the organic matrix).
• Bone contains 99% and 80% of the body's entire supply of Ca and P.
• Bones deteriorate and rot (arthritis).
Anisotropic Properties

- Ability of a joint to resist forces from different directions
- Stability is needed
- Mechanical Properties include absorbance, conductivity, tensile strength.
Bone cartilage Biologic Components (Bio-jello)

- Water - 70-75%
- Collagen - 15-20%
- Mostly Type 2
- Aggrecan - 5-10%, 1 avidity for water (Cartilage specific proteoglycan core protein).
Matrices

• Design an absorbable biologic polyreuthane made out of the components of jello-(Calcium and Phosphate) in a specific matrix.
• 3D printing (Solar/ Wind turbine)
• Energy created to power 3D printers on vessels.
Why on vessels?

- The biologic jello dissolves with the help of blood, salt sea water, and sunlight.
- Sample seawater (Microorganisms vary throughout oceans on Earth).
- What microorganisms will work best at dissolving the biologic polyurethane
Goal

- To design and 3D print a biologic type jello that can be placed in bones to break down for bone cells to create more stronger bone.
- Strong
- Effective
- Safe
- Beautiful
Positive Examples

- Rotting of bones
- Face fractures that have plates that need to be replaced will no longer be needed.
- Burn victims can use 3D printed wraps (matrices used) that allow Epithelial tissue to migrate into the wounds and heal wounds.
Metha® short hip stem

Pelvic bone

Femoral neck bone
Future

• Osteoarticular reconstruction. No longer the need for metal or plastic joints.

• Take cartilage and seed into matrices and take away disease portions of bones ex. (hip arthritis, knee arthritis)
Works Cited

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