A physicochemical approach to design bioactive scaffolds for tissue engineering

STATEMENTS

With the thesis

A Physicochemical Approach to Design Bioactive Scaffolds for Tissue Engineering

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1. Many animals regenerate new parts of their bodies to replace those that have been damaged. For example, sharks continually replace lost teeth in their lifetimes; spiders can regrow missing legs or parts of legs; and most lizards will have regrown their tail within nine months. Can humans regrow or repair their damaged tissues or organs like these amazing creatures? Yes, the discipline of tissue engineering and regenerative medicine will make this come true. This thesis.

2. Scaffolds are one of the essential elements in tissue engineering and regenerative medicine. An ideal scaffold for tissue engineering should be a smart one, which is capable to offer bioactive cues to direct cell differentiation and stimulate tissue regeneration. This thesis.

3. The properties of scaffolds, including scaffold chemistry, surface topography, and structural feature should be taken into consideration in terms of designing bioactive scaffolds for tissue engineering. This thesis.

4. As we know, zirconia ceramic materials are stiff and bioinert. However, zirconia ceramics would turn to be flexible and bioactive if they had a nanofibrous structure. This thesis.

5. Traditional electrospinning, a simple technique to produce continuously fiber, has a major limitation in patterning complex structure. Direct-writing electrospinning offers an attractive approach to produce ultrathin fibrous scaffolds with desirable pattern.

6. Fingerprints, which are made by friction ridges and furrows, are unique patterns. Similarly, cellular behaviors, including differentiation, proliferation, and migration are sensitive to the surface pattern of scaffolds.

7. Albert Einstein quote: "Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution."