

Bottom-Up Approach for Bone Tissue Engineering

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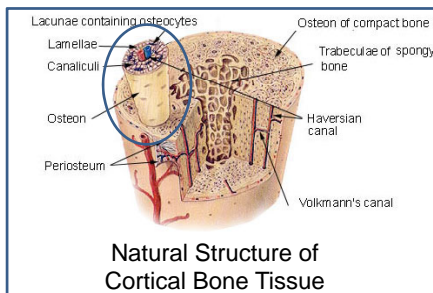
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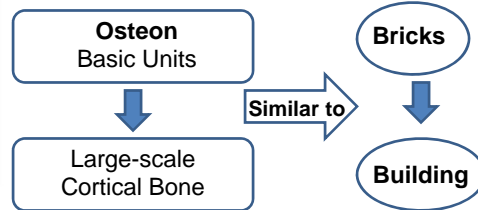
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Bone Tissue Engineering


- Bone defect has become one of major health concerns.
- Bone tissue engineering provides a promising potential to repair and regenerate the damaged bone.
- One of big challenges is how to regenerate the cortical bone (outer layer of long bone), due to its highly organized structural complexity & unique biomechanical properties.



Bottom-up Approach



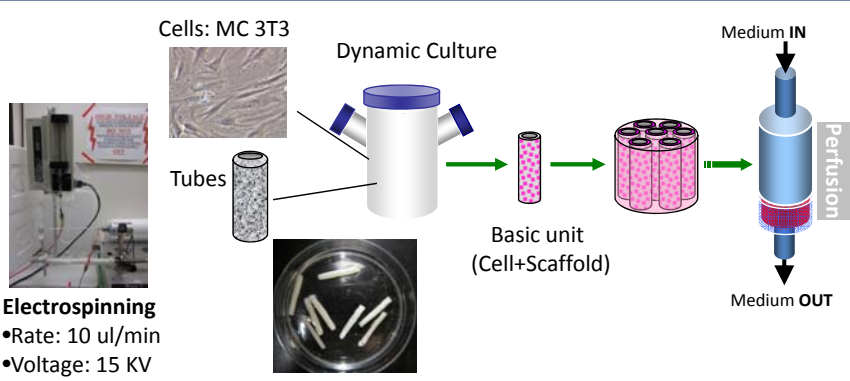
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Materials & Methods

- Electrospinning technique


Procedure:



Electrospinning

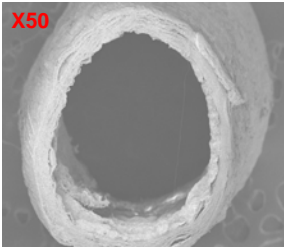
- Rate: 10 ul/min
- Voltage: 15 KV
- Rotating rate: 200 rpm

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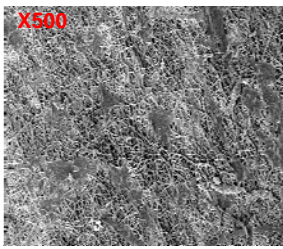


Research Results

SEM



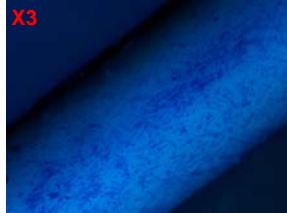
X50




X500

SEM Results:
 Diameter = 1 mm
 Thickness = ~100 um
 Good cell attachment

Methylene Blue Staining



X3



X100

Staining Results:
 Normal cell morphology
Uneven cell distribution

↻

Require further improvement!

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Challenges

- How do the bone cells behave in individual unit and form the mineralized tissue?
- How to assemble them together into complex structure
- To understand how the interaction among individual units goes

Next Steps of Research

- To optimize the seeding process – (use rotating seeding)
- To quantify the cell proliferation, bone tissue formation in the tubular scaffolds
- To assemble repeating units into a complex cortical bone

Expected papers

- Biomimetic composite nanofiber with hydroxapatite for bone tissue engineering
- Invited book chapter of “Naofiber Enabled Tissue Engineering”

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