Matrix Regenerative Platforms for Soft Tissue Repair

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Biography

Prof. Anand Ramamurthi

Keywords: Elastic matrix, Stimulated elastogenesis, regenerative nanotherapeutics, stem cells, cardiovascular tissue engineering

Education and Training

PhD, Chemical Engineering, Oklahoma State University (1999)
Postdoctoral Fellowship, Cleveland Clinic (2001; Sponsor: AHA)

Areas of Research Interest

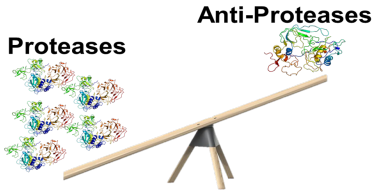
Nanomedicine
In Situ Soft Tissue Repair
Animal Models of Cardiovascular Disease
Extracellular Matrix Regenerative Therapeutics
Biomimicry in Tissue Regeneration
Biomaterials

Select Publications

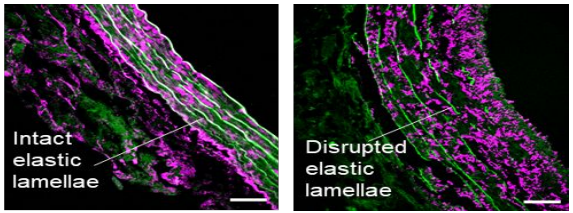
- Camardo A, Seshadri D, Broekelmann T, Mecham R, **Ramamurthi A.** Multifunctional, JNK-inhibiting nanotherapeutics for augmented elastic matrix regenerative repair in aortic aneurysms. Drug Deliv Transl Res. 2018;8(4):964-984.
- Deb PP, **Ramamurthi A.** Spatiotemporal mapping of matrix remodelling and evidence of in situ elastogenesis in experimental abdominal aortic aneurysms. J Tissue Eng Regen Med. 2017;11(1):231-245.
- Bashur CA, **Ramamurthi A.** Composition of intraperitoneally implanted electrospun conduits modulates cellular elastic matrix generation. Acta Biomater. 2014;10(1):163-72.

Elastic Matrix Regenerative Repair

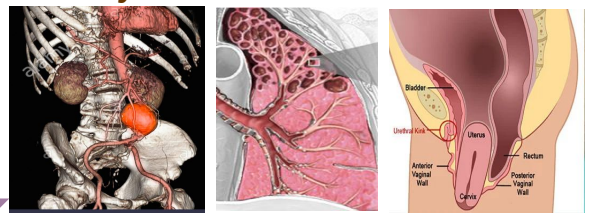
Proteolytic Dysregulation



Elastic Fiber Breakdown



Proteolytic Disorders



AAA **COPD** **POP**

What is the technology being studied?

- Platform approaches to restore elastic structure and mechanics of soft tissues compromised by injury/disease-initiated chronic enzymatic breakdown of elastic fibers and higher order structures (sheets, meshes)

Why is this topic significant?

- Elastic matrix breakdown and structural tissue failure is centric to disorders involving chronic imbalances between proteases and anti-proteases
- Example disorders include abdominal aortic aneurysms (AAAs), chronic obstructive pulmonary disease (COPD), pelvic organ prolapse (POP)
- Complexity of elastic fiber composition and importance to cellular signaling and health mandate cellular regeneration and repair of fibers
- **Reversing pathophysiology is difficult:** Adult/diseased cell types do not naturally regenerate or repair elastic matrix

How is this topic studied?

- Nanomedicine and stem cell-based therapeutics
- In vitro 2-D and 3-D cell culture models
- In vivo rodent models of disease

What are the future directions of this research?

- New single point molecular targets for augmented regeneration
- Biomimetic matrix regenerative and theranostic platforms
- Machine learning tools to predict elastic tissue failure

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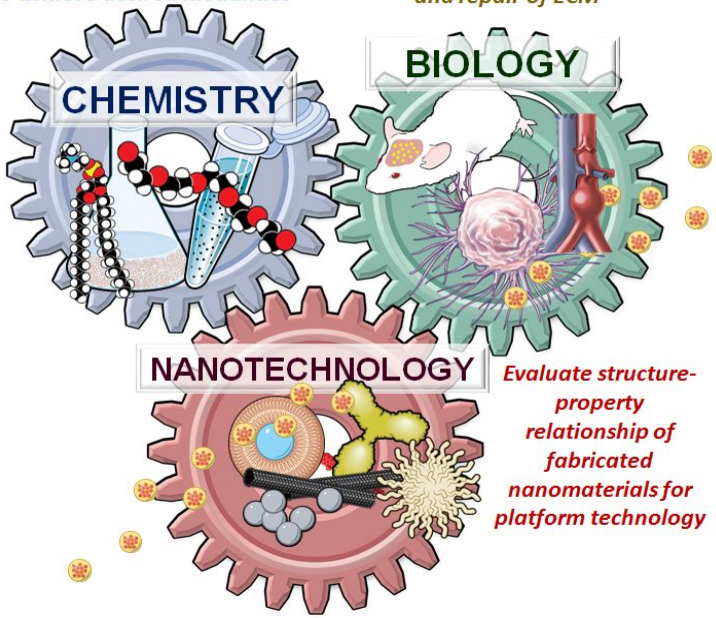
Biomimetic Matrix Regenerative Platforms

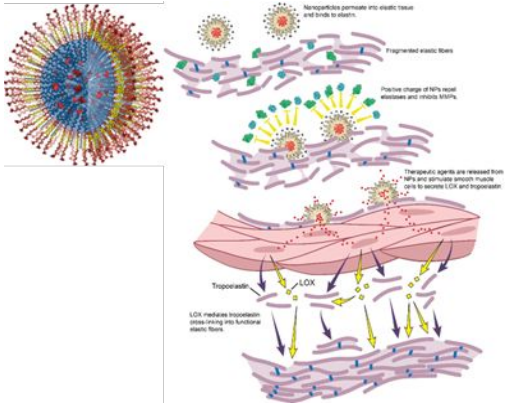
Perform synthesis and characterization of biomaterials to achieve desired modalities

Establish platform technologies for biomimetic regeneration and repair of ECM

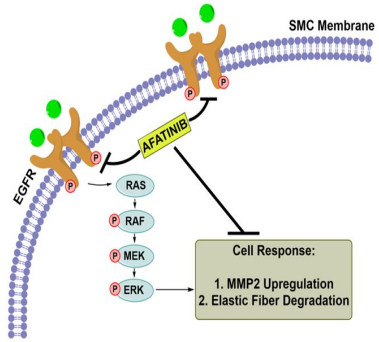


Evaluate structure-property relationship of fabricated nanomaterials for platform technology

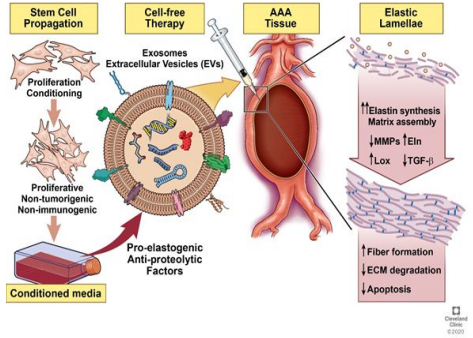
Active Targeted Nanotherapeutics



Novel Drug Targets

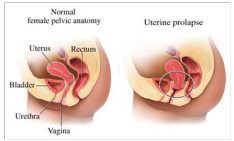


Stem Cell (Inspired) Therapies

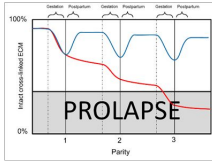


Animal Models of Proteolytic Disorders

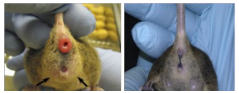
Pelvic Organ Prolapse



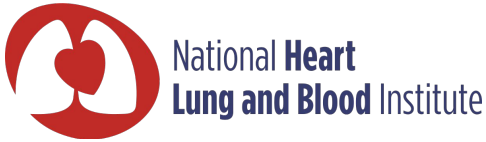
POP involves ECM aberrations



LOXL1 KO mouse model mimics clinical POP phenotype



Research Support and Contact



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