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)

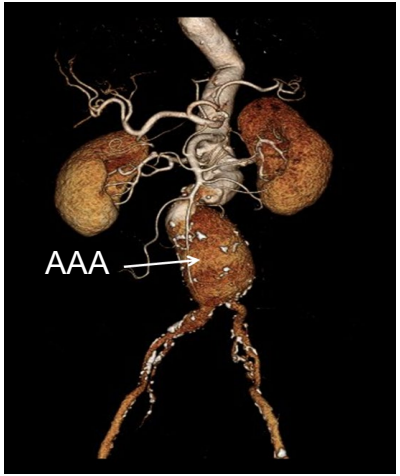
Areas of Research Interest

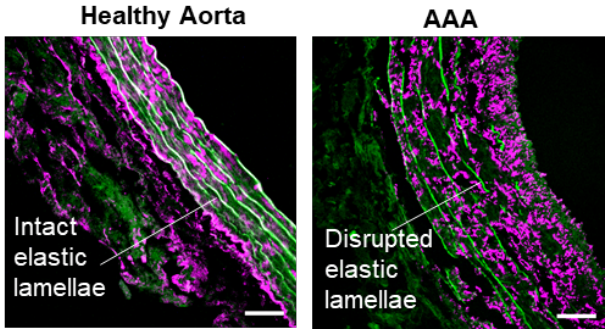
Nanomedicine
In Situ Soft Tissue Repair
Animal Models of Cardiovascular Disease
Extracellular Matrix Regenerative Therapeutics
Biomimicry in Tissue Regeneration
Biomaterials

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





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?

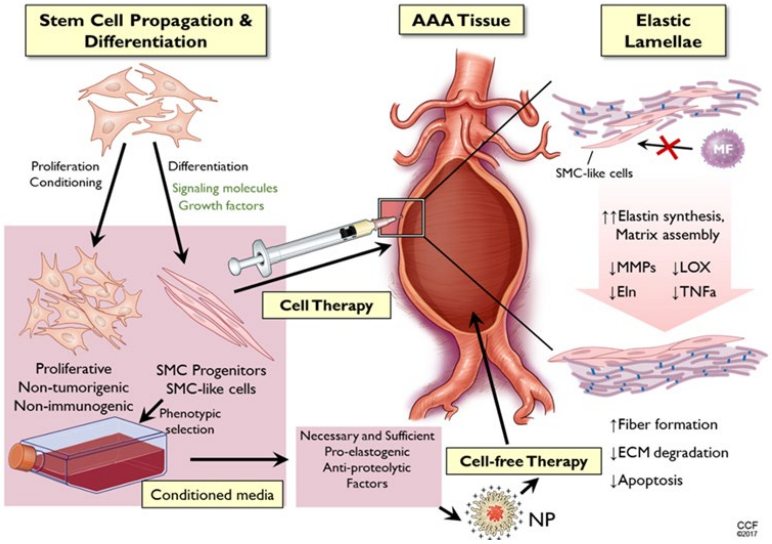
- Nanomedicine and stem cell-based therapeutics
- In vitro 2-D and 3-D cell culture models
- In vivo rodent models of disease

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

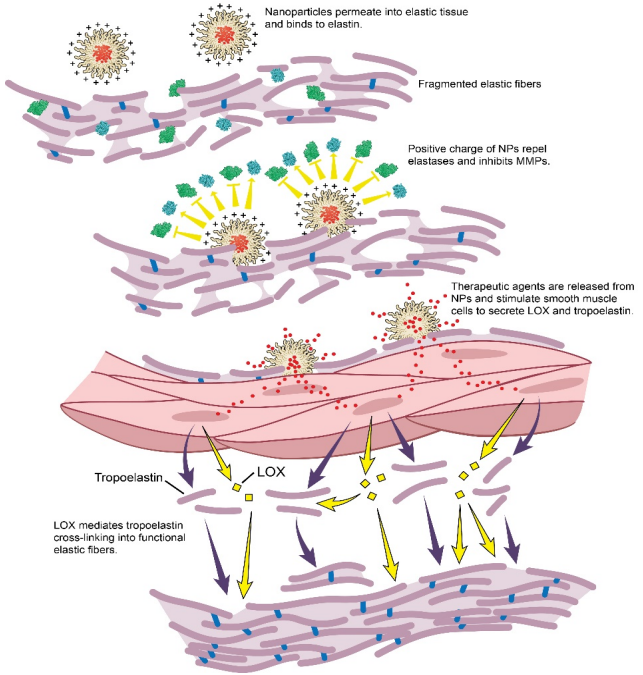
Biomimetic Regenerative Platforms

Stem Cell (Bioinspired) Regenerative Platform



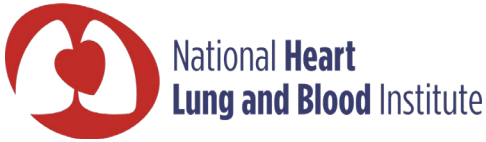
- Intravenous delivery of adult stem cells and derivatives with pro-matrix regenerative and homing properties
- Nanoparticle based delivery of pro-regenerative stem cell secretions
- Actively targeted stem cell extracellular vesicles (exosomes)

Actively Targeted Nanotherapeutics



- Therapeutic loads: MMP inhibitors, siRNA, stem cell secreted pro-elastogenic/anti-proteolytic factor
- Active targeting of NPs using peptides, antibodies, or through magnetic guidance systems

Research Support and Contact



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