

Effects of Aerobic Training Post-Myocardial-Infarction on Hypertrophic Gene Expression in the Heart

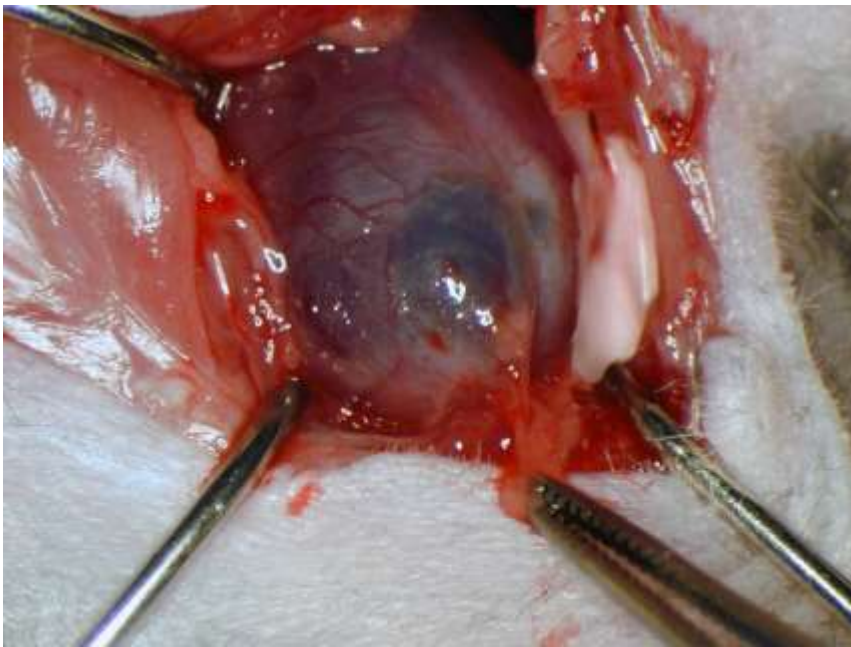
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Background

- Heart attack induces growth
 - Leads to Heart Failure
- Aerobic exercise induces growth



Infarcted Heart. Photo Taken by: Paul Thomas



Girl Running. Retrieved April 22, 2013, From:
http://wallpaperscraft.com/download/girl_athlete_running_paint_smeared_62133

Background

■ Pathological vs. Physiological Hypertrophy

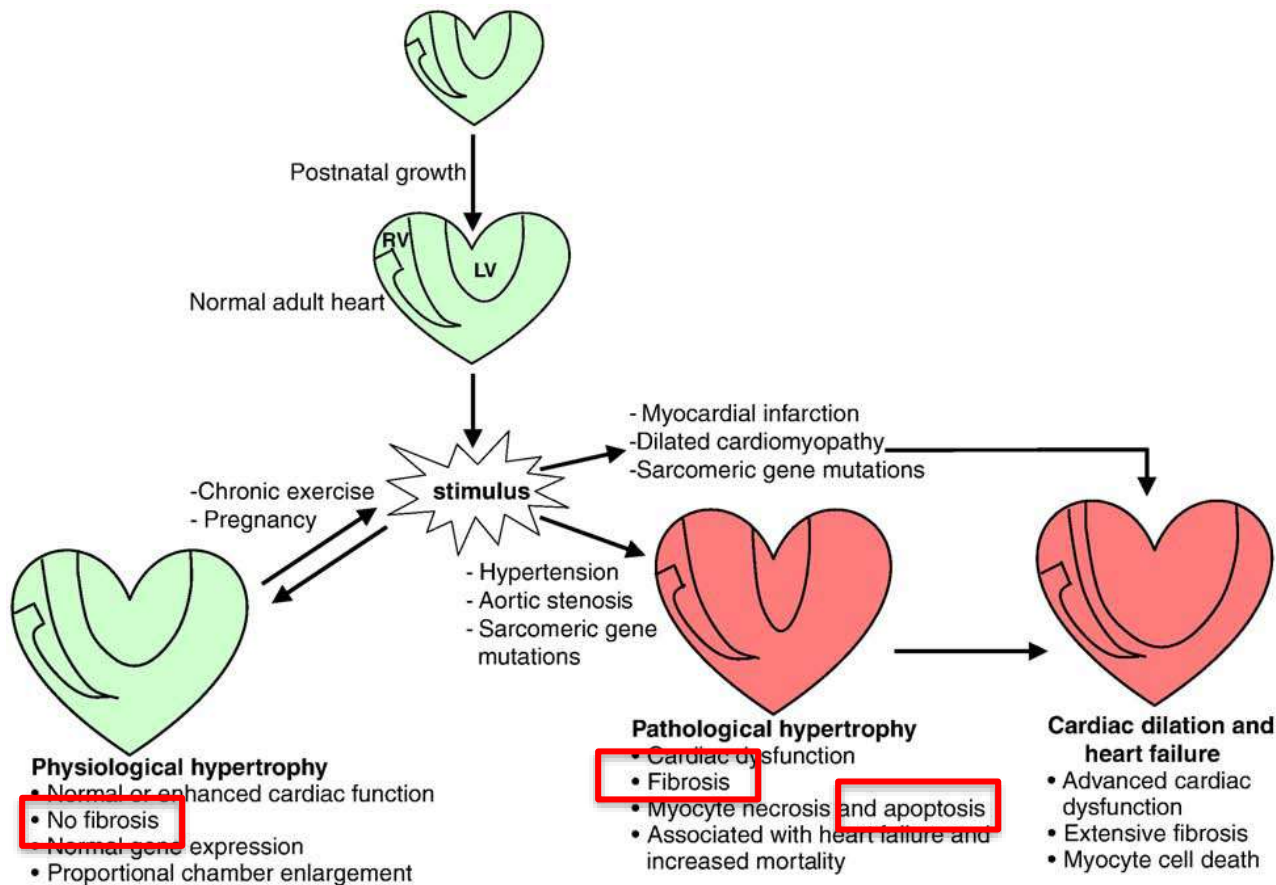


Diagram of Pathological and Physiological Hypertrophy.
Adapted from "Molecular distinction between physiological and pathological cardiac hypertrophy: Experimental findings and therapeutic strategies," by B.C. Bernardo, K.L. Weeks, L. Pretorius, and J.R. McMullen, 2010, *Pharmacology & Therapeutics*, 128(2010), p. 193

Rationale

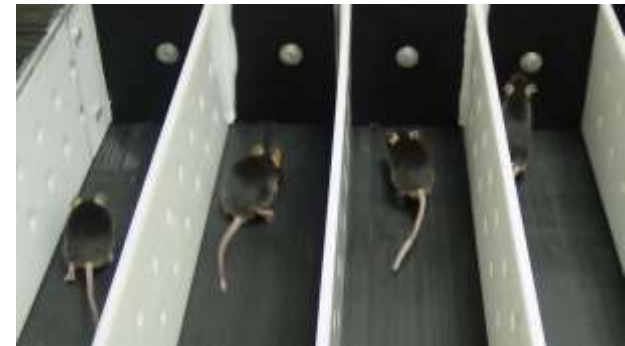
- If both aerobic exercise and a heart attack (MI) can induce cardiac hypertrophy, then will exercise following an MI result in additive growth?

Training- Study Design

- Mice
 - 4 Groups
 - Normal-Sedentary
 - Normal-Trained
 - Infarcted-Sedentary
 - Infarcted-Trained
 - Training
 - Echocardiographs
 - Tissue collection and storage



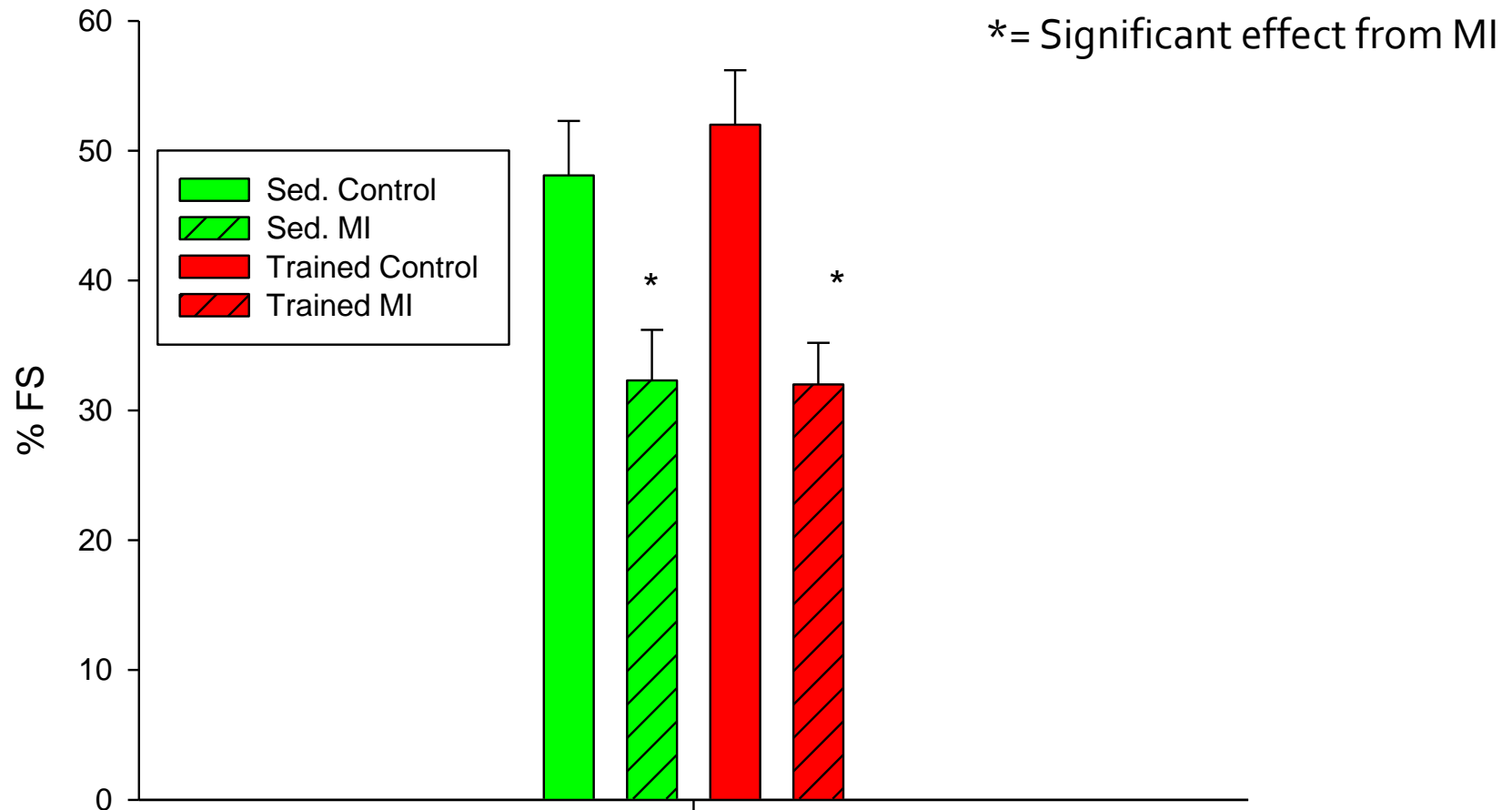
Occlusion of LAD Artery. Photo Taken by: Dr. Paul Thomas



Mice Running on Treadmill. Photo Taken by: Dr. Paul Thomas

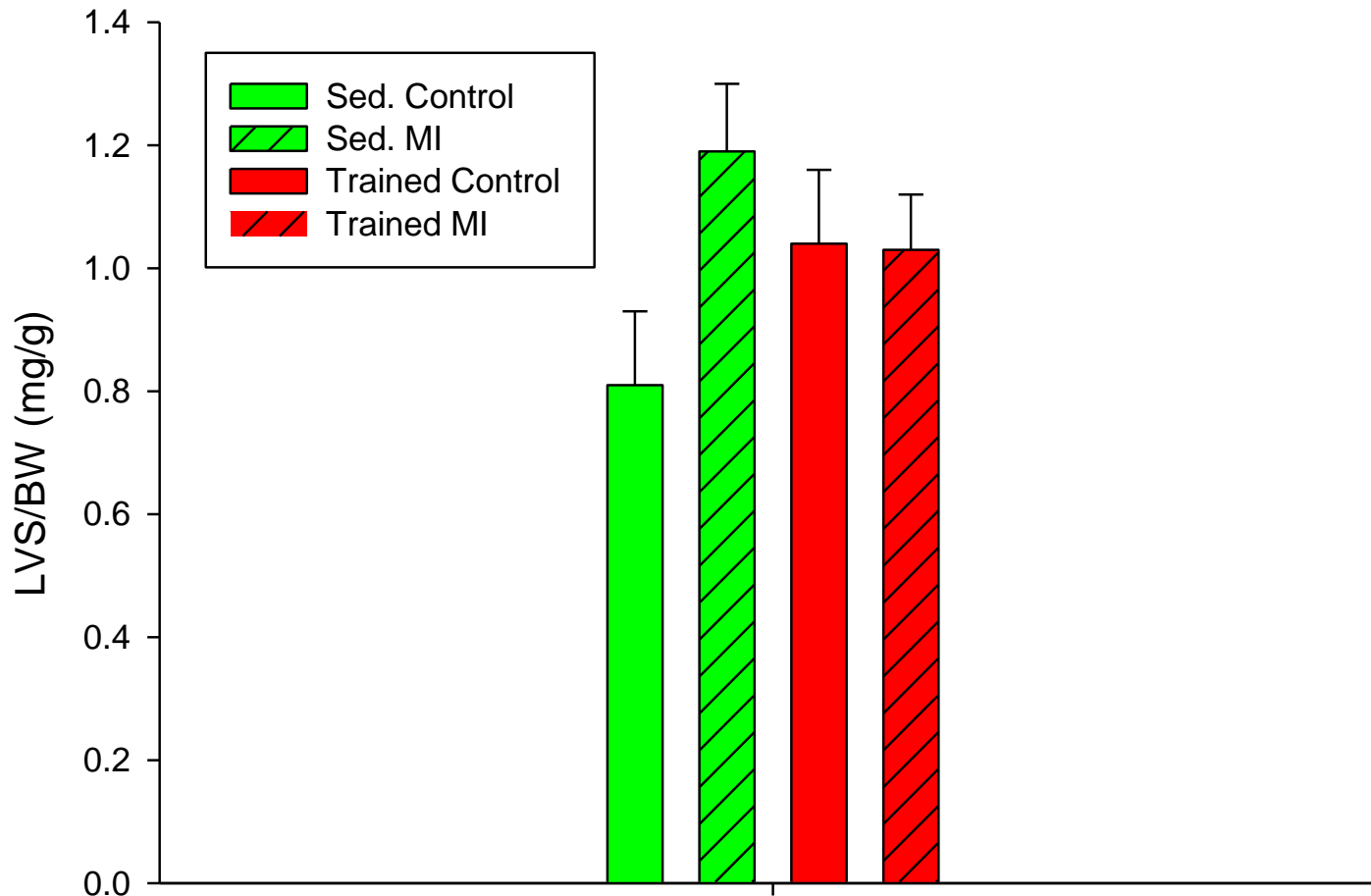
Results- Cardiac Function

Fractional Shortening (%)



Results- Cardiac Hypertrophy

LVSeptum/BW



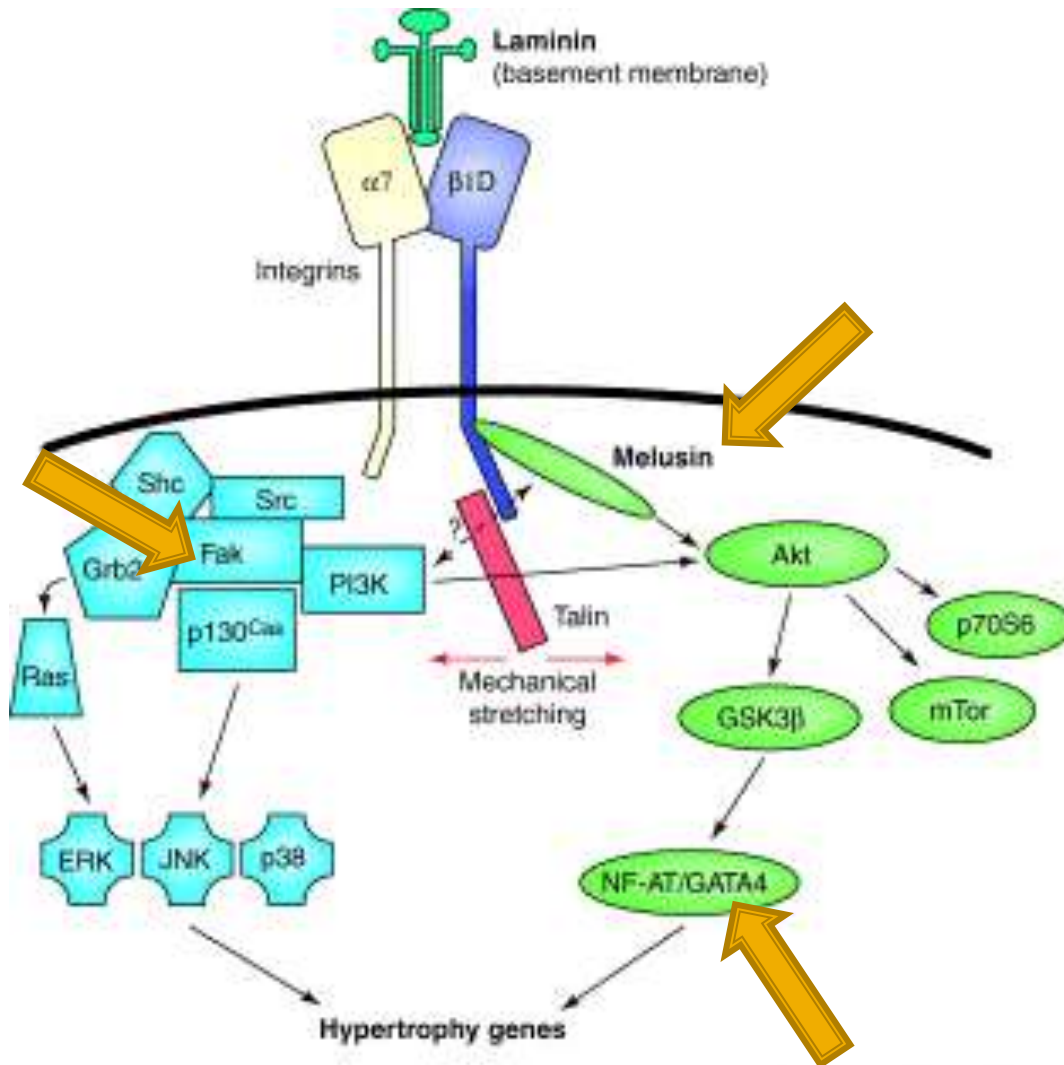
Training Summary

- Infarction resulted in impaired function, regardless of training status
- Training did not result in additive hypertrophy in infarcted mice
 - There was an interaction between these two parameters
 - Growth after an MI may be attenuated by training

Gene Expression-Rationale

- Molecular markers will enable further verification of the level of hypertrophy, and allow differentiation between “good” and “bad” hypertrophy between groups.

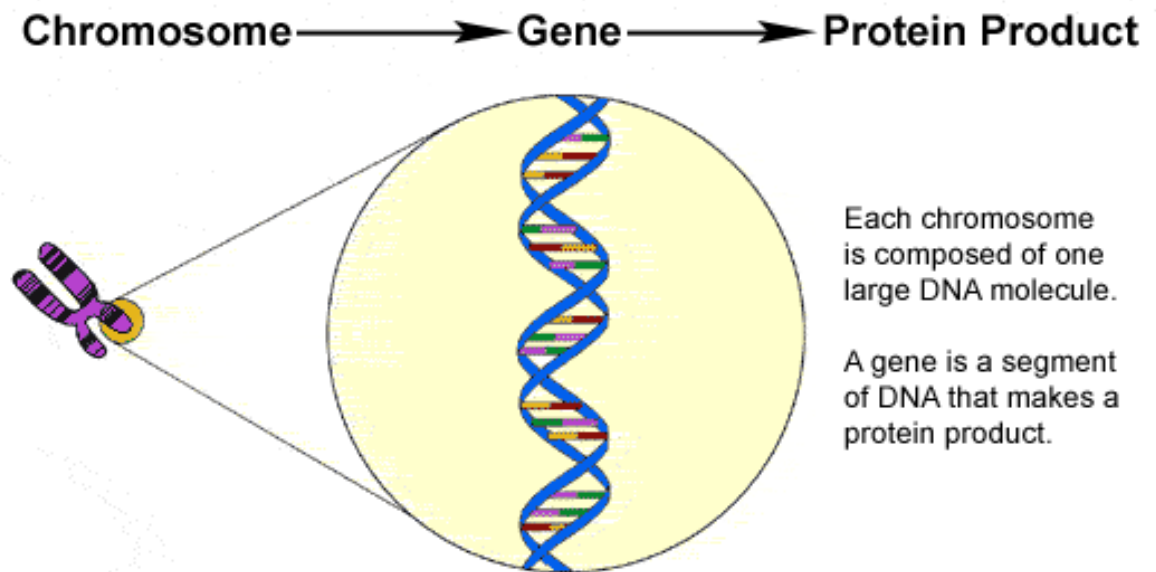
Biochemical Signaling Pathways



Schematic of Cardiac Hypertrophy Signaling Pathways. Adapted from "Molecular interplay between mechanical and humoral signalling in cardiac hypertrophy," by G. Tarone, and G. Lembo, 2003, TRENDS in Molecular Medicine, 9(9), p. 379

Genes of Interest

- Focal Adhesion Kinase (FAK)
- Melusin
- GATA-4



Central Dogma. Retrieved April 23, 2013, From:
<http://www.chop.edu/healthinfo/overview-of-single-gene-defects.html>

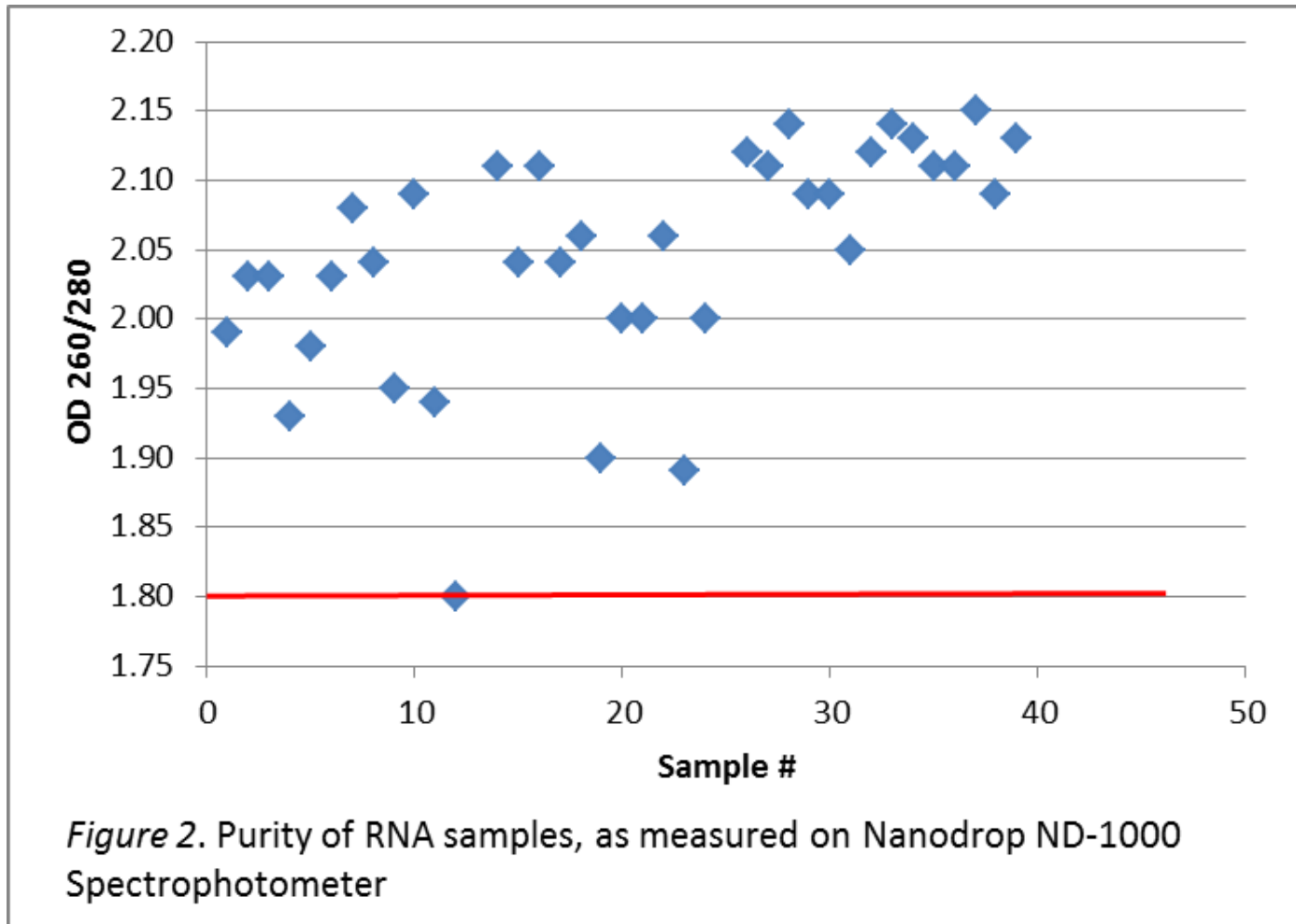
Methods

- RNA Isolation from LVF
 - Difficulty of muscle tissue
 - High Investment samples

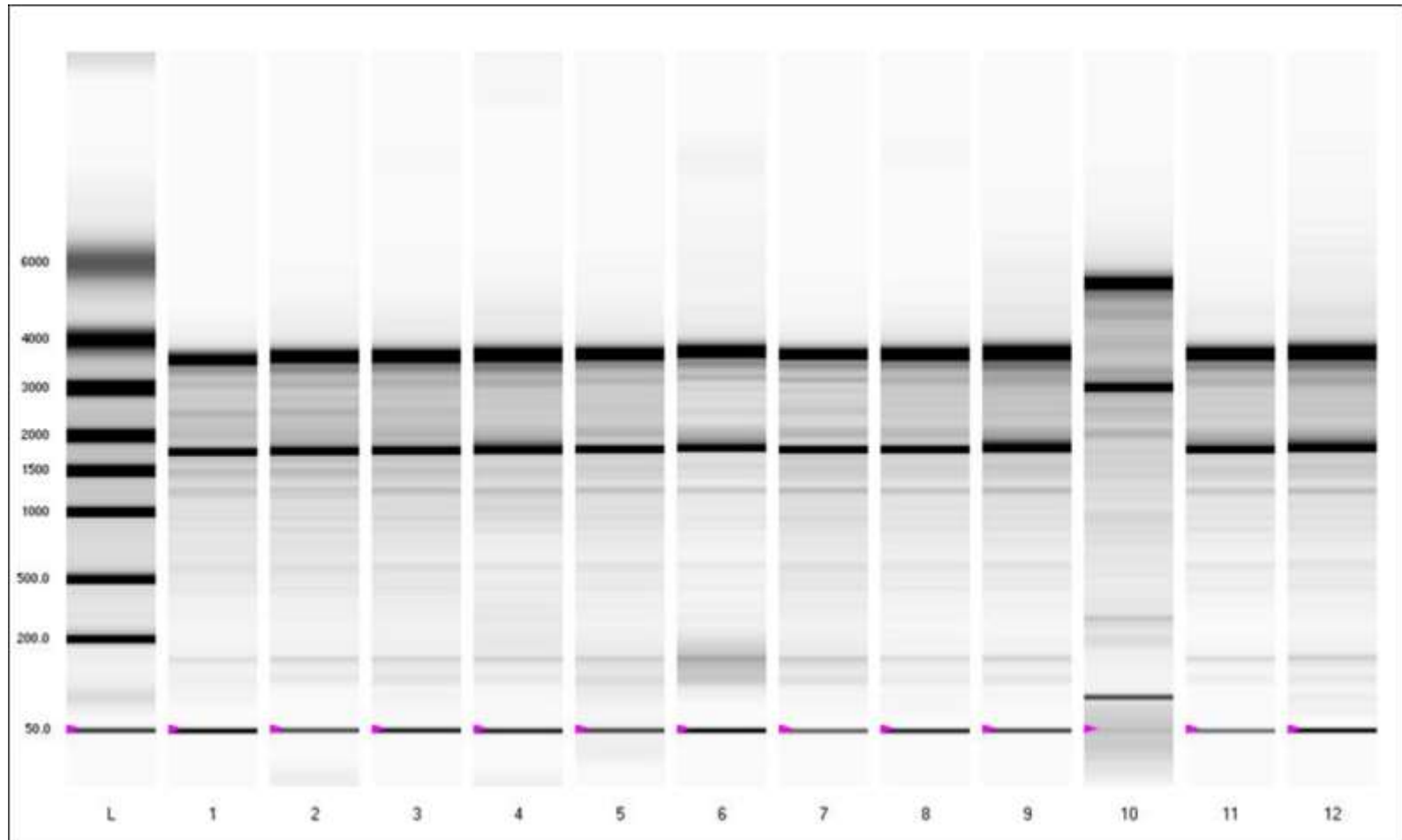


Mortars & Pestles in Lab. Retrieved April 22, 2013, From: http://arkansasagnews.uark.edu/Holifield_Faye2.jpg

Results- RNA Purity

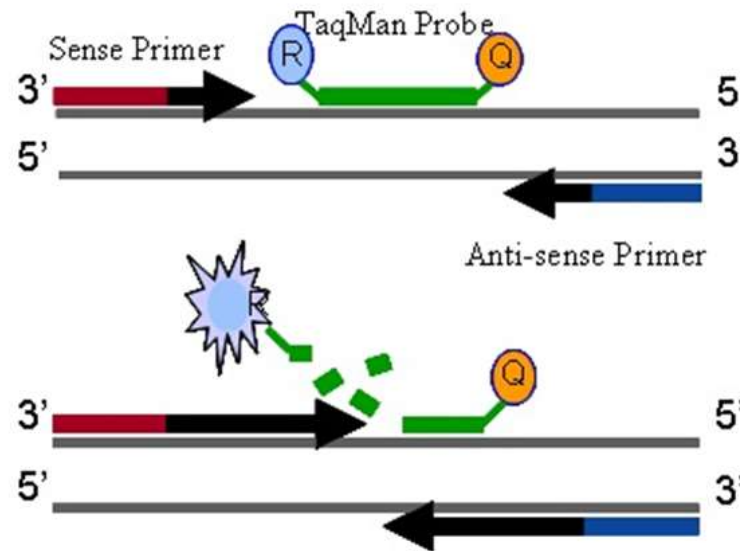


Results- RNA Integrity



Methods- Design for qPCR

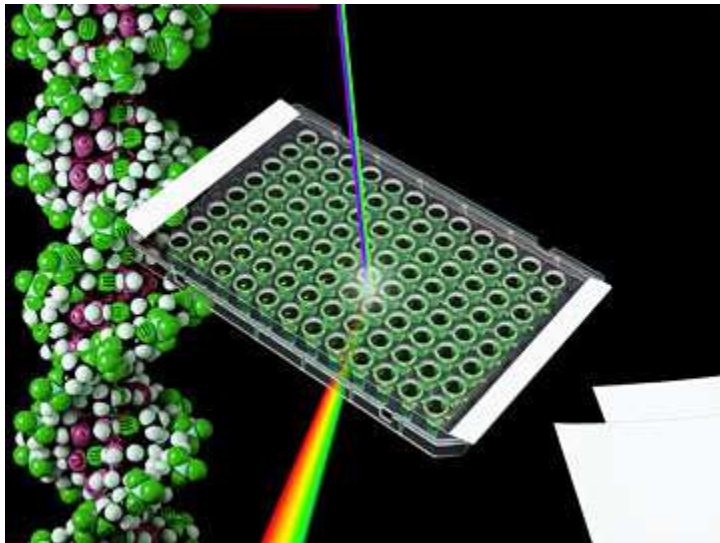
- Multiple Reference Genes
- Taqman Gene Expression Assays



TaqMan vs. SYBR Green. Retrieved April 22, 2013, From <http://www.intechopen.com/source/html/16794/media/image3.jpg>

Final Steps: cDNA & qPCR

- Synthesize cDNA
- Perform qPCR
- Analyze Data



Possible Outcomes & Implications

- Further elucidation of the effects of aerobic training on the heart after an MI, and the interplay of physiological & pathological hypertrophy

References

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