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#2

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Final Progress Report

Project Title: Molecular Basis of Mechano-Signal Transduction in Vascular Endothelial Cells

PI Name: Hanjoong Jo

PI Degree(s): Ph.D.

PI Address:
Wallace H. Coulter Department of Biomedical Engineering
at Georgia Tech and Emory University
308 Woodruff Memorial Building
1639 Pierce Dr.
Atlanta, GA 30322

PI Phone: (404) 712-9654
PI Fax: (404) 727-3330
PI Email: hanjoong.jo@bme.gatech.edu
Project Web Address: http://www.bme.gatech.edu/groups/jo/

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Co-Investigators / Affiliation:
None

NASA Facilities / Equipment used for this project:
None

Number of Funded Students:
Pre-college:
Undergraduate:
Graduate: 2 (Nolan Boyd, Young-Mi Go)
Post-doctoral: 2 (Heonyong Park, Yong Chool Boo)

Summary of Progress.

1. We found that caveolin-1 regulates shear stress-dependent activation of a member of MAP kinase, ERK, in bovine aortic endothelial cells (BAEC). (see paper #1).
2. Chronic pre-conditioning of BAEC with laminar shear stress inhibits expression of caveolin-1, decreases caveolae number, and improves subsequent shear response. (#8).
3. Shear stimulates a member of MAP kinase, JNK, by the PI-3-kinase and Akt-dependent mechanisms. (#2, 3)
4. Shear stress activates NO production by regulating phosphorylation of endothelial NO synthase (eNOS) (#4-8, 10)
5. Identification of BMP4 as a mechanosensitive and inflammatory cytokine leading to atherosclerosis development (#9) - (Patent filed)
6. Identification of superoxide from NADPH oxidase as an inflammatory mechanism leading to atherosclerosis development (#11)

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New Direction

Simulated microgravity studies using a random positioning machine (RPM). One RPM machine has been built for us by Fokker Science in Netherland. Using the device, we have developed an in vitro system to examine the effect of simulated microgravity on osteoblastic bone cells. Using this system, we have carried out gene chip studies to determine the gene expression profiles of osteoblasts cultured under simulated microgravity conditions in comparison to static controls. From this study, we have identified numerous genes, some of which are expected ones inducing bone loss, but many of which are unexpected and unknown. These findings are being prepared for publications.