NSF Award in Engineering

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- **Project:** Engineering enhancement of endothelial cell retention on arterial substitutes
- **Start Date:** September 1, 2009
- **Total Award Amount:** $299,541

How the results of this project will benefit society:

Biomaterial-based arterial reconstruction is an effective approach for the treatment of atherosclerosis, the leading cause of human death. However, biomaterials induce thrombosis and intimal hyperplasia, vascular disorders contributing to the failure of reconstructed arteries. The objective of the proposed research is to establish a molecular engineering approach to enhance endothelial cell retention, reduce thrombosis and intimal hyperplasia, and improve the performance of arterial substitutes.

This research will exert broad impacts in the following aspects. First, given the high failure rate of reconstructed arteries, results from this research may potentially benefit a large number of patients. Second, the cross-disciplinary collaboration between investigators in biomedical science and bioengineering will broaden the impact of the proposed research and facilitate engineering-life science integration in research and education. Third, this investigation will provide information for improving bioengineering education technologies by integrating research components and lab experiments into lecture topics, an approach potentially influencing future scientific and non-scientific communities through undergraduate and graduate education.

The problem the project is trying to solve:

While seeding endothelial cells to arterial substitutes is considered a potential approach for preventing these disorders, endothelial cells often detach from the arterial substitute. Thus, an important issue in arterial reconstruction is to enhance the retention of endothelial cells on arterial substitutes. The intellectual merit of this research stems from the fact that the proposed work may improve the performance of reconstructed arteries by using novel technologies, providing fundamental information for the development of therapeutic approaches for human arterial disorders.

How this project will work:
This investigation is focused on two specific aims: enhance endothelial cell retention on biological matrix scaffold- and polytetrafluoroethylene-based arterial substitutes by siRNA-mediated suppression of adhesion-inhibiting molecules, and test the effectiveness of this approach in a rat model of arterial reconstruction; and propose to improve education technologies by applying the “lab-lecture integration” concept to biomedical engineering curriculum.

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