Modeling Biomaterial Research for Middle School Science Teachers

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Statement of Purpose: The vision of the NSF ERC-RMB is to find biodegradable, non-toxic, and biocompatible materials that will interface with the human body to prolong and improve quality of life. The biomaterials and smart coatings are revolunionized to create novel bio-functional engineered systems. With this cutting edge research, damaged nerves can be regenerated, broken bones can be healed without permanent screws and plates to cause future pain, and drugs can be delivered in specific ways with coatings that can be tuned to degrade at a certain rate and specifically target cancer cells.

Methods: This module models electrospinning , electrospraying, and microbead fabrication. In each of these, scientists work with different polymers that consist of varying concentrations in solution. The module flows from the conditions necessary for nerve tissue regeneration, biofunctional nerve conduit and growth medium - to the electrospinning process of polymers to create fiber for conduit - to the fabrication of microbeads with coatings to deliver drugs and provide the proper medium to facilitate regeneration. Activities include modification of paper towel holders to represent building a conduit for severed nerves, wires representing broken nerves, cotton candy making to represent electrospinning, and a mixture of cornstarch and tonic water flowing into swirling cinnamon to represent the polymers and the bead making process.

Results: Students should be highly engaged in learning about matter and solutions as they work on these hands-on activies. They will be motivated by seeing its application to real world biomedical problems and the scientific methods used to solve them.

Conclusion: This teaching module translates this exciting research into understandable concepts that sixth graders can understand, become excited about, and aspire to emulate in their studies and future careers. This unit is adapted to the 6th grade unit on “matter” from the North Carolina Essential Standards for Science.

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