2019 NEHS Annual Meeting Abstract Submission

ABSTRACT TITLE *	Matrilin-2 and Chitosan form a Three-Dimensional Scaffold within a Collagen Conduit and Increase the Rate of Schwann Cell Migration
Contact Person Name *	Neill Yun Li
Contact Person Email *	
Contact Person Phone Number *	
Name of who will present abstract at NEHS meeting on December 6, 2019 Please note that the same person cannot present more than one abstract at the meeting. *	Neill Yun Li
Please indicate if the presenter is: *	• Resident
List full names of abstract authors *	Neill Li, MD Brandon Vorrius, MS Julie Katarincic, MD Qian Chen, PhD Please place into consideration for H. Kirk Watson Founder's Award. Figures for abstract are unable to be placed into the text box below. If possible to submit with figures via different means please let me know.

ABSTRACT - should include background information and a description of methods, programs, or practices. *

Introduction: Matrilin-2 is a large oligomeric matrix protein found in the perineurium and has been shown to promote axonal growth and Schwann cell migration. Chitosan is a polysaccharide found in the exoskeleton of arthropods that is composed of deacetylated chitin allowing it to be biocompatible and biodegradable. The purpose of this study was to integrate the structural and biologic properties of chitosan and matrilin-2 to form a three-dimensional scaffold to improve upon both the structural support of axonal regeneration and enhancement of Schwann cell migration during nerve regeneration.

Materials and Methods: Chitosan (Sigma-Aldrich) was prepared into a 0.1M solution with 1% Acetic Acid. This was combined with recombinant Human matrilin-2 protein (R&D Systems). The solution was then pipetted into a collagen conduit (Integra) and frozen followed by lyophilization to induce a foamed structure. The conduit alone and conduit with scaffold was then fixed and imaged under scanning electron microscopy (SEM). Concurrently, S16 Schwann cells (ATCC) were cultured and stained with Vybrant Dil Cell-Labeling Solution (Thermo Fisher Scientific). A modified capillary migration study was performed by seeding Schwann cells into a culture dish and placing a 10mm conduit atop the seeded cells. Upward migration was observed using fluorescent microscopy to compare conduits with matrilin-2 and chitosan and collagen conduit alone.

Results: Initial two-dimensional imaging of the chitosan and matrilin-2 matrix demonstrated an arborizing pattern that utilized the walls of the dish in its formation. SEM of our chitosan and matrilin-2 filled collagen conduit demonstrated a three-dimensional cross section of the conduit with notable 50um porous structures within the cross-section compared to only collagen conduit. Our 24-hour migration study demonstrated a greater number of upward-migrating cells at a 7mm cross section of the collagen with matrilin-2/chitosan matrix filled conduit compared to the conduit alone.

Conclusion: Our study demonstrates a novel use of matrilin-2 and chitosan to form a three-dimensional porous scaffold within a collagen nerve conduit. Conduits with scaffold demonstrated a far greater number of migrating Schwann cells over 24 hours compared to a collagen conduit without scaffolding. The advent of introducing chemotactic proteins within a three-dimensional scaffold may improve upon the activity of Schwann cells during repair and subsequent

quality of axonal regeneration. Future studies are required to define the appropriate concentration of matrilin-2 and chitosan in the formation of the scaffold, elution of matrilin-2 from the scaffold, and regeneration studies within a small animal model.
