“Nerve-Specific Fluorophores to Guide Nerve-Sparing Prostatectomy”

PI: Summer Gibbs, Biomedical Engineering Department
Contributors: Theresa Koppie & Dusan Pavcnik

Prostate cancer cure is the primary goal of radical prostatectomy, however preserving the nerve structures responsible for continence and potency are vital for maintained quality of life. Nerve damage following radical prostatectomy continues to plague surgical treatment and is reported in some form in up to 60% of patients 1 to 2 years post surgery. Surprisingly, no method exists to enhance direct nerve visualization in the surgical suite, and nerve detection is completed through a combination of palpation and visualization when possible. Thus, the success of nerve-sparing prostatectomy is dependent upon the surgeon’s ability to master the technique, which is based on general knowledge of prostate nerve anatomy, rather than direct visualization. Few contrast agents exist for staining of nerve tissue in the operating room, and all current contrast agents are specific for myelinated nerve. Preservation of both myelinated and unmyelinated nerves in the neurovascular bundle (NVB) and cavernous nerve of the prostate are vital for preservation of function. I have previously synthesized and characterized nerve-specific fluorophores for systemic administration that bind to all nerve structures following a single intravenous administration, resulting in a library of 230 isomers of the distyrylbenzene (DSB) fluorophore structure. The prostate is a highly innervated organ, where direct labeling of the cavernous nerve and NVB will provide greater imaging contrast by comparison to labeling of all nerve structures in the gland. However, requirements for local administration differ significantly from the previously characterized systemic administration route. To demonstrate feasibility, this proposal aims to develop a local administration protocol for the top 3 candidate DSB fluorophores, for translation into first in human clinical trials. OCTRI funding of this proposal will enable validation of an optimized local administration formulation and protocol with a confirmed signal to background ratio in rodent nerves.