Multi-emissive Boron PLA Nanoparticles for Vascular Optical Hypoxia Imaging

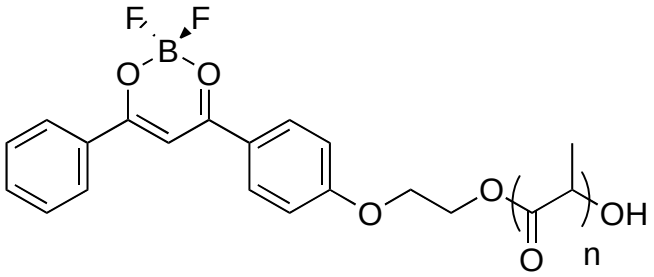
Cassandra L. Fraser (Chem)

Richard J. Price (BME)

Project Summary

- Boron biomaterials synthesis
- Nanoparticle fabrication & characterization
- Biological testing

Boron Biomaterials



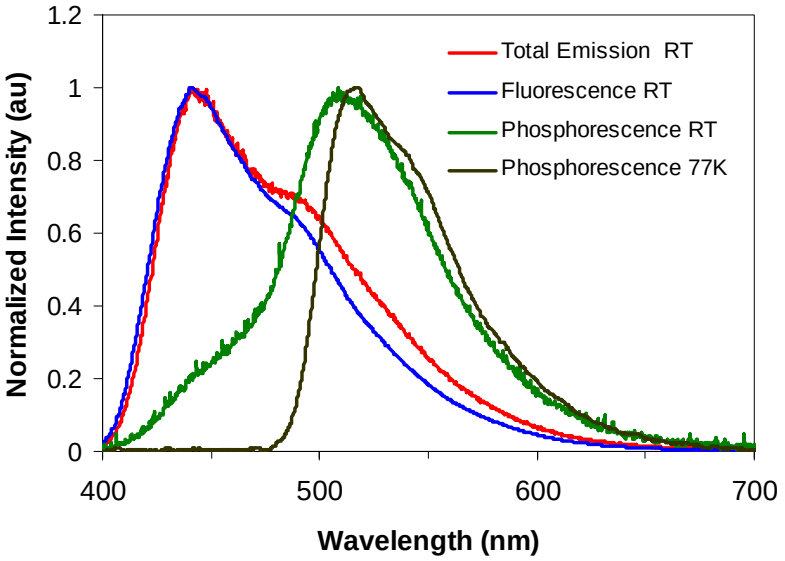
Fluorescence (F)

τ = 1.5 ns

Φ_F = 0.89

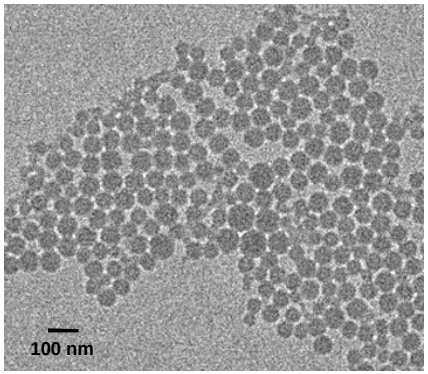
Phosphorescence (P)

τ_0 = 0.17 s

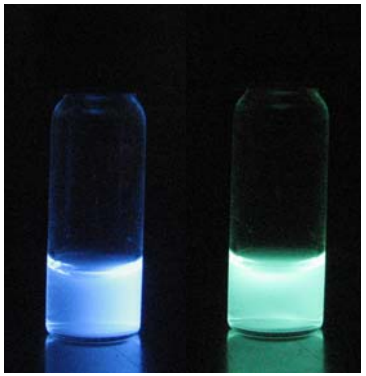


BNPs & Biological Testing

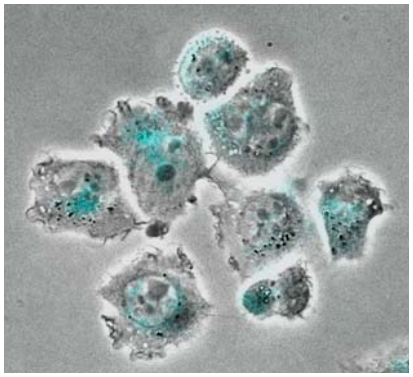
BNPs: TEM



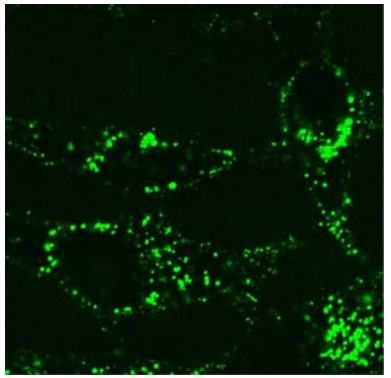
F P



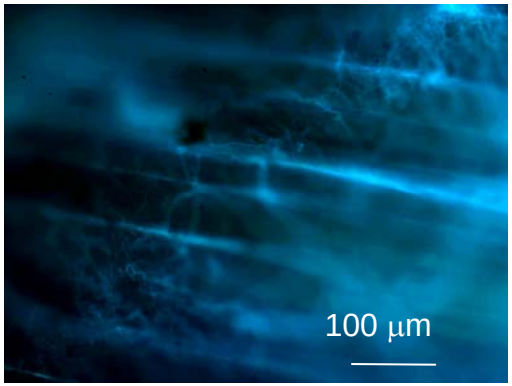
CHO Cells



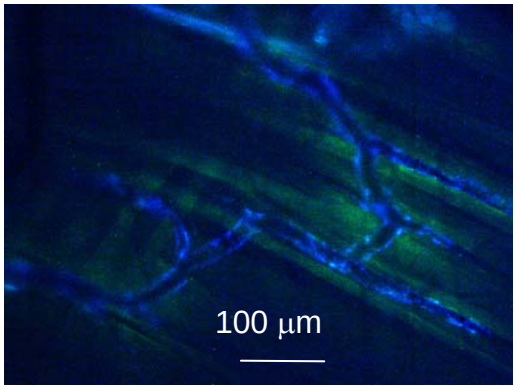
HeLa Cells



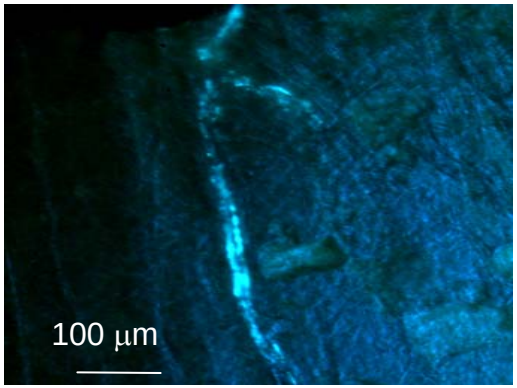
Ex Vivo Gracilis Muscle (F)



In Vivo Cremaster Venules (F)



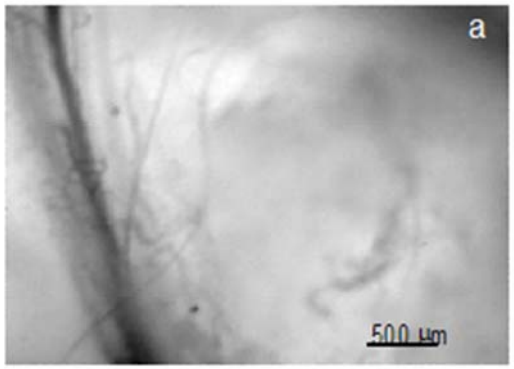
In Vivo Hypoxic Venules (F+P)

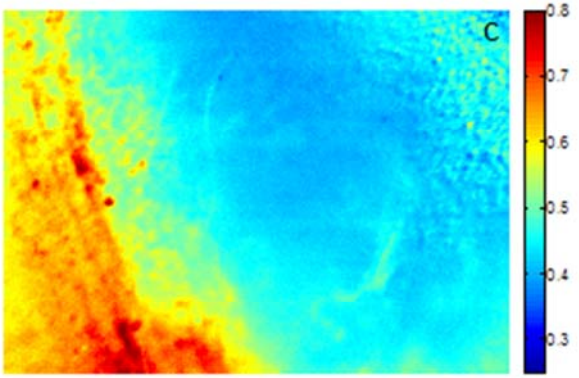


Tumor Hypoxia Imaging

F/P Ratiometric Images (blue = hypoxic tumor region)

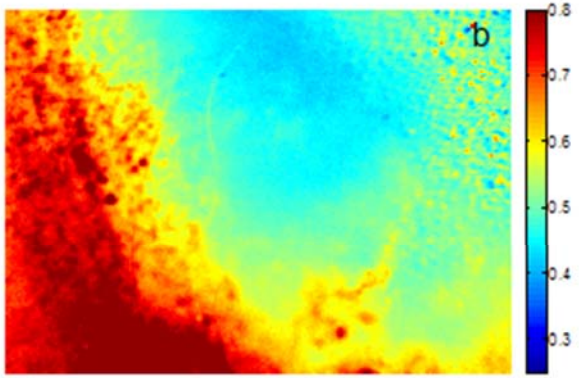
Brightfield Image

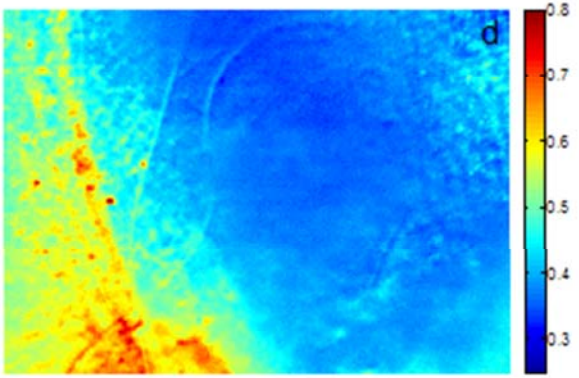




Air (21% O_2)

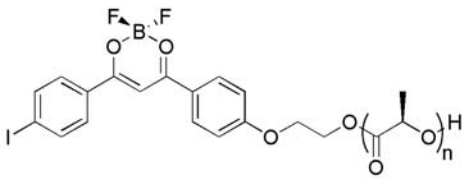
Carbogen (95 O_2)



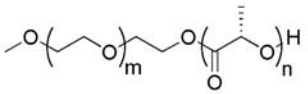


Nitrogen (0 % O_2)

PEGylated BNPs for IV Injection



1



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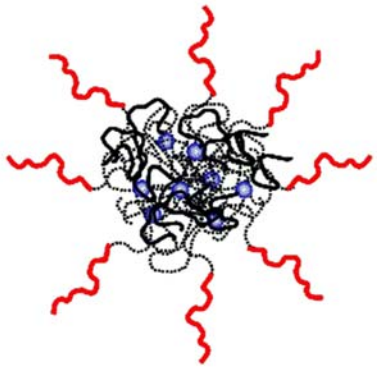
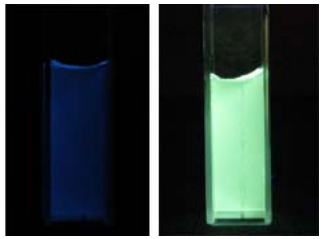
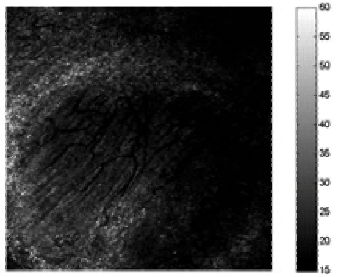




a.



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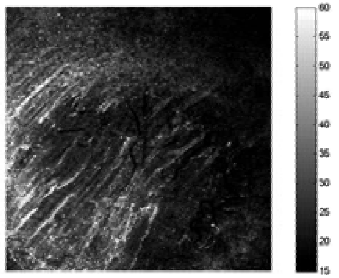
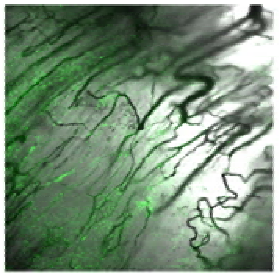
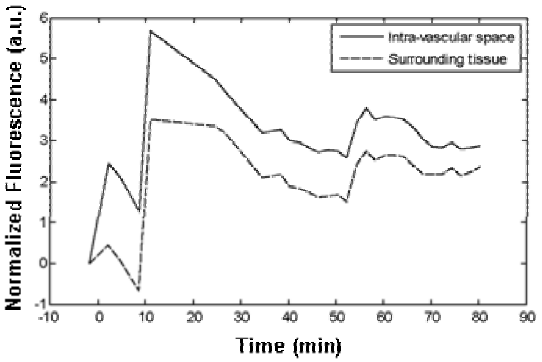


c.



d.



Outcomes & Future Plans

- Boron PLA (+ PEG) materials were synthesized
- BNPs were fabricated by nanoprecipitation
- BNPs allow for vascular imaging
  - Microvessels (F = fluorescence)
  - Vascular damage/ischemia (P = phosphorescence)
  - Tumor hypoxia imaging (F/P ratiometric methods)
  - Hypoxia imaging, other (tissue engineering, wound healing, etc)