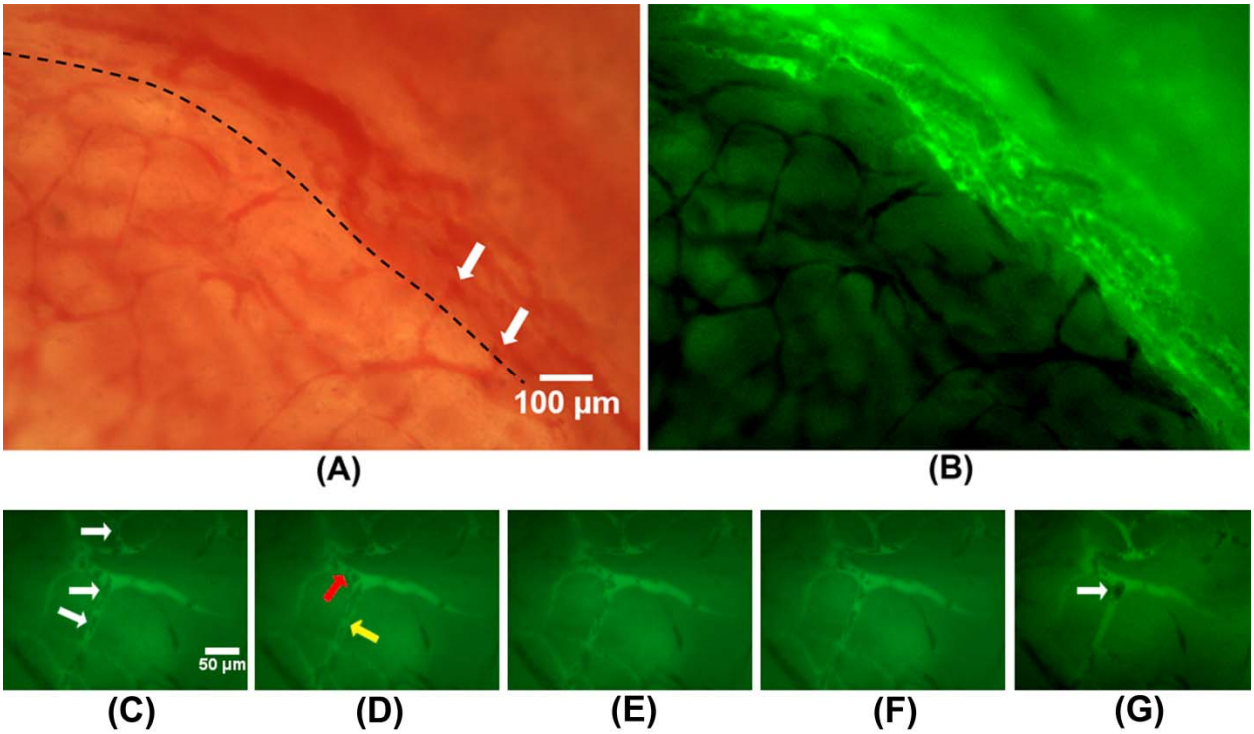
S. White, R. Hingorani, R. Arora, C. Hughes, S. George, B. Choi, "Longitudinal In Vivo Imaging to Assess Blood Flow and Oxygenation in Implantable Engineered Tissues", Tissue Engineering: Part C, Vol. 18, No. 9, pp. 697-709 (2012).

Since its inception in the 1980's, tissue engineering has seen very rapid growth and maturation as a field in a relatively short amount of time. The ultimate goal of this field is to create engineered tissues *in vitro* for implantation into patients suffering from pathologies ranging from whole-organ failure to burn wounds. One of the most significant challenges facing tissue engineers today is the difficulty associated with creating vasculature with similar morphology and functionality to native vasculature. Most implantable tissues used in clinics today address this issue by relying on the host's blood vessels to grow into the implanted tissue – an unacceptably slow process. In a recent publication in Tissue Engineering Part C, we created and implanted "prevascularized" tissues, which are engineered tissues with a "built-in" vascular network that connects with the host's blood vessels following implantation. This ideally results in one continuous and functional vascular network. By then using a variety of imaging techniques that provide day-to-day information about blood flow, vessel remodeling, and blood oxygenation, we were able to discern what design aspects of prevascularized tissues were successful, and which aspects need to be reworked in the process of designing larger, and more complex engineered tissues.




*Host blood initially perfuses implanted vessels in prevascularized tissues, however, the formation of thrombi prevents continued flow within these vessels. (A): Color image of interface between prevascularized implant and native tissue. The interface between these two tissues is delineated by the black dotted line. White arrows indicate vascular connectioned. (B): Fluorescence image of region in (A) following intravenous injection of fluorescent dextran indicating that blood can flow into the prevascularized tissue. (C-G): Fluorescent images acquired using intravital microscopy 30 (C-F) and 40 (G) minutes post fluorescent dextran injection. There is a 2 second delay between each image (C-F). (C) shows flowing mouse erythrocytes (white arrows). (D) shows two preformed vessels where wall shear rate was computed (red arrow = 3.2 $s^{-1}$, yellow arrow = 16 $s^{-1}$). (G) shows the formation of thrombus (white arrow) which induced flow cessation.*