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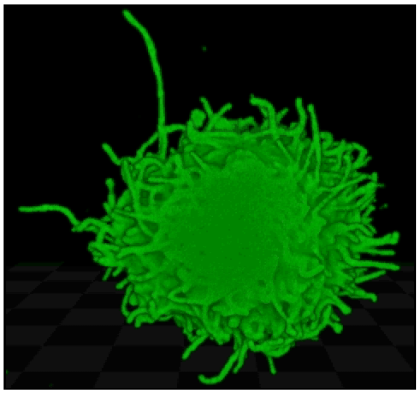
Current research: Reducing the survival of circulating breast tumor cells

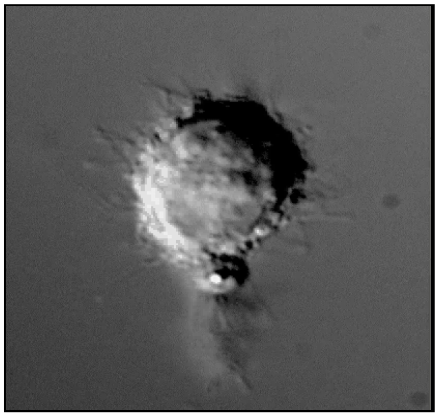
A successful cure for breast cancer will require the destruction of tumor cells that spread throughout the body. Breast tumor cells that are circulating in the bloodstream can invade distant tissues and lie dormant for long periods. The eventual reemergence of these disseminated cells as metastatic tumors is a major cause of patient death. My lab has shown that resistance to cell death promotes tumor dormancy by allowing cells to survive the challenges of bloodborne dissemination, but failing to initiate tumor growth. Such dormant cells persist without active cell division and are therefore resistant to many traditional chemotherapies. Destroying these dormant tumor cells is critical to prevent metastatic recurrence, since their presence predicts poor patient outcome.

My lab has also recently discovered that detached breast tumor cells generate dynamic protrusions that have not been reported before. We have named these protrusions ***microtentacles*** and they appear to be responsible for how circulating tumor cells attach to blood vessel walls during metastasis. Since tumor cells are large and get crushed when pushed through capillaries by blood flow, we are trying to inhibit microtentacles to increase the fragmentation of circulating tumor cells.

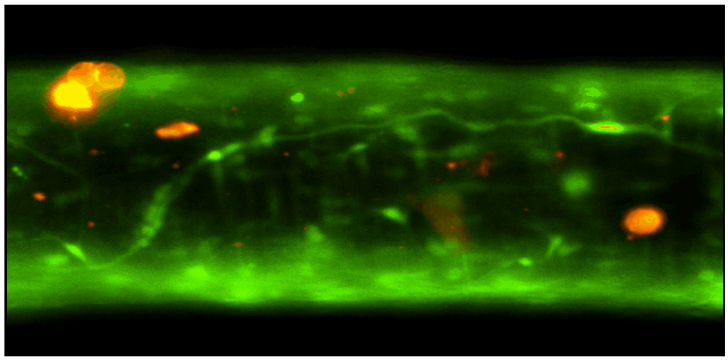
Microtentacles on a breast tumor cell



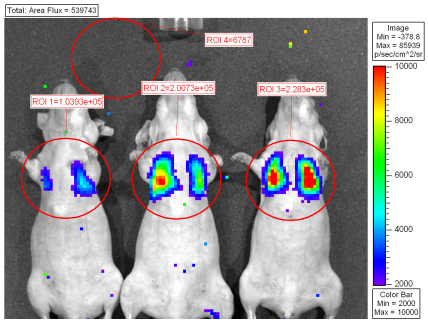
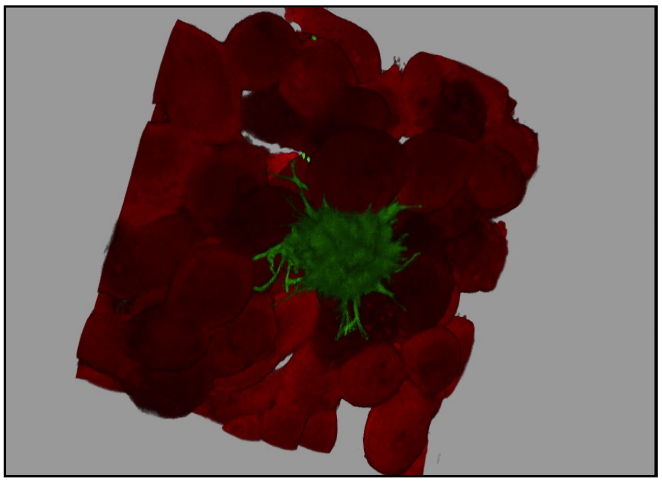
Inhibiting microtentacles with drugs



Tumor cells (red) attaching to blood vessel walls (green)



Whole-animal imaging of tumor cell trapping in lung capillaries



3D imaging of live tumor cell attachment to microvascular endothelial cells