Studies on the Innate Immune Response to Treatment with PDT via Neutrophil Activity.

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The implementation of photodynamic therapy (PDT) as a treatment for tumors leads to tumor death in a number of ways: direct cell death, vascular damage, and death from following immune response. Innate immunity following PDT treatment may be triggered by the release of damage-associated molecular patterns (DAMPs) released from dying cancer cells, allowing for an influx of neutrophils. This immune response facilitated by PDT may be affected by other treatments, including surgical injury, that change the tumor microenvironment. Effective treatment relies on an understanding of the tumor microenvironment, including the tumor-associated neutrophil (TAN) populations (N1 – anti-tumor and N2 – pro-tumor). Within, we outline two methods for studying neutrophil activity in the tumor microenvironment through means of noninvasive imaging and flow cytometry. The first utilizes with a chemiluminescent agent, luminol, to study the activity of anti-tumor neutrophils through the release of a cell-killing peroxidase, myeloperoxidase. The second characterizes populations of arginase-1, which is associated with pro-tumor populations, and intracellular myeloperoxidase, as well as neutrophil influx. Using these techniques, we demonstrate that neutrophil numbers increased in the lymph nodes and trended in the tumor after SI/PDT treatment. For tumor neutrophils, PDT showed increased myeloperoxidase in the PDT-treated group versus the SI/PDT group. Taken together, these results demonstrate time-dependent and treatment-dependent differences in neutrophil profiles that may affect the overall response to therapy. Understanding these differences will enable the design of more effective treatment.

\textit{Emma Snyder is currently enrolled at RIT. She spent her SUPERS time in the lab of Dr. Theresa Busch.}