Lay Abstract: Kaitlin Klotz

In 2015, 21,000 women will be diagnosed with ovarian cancer and 14,000 women will die from the disease. The high rate of mortality associated with ovarian cancer is caused in part by its lack of symptoms in its early stages making diagnosis difficult until late stage. Late stage ovarian cancer is challenging to treat due to its aggressive nature and susceptibility to the formation of secondary tumors elsewhere in the body in a process call metastasis. Though surgery aimed at removing tumors, chemotherapy treatment and radiation have good immediate effects on treating the disease, more aggressive recurrences are common. In order to effectively combat ovarian cancer, it is necessary to develop better methods of early detection and more specific methods of targeting the cancer with chemotherapeutic agents. One treatment of much interest is aptamer conjugated nanoparticle drug administration.

Nanoparticles are small specially engineered particles that serve the purpose of delivering drugs to a specific tissue in the human body. The ability of nanoparticles to target specific tissues is enhanced by the coating of the nanoparticle surfaces with aptamers. Aptamers are short single-stranded DNA or RNA sequences that are between 40 and 100 bases in length and have shown capability of selectively binding to specific cell types similar to how antibodies recognize and bind to specific cells. It is hypothesized that nanoparticles containing chemotherapeutic agents and coated with a selected aptamer will act more effectively to eliminate ovarian tumors with fewer side effects and recurrences than traditional chemotherapy alone.

The Richardson lab previously identified seven DNA aptamers that may specifically bind to ovarian tumors but not normal ovarian cells. The lab has found that three of the seven aptamers are able to bind and internalize into the ovarian tumor cells and internalize into the cytoplasm of target cells. Internalization into the cell is important because that is how the chemotherapeutic drugs will eventually be delivered.

My project will include testing the remaining four aptamers for their affinity to the surface of ovarian tumor cells and the ability for them to internalize into the cell. Methods will include cell culture, flow cytometry and confocal microscopy. This research will give significant information that may be used in the future for both detection of ovarian tumors and also treatment of ovarian cancer.