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Finalist

Rania B.
G.W. Carver High School of Engineering and Science
Philadelphia, PA

Three years ago, my mother and I found out that my aunt was diagnosed with stage four head and neck cancer and a couple of months later my grandmother was diagnosed with stage two breast cancer. The hardest part of accepting this was the realization that we couldn't be there with them in Indonesia during their treatment. Both my aunt and grandmother received chemotherapy and radiation. My mother and I also realized that cancer ran in our family, and we immediately began to research healthy lifestyles, cancer treatments, cancer prevention, and different scientific breakthroughs. Ever since then, my interest in cancer research and biomedical engineering spiked, and I've made it a priority to keep up with my health, advances in cancer research, and for the advances of medical technology around the world.

One scientific discovery that I found interesting was conducted at Stanford University School of Medicine in 2018. This specific discovery caught my eye because of how it is expected to be able to be used in different types of cancer and is an approach of immunotherapy. Researchers from Stanford University discovered how the injection of small amounts of two immune-stimulating agents into tumors in mice can eliminate all traces of cancer in these animals. The combination of these agents causes the reactivation of cancer-specific T-cells to attack the tumor because they are able to identify the abnormal proteins in cancer cells. According to professor of oncology, Ronald Levy MD., "This approach bypasses the need to identify tumor-specific immune targets and doesn't require wholesale activation of the immune system or customization of a patient's immune cells," (Conger, 2018).

This method was discovered through experimentation with mice. Scientist, Ronald Levy, and his team of researchers used mice subjects and transplanted lymphoma tumors on two sites of their bodies. Once one tumor was injected with the agents, both the treated and untreated tumor experienced regression. Through this experiment, 87 out of 90 mice were cured of cancer, the other three mice were treated a second time and both tumors regressed once again. Researchers also observed similar results in other mice with breast, colon and melanoma tumors.

In addition to mice, Levy and his team are also hosting a clinical trial with patients with low-grade lymphoma. The tumors in these patients would be injected with the two agents before the tumor is surgically removed. If the treatment is successful in this case as well, then it will be able to be used to treat a wide range of tumors, "I don't think there's a limit to the type of tumor we could potentially treat, as long as it has been infiltrated by the immune system," says Levy (Conger, para.18., 2018).

During my grandmother's treatment, she received a biopsy and eventually got her tumor surgically removed, this procedure was hard for my grandmother to endure but she was

able to have a safe recovery. The remarkable part of this breakthrough is that small amounts of the agents result in large effects throughout the body, and after the T-cells destroy the original tumor, it will also destroy tumors similar to the original. I believe that if this approach is successful and is approved to be used on humans, immunotherapy will make surgical processes easier and more reliable.

In addition to medical advances like these, combining these discoveries with technological advancements will help many people in other countries and other communities lacking advanced technology treat patients and lower cancer rates. If industries are able to keep costs affordable for those everywhere, regardless of where you live we will create a healthier environment for everybody.

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