

2024 PSBR High School Essay Contest
2nd Place

Anna S.

Schuylkill Haven Area High School
Schuylkill Haven, PA

Each year in the United States, about 240,000 women are diagnosed with breast cancer. In 1995, my great grandmother became part of one such statistic. Born in Scotland in 1926, she met my great grandfather while he was stationed in Scotland during World War II. She married him, and shortly thereafter boarded a boat and sailed to America to start her new life. The entire time I have known my great grandmother, she has been the most stubborn and feisty soul I have ever met. It is with this knowledge that I am not surprised to have learned about her triumph over this terrible disease. However, it is important to note the key animal research that enabled the treatment that ultimately helped her defeat her diagnosis.

The main animal that is used in the research of all types of cancer is mice. This is mainly due to their high genetic similarity to humans. They also have short life spans, which allows scientists to study the effects of their tests on the same specimen throughout their entire lifespan. The use of mice, especially in testing radiotherapy, has helped scientists to understand the reactions at the cell, tissue, and whole-organism levels.

Although breast cancer treatments have come a long way from where they once began, this would not have been possible without the help of animal research. The development of Herceptin, a major treatment for breast cancer, relied on animal research throughout the development of this drug. Scientists first discovered the HER2 protein, which increases the growth of cancer cells, by observing this in rat tumors. They then used mice and hamsters, and later monkeys, to help develop antibodies to target the HER2 protein. Throughout the evolution of Herceptin, scientists were even able to instruct tumor cells in mice to start producing the drug on their own, which actually delivers a higher dose to the tumor than the normal method. In human trials, Herceptin was found to be more effective than chemotherapy alone and when combined with chemotherapy, survival rates increased by more than a third.

Aside from Herceptin, another drug used to fight this cancer, Capivasertib, was first tested on mice to understand the efficacy and tolerability before moving to clinical trials. Capivasertib is a crucial drug in the advancements in treatment of breast cancer, because it treats HER2-negative breast cancers by targeting and blocking the cancer-producing protein called AKT. From these trials, scientists were able to identify and solve two major side effects from this drug, such as the blood pressure and heart problems. A prototype of this drug was also found to reduce human tumors that were engrafted into mice. Today, Capivasertib is used commonly in the treatment of advanced breast cancers, and has shrunk patient's tumors in a third of the cases in which it was used.

Another important treatment for breast cancer is the hormone therapy, Tamoxifen. This works by either increasing or decreasing levels of estrogen, which is a hormone that stimulates

the growth of breast cancer. Research work in testing Tamoxifen was practiced on rats to test the treatment dosage and duration and was found to completely stop the progression of the disease.

My great grandmother's cancer was treated using radiation. Initially, radiotherapy was seen to deliver higher rates of cardiac and pulmonary toxicity among patients, and therefore was not used as often as it is now. However, by the 90s, radiotherapy had evolved to include a computed tomography scanner which allowed for much more accurate treatment. This allowed the radiation to be more specifically placed on a patient's body, which helped to put less organs in danger by using this method. Before this radiotherapy was approved for human use, however; it was first tested on animals. By injecting this radiation into animals, scientists were able to further understand the biology of tumors and how they responded to the treatment.

I am eternally grateful for the treatments that were developed through animal research that saved my great grandmother. Twenty-nine years later, she is still as stubborn as ever, and about to celebrate her 98th birthday on March 23 - which happens to be my birthday as well. I cannot imagine a world where I wouldn't know my favorite birthday twin, and I know I must credit the key advancements in animal research that led this to be possible. She has, and continues to live a very happy life, and I am so grateful to be able to know her.

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