

Of Determination and Dreams

“Eat more, you are too skinny!” my grandmother exclaims. Catching up with her while she piles mountainous heaps of the best food in existence onto my plate provides rare moments of peace in my busy life.

My grandmother has wise wrinkles and a fiery tongue. I remember my five-year-old self boasting that I would become a doctor and later bemoaning that I would fail because I couldn't cure my own stomachaches from overeating her delicious food. She rubbed my stomach and told stories about hurdling societal barriers to become a civil engineer. Her anecdotes of courage and persistence inspired me to follow my own dreams of becoming a doctor and never give up.

On my 12th birthday, my family received a terrifying call--a stage two tumor was discovered in my grandmother's left breast. Heartbroken, I feared that our afternoon stories, walks in the park, and cook-offs were nevermore. I had never been so painfully petrified.

My grandmother received a mastectomy, and to prevent tumor growth in her right breast, she was put on Tamoxifen. Tamoxifen competes with breast cancer cells that rely on the hormone estrogen by binding to estrogen receptors, thus halting cancer growth. The creation of this drug, the most effective breast cancer treatment today, depended on animal testing. In early stages of drug development, rat mammary carcinoma models informed scientists of Tamoxifen's anti-tumorous properties. The models revealed that five months of small doses of the drug inhibited cancer completely. Encouraged by the results, researchers conducted trials in humans and proved that Tamoxifen enhances survival rates, preventing nearly half of cancers. In addition to curing breast cancer, Tamoxifen is found to decrease risk of osteoporosis, which proved crucial as my grandmother's genetics foreshadowed bone degeneration. My grandmother was a perfect candidate for this drug that has saved millions of lives and would not exist absent animal research.

Following her cancer clearance, I spent as much time as possible with my grandmother. But four years later, disaster struck again. She began experiencing extreme fatigue and weight loss and noticed blood in her urine. The diagnosis was stage three kidney cancer.

It was a devastating blow. Defeating breast cancer had been taxing, and facing a more progressed cancer so soon after recovery was particularly cruel. Chemotherapy, the most notorious cancer treatment, was her best option.

My grandmother's life was to be saved by animal research a second time. Like Tamoxifen, Chemotherapy has an intensive animal-testing history, with roots tracing back to World War II studies on nitrogen mustard gas which regressed tumors in mice. Chemotherapy's side-effect of bone marrow depression was predicted and prevented through animal testing.

Treatment was grueling because of distressing side-effects on my grandmother's frail body. We nearly lost her. But against all odds, my grandmother's persistence won, and she remains cancer-free today.

We are indebted to the cures that helped my grandmother win two life-saving battles, and animal research is of great importance to me despite its controversiality. I love animals and abhor animal cruelty. However, the imperative nature of animal research justifies its use in the biomedical field. Animal-based studies assisted development of non-animal methods for testing and screening potential anticancer drugs. Scientists can now grow *in vitro* cells for screening compounds before administration to animals, which reduces the number of animals needed for testing. Most importantly, countless lives such as my grandmother's have been saved thanks to animal research, and the remission rate for cancer patients is now 85%. Animal studies remain at the forefront of the fight against cancer as an integral part of biomedical research because of its practicality and ability to provide hope for those who are suffering.

At seventy-five years of age, my grandmother is a true force to be reckoned with. Despite her medical hardships, her unyielding spirit still shines in her gaze. The success of her treatments heightened my love and respect for the biomedical community immensely. I recently told my grandmother over a bowl of her delectable tomato soup that my dream of becoming a doctor is now accompanied by a vision of myself finding cures for cancer through research. I described summer internships at UoA and ASU where I studied pulmonary hypertension and Alzheimer's pathology with animal samples by running western blots and immunohistochemistry, dissecting rat samples, and extracting RNA. My grandmother's determination to survive inspired me to constantly pursue opportunities to immerse myself in the world that saved her life and countless others, and I love it.

Bibliography

DeVita, Vincent T., and Edward Chu. "A History of Cancer Chemotherapy." *Cancer Research*. American Association for Cancer Research, 01 Nov. 2008. Web. 5 Mar. 2017.

"Imaginis." *Basic Information On Tamoxifen | Breast Cancer Treatment | Imaginis - The Women's Health & Wellness Resource Network*. N.p., n.d. Web. 27 Feb. 2017.

"Animal research is helping us beat cancer." *Cancer Research UK - Science blog*. N.p., n.d. Web. 27 Feb. 2017.

"Tamoxifen – incremental progress, massive impact." *Cancer Research UK - Science blog*. N.p., n.d. Web. 2 Mar. 2017.

"Breast cancer." *Breast cancer*. N.p., n.d. Web. 29 Feb. 2017.

"Posts about animal testing chemotherapy on Speaking of Research." *Speaking of Research*. N.p., n.d. Web. 5 Mar. 2017.