

**2023 PSBR High School Essay Contest**  
**2<sup>nd</sup> Place**

**Noah S.**  
Norwin High School  
North Huntingdon, PA

Biomedical Research and My Life

Chemotherapy is the use of drugs to destroy harmful cancer cells in an organism's body. This treatment is targeted toward quickly dividing cells and stops these cells from growing or dividing further. Chemotherapy can shrink tumors, get rid of all cancer cells in someone's body, or keep these cells from coming back. Chemotherapy is used to treat many types of cancer, and it was used to treat my grandmother's breast cancer when she developed it. If not for the developments in chemotherapy, my grandmother may have not been able to survive her cancer. A large amount of credit for these developments in cancer treatment through chemotherapy can be attributed to animal testing. Without it, chemotherapy would not be at the level of treatment it would be now.

Chemotherapy originated from the usage of mustard gas in World War I. Experiments were held on animal models, and mustard gas that was applied to mice with chemically-induced tumors had resulted in the regression of the tumor's cells. Eventually, more experiments had taken place, and an adequate dosage amount had been found by scientists. This allowed for a clinical experiment to be held in 1931. Relief and disappearance of tumors were reported from the clinical experiment, which demonstrated the potential usage of these chemicals in treating tumors.

Nitrogen mustards had grown the attention of scientists during World War II, and more experiments were held on animal models, most commonly mice. These mice again demonstrated regression of tumor cells, yet the tumors eventually returned. The tumors were again treated with nitrogen mustards, and it worked just as well as it had initially. Additionally, the mice that were tested survived much longer than those that were not, living over three times longer. Another trial was held with humans, and similar results were shown.

After experiments with mice that demonstrated how a single leukemic cell could be deadly to the organism, scientists realized the severity of the problem, and that every cell would need to be destroyed in order to ensure survival and prohibit the cells from growing and dividing. This, in turn, led to more aggressive approaches to the destruction of harmful and cancerous cells. This led to a large increase in remission rates for these cells. All of these factors combined led to the modern-day usage of chemotherapy to treat these harmful and cancerous cells.

Animal models are still widely used in cancer and chemotherapy research. The use of these models can demonstrate how cancerous cells grow, divide, and spread throughout the body. Mice are widely used animal models in this field because of how it is possible to

reproduce the types of tumors found in humans in mice. This then leads to the demonstration of the rates of factors like growth and division. The genetic makeup of mice can also easily be manipulated, allowing for additional adjustments to be made to gain more knowledge on how human cancerous cells work. Another type of test done with mice, other than tracking rates of growth and division, is drug testing. Drugs can be used on mice or other animals with harmful or cancerous tumors similar to humans in order to understand how exactly that drug will affect the organism and the harmful or cancerous cells or tumors. This then allows for knowledge of what drugs could be useful or beneficial in the treatment of tumors in humans. Some drugs have the potential to slow growth rates or destroy harmful cells, and this potential is determined by the tests done on animal models, like mice.

Animal models are even used in other treatments involving cancer other than chemotherapy. Immunotherapy, the treatment of an immune system in order to combat cancer, has its origins in animal models and testing. Mice with chemically-induced tumors were used to study immunotherapy and how it could be further implemented in the treatment of cancer. Without these studies done on animal models, immunotherapy and other forms of cancer treatment would not have reached the level of success that they do today.

Overall, if not for the presence of animal testing in chemotherapy treatment, my grandmother would have a lesser chance of surviving to the age she is now, and being able to live out her life fully, surviving cancer. I hope that with the help of humane animal testing, humanity can someday find a cure for cancer, and save so many lives that would have been taken by it otherwise.

#### Works Cited

*Animal testing significantly advances cancer research.* (n.d.). Retrieved February 22, 2023, from <https://www.pharmamodels.net/blog/animal-testing-significantly-advances-cancer-research/>

Budhu, S., Wolchok, J., & Merghoub, T. (2014). The importance of animal models in tumor immunity and immunotherapy. *Current Opinion in Genetics & Development*, 24, 46–51. <https://doi.org/10.1016/j.gde.2013.11.008>

*Cancer.* (n.d.). Ari.Info. Retrieved February 22, 2023, from <https://www.animalresearch.info/en/medical-advances/diseases-research/cancer/>

*How we use animals—The institute of cancer research, london.* (n.d.). Retrieved February 22, 2023, from <https://www.icr.ac.uk/our-research/about-our-research/animal-research/animal-research-at-the-icr>

Sangild, P. T., Shen, R. L., Pontoppidan, P., & Rathe, M. (2018). Animal models of chemotherapy-induced mucositis: Translational relevance and challenges. *American Journal of Physiology-Gastrointestinal and Liver Physiology*, 314(2), G231–G246. <https://doi.org/10.1152/ajpgi.00204.2017>

*What is Chemotherapy?* (2012, November 9). Cancer.Net.  
<https://www.cancer.net/navigating-cancer-care/how-cancer-treated/chemotherapy/what-chemotherapy>

*What is immunotherapy? | immunotherapy for cancer.* (n.d.). Retrieved February 22, 2023,  
from <https://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/immunotherapy.html>