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Identifying the Relationship Between Benzene Exposure and the Development of Acute Myeloid Leukemia

Jacqueline Tally
Sponsor: Marcella Thompson, Nursing

My interest in epigenetic carcinogenesis-related research stems from both academic and personal experiences. I have come to recognize the significance of environmental chemical exposures in the development of cancer through my studies in nursing, and nutrition and food science. I am particularly interested in the epigenetics of acute myeloid leukemia (AML) because I am an AML survivor.

AML is a rare and highly malignant cancer. It is estimated 13,780 new cases of AML will be identified in the United States this year with a 74% mortality rate (calculated 10,200 deaths/13,780 new cases). AML develops from alterations in the survival and proliferation of hematopoietic stem cells in the bone marrow microenvironment. If AML is not diagnosed early and aggressively treated, bone marrow failure and death occur.

Twenty percent of AML cases have known environmental-related etiologies. These environmental risk factors include cigarette smoke, radiation exposure, and exposure to chemicals (e.g., benzene, organic solvents, and anti-neoplastics). Benzene is one of the most commonly used chemicals in the U.S. Exposure to environmental benzene, even at low levels, has been associated with the disruption of normal hematopoiesis resulting in AML. However, benzene's mechanism of action leading to the development of AML is not fully understood.

Less than ten percent of AML cases are caused by genetic factors, and up to eighty percent of AML cases are of unknown cause. More research is needed to identify factors that contribute to AML etiology.

Through my review of the scientific literature, I have gained insight into the normal cellular processes involved in hematopoiesis, the cellular alterations associated with AML, and benzene's modes of action on the induction of AML. My research poster and article-formatted outline are synopses of what is known and not known about benzene-induced AML. With the completion of this project, I have strengthened my literature research skills, learned the process of gathering and synthesizing data, and developed a sense of what it is like to conduct research as a career opportunity.

Keywords: epigenetics, AML, benzene, exposure, environment, carcinogenesis, hematopoetic stem cell, hematopoiesis