

Project Title: Augmentation of BDNF levels to Prevent Cancer-related Cognitive Impairment (ABC Study)

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In 2020, it is estimated that >3.8 million US women with a history of breast cancer are alive and cured from breast cancer. While treatment is highly effective, research studies have also shown that cancer and its treatment can poorly impact cognitive function in survivors of cancer, affecting memory formation, attention problem, multi-tasking and planning, which are important for survivors to reintegrate back to normalcy after cancer. In our past research studies, we found out that at least 1 in 3 patients experience some type of declining word usage and concentration problems, which is a highly common problem among cancer survivors. Unfortunately, very few effective therapies are available to prevent and treat this problem, making this an extremely serious unmet medical need for many cancer survivors. Riluzole is a drug that is currently used for treating amyotrophic lateral sclerosis, which is a very rare progressive nerve disease that can affect nerve cells in the brain and spinal cord. Riluzole is an oral drug with an excellent safety profile. Past research studies have shown that riluzole is able to increase a protein called brain derived neurotrophic factor (BDNF) in the blood and in the brain, and patients with reduced levels of this protein experience cognitive problems. BDNF can also stimulate nerve cells to grow in the brain. In our past research studies, cancer patients with reduced cognitive function after chemotherapy are likely to have lower blood levels of BDNF, which may explain why patient treated with chemotherapy have poor cognitive function. Hence, we are proposing a study to evaluate whether riluzole can increase BDNF levels in mice that are given chemotherapy, and in turn, preventing them from having cognitive problems. This study will shed light on whether riluzole is useful for preventing cognitive decline in future human studies. In this proposed study (ABC study), we will compare the BDNF levels in chemotherapy-treated mice that are given and not given riluzole, and we will also test the cognitive function of these two groups of mice. We will also perform experiments to check whether riluzole can affect the birth of new nerve cells and nerve stem cells. If successful, our project will lay the foundation for novel therapeutic interventions designed to prevent cognitive problems in patients and survivors who are treated for cancer.