Acute lymphoblastic leukemia (ALL) is one of the most common cancers diagnosed in children. Breakthroughs such as tyrosine kinase inhibitors and other targeted treatments have increased overall patient survivability. However, chemotherapeutic agents can lead to acquired molecular resistance resulting in recurrent tumor tissue, severe toxicity in non-tumor tissues, and systemic side-effects. In order to circumvent these negative attributes of cancer treatment regimes, our work studies the effects of low temperature atmospheric pressure plasma on a cell line of human T-cell acute lymphoblastic leukemia cells.

The aim of this work was to determine the activity of low temperature atmospheric pressure plasma (LTAPP) towards CCRF-CEM human T-cell leukemia cells. The plasma pencil was used to generate the LTAPP to inhibit the progression of cancerous cells. The ALL leukemia cells were grown according to standard cell culture protocols using RPMI-1640 supplemented media in tissue culture flasks. Approximately \(10^6\) cells per well were seeded on 24-well culture plates and exposed to different doses of LTAPP. We hypothesized that the plasma exposure would activate apoptosis in a dose dependent manner. Trypan blue exclusion assay was used to calculate cell death at various times post plasma exposure. In addition, various approaches such as monitoring cellular morphological changes and DNA damage were used to detect if cell death was due to apoptosis or necrosis. The outcome of this study revealed that increasing the time of plasma exposure results in increased CCRF-CEM leukemia cell death. Our study indicates that non-thermal atmospheric pressure Helium gas plasmas promises to be a potentially novel and safe technology for use in cancer therapy.
