

INVESTIGATION OF THE EFFECT OF ATMOSPHERIC PRESSURE LOW TEMPERATURE PLASMA
ON HUMAN LUNG ADENOCARCINOMA

No. 2181285 Kyota Yoshino

(Supervised by Prof. Akira Mori)

ABSTRACT

A tumor is a mutation and abnormal growth of body-forming cells that is not easily controlled by external factors. Tumors can be malignant or benign. Among malignant tumors, those that develop in the epidermis are called carcinomas. Among cancers, lung cancer has a high morbidity and mortality rate, and in Japan, it ranked first in terms of the number of deaths by site in 2019. Among these, this study focused on adenocarcinoma of the lung, which occurs in the entire lung. This is because adenocarcinoma of the lung accounts for about half of all lung cancers, is known to have little association with smoking, and is frequently observed in young people and women. Currently, surgical treatment, drug therapy, and chemotherapy are mainly used. Although minimally invasive surgical treatments such as thoracoscopic surgery exist, surgery is often performed through a large incision in the affected area. Drug therapy and chemotherapy cannot selectively kill only cancer cells, but can damage normal cells as well, resulting in side effects. They are mentally and physically demanding and risky. Therefore, a less invasive treatment method is needed.

The authors will investigate the application of Atmospheric Low Temperature Plasma (ALTP) as a treatment method. Plasma is a state in which atoms and molecules are ionized into cations and electrons, and is described as the fourth state after solid, liquid, and gas. In plasma, various phenomena are produced by ionized nuclei and electrons. Previous research conducted at Tohoku University on human colorectal cancer cells suggested that the plasma inhibited the growth of cancer cells. However, there are many issues that remain to be solved for practical application, including safety and efficacy, because the detailed mechanism of action and differences in effects among different cancer types remain to be clarified. In this study, we focused on lung adenocarcinoma, which is the most common type of cancer in Japan, and aimed to elucidate the mechanism of action of ALTP.

We evaluated the efficacy of ALTP as a therapeutic method by examining its effect on the number of viable cells, expression analysis of apoptosis-related genes, and effect on cell migration ability. The results showed that the ALTP-irradiated group showed a decrease in cell proliferative ability, induction of apoptosis, and decrease in cell migration ability compared to the control group in which normal cell culture was performed. Therefore, ALTP may be useful as an adjuvant therapy when used in combination with current cancer treatment methods.