

# EFFICACY STUDY OF PLASMA TREATED SALINE SOLUTION FOR APPLICATION TO COLORECTAL CANCER TREATMENT

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## ABSTRACT

Cancer is the most common cause of death in Japan. Among these, colorectal cancer affects the largest number of people and is second only to lung cancer in the number of deaths. However, advanced colorectal cancer is treated with highly invasive surgical treatment and drug therapy and chemotherapy, which cause side effects, and there is a possibility that patients will not be able to return to their conventional lives after treatment. Therefore, new, less invasive treatment methods are required. Plasma is being considered as one of the new treatment methods. Plasma is called the fourth state of matter after the three states of matter, and refers to the ionized state of matter associated with an increase in entropy. Currently, technological developments have made it possible to generate plasma at low temperatures under atmospheric pressure, and research is underway to apply this technology to living organisms. Research results suggest that it induces cell death against cancer cells. From previous studies, the effects of plasma on various cancers have been studied in this laboratory. Previous studies in this laboratory suggested that colon cancer cells in the medium irradiated with plasma inhibit proliferation.

Based on the previous studies on colon cancer cells in our laboratory, we examined the effect of plasma on colon cancer in vivo in this study. In examining the in vivo effects, azoxymethane and sodium dextran sulfate were used to create a rat model of colorectal cancer. Since direct plasma irradiation into the colon is invasive, plasma irradiated saline solution (Plasma Treated Saline: PTS) was used to examine the effect of plasma irradiation on colon cancer. PTS was administered intestinally, as in intestinal lavage, or intravenously, as in intravenous injection or infusion, and its effects were examined.

The results of this study suggest that intestinal administration of PTS is less effective against colorectal cancer. On the other hand, tail vein administration of PTS inhibited tumor enlargement. Gene expression analysis of TNF- $\alpha$ , an upstream factor of caspase-3, which induces cell death called apoptosis, showed that TNF- $\alpha$  was expressed by tail vein administration of PTS. In addition, gene expression analysis focusing on tumor enlargement revealed the expression of TSP-1, a gene that suppresses angiogenesis, which is necessary for tumor enlargement. In addition, the expression of IL-6, which induces cachexia, one of the properties of cancer, through browning of fat, was suppressed. Based on this study, tail vein administration of PTS may delay the progression of colorectal cancer.