

INVESTIGATION OF THE THERAPEUTIC EFFECT AND ELUCIDATION OF
THE HEALING MECHANISM OF ATMOSPHERIC LOW TEMPERATURE PLASMA
IRRADIATION ON BURN WOUNDS

No. 2281288 Yuki Mori

(Supervised by Prof. Akira Mori)

ABSTRACT

A burn is a wound that is caused by high heat applied to the skin surface. Current treatments include topical medications and wound dressings to prevent infection and promote wound healing. Long-term use or excessive application may cause side effects such as skin atrophy and drug allergic reactions. Therefore, new treatment methods that are less invasive and shorten the wound healing period are needed.

Recently, Atmospheric Low Temperature Plasma (ALTP) has been investigated as a new, less invasive treatment method. Plasma is the fourth state of matter after the three states of matter and refers to the electrified state of matter. ALTP has been reported to promote wound healing, but the detailed mechanism leading to healing has not been elucidated. In the present study, we investigated the effect of ALTP irradiation on the healing process.

A comparison of the healing status of the ALTP irradiation group and the non-irradiation group at the burn site showed that ALTP irradiation accelerated healing. Gene expression analysis using real-time PCR revealed that the expression levels of angiogenesis-promoting factors (*VEGF-A*, *SDF1*) were significantly increased by ALTP irradiation on day 14, which corresponds to the proliferative phase. In addition, it was confirmed that the expression levels of *IL-6*, which is a type of inflammatory cytokine, and *HIF-1 α* , which promotes the release of inflammatory cytokines and the migration of inflammatory cells, were significantly increased by ALTP irradiation on days 1 and 3, which correspond to the inflammatory phase.

These results suggest that ALTP irradiation stabilized and increased the transcription and expression of *HIF-1 α* , which contributed to the increased expression of *IL-6*, an inflammatory cytokine, during the inflammatory phase and to the increased expression of *VEGF-A* and *SDF-1*, angiogenesis-promoting factors, during the proliferative phase, thereby affecting the inflammatory and proliferative phases of the wound healing process, thereby shortening the wound healing period.