

News Release

Title

Proposal of a Novel Treatment with Plasma Activated Liquids for Peritoneal Metastasis in Pancreatic Cancer.

Key Points

- Plasma activated Lactated Ringer's solution (PAL) had an anti-tumor effect on pancreatic cancer cell lines.
- PAL weakened the adhesive ability of pancreatic cancer cells.
- Intraperitoneal injection of PAL inhibited the formation of peritoneal metastases *in vivo*. These results suggest that PAL has potential as a novel therapeutic option for peritoneal metastasis in pancreatic cancer.

Summary

The research team led by Prof. Yasuhiro Kodera (Department of Gastroenterological Surgery) of Graduate School of Medicine, Nagoya University, in collaboration with Prof. Masaaki Mizuno (Center for Advanced Medicine and Clinical Research) in Nagoya University Hospital and Prof. Masaru Hori (Institutes of Innovation for Future Society) from Nagoya University Graduate School of Engineering reported Plasma activated Lactated Ringer's solution has potential as a novel therapeutic option for peritoneal metastasis in pancreatic cancer.

The medical applications of non-equilibrium atmospheric pressure plasma in cancer therapy have attracted attention. We previously reported on the anti-tumor effect of plasma-activated medium on gastric cancer and pancreatic cancer. However, this approach requires plasma-activated liquids that are administrable to the human body to use in clinical setting. In this study, we produced plasma-activated lactated Ringer's solution (PAL) and demonstrated its anti-tumor effect and mechanism on pancreatic cancer cells. Furthermore, we showed the effect of the intraperitoneal administration of PAL using a peritoneal dissemination mouse tumor model. Intraperitoneal injection of PAL inhibited the formation of peritoneal metastases. These results suggest that PAL has potential as a novel therapeutic option for peritoneal metastasis in pancreatic cancer.

Research Background

Pancreatic cancer carries a dismal prognosis. Of the various patterns of metastasis observed in this lethal disease, peritoneal dissemination is relatively common, and often affect patient quality of life. Systemic chemotherapy or peritoneal chemotherapy has been attempted in these patients, but satisfactory results have not been obtained. Recently, the medical applications of non-equilibrium atmospheric pressure plasma in cancer therapy have attracted attention. We previously reported on the anti-tumor effect of plasma-activated medium. However, this approach requires plasma-activated liquids that are administrable to the human body.

Research Results

We produced the plasma activated lactated Ringer's solution (PAL) by irradiating lactated Ringer's with non-equilibrium atmospheric pressure plasma. We demonstrated that PAL had an anti-tumor effect on pancreatic cancer cell lines using cell proliferation assay. The TUNEL assay showed that PAL induced apoptosis. ROS uptake was observed in PAL-treated cells, and the anti-tumor effect was inhibited by NAC which is ROS scavenger. Cell adhesion was also suppressed by PAL. Finally, we demonstrated that intraperitoneal injection of PAL inhibited the formation of peritoneal metastasis *in vivo* without adverse side effects.

Research Summary and Future Perspective

We demonstrated that PAL has anti-tumor effects via inducing apoptosis in pancreatic cancer cells and that these effects were mediated by ROS. Furthermore, we demonstrated that PAL affected the adhesive ability of cancer cells and that intraperitoneal injection of PAL inhibited the formation of peritoneal metastases *in vivo*. These results suggest that PAL, which was produced using liquids that are administrable to the human body, has potential as a novel therapeutic option for peritoneal metastasis.

Publication

Effect of plasma-activated lactated Ringer's solution on pancreatic cancer cells *in vitro* and *in vivo*

Yusuke Sato, MD, Suguru Yamada, MD, PhD, FACS, Shigeomi Takeda, MD, Norifumi Hattori, MD, PhD, Kae Nakamura, PhD, Hiromasa Tanaka, PhD, Masaaki Mizuno, MD, PhD, Masaru Hori, PhD and Yasuhiro Kodera, MD, PhD, FACS

Annals of Surgical Oncology, published online on November 14, 2017.

DOI : 10.1245/s10434-017-6239-y

Japanese ver.

https://www.med.nagoya-u.ac.jp/medical_J/research/pdf/Annals_of_S_20171121.pdf