Effects of combined plasma jet and gemcitabine treatments on tumor proliferation of a murine orthotopic pancreatic carcinoma model

Laura Brullé[1,2], Delphine Ries[3], Marc Vandamme[1,3,4], Eric Robert[3], Stéphanie Lerondel[1], Eric Martel[2], Alain Le Pape [1], Jean-Michel Pouvesle[3].

[1] : *TAAM-CIPA, UPS44 CNRS, 45071 ORLEANS cedex 2, France.*
[2] : *CERB, 18800 Baugy, France.*
[3] : *GREMI UMR-7344 CNRS, Université d'Orléans, 45067 ORLEANS cedex 2, France.*
[4] : *GERMITEC SAS, 30 rue Mozart, 92110 CLICHY, France*
E-mail: laura.brulle@cnrs-orleans.fr

Cancer of the exocrine pancreas is rarely curable and has an overall survival rate of less than 4%. While it is relatively rare for the time being, pancreatic cancer is also one of the most formidable and its incidence appears to increase significantly with number of cases of diabetes. Chemotherapy and radiotherapy treatments showed limited efficacy, development of new therapeutic strategies is then necessary.
Recent results were obtained on the treatment of glioblastoma [1] and colon carcinoma [2] using non thermal plasma (NTP). They led us to assess the antitumoral effect of NTP alone or in combination with gemcitabine a reference chemotherapeutic agent with radiosensitizing properties, on pancreatic cancer.
Experiments were carried out using the Plasma Gun developed in GREMI both *in vitro* on MIA PaCa2-luc cell lines (pancreatic cancer cells) and *in vivo* on orthotopically grafted tumor cells to induce a pancreatic carcinoma model in immunodeficient mice.
Plasma Gun showed an *in vitro* significant antitumor activity with an IC50 corresponding to 13s exposure duration. *In vivo* experiments were carried out using four mouse groups: one control group, one group treated only with gemcitabine (200 mg/kg), one group treated only using the Plasma Gun, and one group treated using a combination of gemcitabine (200 mg/kg) and Plasma Gun.
Our data showed a significant inhibition of tumor growth in NTP and/or gemcitabine treated mice, this from the 20th day post treatment. We demonstrated that plasma gun induced an inhibition of MIA PaCa2-luc cell proliferation *in vitro* and *in vivo* and that this effect is enhanced when combined with gemcitabine, a radiosensitive agent, this later being reported for the first time *in vivo*. Given these results, the possibility to use NTP in combination with a chemotherapeutical agent to increase its effects seems of very high interest for further developments in oncology involving cold plasmas, eventually delivered through an endoscopic approach. There is also a need for optimization of the sequence of chemotherapeutic agent administration and NTP exposition. This will be done in a forthcoming study.

References

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