Anticancer Res. 2013 Nov;33(11):4827-32.

# Effect of hyperbaric oxygenation and gemcitabine on apoptosis of pancreatic ductal tumor cells in vitro

Gerardo Bosco [1], Luca Guizzon, Zhongjin Yang, Enrico Camporesi, Andrea Casarotto, Claudio Bosio, Devanand Mangar, Chung Chen, Marta Cannato, Luana Toniolo, Giacomo Garetto, Emanuele Nasole, Claudio Bassi

Affiliations
PMID: 24222119



## Abstract

**Background:** Gemcitabine is first-line therapy for advanced pancreatic ductal adenocarcinoma (PDAC) with a poor survival and response rate. Hyperbaric oxygenation (HBO) enhances delivery of oxygen to hypoxic tumor cells and increases their susceptibility to cytotoxic effects of chemotherapy. We hypothesized that the anticancer activity of gemcitabine (GEM) may be enhanced if tumor cells are placed in an oxygen-rich environment. The present study evaluated the effects of gemcitabine, HBO and their combination on apoptosis of tumor cells.

**Materials and methods:** PANC-1 and AsPc-1 PDAC tumor cell lines were used. Cultured tumor cells were treated with GEM at its growth-inhibitory concentration (IC50) and HBO at 2.5 ATA for 90 min or a combination of both (HBO then GEM and GEM then HBO). Twenty-four hours later, apoptotic cells in each group were analyzed and the apoptotic index (AI) was calculated.

**Results:** PANC-1 cell line: HBO alone had no effect on AI: 6.5 ± 0.1 vs. 5.9 ± 0.1. HBO before and after gemcitabine did not further increase AI: 8.2 ± 0.1 (HBO-GEM), 8.5 ± 0.1 (GEM-HBO) vs. 8.1 ± 0.1 (GEM). The combination of HBO and gemcitabine significantly increased AI: 10.7 ± 0.02 ($p<0.001$ vs. all groups). AsPc-1 cell line: HBO-alone had no effect on AI: 5.9 ± 0.1 vs. 5.9 ± 0.1. HBO before and after gemcitabine did not further increase AI: 8.2 ± 0.1 (HBO-GEM), 8.4 ± 0.1 (GEM-HBO) vs. 8.0 ± 0.1 (GEM). The combination of HBO and gemcitabine significantly increased AI: 9.7 ± 0.1 ($p<0.001$ vs. all groups).

**Conclusion:** HBO-alone, whether administered before and after gemcitabine has no effect on apoptosis of PDAC cells in vitro. HBO significantly enhanced gemcitabine-induced apoptosis when administered during gemcitabine. Our findings suggest that the time window would be critical for using HBO as adjuvant to chemotherapy.

**Keywords:** AsPc-1 cells; PANC-1; Pancreatic ductal adenocarcinoma; apoptotic index; gemcitabine; hyperbaric oxygen therapy.

## Related information

MedGen
PubChem Compound (MeSH Keyword)

## LinkOut - more resources

**Full Text Sources**
HighWire

**Medical**
MedlinePlus Health Information

**Research Materials**
NCI CPTC Antibody Characterization Program