Breast cancer is one of the major malignant tumors for women, which has the highest incidence for women in America, and cause the second highest mortality among other cancers. Traditional treatment of breast cancer includes surgery, radiation treatment and chemotherapy, most of which have various disadvantages and side effects. Gemcitabine is a clinical used chemotherapeutic drug, inhibiting tumor through cytotoxic activity.

In this study, a novel promising technique in cancer therapy, the nanosecond pulsed electric fields (known as nsPEFs), was applied in combination with Gemcitabine to the treatment of 2 types of human breast cancer cell lines MCF-7 and MDA-MB-231. Both kinds of cells were exposed to nsPEFs before treated with Gemcitabine. Significant inhibitory effects were achieved in both cell lines, verified by MTT tests (viability test). A 5-fold increase of cell inhibition was detected in cells pulsed before exposing to Gemcitabine compared to treated by Gemcitabine alone. The typical morphological changes of cell apoptosis were observed by TEM, and apoptosis evaluated by cytoflowmetry. Transwell invasion assay and clonogenic assay indicated a decrease in the cell ability of migration and proliferation after the combined treatment. It is hypothesized that nsPEFs triggered cell functions, inducing cell apoptosis, and enhanced the inhibition effects in the treatment of Gemcitabine after nsPEFs exposure. This novel combined approach in breast cancer treatment may have potential applications in clinical medicine.

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Jinsong Guo, Shan Wu, Wendong Wei, Jue Zhang, and Jing Fang

Academy for Advanced Interdisciplinary Studies, Peking University, Beijing, China

Jing Wang

School of Stomatology, Lan Zhou University, Lanzhou, China