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Study of Effects of Nanosecond Pulsed Electric Fields on Cancer Cell by using in Vivo and ex vivo Assay.

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Treatment approach of malignant neoplasm (cancer), which has high probability to death, has been actively studied. Although there are several current cancer therapy as radiation therapy, surgical therapy, and chemotherapy (anticancer drugs), these therapy have some disadvantages such as radiation to patient and critical side effects. The goal of this study was to establish a new cancer therapy, using nanosecond pulsed electric fields (nsPEFs), so as to lead to regression of these disadvantages.

2ns-PEFs were applied on solid tumors obtained by embryonic chick assay. The tumors were dissected from the eggs in a few days after the PEFs application and were weighed. It was confirmed that the mean weight of the pulse-treated tumors was significantly smaller than that of controls; tumor growth was constricted by nsPEFs application. The nsPEFs were applied subsequently to the tumor cell suspension to examine the effect of nsPEFs application in detail. The viability of tumor cells was measured by the WST-1 assay (water soluble tetrazolium salts) in advance. In increasing the charging voltage and the number of times, the viability of pulse-treated cells was significantly smaller than that of controls which were not exposed to nsPEFs. By using a flow cytometry with Apoptotic/Necrotic/Healthy Cells Detection Kit, it was confirmed that apoptosis was induced and necrosis was slightly occurred in cell by nsPEFs application. In addition, it was confirmed that equal or more apoptosis in cells were induced by nsPEFs application than Anisomycin application as a positive control. In other words it was also confirmed that apoptosis was induced. In the same way, an ex vivo assay was performed on pulse-applied solid tumors obtained by embryonic chick assay. The discussions will be presented in detail.

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