

EFFECT OF PULSING SEQUENCE OF NANOSECOND PULSED ELECTRIC FIELDS ON HELA CELLS

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There are a number of studies that show the biological effects of intense pulsed electric fields (PEFs) dependent on the waveform of the pulses such as duration, rise time as well as the number of pulses. PEFs with a pulse duration exceeding 1 μ s cause the increase in the permeability of cell membrane in other words electroporation. As the duration and rise time of PEF are decreased to nanosecond range, the cell response changes. Schoenbach et al. have reported that nanosecond pulsed electric fields (nsPEFs) cause intracellular effects. Also they have successfully reduced melanoma on mice. Here, we have examined the effect of pulsing sequence including pulse repetition rate and the pulse number on the biological activity of cultured HeLa cells. The pulse compression generator (MPC300S, Suematsu Denshi) was used to deliver repetitive 100 ns long high voltage pulses to HeLa cells in a cuvette electrode. Our experiment shows that the apoptosis activity in HeLa-S3 depends on the pulse repetition rate. Unexpectedly, pulsing with low repetition rate less than 1 pulse per second (pps) induces more apoptosis compared to highly repetitive operation which is accompanied by the transient thermal effect. We have investigated the apoptosis signal cascade dependent on the pulsing sequence by means of flow cytometry (FCM) and realtime polymerase chain reaction (RT-PCR). Also we will report the effect on the mature fat cells.

1. K. Abe, N. Nomura, J. Zhang, M. Yano K. Mitsutake, S. Katsuki, H. Akiyama and S.I. Abe, "Effect of Intense Burst Sinusoidal Electric Fields (IBSEF) on HeLa cell and animal organ" International Bioelectrics Symposium, June25-26, 2009, PB1

* Work supported by the Global COE program on "Pulsed Power Science" administrated by Kumamoto University.