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3P60 - Optimization of GFP introduction into HL-60 cells with a combination of two different rectangular pulses

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Electroporation is a method to introduce genes into cells. In electroporation, voltage pulses are used to create pores on cell membrane, and then genes are expected to be introduced into cells through the pores. A condition of voltage pulse is very important factor to achieve high efficiency of introduction.
In this study, two different rectangular voltage pulses were applied in a short time to HL-60 (human promyelocytic leukemia cells) to introduce a GFP (green fluorescent protein). A nano-second high voltage pulse (15 - 200 ns, 500 - 5 kV) was applied first, and a second pulse was applied after 100 ms. The condition of second pulse (i.e. pulse duration and amplitude of voltage) was selected from 10 microsecond to 1 second and from 4 V to 400 V, respectively.
The conditions of HL-60 after pulsing were roughly divided into three types: 1st - no effect (no electrical damage, no introduction), 2nd - too much damage by voltage pulses, and 3rd - good introduction, and were plotted in a graph with an electric field on the vertical axis and an input energy on the horizontal axis. The graph showed that there was an area suitable for introduction. The best conditions of two pulses were easily found by the graph.

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