ABSTRACT

From its introduction, in utero electroporation has been recognized as a powerful tool to manipulate neural-precursor cells of the parietal cortex and their progeny in vivo. Although this technique has unlimited potentials for targeting numerous brain areas, the experimental outcome appears to have been hindered so far by low reliability of transfection in some brain regions and by the inability to target other regions. Here, we present a new in utero electroporation configuration based on the use of three electrodes that overcomes the physical limitations of the standard bipolar configuration. We report how the proposed configuration allows for exceedingly reliable mono/bilateral transfection at different brain locations only sporadically targeted before, by simply adjusting the relative positions and polarities of the three electrodes. Indeed, we provide experimental evidence supported by a mathematical simulation, of the consistent improvement obtained in the efficiency of the electrical field distribution to target hippocampus motor cortex and visual cortex. The proposed multi-electrode configuration, in virtue of this increased efficacy of the electrical field also extends the developmental timeframe for reliable electroporation, allowing for the first time specific transfection of Purkinje cells in the cerebellum.