



## **Short intense electric pulses applied to cells in vitro and in vivo: from models to recent new developments of medical applications**

Luis M. Mir\*, Leslie A. Vallet, and Franck M. André

Systemic and Metabolic Aspects of Oncogenesis (METSYS), Université Paris-Saclay, CNRS, Gustave Roussy, 94805 Villejuif, France, e-mail: luis.mir@cnr.fr; leslie.vallet@gustaveroussy.fr; franck.andre@cnr.fr

### **Extended Abstract**

The team at Villejuif has explored electropulsation basics since several years. Electropulsation is not a classical term to refer to the consequences at the level of cell membrane of the application of short and intense electric fields to the cells. The classical terms are membrane electroporation and cell electropermeabilisation. However, they describe different entities and states. One may have electroporation without electropermeabilisation and viceversa. The consequences of the electric pulses application depends on the duration of the electric pulses, their amplitude, the number of pulses as well as of the repetition rate of these pulses. It depends also on the target of these pulses. However, the robustness of the phenomenon is demonstrated by the fact that at least part of the mechanisms and physiological consequences that are similar for pulses duration differing of 6 orders of magnitude and pulses amplitudes that also widely differ. I will discuss some of the recent aspects of the research developed in my team on these issues that we have explored even at the level of the molecular interactions using very different technological approaches.

The second aspect that I will rapidly develop is the interest of electrochemotherapy to treat tumors even in the cases where no ablative technique can be applied. There are recent medical results that are showing the interest of electrochemotherapy, the antitumor treatment that results of the combination of reversible electroporation and non-permeant drugs such as bleomycin. Indeed, it is very effective to eliminate the tumors while respecting the normal surrounding tissue, which is what makes the differences with the the classical ablative antitumor approaches.