



Electroporation: a clinical platform technology for locally enhanced chemotherapy and electrogenetransfer

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Electroporation (EP) increases the permeability of the cell membrane to molecules that scarcely penetrate into the cell. Electrochemotherapy (ECT) is a locally enhanced chemotherapy that combines the administration of cytotoxic drugs with electric pulses to promote cell membrane EP. Since its first application, ECT is gaining popularity as minimally invasive oncological treatment. Electrochemotherapy is currently used to treat metastatic tumour nodules located at the skin and subcutaneous tissue. The objective response rate following a single ECT session exceeds 80%, with minimal toxicity for the patients. Electrochemotherapy has also been used to treat primary skin tumours, except melanoma, and recent evidence suggest that ECT is equally effective as surgery in attaining complete response in patients affected by primary Basal Cell Carcinomas (BCC). Early clinical results are also available for bone metastases and visceral tumours: ECT proved to be feasible, effective and safe, and allowed the treatment of tumour nodules located closed to important functional structures, nerve and vessels. Worth of notice, it has been reported that treatment of tumour nodules with ECT recruits component of the immune system, eliciting a systemic immune response against tumour antigens. This observation opens the way to the promising opportunity of a combined therapeutic approach based on ECT and Immunotherapy to achieve synergistic anti-cancer effects.

Electroporation can also be exploited to enhance the delivery of DNA and RNA molecules into the cell. On this basis, EP has also been applied for non-viral mediated electrogenetransfer (EGT) in either gene therapy or DNA vaccination settings. EGT represents a real alternative to viral approaches for gene transfer in vivo, with recognized efficacy and biological safety.

Altogether, considering the proven safety in different clinical settings, EP should be considered as a promising technology with established clinical use in ECT and broad prospects for use in gene therapy and DNA vaccination.