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Electroporation and Electrofusion utilize high voltage, short duration electrical pulses to temporarily create pores in a cell membrane to allow the transfer of molecules or to fuse membranes together. The composition of cell membranes can differ between cell lines. This difference can affect the transfection or transformation parameters needed for successful electroporation. The ability to adjust the parameters using the BTX systems will ensure the highest transfection or transformation rates possible. The following are guidelines for determining ideal electroporation parameters.

Field Strength

The field strength is the amount of energy, measured as “Volts”, applied to an area or “gap” in order to create pores in the cell membrane. This is expressed as kV/cm. Molecules such as DNA, siRNA, proteins and drugs can be easily transferred through these pores during the electrical pulse. Each cell line is unique in size, shape and membrane composition. By varying the voltage in a cuvette sample the ideal parameters can be determined to obtain the maximum transfection rate and cell viability. If the cuvette size is doubled then the voltage needs to be doubled to maintain the field strength.

Pulse Length

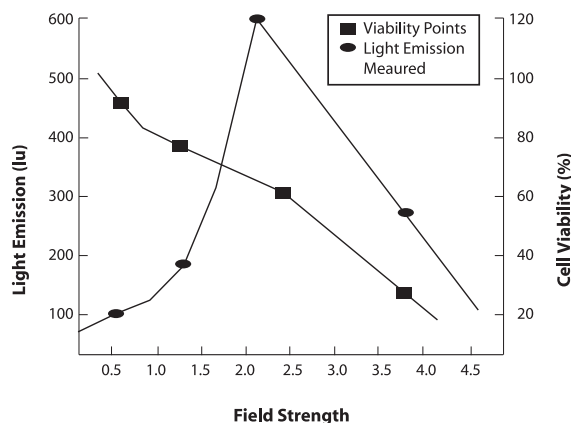
The pulse length is the duration of time it takes to deliver the electrical pulse. Pulse length and field strength together are key parameters that affect the transfection efficiency and cell viability. The duration of a pulse can help to increase the pore formation in a cell membrane as well as increase the uptake of target molecules. Most BTX generators offer adjustment of the pulse length so optimization can be fine tuned for any cell line.

Number of Pulses

Electroporation is often carried out using a single pulse. However, some cell types may require more than a single pulse to achieve maximum transfection rates. Multiple pulsing is critical for many applications which focus on the use of whole tissues, In utero embryos and fragile cell lines. Electroporation of In vivo, In ovo, In utero and ex-plant tissues require the use of multiple pulsing. This technique gently opens the cell pores achieving high transfection efficiencies without causing damage to the tissues. The BTX square wave systems permit multiple pulsing for higher flexibility.

Electroporation Buffer

The buffers used for electroporation can vary depending on the cell type. When using BTX equipment, no expensive specialty buffers are required to achieve efficient electroporation. Many applications use simple buffers routinely found in many labs such as PBS (Phosphate Buffered Saline) and HBS (Hepes Buffered Saline) or standard culture media which may contain serum. Many of our electroporation protocols suggest specific buffers and recipes for these buffers including fusion buffers. BTX offers these protocols online.



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