dual pulse

In vivo electroporator

CUY21EX

New generation of in vivo electroporator

Features

Dual pulse electroporation

CUY21EX generates two different kinds of square wave pulses in tandem (refer to fig.1). One is to make a pore on cell membrane (hereafter called “Poration pulse”) and the other is to drive genes or molecules into a cell (hereafter called “Driving pulse”). The poration pulse requires high voltage enough to make a pore on cell membrane. On the other hand, the required voltage of the driving pulses should be relatively lower as they are used only for electrophoresis of genes. With commercially available devices, a poration and driving pulses can not be separated mechanically. The voltage of an electroporation program must be adjusted to the level making a pore on cell membrane. However, the voltage adjusted to a poration pulse is too high for the following driving pulses (refer to fig. 2). As a result, the entire electric load on a tissue or organ is excessive and causes damage to it. In order to resolve the problem, the dual pulse electroporator was developed. One high voltage pulse with short pulse length and several low voltage pulses are applied respectively. The combination of high and low voltage pulses minimizes damage on a tissue or organ and results in increasing transfection efficiency.

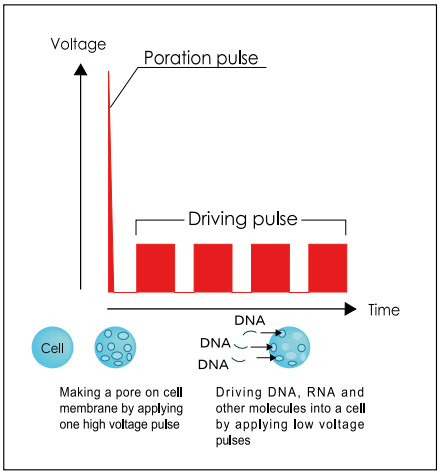


fig.1 Dual pulse electroporation

Resistance measurement

The resistance measurement function is built in CUY21EX and enables one to measure the resistance value of a biological sample prior to electroporation. The most important value in in-vivo electroporation is current. As long as current value is in the optimal range, DNA, siRNA and other molecules are introduced into a cell. As physical conditions such as a gap between electrodes, location of electrodes and volume of a sample vary, resistance value also changes considerably every experiment. According to Ohm’s law, current and resistance value are interrelated and affect one another. It is necessary to adjust resistance value in order to put current value in the optimal range. With a resistance measurement function, before an electroporation program is run, resistance value can be measured and adjusted to put current value in the optimal range. High reproducibility will be achieved.

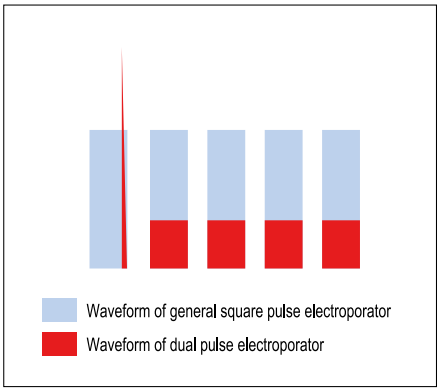


fig.2 General square pulse and dual pulse

* Product specifications are subject to change without notice

In vivo electroporator

Various applications

The voltage range of both a poration and driving pulse is up to 500V. CUY21EX will meet the requirements from various applications.

Easy operation

Each parameter of an electroporation program has an independent LED window. It is easy to set and edit a program. All measured values such as resistance, current and voltage are also displayed on its own LED window. It is easy to verify an electroporation process. Numerical keys enables one to enter a parameter easily.

99 programs

Up to 99 programs can be saved.

Actual current measurement function

Actual current value can be measured and displayed immediately after an electroporation is completed. There is the optimal current value for each application. It is possible to verify the electroporation process electrically by checking the actual current value. Even though a result of an electroporation turns out to be failure, as the electroporation process is already verified electrically, the cause of a failure can be identified easily.

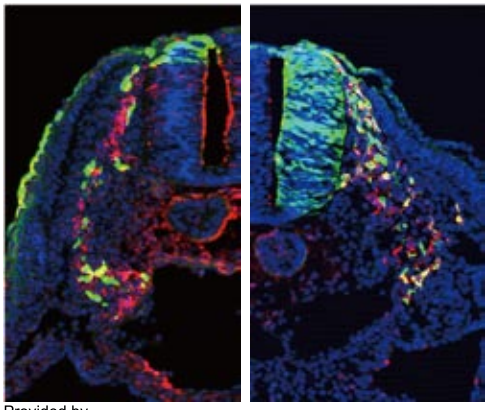
Actual voltage measurement function

The voltage of a poration pulse is measured and displayed immediately after an electroporation is completed. This function enables one to check the performance of a device and identify a mechanical problem immediately if there is something wrong with a device.

Electroporating a neural tube of E2 chick embryo

We compare the transfection efficiency by using dual pulse electroporator CUY21EX and a normal square wave pulse electroporator. EGFP was introduced into a neural tube of a 2-day chick embryo. The result is shown in the fluorescence images below. It is obvious that with CUY21EX the EGFP expression area is larger. The electroporation parameters are as follows:

General sqaure wave pulse　　Dual pulse



Provided by
Nara institute of science and technology
Molecular and developmental biology
Prof. Takahashi's lab
Dr. Daisuke SAITO

■ EP parameters of dual pulse electroporatior

Poration pulse

Voltage：50 V　Pulse length：0.05msec　No of pulses：1

Driving pulse

Voltage：9 V　Pulse length：25msec　No of pulses：4

■ EP parameters of square wave pulse electroporator

Voltage：12 V　Pulse length：25msec　No of pulses：5

Green color indicates the EGFP transfection area by electroporation

Red color indicates the area dyed by HNK-1 which is a marker of neural crest cells.

Specification

Pulse	Poration pulse	Driving pulse
DC pulse waveform	Square wave	
Voltage range	1 ～ 500V　(1V increment)	1 ～ 500V　(1V increment)
Pulse length range	0.01 ～ 99.9 msec.（0.01msec increment）	0.1 ～ 99.9 msec.（0.1msec increment）
Pulse interval range	0.05 ～ 99.9 msec.（0.01msec increment） *1	1 ～ 999 msec.（1msec increment）
No of pulses	1	1 ～ 10 pulses

Resistance measurment range	Max 30KΩ	Memory	99 programs
Current measurement range	1 ～ 500V	Power	Single phase 100V　500VA　50/60Hz
Voltage measurement range	0.1 ～ 50A	Dimensions/weight	W360mm X D380mm X H180mm, 10.5Kg

＊1 Interval between poration and driving pulse

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