

# Experiment of Iontophoresis for Optimization of Drug Delivery Velocity Using Digital-Signal Injection

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**Abstract**— In this study, the experiment of iontophoresis is performed with a potato instead of human body for drug delivery effect using pulse (Digital) signal. The optimization in injection of electrical energy is tested by the measurement of signal velocity on drug delivery.

## I. Introduction

Iontophoresis is a technique that uses an electrical current to move substances across the skin or other body surfaces such as the eye [1]. In this paper, the iontophoresis is tested for drug delivery effect. The experiment for signal velocity on drug delivery is performed for optimization in injection of pulse (Digital) signal.

## II. Analysis and Experiment

For direct current (DC) to pass through the skin two electrodes (positive and negative voltages) are required as shown in Figure 1 [2].

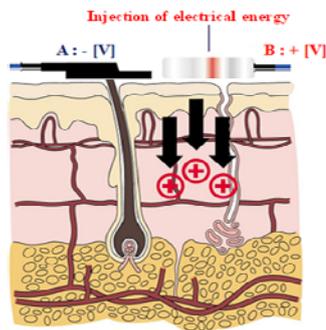


Figure 1. Progress of iontophoresis on human body using electrical energy

In this work, the injection of drug is used for a potato instead of human body as shown in Figure 2 where the DC and pulse signal can be observed [3]. As an experimental process, a potato is prepared with a groove filled by potassium iodide and the electrical energy is injected into the potato at sides. Then, the negative ion is shifted from potassium iodide to the positive electrode of the potato. Thus, the color of positive electrode in the potato is changed blue because of synthesizing the blue starch iodine. It represents the result of successful drug delivery.

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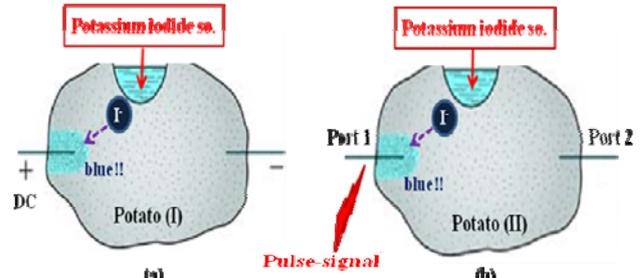


Figure 2. Experiment of energy injection for potato, (a) DC (b) pulse-signal

Table 1 shows the experimental results for ionization time of drug delivery with the potato using electrical energy.

TABLE I. Results for response of drug delivery

signal	Freq. [MHz]	Vpp [V]	Offset [V]	Duty cycle [%]	I [mA]	min : sec
DC	0	1.0	-	-	1.0	19:47
pulse	1.0	1.0	1.0	20	1.0	05:04

Here, the capacity of potassium iodide is 2 %. Figure 3 shows the experimental results for response of time corresponding to the iontophoresis for drug delivery using electrical energy. From the figure, the velocity of moving ion using pulse-signal was 14 minute faster than DC energy.

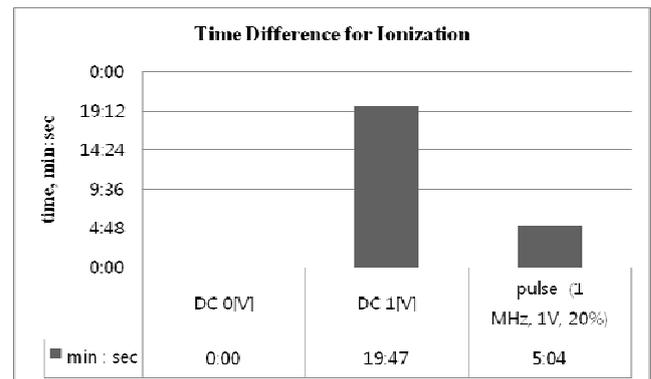


Figure 3. Experimental results for response time of drug delivery

It is expected that the drug delivery in the nervous system using similar experimental condition can be done [4].

## References

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