

Noninvasive Transcutaneous Sampling of Glucose by Electroporation

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Abstract

Background:

In people with diabetes, blood glucose levels should be monitored regularly to prevent serious complications associated with diabetes. This involves the invasive method of withdrawing blood, which causes inconvenience to patients. The objective of this study was to investigate the efficiency of the noninvasive electroporation and transcutaneous sampling (ETS) technique for predicting blood glucose levels.

Methods:

In vitro studies were carried out in Franz diffusion cells using porcine epidermis to assess the feasibility of transcutaneous sampling of glucose. *In vivo*, the ETS technique was assessed in the diabetes-induced Sprague–Dawley rat model. Glucose was sampled following the application of 30 electrical pulses of 1 ms duration at 120 V/cm², 1 Hz. Clarke error grid analysis was carried out for the venous blood glucose levels that were determined by the ETS with reference to those measured by a glucose meter.

Results:

The amount of glucose sampled by the ETS method both *in vitro* and *in vivo* was proportional to the dermal glucose concentration. All data points from *in vivo* studies were in A and B zones of Clarke error grid analysis, and the mean absolute relative error was 12.8%.

Conclusion:

Results of the present study demonstrate that ETS technique could be developed as a noninvasive method of predicting venous blood glucose levels in people with diabetes.

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Abbreviations: (ETS) electroporation and transcutaneous sampling, (PBS) phosphate-buffered saline

Keywords: electroporation and transcutaneous sampling, glucose, *in vitro*, *in vivo*

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