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Commentary

Characterization of Conductance Meters: Monitoring Diabetes by Potential Technologies

Xiaodong Wang*

Department of Pharmaceutical Sciences, Fudan University, Shanghai, China

DESCRIPTION

High blood glucose levels brought on by inadequate insulin synthesis or activity are its defining feature. Diabetes can result in a number of side effects, including heart disease, renal failure, nerve damage, and eye issues. Therefore, to avoid or postpone these problems, early diabetes detection and care are essential. Using a finger-prick test or a laboratory test to measure blood glucose levels is one of the common ways to diagnose diabetes. These techniques, however, are intrusive, uncomfortable, expensive, and time-consuming. Additionally, they could not accurately represent the patients' long-term glycemic management. As a result, there is a need for more simple, non-invasive, and alternative screening and monitoring techniques for diabetes.

One of the potential candidates for such methods is measuring the salivary glucose level using a conductivity meter. Saliva is a bio-fluid that contains various biomarkers, including glucose that can reflect the physiological and pathological conditions of the body. Saliva is easy to collect, store, and analyze without causing discomfort or infection to the patients. Saliva also has a close correlation with blood glucose level, making it a potential indicator of diabetes. A conductivity meter is a device that measures the electrical conductivity of a solution, which depends on the concentration and mobility of the ions in the solution. Since glucose is an uncharged molecule, it does not directly affect the conductivity of saliva. However, glucose can interact with other salivary components, such as proteins and electrolytes, and alter their structure and function. This can change the ionic composition and concentration of saliva, which in turn affects its conductivity.

Several studies have demonstrated the feasibility and accuracy of using salivary conductivity meters for screening and monitoring diabetes. A newly created salivary sensor with gold electrodes is inserted by using conductivity measures inorder to detect diabetes. They tested their sensor on 30 healthy subjects and 30 diabetic patients and found that the sensor could distinguish between the two groups with high sensitivity and specificity. They also found that the sensor could measure the salivary glucose level within 10 seconds and display the result on an organic light-emitting diode screen. They pointed out that salivary conductivity meters are simple, portable, inexpensive, and non-invasive devices that can provide rapid and reliable results. However, they also noted that salivary conductivity meters are affected by various factors, such as salivary flow rate, pH, temperature, hydration status, medication use, oral hygiene, and food intake. Therefore, they suggested that salivary conductivity meters should be used as an adjunct to blood glucose testing rather than a replacement. Conductivity meters for screening of diabetes can be improved by using novel materials and techniques to enhance their sensitivity and selectivity. For example, a salivary sensor with Graphene Oxide (GO) modified electrodes and conductivity meters for screening of diabetes. GO is a nanomaterial that has high electrical conductivity, large surface area, and strong affinity for glucose molecules. The sensor showed a linear relationship between salivary glucose concentration and conductivity change, with a detection limit of 0.1 mM. The sensor also exhibited good stability, reproducibility, and anti-interference ability.

CONCLUSION

Conductivity meters for screening of diabetes are potential devices that can measure the salivary glucose level indirectly by measuring the salivary conductivity. They offer several benefits over blood glucose testing methods, such as being non-invasive, convenient, fast, and cheap. However, they also have some drawbacks, such as being influenced by various confounding factors that may affect the accuracy and reliability of the results. Therefore, more research and development are needed to improve the performance and applicability of conductivity meters for screening of diabetes and by measuring the salivary conductivity using a conductivity meter; one can indirectly estimate the salivary glucose level and infer the diabetic status of the patient.

Correspondence to: Xiaodong Wang, Department of Pharmaceutical Sciences, Fudan University, Shanghai, China, E-mail: wang@fu.com

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