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# Abstract

For many years, researchers in the biosensors field have been trying to develop a device allowing the precise measurement of the glucose level through the intact skin. The control of glycemia is essential for people who suffer from irregular regulation of the glucose levels (same as for diabetics). Solianis, a Swiss company, is developing a non-invasive continuous glucose monitoring device using impedance spectroscopy for diabetics.

In this project, an efficient device was constructed for the in-vitro impedance measurement in order to see the frequential response of RBC, the beta-dispersion. We used a glass chip covered with micro-electrodes on which an agarose gel (3.8 %) containing red blood cells (RBC) is mold. Several solutions (saline solution, glucose and sucrose) were prepared to assess three important blood parameters: metabolism, conductivity and osmolarity. Those solutions were diffused into the gel filled with RBC. Then impedance spectroscopy was performed to analyze the relationship between glucose and impedance of RBC.

A particular interest has been focused on the extracellular resistance (Rext) since reflecting the swelling of RBC: a decrease of sucrose concentration increases Rext, as well as an increase of extracellular glucose concentration (balanced with sucrose and saline solution).

Furthermore, a hemolysis experience was performed to assess the viability of RBC under different PBS concentrations. For a 63% PBS solution (183 mM), 50% of the RBC did not survive. In these conditions, an increase of glucose concentration has a protective effect on RBC. At the same time, a question raised by the Solianis team was perhaps solved: why do the swollen and biconcave RBC have a different response face to glucose [1]? A hypothesis could be that when they exposing swollen RBC to glucose, they measured the cell lysis rather than the electrical properties of RBC.