

GLUCOSE SENSOR: COMPARISON OF ENZYMATIC AND
ELECTROCATALYTIC PRINCIPLES

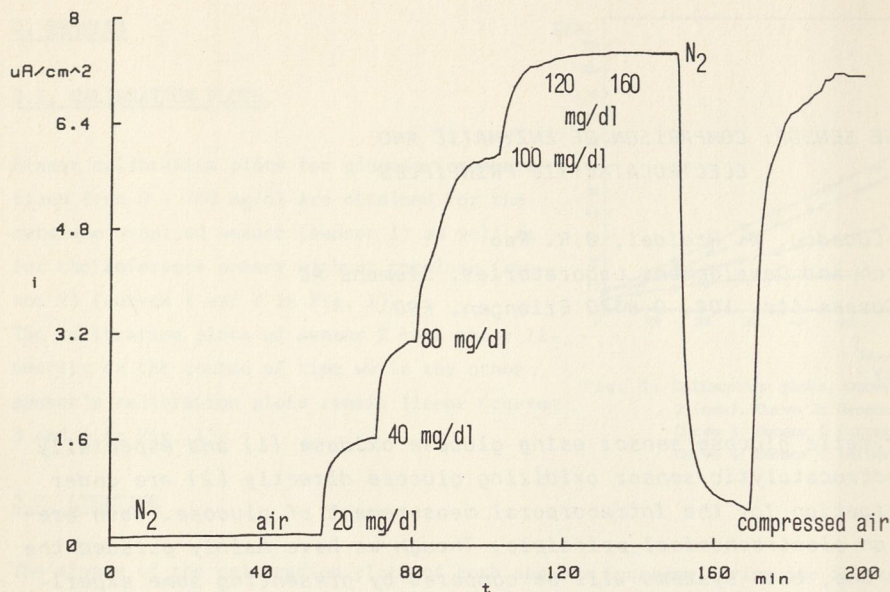
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SUMMARY

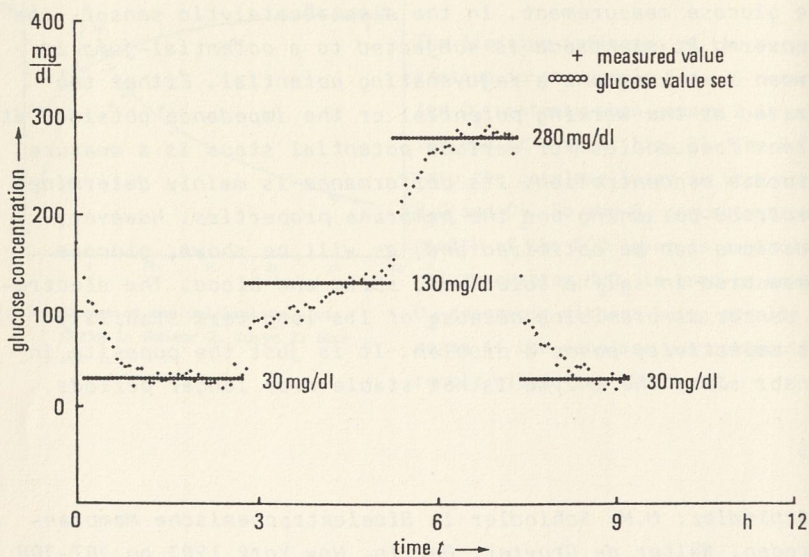
An enzymatic glucose sensor using glucose oxidase (1) and especially an electrocatalytic sensor oxidizing glucose directly (2) are under investigation for the intracorporal measurement of glucose. Both are based on electrochemical principle. Though we have mainly pursued the latter one, both systems will be compared by presenting some experimental results. The enzymatic sensor was designed in a simple way: Pt-electrode/glucose oxidase solution/membrane. This sensor is featured by the residual current due to direct oxidation of glucose at the electrode, the effect of H_2O_2 which results as a product of enzymatic oxidation of glucose and the presence or absence of oxygen during the glucose measurement. In the electrocatalytic sensor, the membrane covered Pt-electrode is subjected to a potential-jump in cycle between a working and a rejuvenating potential. Either the charge derived at the working potential or the impedance obtained at two different frequencies for various potential steps is a measure for the glucose concentration. Its performance is mainly determined by the electrode poisoning and the membrane properties. However, these conditions can be optimized and, as will be shown, glucose still be measured in saline solutions, serum and blood. The electrocatalytic sensor is promising because of its long term stability though its selectivity poses a problem. It is just the opposite in enzyme sensor since the enzyme is not stable over longer periods.

REFERENCES

- (1) J.G. Schindler, M.M. Schindler in *Bioelektrochemische Membran-Elektroden*, Walter de Gruyter, Berlin, New York 1983 pp 207-308
- (2) U. Gebhardt, G. Luft, K. Mund, W. Preidel, G.J. Richter *Siemens Forsch.- und Entwickl.-Ber.* 12 (1983) 91-95



Glucose response with the system Pt / GO / Membrane at $\varphi(\text{Hg}/\text{Hg}_2\text{Cl}_2) = 450 \text{ mV}$
 N_2 or air sat. electrolyte; pH = 7 and RT; glucose concn. in mg/dl



Glucose profile in defibrinated sheep's blood at room temperature