Redox potential and antioxidant activity monitoring for complication diagnosis in patients with kidney transplants

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It is well known that an imbalance of pro- and antioxidants can be an indication of certain pathological processes taking place in the organism. The use of redox potential monitoring of blood serum for diagnosing certain complications in patients following kidney or liver transplantation was previously developed [1]. Such use of redox potential measurements in biological media is possible because the redox potential an integral value, indirectly reflecting the pro- and antioxidant balance [2]. Synchronous measurement of redox potential and antioxidant activity in blood serum was proposed as a way to make the monitoring more comprehensive.

Since state-of-the-art methods of antioxidant activity measurement in biological media are quite expensive and relatively slow, a new electrochemical method was developed that measures antioxidant activity by cyclic voltammetry in blood serum added to aqueous benzoquinone mediator (Fig. 1). Antioxidant activity level was determined relative to quercetin.

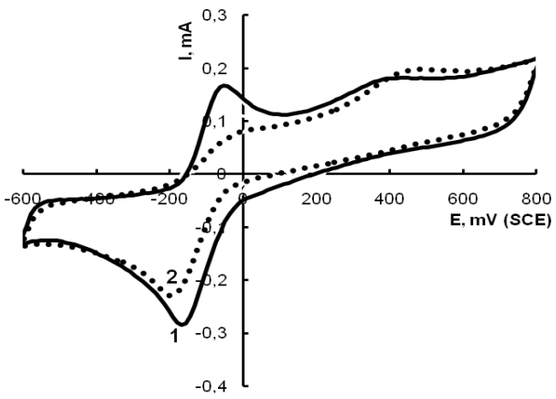

Fig.1. Cyclic voltammogram of benzoquinone without (1) and with blood serum (2) on Pt.

Synchronous monitoring of redox potential and antioxidant levels in blood serum was performed in patients with kidney transplants. As the data in Fig. 2 show, redox potential and antioxidant activity levels have similar time dependences. Decreases in antioxidant levels correspond to positive shifts of redox potential, while increases correspond to redox potential negative shifts. These observations demonstrate that similar conclusions are reached based on either method.

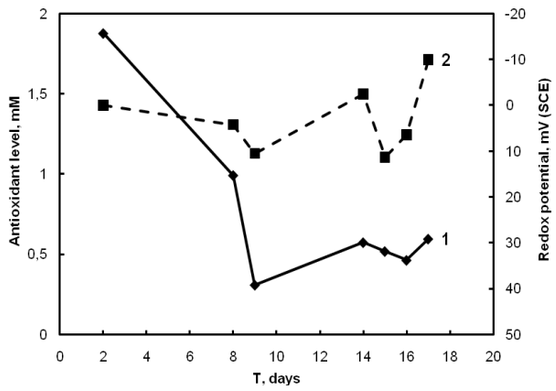

Fig.2. Monitoring of redox potential (1) and antioxidant level (2) of blood serum.

However, at times no correlation was found between the two methods. For instance, sharp redox potential shifts (>30 mV) are known to indicate inflammatory complications, but are not reflected in the antioxidant level data. This absence of correlation may suggest that corrections in the course of treatment are needed.

Thus, synchronous monitoring of redox potential and antioxidant levels may possibly be used for assessment and adjustment of the medicinal treatment in patients with organ transplants.

1. Khubutiya M.S., Goldin M.M., Evseev A.K., Zhao A.V., Salienko A.A. *ESC Transactions* 35(35), 45-50 (2012).

2. Margină D., Daniela Grădinaru D., Mitrea N. *Revue Roumaine de Chimie* 54(1), 45–48 (2009).