Measuring the Antioxidant Capacity Induced by Reduced Thiols in Human Erythrocytes Using SW-Voltammetry

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This study examines the use of square wave voltammetry (SWV) to measure the antioxidant capacity induced by reduced thiols in human erythrocytes using a static mercury drop (working), a platinum wire (auxiliary) and the Ag/AgCl saturated electrode. The erythrocytes were isolated from fresh collected blood of 15 subjects aged between 20-30 years old. The applied voltage ranged from -0.8 to -0.4 V. The current intensity peak (I_p) increases with the hemoglobin concentration (11.3 – 86.0 $\mu\text{mol/L}$) of the erythrocyte mixture (line equation $R=0.9$), increasing additions of reduced glutathione (0-90 $\mu\text{mol/L}$) to 23 $\mu\text{mol/L}$ of hemoglobin. The signal decreases when increasing concentrations of diamide (a specific thiol ligand) (0 – 46 mmol/L) was added to the erythrocyte preparation (70.0 $\mu\text{mol/L}$ hemoglobin). This decreasing was fitted by a quadratic equation ($R^2=0.99$). The SWV method demonstrate to be more adequate to quantify the oxidative attack promoted by small concentrations of H_2O_2 (0-53 $\mu\text{mol/L}$) to the erythrocyte preparation (65 $\mu\text{mol/L}$ hemoglobin), when compared to the spectrophotometric method that detect the diminishment of oxyhemoglobin and increase of methemoglobin and hemichrome. These results allow the use of the proposed method to quantify alterations in the antioxidant status of the human erythrocytes.

Keywords: SW voltammetry, erythrocyte oxidative status, reduced thiols.

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