Electrical Properties of Blood in Patients with Type 2 Diabetes Mellitus

V. Paskova[1], N. Antonova[1], N. Chaushev[2], I. Velcheva[2], I. Ivanov[1]
[1] Institute of Mechanics, Bulgarian Academy of Sciences, Sofia, Bulgaria
v.kostova@imbm.bas.bg; antonova@imbm.bas.bg
[2] University Hospital of Neurology and Psychiatry St. Naum, Medical University, Sofia, Bulgaria
nino.chaushev@mail.bg, velchevairena@gmail.com

Keywords: Kinetics of blood conductivity, Growth and relaxation curves, Non-linear curve fitting, Type 2 diabetes mellitus

The aim of the study was to investigate the kinetics of blood conductivity in patients with type 2 diabetes mellitus under transient viscometric flow. The measurements were performed by the rotational viscometer Contraves Low Shear 30 (Switzerland) with a concurrent measuring system MS 1/1, including a device, developed by the conductometric method with a software for measurement of conductivity of biological fluids (Data acquisition system) [1]. The measurements of whole blood conductivity in a group of 13 patients with type 2 diabetes mellitus were carried out at a temperature of 37◦ C and they were completed within 3hours after the blood withdrawal. The time variation of whole human blood conductivity and the shear stresses were investigated at rectangular shaped Couette viscometric flow under electric field of 2 kHz. The kinetics of conductivity signals were recorded both under transient flow and after the complete stoppage of shearing at shear rates from 0 to 94.5 s^{-1}. The experimental dependences of whole human blood conductivity were processed through the program Origin 61 by non-linear curve approximation of the growth and relaxation curves of the signal. The parameters of the equations, determined from the experimental data were analyzed as time characteristics of the transient organization of erythrocytes in red blood cells (RBC) aggregates at low shear rates or after complete flow stoppage and their desaggregation under high shear rates. The results obtained for the blood conductivity in time depends on the shear rate and on the hematocrit of the samples under transient flow. The results suggest that this technique may be used to clarify the mechanism of dynamics of RBC aggregates in patients with type 2 diabetes mellitus.