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A constitutive equation for whole human blood

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Abstract: A constitutive equation for whole human blood was developed using a power law functional form containing two parameters, a consistency index and a non-Newtonian index. These two parameters were determined by a multiple regression technique performed on viscometric data obtained from anticoagulated blood samples of known hematocrit and chemical composition. An initial constitutive model depending only on shear rate was found to be lacking any substantial degree of significance. When hematocrit was included as an independent variable, there was a considerable increase in the fit of experimental data with the analytic model. This fit became even better when fibrinogen and globulin concentrations were further taken into account. The best constitutive model ultimately included a dependence of shear stress on shear rate hematocrit and the sum of fibrinogen and globulin concentrations. Plasma lipids and the protein albumin were found to contribute little to the rheologic behavior of blood.

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