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Plasma dynamic viscosity determined by NMR

A NMR based experimental procedure to determine the dynamic viscosity (η) in Plasma solutions is presented. An equation relating η and the transversal proton magnetic relaxation time (T_2) is obtained after considering a fast exchange between the free and associated water inside the Plasma Solution, the dominant role of the associated water in proton magnetic relaxation, the characteristic mobility of the plasma proteins and the magnetic field value used in the experiment. Carr-Purcell-Meiboom-Gill pulse sequence was used to measure T_2 in a magnetic resonance console coupled to one homogeneous magnetic system (0,095 T). An η value of 1.66 ± 0.05 mPas was obtained in 27 controls individuals, which statistically match with the value obtained in the same samples using the Oswald viscometer (1.62 ± 0.03 mPas). η was determined in 166 patients with Multiple Myeloma (2.24 ± 0.07 mPas) and 54 with Sickle Cell Disease (1.92 ± 0.05 mPas) showing an statistically significant increase over the control individuals. The results show the utility of this NMR method to estimate dynamic viscosity in Plasma with medical purpose.

Key words: Dynamic viscosity, Transversal relaxation time, Plasma, Multiple Myeloma, Sickle Cell Disease.

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