Water Proton Relaxation Rate Enhancements and Association Constants for Mn(II) to Serum Proteins Determined by NMR T_1 Measurements

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The water proton relaxation rate enhancement of Mn(II) bound to bovine serum albumin (BSA) and the association constant for manganese to BSA have already been determined, but such determinations have not been done for human serum albumin (HSA) and other human serum proteins and also for human serum. In this work, NMR T_1 values in aqueous solutions of serum proteins and serum were measured versus increasing concentration of Mn(II). Proton relaxation rate enhancements (ε^*) caused by different manganese concentrations were determined for each solution and $1/\varepsilon^*$ was fitted against concentrations of Mn(II). Proton relaxation rate enhancements (ε_b) of Mn(II) bound to albumin, γ-globulin, (α+β)-globulins and serum were found to be 13.69, 3.09, 8.62, and 10.87, respectively. Free and bound manganese fractions, resulted from each addition of Mn(II) to the sample, were determined by using corresponding (ε^*) and the ε_b values. Association constants for Mn(II) to HSA and γ-globulin were calculated as 1.84×10^4 M^{-1} and 2.35×10^4 M^{-1}, respectively. Present data suggest that the proton relaxation rate enhancement of Mn(II) in serum is caused by Mn(II) bound to various serum constituents. Data also suggest that association constants for Mn(II) to γ-globulin are nearly the same as that to HSA.

Key words: Water Proton, Enhancement, NMR Relaxation, Association Constant