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Voltammetric, UV Absorption and Viscometric Studies of the Interaction of Norepinephrine with DNA

Mehmet ASLANOĞLU, Necla ÖGE

Department of Chemistry, Harran University, 63510 Şanlıurfa-TURKEY

e-mail: maslanoglu@harran.edu.tr

 [Keywords](#)
[Authors](#)



chem@tubitak.gov.tr

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Abstract: Voltammetric, UV-vis spectroscopic and viscometric methods were used to investigate the interaction between norepinephrine and DNA. The results of square wave voltammetric and UV-absorption measurements have shown that norepinephrine was bound to DNA. Besides the electrostatic interaction between DNA and norepinephrine, hydrogen bonds and intercalation may also exist. Viscosity measurements also suggest that NE is bound to DNA via an electrostatic mode of interaction at lower norepinephrine concentrations. However, at higher concentrations of norepinephrine, the increase in the relative viscosity of DNA indicated that the intercalation is also involved in the binding. The binding constant and the binding site size for the interaction of norepinephrine with DNA were $K = 3.3 (\pm 0.18) \times 10^3 M^{-1}$, $s = 2.89 (\pm 0.05)$ base pairs and $K = 5.15 (\pm 0.38) \times 10^3 M^{-1}$, $s = 2.41 (\pm 0.04)$ base pairs for the limiting conditions of static and mobile binding equilibrium, respectively. The binding site size determined shows that norepinephrine covers more than 2 base pairs upon binding to DNA. The standard Gibbs free energy change ($\Delta G^0 = -RT \ln K$) comes out to be approximately -21.17 kJ/mol at 25 °C, which indicates the spontaneity of the binding of NE with DNA.

Key Words: DNA, norepinephrine, voltammetry, UV absorption, binding constant, binding site size

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