A Study on the Interaction of Pb(II) with Herring Sperm DNA by UV-Vis Spectroscopy

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by

Eben S. Dy

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ABSTRACT

In this work, the complexation reactions of Pb(II) with Herring sperm DNA were studied. The DNA solution prepared was tested for hyperchromicity; and then, Pb(II) ions were added to form 0.0, 0.33, 0.5, 1.0, 1.5, and 2.0 Pb(II)/DNA mole ratio solutions. Changes in UV-Vis heating and reheating absorbance spectra (at 258 to 261 nm) of these solutions indicate the following:

i. At low concentration (0.0 to 0.33), Pb(II) binds primarily to the phosphate backbone thereby stabilizing the DNA molecule and increasing its melting point.

ii. At higher concentrations (0.50 to 2.0) however, Pb(II) also binds to the nucleic acid group. This gives an overall effect of destabilizing the DNA molecule and decreasing its melting point.

iii. The binding of Pb(II) to the nucleic acids in the DNA holds the two strands of the double helix molecule in proximity upon heat denaturation. This makes the rewinding of the DNA molecule after cooling possible. At relatively high Pb(II) concentration (1.0 Pb(II)/DNA mole ratio and above) however, Pb(II) becomes too tightly bound to the DNA molecule and NaCl has to be added (to precipitate out the Pb(II)) for the rewinding process to occur.