

DE LA SALLE UNIVERSITY

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

000000

A Thesis
Presented to the
Faculty of the Graduate School,
De La Salle University, Manila.

In Partial Fulfillment
of the Requirements for the Degree of
Master of Science in Chemistry

by

Eben S. Dy

December 16, 1992



DE LA SALLE UNIVERSITY

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.

DE LA SALLE UNIVERSITY

TABLE OF CONTENTS

1. Introduction	1
1.1 Purpose of the Study	3
1.2 Limitations of the Study	4
2. Review of Literature	4
3. Methodology	
3.1 Preparation of DNA Stock Solution	13
3.2 Preparation of Collodion Bag	13
3.3 Dialysis of DNA Stock Solution	14
3.4 Test for Hyperchromicity	15
3.5 Effect of Pb(II) on Thermal Denaturation of DNA	16
4. Result and Discussion	
4.1 Test for Hyperchromicity	17
4.2 Absorbance spectra of Pb(II)-DNA Solutions at Various Mole Ratio	19
4.3 Heating and Reheating Curves of Herring Sperm DNA-Pb(II) Solutions	20
5. Conclusion	27
6. Recommendation	28
7. References	29