SUMMARY
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L-DOPA is the metabolic precursor for the synthesis of the neurotransmitter dopamine and the hormones, noradrenalin and adrenalin. The neurological disorder Parkinsons disease is associated with an underproduction of dopamine and therefore L-DOPA is an effective drug in the treatment of Parkinsons disease. Further, it has been proposed that copper ion release in the presence of L-DOPA and its metabolites may be an important mechanism of neurotoxicity in Parkinsons disease and Amyotrophic lateral sclerosis (ALS).

In this thesis, I have shown that L-DOPA in the presence of Cu(II) causes strand breakage in calf thymus DNA and supercoiled plasmid DNA. Of the several metal ions tested, only Cu(II) and to a lesser extent Fe(II) complemented L-DOPA in the DNA breakage reaction. L-DOPA catalysed the reduction of Cu(II) to Cu(I), which was shown to be an essential intermediate in the DNA
cleavage reaction. The involvement of active oxygen species (such as the hydroxyl radical, superoxide anion and hydrogen peroxide) in the reaction was confirmed by the inhibition of DNA breakage by known scavengers of oxygen radicals. Fluorescence quenching studies indicated that L-DOPA is capable of binding to DNA.

Experiments were also done to study the viability of bacteriophage lambda on reaction with L-DOPA and Cu(II). Increasing concentrations of L-DOPA and Cu(II) resulted in a progressive loss of survival of the phage. The effect of UV irradiation of host cells on the L-DOPA-Cu(II) mediated sensitivity of phage was also examined. There was some evidence that the treatment enhanced the recovery of phage, indicating the involvement of UV-inducible pathway in the repair of L-DOPA-Cu(II) mediated DNA damage. Using various repair defective mutants of *E.coli* it was shown that DNA repair occurs and predominantly involves the polA pathway.
Protein-bound 3,4-dihydroxyphenylalanine (PB-DOPA) is a major reductant formed during hydroxyl radical damage to proteins. Generation of PB-DOPA in BSA, T3RNA polymerase and EcoRI methylase caused strand breakage in plasmid DNA on addition of Cu(II). This reaction has the potential of being used for site specific DNA cleavage by DNA binding proteins.