In this Diploma Thesis, an interaction of genotoxic environmental pollutant 2-nitrofluorene with a double-stranded calf thymus DNA has been studied using a hanging mercury drop electrode (HMDE) as an electrochemical sensor. Two types of DNA damage were investigated and electrochemically detected (using cyclic voltammetry and differential pulse voltammetry): (i) The DNA damage caused by the direct interaction with 2-nitrofluorene and (ii) the DNA damage caused by short-lived radicals generated by the electrochemical reduction of the nitro group in 2-nitrofluorene.

For the study of direct interaction, HMDE was modified by DNA and the interaction of DNA with 2-nitrofluorene was studied, after their incubation, right at the HMDE surface (adsorptive transfer stripping technique) or the DNA was preincubated with 2-nitrofluorene and, subsequently, the interaction was studied voltammetrically (DNA titration technique). Using both detection techniques, the formation of DNA – 2-nitrofluorene complex was observed and the mutual interaction was interpreted as an intercalation between the DNA base pairs, although such interaction was not clearly confirmed by UV-visible absorption spectroscopy. An electrostatic binding of 2-nitrofluorene on DNA sugar-phosphate backbone was partially formed at low concentrations of 2-nitrofluorene.

After reductive activation of 2-nitrofluorene giving short-lived nitro anion radicals, the oxidative DNA damage induced by these reactive species was evaluated from the height of cathodic peak CA (due to reduction of cytosine and adenine). On the basis of obtained results, we suppose that expected formation of 8-oxoguanine (one of the most common DNA lesions) leads to guanine–cytosine base pair interruption and DNA double-strand breaks.