

DNA damage and adduct formation in immune organs of developing chicks by polycyclic aromatic hydrocarbons

ABSTRACT

Polycyclic aromatic hydrocarbons (PAHs) are persistent pollutants and chemically a class of structurally similar chemical compounds characterized by the presence of fused aromatic rings. This research was undertaken to find out immunotoxic effects produced by pyrene, phenanthrene and fluoranthene. These chemicals were injected into developing chicks at three dose levels (0.2, 2 and 20 mg per kg) through allantoic route to rule out possible mechanisms involved in immunotoxicity. DNA adduct produced by PAHs in immune organs were analyzed by DNA adduct enzyme-linked immunosorbent assay (ELISA) kit and DNA damage was assessed by comet assay. A significant increase in the DNA adduct levels was found in thymus and bursa in 2 mg and 20 mg dose levels of pyrene, fluoranthene and phenanthrene treated groups, whereas those in spleen simulated the value of controls. Comet assay indicated that PAHs especially pyrene, fluoranthene and phenanthrene were capable of inducing increased level of comet parameters in thymus at all the dose levels. Bursa of Fabricius and spleen also showed a gradual rise in comet parameters corresponding to all dose levels, but the increase was more marked as in thymus. Thus, it can be concluded that DNA adducts produced by PAHs lead to single-strand breaks and reduced DNA repair, which ultimately begin a carcinogenic process. Hence, this experiment can be considered as a strong evidence of genotoxic potential of PAHs like pyrene, phenanthrene and fluoranthene in developing chicks.

Keyword: DNA adduct; Polycyclic aromatic hydrocarbons; Comet assay; Fluoranthene; Phenanthrene; Pyrene