DNA adduct formation and oxidative stress in colon and liver of Big Blue (R) rats after dietary exposure to diesel particles

Exposure to diesel exhaust particles (DEP) via the gastrointestinal route may impose risk of cancer in the colon and liver. We investigated the effects of DEP given in the diet to Big Blue (R) rats by quantifying a panel of markers of DNA damage and repair, mutation, oxidative damage to proteins and lipids, and antioxidative defence mechanisms in colon mucosa cells, liver tissue and the blood compartment. Seven groups of rats were fed a diet with 0, 0.2, 0.8, 2, 8, 20 or 80 mg DEP/kg feed for 21 days. DEP induced a significant increase in DNA strand breaks in colon and liver. There was no effect on oxidative DNA damage (8-oxodG) in colon or liver DNA or in the urine. However, the mRNA expression of OGG1, encoding an enzyme involved in repair of 8-oxodG, was increased by DEP in both liver and colon. DNA adduct levels measured by P-32-post-labelling were elevated in colon and liver, and the expression of ERCC1 gene was affected in liver, but not in colon. In addition to these effects, DEP exposure induced apoptosis in liver. There was no significant change in mutation frequency in colon or liver. The levels of oxidative protein modifications (oxidized arginine and proline residues) were increased in liver accompanied by enhanced vitamin C levels. In plasma, we found no significant effects on oxidative damage to proteins and lipids, antioxidant enzymes or vitamin C levels. Our data indicate that gastrointestinal exposure to DEP induces DNA adducts and oxidative stress resulting in DNA strand breaks, enhanced repair capacity of oxidative base damage, apoptosis and protein oxidation in colon mucosa cells and liver.

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