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Prof Jos Kleinjans
Dept. Health Risk Analysis & Toxicology
Maastricht University
Universiteitssingel 50
PO box 616
6200 MD Maastricht
The Netherlands
Email: j.kleinjans@grat.unimaas.nl

Exposure-disease continuum in neonates of mothers exposed to carcinogens

Roger Godschalk, Patricia Mercelina-Roumans, Harma Albering, Jan Dallinga, Frederik-Jan Van Schooten, Jelte de Haan & Jos Kleinjans* (University of Maastricht and University Hospital Maastricht, Maastricht, The Netherlands)

The impact of maternal exposure to carcinogens during pregnancy on childhood cancer may be especially relevant for genetically susceptible infants. A molecular epidemiological approach, which has the potential to characterize the processes between exposure and subsequent health effects in newborns by using biomarkers, is expected to provide valuable information to identify vulnerable neonates. Therefore, biomarkers of exposure (e.g. plasma cotinine levels, DNA- and protein-adducts) and biomarkers of early effects (e.g. the occurrence of somatic mutations in cord blood) have been studied in relation to birth outcomes. In this mini-review, the most important literature data with regard to these biomarker studies in relation to potential adverse health effects in neonates will be summarized and will be compared with outcomes of a study on 59 mother-child pairs in which all these biomarkers were assessed simultaneously. Overall, it can be concluded that plasma cotinine levels, macromolecule-carcinogen adduct levels and the HPRT mutant frequencies are increased in cord blood of neonates of mothers who were exposed during pregnancy and their levels correlated with health effects, such as intra-uterine growth retardation. Moreover, DNA damage was found to be highest in those neonates that carried (multiple) risk alleles in genes that code for biotransformation enzymes. These results were confirmed in our study, which indicates that it is possible to identify a susceptible subgroup of newborns and there is profound concern for genotoxic effects in newborns of exposed mothers. Results of these studies have laid the basis for the FP6 IP NewGeneris (www.newgeneris.org) which will be highlighted.