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# **CHARACTERIZING LIFE-LONG HUMAN EXPOSURE TO PERSISTENT ENVIRONMENTAL POLLUTANTS**

Av

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## ABSTRACT

Humans are exposed to a variety of potentially harmful contaminants on a daily basis. Characterizing the exposure in different subgroups of the general population is important for sufficient protection of public health.

The overall aim of this thesis was to refine human exposure assessment by applying different methodological approaches for characterizing the exposure to harmful contaminants such as polychlorinated biphenyls (PCBs), dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs) in different subgroups of the Swedish general population.

We assessed the exposure to PCBs and PCDD/Fs in breastfed infants (up to 6 months of age), children and young adults (1 – 24 years of age) and first-time mothers based on food consumption data (1989) and contaminant concentrations in food (1998 - 2004) and breast milk (2000 - 2006). A food concentrations database was developed for the assessment of food frequency questionnaire (FFQ)-based PCB153 exposure in middle-aged and elderly women (born 1914 - 1948).

Median exposure to PCBs and PCDD/Fs declined from 44 pg/kg body weight in 1 month old breastfed infants to less than 1.4 pg/kg body weight in adults 15 - 40 years of age. The proportion of individuals exceeding the current TDI of 2 pg TEQ/kg body weight decreased from 100% in infants and young children to less than 26% in adults. Mean exposure to PCBs and PCDD/Fs was comparable when using either the probabilistic or the deterministic approach, whereas the deterministic worst-case scenario estimate was up to 1.7 times higher than the probabilistic estimated 95<sup>th</sup> percentile. We obtained a reasonable validity of the FFQ for estimating concurrent (Spearman correlation  $r_s$  0.37;  $p < 0.001$ ) and long-term ( $r_s$  0.32;  $p < 0.05$ ) dietary PCB153 exposure assessment against serum PCB153 concentrations. Based on the validated FFQ we found a significantly increased risk (hazard ratio 1.67; 95% CI 1.17 – 2.40) of myocardial infarction in middle-aged and elderly women of the highest exposure group (median 280 ng/day) compared to the lowest (median 98 ng/day) using a Cox regression model. Highly exposed individuals were characterized by a high fish consumption independent of age. A high dietary PCB153 exposure and a low intake of fish fatty acids (<0.20 g/day of EPA - DHA) were associated with a greater risk of myocardial infarction (hazard ratio 2.22; 95% CI 1.25 to 3.94) compared to a low exposure and a high intake of EPA and DHA (> 0.29 g/day). Thus, continued actions are needed to reduce environmental levels and at the same time conduct risk benefit analysis for efficient dietary recommendations.

This thesis provides new and detailed knowledge of exposure to environmental contaminants in different subgroups of the population by using different methodological approaches, necessary to increase the precision in the exposure estimates. Refining the exposure assessment is a prerequisite for sustaining public health.

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