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Risk assessment for dioxins in France based on a dynamic modeling of exposure

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Due to bioaccumulation, removal of dioxins from the human body is very slow, resulting in increasing levels of dioxins with exposure duration. Moreover, the environmental contamination by dioxins has varied greatly since their introduction in the 1930s. The objective of this work is thus to develop a method to assess the accumulated amount in the body (Body Burden) of the French population taking into account the change in exposure over time and the slow elimination from the human body. Dietary intakes of the French population are first calculated combining concentration data and consumption habit data. Then, current and future body burdens are estimated with a dynamic model which considers the accumulation due to successive dietary intakes and the elimination process between intakes. Moreover, in order to take into account the historic evolution of the exposure in this modeling, a Bayesian approach is used to fit a function which correct past exposure from biomonitoring data. Finally, present and future estimated body burdens are compared to different critical body burdens worked out from epidemiological human studies and from experimental studies using Bench Mark Dose modeling.
In 2009, the probability of exceedance of the various critical body burdens is significant and some individuals would remain highly exposed until 2030. However, a birth-cohort effect is demonstrated involving a reassuring downward timetrend for the risk related to dioxins. Simulations of body burdens of individuals born in 2010 suggest that dioxins levels in food would not be a future public health concern in France.