

2019 SOT Conference
Poster: Risk Assessment II
Wednesday March 13, 2019
9:15AM-4:30PM

Comparison of Lung Cancer Risks from Environmental Exposures to Arsenic and from Those Associated with Medical Monitoring Criteria for Smokers

The Agency for Toxic Substances and Disease Registry (ATSDR) may request medical monitoring as a follow-up to health evaluations at contaminated Superfund sites. Despite the general medical monitoring criteria outlined by ATSDR, it is sometimes difficult to determine whether potential disease risks among individuals who might have been exposed to specific environmental contaminants (*e.g.*, arsenic in soil or water) at or near Superfund sites may warrant medical monitoring. In contrast, detailed criteria for lung cancer screening based on smoking history are available (*i.e.*, lung cancer screening is only recommended for older individuals who have smoked in the past 15 years with at least 30 pack-years of cumulative smoking). Here, we present a case study comparing theoretical lung cancer risks from exposures to arsenic in soil to those among heavy smokers eligible for lung cancer screening. We first calculated lifetime excess lung cancer risks for adults and children using a hypothetical arsenic concentration in soil, applying exposure assumptions used to derive the United States Environmental Protection Agency (US EPA) residential soil Regional Screening Levels, as well as more plausible exposure assumptions, and an oral lung cancer-specific cancer slope factor (CSF) for arsenic of 1.6 and 2.1 per mg/kg-day, for men and women, respectively. This CSF assumes a linear dose-response relationship, although evidence supports a threshold. Assuming an arsenic in soil concentration of 225 mg/kg and US EPA default exposure assumptions, the hypothetical lifetime excess lung cancer risks were 3.3×10^{-4} (0.03%) and 4.5×10^{-4} (0.05%) for men and women, respectively. For calculating the cumulative lung cancer risks of heavy smokers eligible for lung cancer screening, we relied on published absolute and relative lung cancer risks estimated from nearly a million men and women in the US during years 2000-2010. Considering age- and sex-specific absolute lung cancer risks, relative lung cancer risks specific to smoking behaviors and history, and assuming various ages at which individuals started smoking, we calculated excess lung cancer risks due to smoking to be at least 2.8% and 1.6% for men and women, respectively. In conclusion, potential lung cancer risks from exposure to arsenic in soil at a concentration of 225 mg/kg are at least 30-fold lower than those of heavy smokers if US EPA default exposure assumptions are applied, and potentially up to 200-fold lower if more plausible exposure assumptions are applied and, thus, do not warrant lung cancer screening.