

Relationship between environmental exposure and breath for gasoline service workers

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Abstract

This study evaluated the relationship between the breath concentrations of, and personal exposure to, toluene, xylene and ethylbenzene of thirty workers from ten gasoline stations. Personal exposure air samples and workplace samples were collected simultaneously. Each subject provided a sample of exhaled breath after his or her personal exposure air was sampled. Twenty-five personal air, 17 workplace and 30 breath samples were collected in this study. Results indicated that breath concentrations of toluene and xylene were significantly correlated with personal monitoring concentrations. Furthermore, multiple regression analysis showed that exhaled toluene levels were highly influenced by personal toluene concentrations and the amount of personal gasoline sold ($r^2 = 0.762$), while exhaled xylene levels depended on wind speed and personal xylene exposure concentrations ($r^2 = 0.665$). Exhaled ethylbenzene levels were too low to present a relationship between concentrations and personal exposure levels. The exhaled toluene, xylene and ethylbenzene concentrations ranged from 4.3 to 41.8, 0.9 to 13.9, and 0.2 to 6.5 ppb, and the corresponding personal monitoring concentrations ranged from 60.3 to 572.3, 16.4 to 156.6, and 10.7 to 136.6, respectively. The average number of symptoms per person, according to neurotoxic questionnaire 16 (abbreviated as Q16) was 4.1 and six workers showed over six symptoms in Q16. This study suggests that exhaled toluene and xylene levels are suitable for use as biological exposure indices even at the ppb-level of exposure. Gasoline service workers are exposed to high levels of volatile organic compounds (VOCs) and the potential threats to their neurological systems deserve further investigation.