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Original Article

Inhalation Exposure to Dioxins Air Pollutant Generated by Dead Body Incineration at Buddhist Temple: Cancer Risk Estimation

Abstract

Background: Dioxin is accepted as an important toxic chemical that can induce carcinogenesis. The dioxin contamination in air is accepted as an important air pollutant. Apart from the industry, the dioxin in air can be generated by other little mentioned sources. **Methods:** Here, the authors assessed the cancer risk due to inhalation exposure to dioxins air pollutant generated by dead body incineration at Buddhist temple based on situation in Indochina. Indeed, there are many thousand Buddhist temples in Indochina and the dead body incineration is routinely done at the temple every day and the dioxin generated from this activity is little mentioned. **Results:** According to this study, the risk of cancer due to exposure to dioxins air pollutant generated by dead body incineration at Buddhist temple is high and should be the issue for proper public health management. **Conclusion:** Dioxins air pollutant generated by Dead bodyIncineration at Buddhist temple is an important cancer risk for both adult and children living in that area.

Keywords: *Air, cancer, dioxin, incineration, temple*

Beuy Joob, Viroj Wiwanitkit[1]

Sanitation 1 Medical Academic Center, Bangkok, Thailand, [1]Department of Tropical Medicine, Hainan Medical University, Haikou, Hainan, China

Introduction

Dioxin is accepted as an important toxic chemical that can induce carcinogenesis. This substance is classified by the World Health Organization as one of the most problematic toxic chemical substances.[1] The contamination in the environment is a serious concern in global public health.[1] Health effects associated with exposure to dioxin have been extensively studied, and the problem is confirmed.[2] In oncology, it is no doubt that dioxin is an important carcinogen.[3] Exposure to dioxin can result in risk of cancer. In medicine, one might expose to dioxin through several routes. The ingestion of contaminated food is a big concern. Struciński *et al*. noted that "exposure through food (mainly of animal origin) is the major source of dioxin exposure for humans, estimated to account for about 95% of the total intake for nonoccupationally exposed persons."[4] It is no doubt that the surveillance of contamination becomes the common practice in food safety worldwide.

Nevertheless, another important way one might expose to dioxin is the exposure to contamination environment. Air contamination is a big problem. The dioxin contamination in air is accepted as an important air pollutant. Industry is the main accused source of dioxin pollutant. Apart from the industry, the dioxin in air can be generated by other little mentioned sources. Dopico and Gómez noted that "nonindustrial sources are gaining over the last years in front of the decreasing tendency of industrial sources."[5] Here, the authors assessed the cancer risk due to inhalation exposure to dioxins air pollutant generated by dead body incineration at Buddhist temple based on situation in Indochina. Indeed, there are many thousand Buddhist temples in Indochina and the dead body incineration is routinely done at the temple every day and the dioxin generated from this activity is little mentioned. According to this study, the risk of cancer due to exposure to dioxins air pollutant generated by dead body incineration at Buddhist temple is high and should be the issue for proper public health management.

Materials and Methods

This is a descriptive study aiming at estimation of risk of cancer due to exposure to dioxins air pollutant generated by dead body incineration at Buddhist temple. The situation in Bangkok, capital of Thailand,

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Address for correspondence:
Dr. Beuy Joob, Sanitation 1 Medical Academic Center, Bangkok, Thailand.
E-mail: beuyjoob@hotmail.com

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is used as a model. Thailand is a Buddhist country, and in that, the dead body incineration at Buddhist temple is routinely done every day. To estimate the risk, the authors refer to the standard technique as described by Dziubanek *et al*.[6] Briefly, the cancer risk estimation is based on the mathematical modeling as the following "cancer risk = inhalation cancer slope factor (CSF) × daily respiratory exposure to dioxins."[6] The CSF for dioxin is equal to 1.5×10^5 $(mg/kg/day)^{-1}$.[6,7] For the daily respiratory exposure to dioxins, it is hereby primarily assumed to be the dosage of emitted dioxin as pollutant from a Buddhist temple due to dead body incineration at Buddhist temple. In Bangkok, there is a local report (http://gaiaace.com/default.aspx?subheadmenu=trueandsubheadid=H000000003andid=M000000001) that the average air dioxin pollutant due to dead body incineration at Buddhist temple is about 1.74–1.79 ng/m^3. Based on the primary assumption by Dziubanek *et al*.[6] (inhalation rate for adults: 20 m^3/day, for children: 12 m^3/day, and body weight of adults: 70 kg, of children: 27 kg), the cancer risk for adults and children in Bangkok can be calculated.

Results

Based on the given data, the cancer risk for adults and children in Bangkok due to exposure to dioxins air pollutant generated by dead body incineration at Buddhist temple for adults and children are equal to 3.654×10^{-2}–3.759×10^{-2} and 8.4564×10^{-3}–8.6994×10^{-3}, respectively.

Discussion

Dioxin air pollutant becomes the interesting problem in several industrial countries worldwide. Cancer related to emission of dioxin is an important concern in public health.[8] Living in the industrial areas poses the risk for exposure to dioxin air pollutant, and this situation is proved for further risk for cancer.[9] Nevertheless, nonindustrial source of dioxin air pollutant is also important but little mentioned.[5] Here, the authors point out an important source of dioxin pollutant in Indochina. This is a local culture-bounded issue and needs gentle public health management. The management of dead body in Indochina is usually by incineration at the Buddhist temple. The standards of combustion during the incineration are usually overlooked, and the dioxin air pollutant due to this activity is little mentioned. Based on this study, the estimated risk is considerably high. Comparing to the report from Poland,[6] the risk of local people in this Indochina area is more than one hundred time higher. Indeed, the similar risk of cancer risk due to culture bound or religious-related practice is also observed in many Asian areas. The good examples are risk due to holy paper burning and joss stick incineration activities.[10,11]

Conclusion

Dioxins air pollutant generated by Dead bodyIncineration at Buddhist temple is an important cancer risk for both adult and children living in that area. The control for this little mentioned pollutant is required.

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Conflicts of interest

There are no conflicts of interest.

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