Title: ENVIRONMENTAL WORKPLACE ASSESSMENT AND HAZARDOUS IDENTIFICATION IN INCENSE AND JOSS STICK MAKING IN SMALL HOUSEHOLD FACTORIES, ROI-ET PROVINCE, THAILAND

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ABSTRACT

Introduction: Environmental workplace associated with health hazards have been investigated in various factories. Incenses and joss sticks are generally used in the world; most products are made in China, Taiwan, Vietnam, India and Thailand. Dust and chemical substances in making process may cause contaminating in environmental workplace and impact on workers’ health.

Objectives: The aims of the study were to evaluate environmental workplace exposure and to identify hazards from the process of incense and joss stick making in small household factories.

Methods: The walkthrough survey study was conducted in October 2011- March 2012, in Dong Dang village, at Roi-Et province, Thailand. The data were collected by using walkthrough survey form, adopt from Canada occupational walkthrough survey form. The contents comprise nature of processing, material and quantities used equipment, personal protective equipment (PPE) and others. The real time exposure monitoring by measuring aerosol and particle concentration was completed using Dust-trakPm monitor. The inductively coupled plasma optical emission spectrometry (ICP-OES) method was used for heavy metal residue analysis.

Results: Nine small household factories were selected for walkthrough survey and collected the data. There were 51 workers in those factories that made incense and joss stick. 80.4 % of them were males and 19.6% were females. Only 3.9 % of female workers used PPE during
working. The manual incense and joss stick-making process consists of the six steps such as (1) preparation of bamboo stick, (2) mixing incense powders, (3) immerse a bundle of bamboo stick in water, rolling and shaking, (4) dipping colored, (5) drying, and (6) spraying and packing. Several heavy metal concentration were found in incense and joss stick products such as manganese (Mn), lead (Pb), nickel (Ni), cadmium (Cd) were 1.45±0.03 (mg/kg), 0.95±0.03 (mg/kg), 0.84±0.09 (mg/kg), 0.15 ±0.01 (mg/kg), respectively. The averages real time dust concentration and particles count measurement showed that was high in the step of rolling and shaking with fine powder (1.12 mg/m^3, 7730.3), rolling and shaking with coarse wood powder (0.68 mg/m^3, 1508.3) and packing. (0.27 mg/m^3, 8890.2) From the walkthrough survey found that the wastes and residues from the production process were left around house and they did not have proper waste disposal.

**Conclusion:** The study indicated that dust and chemicals used in incense and joss stick making were major threats and contaminated in environment workplace. The workers may affect to health in longer term of exposure such as respiratory and skin effects due to heavy metals on incense and joss stick products during production process. So the workers should be awareness to health protection by using PPE during working. The household factory may also effect to other members in house especially children and elderly. The emphasis on environmental workplace management and health protection during working is important

**Keywords:** incense and joss stick, household factories, environmental workplace, Thailand