



Screening Workers Exposed to 4,4'-Methylenebis(2-Chloroaniline) (MBOCA) for Bladder Cancer in Taiwan

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Keywords

4,4'-Methylenebis(2-chloroaniline); MBOCA; Bladder cancer

Introduction

The most notable risk factor for the development of lower urinary tract cancers is occupational exposure to aromatic amines, first noted in England in 1895 [1]. Occupational exposure to carcinogenic compounds found in dye, rubber, paint, plastics, metal, and motor vehicle exhaust significantly raises the risk of bladder cancer [2]. It has been estimated that these occupational exposures are responsible for 18% of bladder cancer cases [3]. 4,4'-Methylenebis(2-chloroaniline) (MBOCA) is a synthetic aromatic diamine used widely as a curing agent for polyurethane and epoxy resins. The International Agency for Research on Cancer [4] and the U.S. Environmental Protection Agency have determined that MBOCA is a toxic substance (category 2A; Agency for Toxic Substances and Disease Registry, ATSDR, 1994) [5]. The manufacturing of MBOCA includes reaction, neutralization, washing, purification, and packing processes. The studies of workers exposed to MBOCA in the United States, cases of urinary-bladder cancer were detected in a screening program [6]; although the production of MBOCA in the United States ceased in 1982, MBOCA is still manufactured in other countries.

In this study, the U.S. Occupational Safety and Health Administration analytic method No. 24 was adopted to measure air MBOCA concentrations. A total of 70 MBOCA-exposed workers and another 92 nonexposed workers were recruited for screening from four factories in 2004. The MBOCA-exposed workers indicate who performed the MBOCA materials manufactures, the

nonexposed workers indicate who are staffs in the administration office. The results of this study have identified a proven bladder carcinoma in MBOCA manufacturing factories. In addition, 1 worker with suspected malignant cells on urine cytology and 1 worker with atypical cytology combined with gross hematuria were identified. Although most of the processes are in a closed system and are automatic, leakage of products from pipes and tanks were noted. Therefore, the health impact of MBOCA is still of concern in the occupational settings in many countries. A recently experimental report showed that pathological changes in the liver, kidney and urinary bladder of MBOCA-treated mice revealed unusual lesions of inflammatory degeneration and malignant change; the plasma 8-hydroxydeoxyguanosine (8-OHdG) levels showed that the MBOCA-treated mice had significantly higher 8-OHdG levels than the control mice [7]. The findings of this study support the conclusions from other studies that MBOCA is potentially carcinogenic to humans [8]. Workers may inhale small particles of MBOCA in the air or absorb MBOCA dust or vapor through the skin. Control measures such as issuing work clothing (including underwear) that is not to be worn home, requiring employees to shower at the end of a work shift, and improving the ventilation system are needed in MBOCA manufacturing plants [9]. There is also no information regarding the daily dose of MBOCA to which workers were exposed or the route of exposure [5]. However, it remains unclear whether MBOCA causes malignancy. To screen for other potential carcinogenic compounds in those factories may be helpful in future.

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