

High Toxicity and Carcinogenesis of Occupational Exposure to 4,4'-Methylenebis (2-Chloroaniline) (MBOCA)

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Short Communication

4,4'-Methylenebis (2-chloroaniline) (MBOCA) is an aromatic diamine used widely as a curing agent for polyurethane and epoxy resins. 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]. A sentinel case of transitional cell carcinoma of the urinary bladder was diagnosed in an MBOCA manufacturing factory in Taiwan in 2005 [2]. There is also no information regarding the daily dose of MBOCA to which workers were exposed or the route of exposure [3]. However, it remains unclear whether MBOCA causes malignancy.

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) [3]. In addition, in a report on carcinogens, the National Toxicology Program reported that MBOCA might reasonably be anticipated to be a human carcinogen [5]; however, the U.S. Environmental Protection Agency has no information on the chronic effects of MBOCA in humans [6]. Although the production of MBOCA in the United States ceased in 1982, MBOCA continues to be manufactured in other countries. In studies of workers exposed to MBOCA in the United States and Taiwan, cases of urinary-bladder cancer were detected in a screening program [7,8]; however, the data available from epidemiological studies are inadequate to evaluate the relationship between human cancer and exposure to MBOCA specifically [9].

Few studies have been performed on the genotoxicity of MBOCA, and there are literature reports of urinary bladder tumours in dogs exposed to MBOCA [10]. It was recently proposed that chemical carcinogenesis may involve the formation of chemical adducts in DNA through covalent binding based on the finding that MBOCA produces DNA adducts in rat liver at levels characteristic of genotoxic carcinogens [11]. In addition, a recently experimental report showed that pathological changes involved 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 [12]. Those results support the conclusion that MBOCA is a carcinogen and highly toxic to both animals and humans.

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