Toxicity affects of phenol/chloroform/isoamylalcohol and of the β-mercaptoethanol

The third advantage of this protocol is the absence of the toxic phenol/chloroform/isoamylalcohol mixture and of the β-mercaptoethanol. Phenol (C₆H₅SOH) is produced commercially and has many uses which bring it into direct contact with humans. Inhalation by breathing contaminated air and dermal exposure through skin contact is highly irritating to the skin, eyes and mucous membranes and can induce eczema, inflammation, discoloration, necrosis, sloughing and gangrene. Inhalation alone adversely affects the lungs, causing hyperemia, infarcts, bronchopneumonia, purulent bronchitis, and hyperplasia of the bronchial tissues. Long-term inhalation exposure to phenol in animal studies has shown effects on the liver and kidneys, and on the respiratory, cardiovascular and central nervous systems. Chloroform (CHCl₃) is a volatile member of the trihalomethane group (Aggazzotti et al., 1995) which is widely used as an organic solvent (Kasai et al., 2002; Yamamoto et al., 2002). It is ubiquitously present in the air, drinking water, and some foodstuffs (Kasai et al., 2002; Yamamoto et al., 2002; Nagano et al., 2006) and enters the body by inhalation, oral and dermal routes of exposure (Aggazzotti et al., 1995; Kasai et al., 2002; Yamamoto et al., 2002; Nagano et al., 2006). Chloroform is also classified as a possible human group 2B carcinogen by the International Agency for Research on Cancer (IARC) and the Japan Society for
Occupational Health (JSOH), and as a confirmed animal carcinogen with unknown relevance to humans by the ACGIH (Yamamoto et al., 2002). The ACGIH and the JSOH recommend an occupational exposure limit (Kasai et al., 2002). According to the Carcinogenic Potency Database (CPDB) at Berkeley University, chloroform has been found carcinogenic to rats and mice (http://potency.berkeley.edu/chempages/CHLOROFORM.html). Chloroform is also a major environmental contaminant, formed in the chlorination of community drinking water, in the cooling of water from power plants and in the process of bleaching paper, and is thus a potential hazard to the health of workers and community residents (Kasai et al., 2002). Isoamylalcohol (C₅H₁₁OH) is a colorless flammable liquid that reacts violently with strong oxidants and reducing agents and can react with hydrogen trisulfide, creating an explosion hazard. The substance can be absorbed into the body by inhalation and by ingestion. It is irritating to the eyes, the skin and the respiratory tract, and if ingested, may affect the central nervous system. β-Mercaptoethanol (HOCH₂CH₂SH), also known as 2-hydroxy-1-ethanethiol or thioglycol, is a colorless liquid with a characteristic odor. The substance reacts with oxidants and metals and upon heating, it decomposes to toxic sulfur oxide gases. Like all of the aforementioned substances, it can be absorbed into the body by inhalation of its vapor, through the skin and by ingestion. Short-term exposure irritates the eyes, skin, and respiratory tract, and it may have detrimental effects on the central nervous system.

References


