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Editorial

Occupational Exposure to Anesthetic Waste Gases in Operating Rooms: a Need to Revise Occupational Exposure Limits in Iran

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Anesthetic gases were developed in the 17th century and nowadays are widely used for the general anesthesia in the operating rooms (ORs).[1] Anesthetic agents, especially halogenated anesthetics and nitrous oxide (N2O), can contaminate the ambient air of the ORs and therefore occupational exposure to these gases is a common occupational hazard. The anesthesia machine leakage, inadequate scavenging system and exhalation of the patient are the major causes of exposure to anesthetic wastes in ORs.[2]The emission of anesthetic gases into the atmosphere of ORs could be minimized by different approaches such as engineering and administrative controls.

Different adverse health effects including neurobehavioral changes, fatigue, headaches, dizziness, lethargy, memory problems have been reported as the result of exposure to trace levels of waste anesthetic gases.[3-5] According to much of the supportive evidence derives from animal studies, the chronic exposure to these agents have linked to liver and kidney damage, genotoxicity, spontaneous abortion, and congenital malformations.[5,6]

Personal exposure assessment of anesthetic gases includes biological and breathing zone air monitoring. ACGIH did not set any biological exposure index (BEI) for anesthetic gases. Some researchers investigated the urinary concentration of unmetabolised anesthetic agents or their metabolites. For example, the urinary concentrations of sevoflurane and hexafluoro-isopropanol (HFIP) have been investigated in the occupationally exposed personnel.[7,8] In the studies in which the concentration of breathing zone and urinary concentration of anesthetic agent has been correlated, a biological equivalent limit corresponding to the established OEL has been suggested. For example, Jafari et al. found biological equivalent limit of 3.61 µg/lurine for 2 ppm environmental exposure of isoflurane. Similar values have also reported as biological equivalent limit for isoflurane by other researchers.[9] Further studies are needed to establish BEI for anesthetic agents.

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To monitoring air quality in ORs, portable direct reading instruments and sample collection device methods are utilized. For instance, a photo-acoustic infrared spectrometry analyzer has been used for direct reading of halogenated and N2O in ORs.[10] Time-integrated air samples could be collectedeither by adsorption tubes connected to a pump or by passive dosimeters.[9]

Different values have been set as OELs of anesthetic gases. For example, NIOSH recommended that the concentration of a halogenated anesthetic agent during its administration should be less than 2 ppm if it is used alone or below 0.5 ppm if it is used in combination with nitrous oxide. The NIOSH REL for N2O is 25 ppm.[6,11] At present, OSHA does not have PEL for anesthetic agents. ACGIH has set TLVs only for enflurane, halothane, and nitrous oxide as 75, 50, and 50 ppm respectively. The Iran Ministry of Health and Medical Education has set OELs of desflurane and sevoflurane as 20 ppm; N2O, isoflurane and halothane as 50 ppm; and enflurane as 75 ppm. It seems that in the absence of any TLV (by ACGIH) or PEL (by NIOSH) for isoflurane, desflurane and sevoflurane and considering the REL of 2 ppm for any halogenated anesthetic agents, the Iran OELs of desflurane, sevoflurane, and isoflurane might be used with caution. It is worth mentioning that in ORs of Iran, N2O is commonly used in combination with isoflurane and sevoflurane. Therefore, the reduction in OELs of these halogenated agents, similar to NIOSH REL, would be proposed. The OEL of halothane could alsobeintheforefrontofchange, since the hepatotoxicity of this agent has been reported.[12]

As a conclusion, the occupational exposure to anesthetic waste gases should be monitored periodically to protect the personnel of ORs and in the assessment of monitoring results, specific attention should be paid to concurrent use of N2O and halogenated anesthetic gases. Importantly, in the future revise of OELs by Iran Ministry of Health and Medical Education the concerns addressed here would be considered helpful.

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