

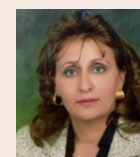


Occupational Exposures to Anesthetic Gases in Operating Room

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Despite the significant role of environment in human safety, the impact of operating room environment on staff health was considered in the middle of 1990s.¹ Operating room staff, particularly women are among high risk groups due to exposure to chemicals, ionizing radiation,² drugs, pathogens-induced blood infection, needle stick injuries and contact with contaminated secretions, blood and body fluids.^{3,4} However, one of the occupational hazards is exposure to anesthetic agents.⁵ Anesthetic gases are the primary source for hospital air contamination.⁶ These gases are rapidly eliminated from the body due to their low solubility.⁵ Therefore, there have been reported several neurological toxic, immunosuppressive, reproductive effects, carcinogenic, genetic damage, liver-kidney and respiratory adverse effects.⁷ Repeated exposure may lead to cellular damage, increases in cell proliferation, hyperplasia and finally tumor development.⁵ The effects of chronic exposure to anesthetic gases on the medical staff and team's health and well-being are of prime important. In survey of occupational exposures literature from 2000 to 2016, general information about occupational exposures to anesthetic gases in operating room was collected. The most important finding of the articles reviewed and published concerning the dangers of anesthetic gases in the operating room staff is occupational exposure to anesthetic gases, including genotoxic damage and fetal abortion and abnormalities and liver toxicity in the operating room staff. Genotoxicity is associated with waste inhaled anesthetic.⁸ Significant amount of inhaled anesthetic gases was found in dental surgery clinics, resulting in spontaneous abortion and liver disease.⁹ Primary studies on N₂O toxicity due to exposure with N₂O showed reproductive problems, but this concern was not demonstrated.¹⁰ The approaches for diminishing of operating room staff exposure-related risks include appropriate guidelines such as lowering their work hours in operating rooms, considering recommended exposure limit for special groups such as pregnant women or those with hepatic dysfunction, providing comprehensive training course, improving ventilation scavenger system,

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utilizing standard equipment as far as possible and promoting self-awareness.

Ethical Issues

Not applicable.

Conflict of Interests

The authors declare that they have no conflicts of interest.

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References

1. Pisters P, Bien B, Dankner S, Rubinstein E, Sheriff F. Supporting hospital renewal through strategic environmental sustainability programs. Paper presented at: Healthcare Management Forum; 2017.
2. Gupta D, Mckelvey G, Kaminski E, Zestos MM. Does exposure to inhalation anesthesia gases change the ratio of X-bearing sperms and Y-bearing sperms? A worth exploring project into an uncharted domain. *Med Hypotheses*. 2016;94:68-73. doi: 10.1016/j.mehy.2016.07.002.
3. Kasatpibal N, Whitney JD, Katechanok S, et al. Practices and impacts post-exposure to blood and body fluid in operating room nurses: A cross-sectional study. *Int J Nurs Stud*. 2016;57:39-47. doi:10.1016/j.ijnurstu.2016.01.010.
4. Cutter J, Jordan S. Inter-professional differences in compliance with standard precautions in operating theatres: a multi-site, mixed methods study. *Int J Nurs Stud*. 2012;49(8):953-68. doi:10.1016/j.ijnurstu.2012.03.001.
5. Yılmaz S, Çalbayram NÇ. Exposure to anesthetic gases among operating room personnel and risk of genotoxicity: A systematic review of the human biomonitoring studies. *J Clin Anesth*. 2016;35:326-331. doi:10.1016/j.

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- jclinane.2016.08.029.
6. Castellanos M, Xifra G, Fernández-Real JM, Sánchez JM. Breath gas concentrations mirror exposure to sevoflurane and isopropyl alcohol in hospital environments in non-occupational conditions. *J Breath Res.* 2016;10(1):016001. doi: 10.1088/1752-7155/10/1/016001.
 7. Sharifi N, Sadeghi S, Javani M. Survey the relationship between chronic exposure to anesthetic gases and spontaneous abortion, fetal abnormalities. *Persian Journal of Medical Sciences.* 2015;2(4):84-88.
 8. Hoerauf K, Wiesner G, Schroegendorfer K, et al. Waste anaesthetic gases induce sister chromatid exchanges in lymphocytes of operating room personnel. *Br J Anaesth.* 1999;82(5):764-766.
 9. Cohen EN, Brown BW, Bruce DL, et al. A survey of anesthetic health hazards among dentists. *J Am Dent Assoc.* 1975;90(6):1291-1296.
 10. Schuurs A. Reproductive toxicity of occupational mercury. A review of the literature. *J Dent.* 1999;27(4):249-256.

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