

## **Health Risk Assessment of the Carcinogenic and Non-carcinogenic Risks Associated with Airborne Formaldehyde Exposure in Laboratory Settings**

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### **Structured Abstract**

**Background:** Formaldehyde (FA) exposure in laboratory settings is a major concern due to the possible health risks, which include both carcinogenic and non-carcinogenic consequences. This study intends to fill a knowledge gap regarding airborne FA concentrations in academic institution laboratories, especially at Faculty of Applied Sciences (FSG) at Universiti Teknologi MARA (UiTM) Shah Alam. The primary objectives were to determine the FA concentrations in indoor air, compare them to the acceptable exposure limits (PEL-TWA) stipulated by OSHA, NIOSH, ACGIH, and ICOP 2010 and evaluate the carcinogenic and non-carcinogenic health risk associated with FA exposure.

**Methods:** The process included weekly air sampling over two weeks in several FA-utilising laboratories namely, biology (A402), polymer synthesis (A411), chemistry (MK1), and instrument materials technology (OM109) laboratory to determine FA concentrations. The FA concentrations were measured using Formaldehyde Meter (LKC-1000) over 8 normal working hours. The FA health related symptoms were assessed using the Appendix 3B of ICOP 2010 guidelines. The data was analysed and compared to exposure limits and the carcinogenic and non-carcinogenic health risks were identified using statistical and risk assessment methods.

**Results:** The results indicated that majority of the exposure levels for the laboratories exceed the limits set by NIOSH at 0.016 ppm and ACGIH and ICOP 2010 at 0.1 ppm. Regarding carcinogenic risk, all of the studied subjects were in the negligible carcinogenic risk range ( $ELCR < 1.0 \times 10^{-6}$ ). Furthermore, all of the laboratory personnels were in the unhealthy risk range ( $HQ > 1$ ). The laboratory personnels also showed FA exposure-related symptoms such as fatigue, headache, cough, wheezing, and shoulder pain.

**Conclusion:** In conclusion, the findings revealed significantly higher carcinogenic and non-carcinogenic risks. Therefore, it is imperative to implement control measures across various laboratories to mitigate occupational formaldehyde exposure levels effectively. This study will give insights into current safety standards and identify opportunities for improvement. This study will assist not only academic institutions, but also other settings in which FA is utilised.

**Keywords:** Formaldehyde, Health Risk Assessment, Carcinogenic, Non-carcinogenic

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