Article published online: 2021-07-04

Estimation of Cancer Risk Due to Exposure to Airborne Particle Emission of a Commercial Three-dimensional Printer

Beuy Joob, Viroj Wiwanitkit[1]

Sanitation 1 Medical Academic Center, Bangkok, Thailand,
[1]Department of Medicine, Faculty of Medicine, University of Nis, Serbia

Address for correspondence:
Dr. Beuy Joob,
Sanitation 1 Medical Academic Center, Bangkok, Thailand.
E-mail: beuyjoob@hotmail.com

Sir,

The three-dimensional (3D) printer is the basic office tool widely used around the world. The environmental effect due to 3D printer use is an interesting issue. Yi noted that "laser printers that emit ultrafine particles (UFP) suggest the need to characterize 3D printer emissions to enable reliable risk assessment."[1] Stabile *et al*. reported that using 3D printer could produce airborne particle can spread dose up to 200 mm^2 in <1 h.[2] The "ultrafine particles (UFPs, particles <100 nm) are the main emitted particles by the 3D printers.[3] The risk of cancer induced by exposed to such emitted particles is an interesting topic. Here, the authors estimated the cancer risk due to exposure to such UFP particles. Using the same method as previously published in Indian J Cancer,[4] the calculation for the cancer risk was performed. Briefly, individual lifetime cancer risk is equal to "concentration of contaminated particle in atmospheric air × lifetime unit risk factor." There are data on individual life time cancer risk for UFP particles (average weight 0.106 ng) is previously reported by Liao *et al*. on risk assessment for exposure to urban environmental pollution and equal to 4.45×10^{-4}.[5] According to the report by Liao *et al*., the calculation based on the situation of exposure to average UFP amount of 1.69 ng/m^3 for 15 h/day or equal to 0.113 $ng/m^3/h$.[5] Focusing on the data on the concentration of contaminated particle in atmospheric air is previously reported by Stephen *et al*.[6] According to the study by Stephen *et al*.,[6] the "emission rates up to 2×10^{10} particles/min."[6] This is equal to 1.2×10^{12} particles/h in a close room 32.7 m^3 or 3.67×10^{10} particles/m^3/h or 0.389×10^{10} $ng/m^3/h$ was reported. Hence, the risk for carcinogenesis due to exposure to emitted 3D printers should be 3.44 times higher than simple exposure to urban environmental pollution. The estimated individual life time cancer risk equal to 4.45×10^{-4} or this mean in a life time, there will be 4.45 cancerous cases per 10,000 people exposed to 3D printer. This rate is significantly high and brings attention for further public health concern on the present widely used tool in any office, 3D printer.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Yi J, LeBouf RF, Duling MG, Nurkiewicz T, Chen BT, Schwegler-Berry D, *et al.* Emission of particulate matter from a desktop three-dimensional (3D) printer. J Toxicol Environ Health A 2016;79:453-65.
2. Stabile L, Scungio M, Buonanno G, Arpino F, Ficco G. Airborne particle emission of a commercial 3D printer: The effect of filament material and printing temperature. Indoor Air 2017;27:398-408.
3. Azimi P, Zhao D, Pouzet C, Crain NE, Stephens B. Emissions of ultrafine particles and volatile organic compounds from commercially available desktop three-dimensional printers with multiple filaments. Environ Sci Technol 2016;50:1260-8.
4. Joob B, Wiwanitkit V. Estimation of cancer risk due to exposure to lead contamination in Thai Ayurveda products. Indian J Cancer 2015;52:550.
5. Liao CM, Chio CP, Chen WY, Ju YR, Li WH, Cheng YH, *et al.* Lung cancer risk in relation to traffic-related nano/ultrafine particle-bound PAHs exposure: A preliminary probabilistic assessment. J Hazard Mater 2011;190:150-8.
6. Stephens B, Azimi P, Orch ZE, Ramos T. Ultrafine particle emissions from desktop 3D printers. Atmos Environ 2013;79:334-9.

Access this article online

Quick Response Code:

Website: www.ijmpo.org

DOI: 10.4103/ijmpo.ijmpo_118_17

How to cite this article: Joob B, Wiwanitkit V. Estimation of cancer risk due to exposure to airborne particle emission of a commercial three-dimensional printer. Indian J Med Paediatr Oncol 2017;38:409.