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Genotoxicity induced by different brands of e-cigarette liquids

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Recent studies have shown that e-cigarettes contain carcinogenic compounds and nicotine that makes their long-term safety questionable; however findings on their genotoxic behaviour are still limited. We used in vitro single-cell gel electrophoresis (comet) and micronucleus (MN) assays with human lymphoblastoid TK6 cells to examine the genotoxicity of different brands of e-cigarette refill liquids collected from local e-cigarette smokers. As indicated in the label, these refills contain 1 to 8 mg nicotine. We tested nicotine content in these refills by Gas Chromatography/Mass Spectrometry and the range was between 0.5 to 10.4 mg with poor correlation ($r=0.283$, $p=0.019$). Six refills had nicotine ≥ 2 folds the label. Human lymphoblastoid TK6 cells were exposed overnight to 20 μ l of e-cigarette liquids, and nicotine (4 mg). Negative (untreated cells) and positive controls (cells treated with 100 mM H₂O₂) displayed respectively the absence and presence of DNA damage. 14 samples induced ≥ 5 folds strand breaks in DNA as depicted by tail moment higher than the negative control. Nicotine in these samples was in the range of 0.96 to 10.4 mg. We exposed 23 refills that showed no positive

response for 3 hours to metabolic activation (liver microsomal S9 fraction from Wistar rats). The introduction of S9 mix made significant increase in DNA damage ($p<0.001$). Out of 23 refills, ≥ 5 folds increase in TM was observed in 13 refills. Chromosome breakage expressed as MN frequency ≥ 3 folds higher than in untreated cells was found in 20 refills out of 63 tested (31.7%) that contains nicotine in the range between 1.3 to 9.6 mg. There was significant positive correlation between TM and MN ($r=0.284$, $p=0.021$). An evidence of positive relationship was seen between nicotine and MN ($r=0.212$, $p=0.095$) but not with TM. Our results suggest that some other ingredients with mutagenic/genotoxic properties in e-cigarette refill liquids might have induced DNA damage. Further investigation is required confirming our observation.

Speaker Biography

Ghofran Al-Qudaihi was awarded her PhD degree in 2011 by Newcastle University, United Kingdom. In 2014, she joined the Environmental Health Program at the King Faisal Specialist Hospital & Research Centre. Currently her research interests are directed towards the identification of genotoxic chemicals present in everyday life and the environment.

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