

## Short Communication

# Aerosol Chemistry – Comparison to Smoke

Somchai Bovornkitti, MD, FRCP, FRACP, FACP

The Academy of Science, The Royal Society of Thailand

**Corresponding Author:** Somchai Bovornkitti, MD, FRCP, FRACP, FACP

The Academy of Science, The Royal Society of Thailand

According to epidemiological data showing that worldwide more than 1 billion adults smoke, and smoking causes serious diseases including cardiovascular diseases, lung cancer and chronic obstructive pulmonary disease (World Health Organization. [https://www.who.int/tobacco/global\\_report/2015/report/en/](https://www.who.int/tobacco/global_report/2015/report/en/)).

The strategies for reducing the harm associated with cigarette smoking was focused on promoting smoking cessation. The status quo in smoking cessation presents smokers with two alternatives: quit or suffer from the harmful consequences. However, there is another choice for smokers, i.e. switching to the smoke-free cigarette powered by a rechargeable battery that is designed to heat tobacco leaf instead of burning. Therefore, the chemical contents in an aerosol that is not smoke are inhaled. Hence a transformation in the tobacco industry to create smoke-free products such as the heat-not-burn electronic cigarette would intimately benefit users. Besides electronic cigarettes also provide a coping ritual associated with smoking gestures e.g., the hand-to-mouth action of smoking. For these reasons electronic cigarette, the heat not burn product is now perceived by users as a more attractive substitute for smoking.

As regard the comparative assessment of electronic products with tobacco cigarette smoke, there are articles, namely, “A comparative in vitro toxicity assessment of electronic vaping product e-liquids and aerosols with tobacco cigarette smoke” by R. Wieczorek, et al, in *Toxicology in Vitro* pre-proof, April 14, 2020 (<https://doi.org/10.1016/j.tiv.2020.104866>) and “Free Radical Production and characterization of Heat-Not-Burn Cigarettes in Comparison to Conventional and Electronic Cigarettes” by

Zachary T. Bitzer and Colleagues in Chemical Research in Toxicology, May 20, 2020 (<https://doi.org/10.1021/acs.chemrestox.0c00088>). Both papers disclosed that the conventional cigarettes, which its burning cone reached temperatures of >900 degrees Celsius, producing numerous toxicants and significant levels of highly reactive free radicals, while the electronic heat-not-burn cigarettes below the temperature of 250-350 degrees Celsius potentially limiting the production of combustion-related toxicants by the conventional cigarettes (Table).

**Table 1** Gas-Phase Radicals Per Puff

| Device | Nicotine (mcg) | Particulate-phase radicals (pmol) | Total gas-phase radicals (pmol) |
|--------|----------------|-----------------------------------|---------------------------------|
| IR6F   | 189.5 ± 7.9    | 73.9 ± 7.5                        | 567.6 ± 78.3                    |
| IQOS   | 122.2 ± 9.6    | nd                                | 12.6 ± 1.1                      |
| Juul   | 155.7 ± 44.6   | nd                                | 5.3 ± 0.5                       |

IR6F (conventional cigarettes)

IQOS (HnB product)

JUUL (nicotine liquid e-cigarette)