

## Systematic Review

### E-cigarette Smoking: Health Risk or an Opportunity for Smokers?

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#### Abstract

Tobacco smoking cessation is an extremely difficult task because of nicotine addiction. Those ones unable to quit, will inexorably face serious diseases such as myocardial infarction, stroke and tumors. These harms are mainly due to tobacco combustion. Digital smoking (e-cigarettes and tobacco heating system) appeared in such a scenario with the goal of reducing combustion harm. Digital smoke it is not safe but can significantly reduce toxicity, compared to conventional cigarette smoking, in smokers who are unable or non-willing to cessation. Digital smoking toxicity data are often inconsistent due to the lack of a standardized research approach, generating confusion both among scientists and policy makers. We recently published a study whose results support the concept that the exclusive use of digital smoking is capable of significantly reducing levels of carbon monoxide, with values returning within the range of normality. Research aimed to further expand knowledge on toxicity are needed but should be planned on the basis of the risk reduction concept as a viable option for inveterate smokers.

#### Introduction

Tobacco smoking cessation is a complicated objective since smokers are difficult to reach and most cessation attempts fail even when following the instructions from the guidelines [1-3]. Clinical experience supports the idea that smokers who are not able to quit, left to their own addiction, for the most part return to conventional tobacco use.

The failure of quitting makes the prognosis of cardio-vascular illnesses, such as acute coronary syndrome [4] and also pulmonary

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cancer [5], worse. In the face of this failure and of the thousands of resulting deaths, the UK Health Ministry has introduced e-cigarette smoking as a public health measure in support of smokers who are unable to quit [6]. In 2019, a study has shown that 866 smokers who had used the National Health Service to stop smoking had double the chance at succeeding in their goal if they used e-cigarettes instead of Nicotine Replacement Therapy (NRT) [7].

Again in 2019, results from a time series analysis between 2006 and 2017 have been published. The increase in prevalence of e-cigarette use by smokers in England has been positively associated with an increase in success rates of quit attempts and overall quit rates after adjusting for a range of possible confounding variables [8].

In this scenario, an EVALI (E-cigarette or Vaping product use Associated Lung Injury) epidemic has broken out in the United States [9]. The still ongoing investigations support the idea that the deaths and the hundreds of hospitalization cases are tied to an improper use of the e-cigarette: the cartridges were recklessly filled with oily liquids containing cannabis extracts, vitamin E acetate, and other undefined, potentially lethal toxic agents. Despite this dramatic proof, the Centers for Disease Control and Prevention (CDC) in the United States, in addition to advising against the purchase of vaping liquids from unauthorized centers, recommended those smokers who had switched to e-cigarettes to not return to conventional cigarettes [10]. This latest instruction from the CDC is extremely important because it suggests that legal e-cigarette smoking has toxicity levels lower than those of tobacco smoke.

The reduction of risk is a clinical strategy widely used in drug addiction [11], but still faces obstacles in nicotine addiction. In this regard, there are interesting observations from Scandinavian countries on the use of snus in relation to cigarette combustion smoke and its link to lung cancer [12], which highlight that a direct correlation between the use of snus and lung cancer does not exist, contrary to what has been established by now regarding conventional cigarette consumption. There is still a spirited ongoing scientific debate on e-cigarettes: research has offered contradictory points in relation to e-cigarette smoking, and the media has often released information that has confused the general public.

For example, in a study carried out on cultured cells of immature lung bathed in electronic cigarette vapor containing common flavors, a toxic reaction was observed [13]. Similarly, laboratory rats with respiratory allergies were exposed to flavored e-cig vapor, and developed asthma as a result. Consequently, the AA recommended caution in using e-cigarettes for asthma sufferers and hoped for further studies with the goal of implementing standards for e-cigarette use [14]. The careful reader will be well aware that laboratory testing in experimental conditions, on cell lines or genetically engineered laboratory rats, cannot be simplistically transferred in the clinical field to humans. In contrast with this evidence, P Shields et al. have published an in-depth study on the lung toxicity of the e-cigarette vapor compared to cigarette smoke, and have concluded that e-cigarettes have a much

lower inflammatory potential on lung tissue than that of conventional cigarettes. They have also observed that a series of cancer biomarkers present in the blood and urine of smokers fell substantially with a complete switch to electronic cigarettes and in a less significant manner for those who use both [15].

Robert Strogan asserts that all smokers should be encouraged to stop smoking cigarettes and instead use e-cigarettes if there is a resistance to quitting smoking. The author hopes that studies on the risks linked to e-cigarettes will continue in order to optimize risk reduction and to encourage smokers to quit [16].

K. Farsalinos and G. Lagoumintzis have published data on the toxicity of the flavors in the e-cigarette vapor, proving that their quantity is distinctly less than the minimum necessary in order to be declared toxic [17]. Previously, ML Goniewicz et al. have demonstrated very convincingly that switching from conventional cigarettes to e-cigarettes can significantly reduce exposure to the toxic products of tobacco, recommending it as a viable method for reducing risk in smokers who were unable to quit [18].

Recently, Wang G et al. conducted an in-depth and scientifically rigorous evaluation on e-cigarette smoking, with an updated review where the results show that the research data relating to the components of the e-liquids with toxic potential are inconsistent. They have also shown that most of the studies comparing the toxicity of e-cigarettes with conventional cigarettes indicate a lower toxicity of e-cigarettes. Wang G et al. assert that the scientific tests on the toxicity of the e-cigarette are contradictory because of the lack of a standardized research method which should take into considerations nicotine, the ingredients, and the type of devices, in the area of the risk reduction research field [19]. A significant number of smokers, unable to quit, turn to Tobacco Heating Systems - THS, which are designed to reduce the toxicity resulting from combustion, seeming more similar to conventional cigarettes compared to e-cigarettes.

Research findings, in some cases, are contradictory for this particular category of products as well. But there is laboratory data documenting a significant reduction in toxicity for THS compared to standard, non-digital smoking [20].

Exposure to the carbon monoxide contained in the THS aerosol is comparable to environmental exposure, and the acrolein and formaldehyde levels are respectively 89-95% and 66-91% lower than those of conventional cigarettes [21]. Furthermore, the nicotine levels produced by THS are similar to those of combustible cigarettes [21], a factor that points to the possibility of THS users being able to completely turn their back on conventional cigarettes and switch to solely using THS. This has been recently confirmed in a study carried out by the American Cancer Society demonstrating the significant reduction in cigarette sales in Japan, following the introduction of THS [22].

In the United States, the Food and Drug Administration recently authorized the sale of THS (Pre-Market Tobacco Application - PMTA) calling it appropriate for the protection of public health because, among the various key toxicology and clinical considerations, these products produce lower quantities and levels of a number of toxic substances than cigarettes entailing combustion [23]. There are also those who remain cautious and do not provide their take [24]. In this complex clinical and scientific framework, the pilot study by F. Beatrice and G. Massaro has recently been published [25].

The work proves that a significant sample of heavy smokers evaluated at the Anti-Smoking Center in the San Giovanni Bosco Hospital in Turin (Italy), unable to quit in spite of the support provided as per the guidelines, leaned towards switching to digital smoking backed by the experts with specific counseling (MB Jacobacci & Partners, trademark number 013388186) [26].

One group of the smokers independently chose a closed-system e-cigarette model with medium supply potential and a pre-set dose of nicotine. Another group chooses the THS product. The latter had a level of nicotine dependence, measured with the Fagestrom test, higher than the sample that had chosen the e-cigarette. The difference was statistically significant and could indicate that for some smokers the perception of the presence of tobacco is essential.

In both groups, the switch was exclusive and after six months the exhaled carbon monoxide, a clinical indicator of toxicity from combustion, remained within a normal range. Although the question of inhaled toxicity and nicotine dependence has not been completely resolved, digital device smoking seems to constitute an acceptable option and a turning point for inveterate smokers [27].

## Conclusion

The choice of digital device smoking by a smoker represents a change and a greater care being given to one's own health. If supported with objectivity and transparency in the area of a doctor-patient relationship based on trust, in addition to strengthening a therapeutic "partnership", it could broaden the horizon to further progress towards the goal of quitting which remains the main objective.

Further independent studies evaluating the acute, sub-acute and chronic effects of digital device smoking over time are necessary. The consequences of cigarette smoke are, on the other hand, dramatic and existing in the present, and this certainty must not, for the sake of the principle of precaution, lead to the collapse of assistance policies for smokers.

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