

# Electronic Cigarettes, Oral Health, and COVID-19: What You Need to Know

Cigarrillos Electrónicos, Salud Oral y COVID-19: Lo que Necesita saber

Wilson Gustavo Cral<sup>1</sup> & Mariane Michels<sup>2</sup>

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**ABSTRACT:** Known as “vaping devices”, electronic cigarettes (e-cigarettes) have been consumed more and more on a global scale, in addition to being considered another factor in the transmission of COVID-19. Electronic cigarettes use chemicals in liquid form, which are incorporated, heated and vaporized. Such solutions may or may not contain nicotine. For this reason, many users of conventional cigarettes rely on the idea of stopping their addiction by switching to electronic cigarettes, with the justification of reduced harm. Despite a scientific knowledge still in formation, unable to remedy all the consequences that these cigarettes cause on the individual's health, as well as their effects on the mouth, the purpose of this article is to discuss the main results that scientific studies have found on this topic and propose an awareness of the population about its harmful effects on health and transmission of COVID-19 by sharing among users.

**KEY WORDS:** electronic nicotine delivery systems; oral health; covid-19; delivery of health care; health education.

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## INTRODUCTON

### Conventional and electronic cigarettes: an overview.

Also known as “vaping devices” in Brazil, and “Electronic Nicotine Delivery Systems (Ends)”, and “e-cigarettes” in other countries, electronic cigarettes have been increasingly consumed worldwide. They consist of cigarettes that run on a battery (usually lithium) and use liquid solvents that are initially heated and finally vaporized. The users of e-cigarettes are common in the young population and in individuals who have or do not have previous experience with conventional cigarettes (de Mesquita Carvalho, 2018).

In general, conventional cigarettes are products that release nicotine and other cytotoxic and carcinogenic substances through the combustion (burning) of tobacco. For this reason, the consumption of cigarettes is called smoking, and the diseases caused by the release of their products are called tobacco-related diseases (de Mesquita Carvalho, 2018).

In the last decade, more than 50 million people are estimated to have died in underdeveloped or developing countries as a result of tobacco-related diseases, such as lung and cardiovascular diseases, and cancer. The gravity is so great that, by the end of this century, an estimated 1 billion people will be victims of tobacco. For this reason, in 1997, smoking was considered by the World Health Organization as a disease of the group of mental and behavioral disorders resulting from the use of psychoactive substances (de Mesquita Carvalho, 2018).

With the increasing use of e-cigarettes in Brazil and in the world, many questions begin to arise. What are its effects on general and mouth health? Are the effects caused by it the same as those caused by conventional cigarettes? There is still a long way to go, in order to solve all the questions that arise about

<sup>1</sup> University Center of Federal District (UDF), Brasília, Brazil.

<sup>2</sup> University of Sorocaba (UNISO), Sorocaba, São Paulo, Brazil.

this new type of addiction. However, scientists believe that the nicotine used in these e-cigarettes undergoes some transformations, that is, "filtration", through the heating and vaporization system (de Mesquita Carvalho, 2018; Rouabhia, 2020).

E-cigarettes use chemical substances, the so-called "juices", in liquid form, which are incorporated, heated and vaporized by a lithium battery system. Such solutions may or may not contain nicotine, in a concentration of up to 36 mg/mL, which is a psychoactive substance derived from tobacco leaf. Other additives that can be used are: flavoring agents, propylene glycol, glycerol, among others (Leigh *et al.*, 2016; de Mesquita Carvalho, 2018; Rouabhia, 2020).

In spite of the existence of studies regarding the cytotoxic and carcinogenic effect arising from the release of these substances, little is known about the site of incorporation in the human body and about the long-term effects of their inhalation (de Mesquita Carvalho, 2018). However, studies indicate a reduction in toxic compounds compared to conventional cigarettes, in addition to the non-production of tar and carbon monoxide (Audrain-McGovern *et al.*, 2016; Leigh *et al.*, 2016). Despite this, e-cigarettes have no beneficial effects on the body, quite the contrary: there is a relationship with irritation of the lungs, lung diseases, coughing, sneezing and exacerbation of asthma. In addition, it can be considered a gateway to conventional cigarette addiction (Holliday *et al.*, 2021).

The presence of numerous flavors in the substances used by e-cigarettes, including when associated with nicotine, can change the user's behavior in relation to the subjective value of reward. The study by Leigh *et al.* (2016), showed that users of flavored products exerted more effort during puffs, in addition to inhaling twice as many e-cigarettes compared to those who used the unflavored product.

In contrast, the use of e-cigarettes with nicotine has a justification based on the "reduction of risks" by its users. This is because many of the individuals are making the transition from using conventional cigarettes to e-cigarettes, since their health effects are lower, and the satiety effect, promoted by nicotine, remains. However, it is worth mentioning that replacing one addiction with another is not capable of fighting smoking or alleviating addictions (de Mesquita Carvalho, 2018; Holliday *et al.*, 2021).

In addition, it is recommended to follow the principle of prevention, based on the lack of knowledge about all the effects of these e-cigarettes on the organism in the long term, such as cancer (de Mesquita Carvalho, 2018).

### **Electronic cigarettes and oral health: what do the studies show?**

Regarding the oral manifestations caused by e-cigarettes, more studies are needed to validate their effects in the mouth. However, it is suggested that effects on the periodontium, such as inflammation, bacterial plaque index and periodontal welding depth were greater in conventional cigarettes, followed by e-cigarettes compared to non-smoking individuals (Soussy *et al.*, 2016; Tierney *et al.*, 2016; Yao *et al.*, 2017; Kim *et al.*, 2018).

Furthermore, studies show that e-cigarette aerosols caused an increase in the adhesion of *Streptococcus mutans* bacteria to the enamel surface, promoting the formation of bacterial plaque (Kim *et al.*, 2018).

They also show that enamel exposed to aerosols from flavored e-cigarettes had decreased hardness compared to unflavored ones. This bacterial-initiated enamel demineralization was linked to high levels of esters (ethyl butyrate, hexyl acetate, and triacetin) found in the liquid substances in e-cigarettes. Such commercial liquids are known to contain various additives at various levels, including sucrose, although interactions with teeth may vary from liquid to liquid. Therefore, more studies are needed to assess the extent to which e-cigarettes increase the incidence of caries in their users (Soussy *et al.*, 2016; Tierney *et al.*, 2016; Yao *et al.*, 2017; Kim *et al.*, 2018).

Among other effects on oral health, there are reports of changes in tooth structure and pain. In the study by Yao *et al.* (2017), 11.4 % of e-cigarette users had teeth with cracks or fractures in the last 12 months, 18.5 % reported gum pain and/or bleeding, and 11.0 % reported pain on the tongue, with and without inner cheek pain. Such results are corroborated by the study Hua *et al.* (2013) that reported sensitive teeth and mouth ulcers.

In the study by Polosa *et al.* (2014), the most frequently reported adverse events were throat and/or mouth irritation (35.6 %), dry mouth and/or dry throat (28.9 %), headache (26.7 %) and dry cough (22.2 %).

These changes suggest that e-cigarettes may have negative effects on oral health, increasing mouth irritation, dry mouth and ulceration.

### E-cigarettes and the transmission of COVID-19.

According to Gaiha *et al.* (2020), the use and sharing of e-cigarettes by young people during the COVID-19 pandemic is associated with the transmission of the disease. In addition, due to the diminished immune responses in users of these cigarettes and the fact that they can affect protective lung barriers by increasing peribronchial inflammation and fibrosis, the development of COVID-19 symptoms can be even more frequent and severe (Gao *et al.*, 2021; Brar *et al.*, 2021). The authors also warn about the importance of the population knowing the different forms of contagion.

The North American study by Gao *et al.* (2021) investigated the impact of the spread of information about electronic cigarette consumption during the pandemic among users of the social network Twitter. The research concluded that young people who commented more on this topic had greater awareness and concern about health, with Twitter being an important tool for sharing information among the young population, especially.

### Final considerations.

In scientific articles, most of the effects caused by e-cigarettes, especially in the mouth, are self-reported. In addition, there is a gap in the scientific literature regarding the main binding sites of nicotine (available in these cigarettes) in the organism, and consequently, the relationship of these e-cigarettes with the development of cancer and other changes in oral tissues.

Many of its users already have some previous experience, often chronic, with the use of conventional cigarettes - which makes it difficult to particularize the isolated effects of e-cigarettes by scientific studies in humans.

However, the importance of disseminating scientific and up-to-date information regarding its dependence and transmission of COVID-19 is emphasized, so that such data are disseminated to the population and promote effective public health measures for the prevention and awareness of its use. Electronic cigarettes, as well as other sources of nicotine consumption, are harmful to health as well as the oral cavity.

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**RESUMEN:** Conocidos como “dispositivos de vapeo”, los cigarrillos electrónicos (e-cigarettes) se han consumido cada vez más a escala mundial, además de ser considerados un factor adicional en la transmisión del COVID-19. Los cigarrillos electrónicos utilizan productos químicos en forma líquida, que se incorporan, calientan y vaporizan. Tales soluciones pueden o no, contener nicotina. Por esta razón, muchos usuarios de cigarrillos convencionales confían en la idea de dejar su adicción pasándose a los cigarrillos electrónicos, con la justificación de la reducción del daño. A pesar de un conocimiento científico aún en formación es incapaz de remediar todas las consecuencias que estos cigarrillos provocan en la salud del individuo, así como sus efectos en la cavidad oral. El propósito de este artículo fue discutir los principales resultados que los estudios científicos han encontrado sobre este tema y proponer una concientización de la población sobre los efectos nocivos en la salud y transmisión del COVID-19 mediante el intercambio entre usuarios.

**PALABRAS CLAVE:** sistemas electrónicos de suministro de nicotina, salud oral, COVID-19, prestación de atención de la salud, educación para la salud.

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Corresponding author:

Prof. Dr. Mariane Michels  
DDS, MSc, PhD in Oral Radiology  
UNISO - University of Sorocaba  
Sorocaba  
São Paulo  
BRAZIL

<https://orcid.org/0000-0001-6234-0738>

E-mail: [mariane.professora.odontologia@gmail.com](mailto:mariane.professora.odontologia@gmail.com)