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The Not So Hidden Dangers of Vaping

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Abstract: The use of e-cigarettes and vaping devices has become a widely accepted trend in our society. These devices come with many negative effects that pose harm to one's health. This article examines the truths about these dangers and the risks associated with vaping.

Over the last several years, there has been a drastic rise in the prevalence of vaping. Vaping is the use of an electronic device, such as an e-cigarette, to heat up a vapor for inhalation. Vapors often contain nicotine and can come in many different flavors. Adolescents between the ages of 10 and 24 are the most rapidly accelerating group of those who vape. Between 2017 and 2019, vaping rates more than doubled among high school students, rising from 25% of high school seniors and 21% of sophomores to 40% and 36% respectively just two years later.[1] The introduction of the Juul, a discreet vaping device, and other similar devices have aided in this trend by providing a more inconspicuous way to take a hit of the nicotine. Although originally developed to aid smoking cessation, vaping has become a social trend that can lead to nicotine addiction, respiratory problems, and puts the well-being of adolescents at risk.

E-cigarettes first became commercially available in China in 2003 and were introduced to the United States in 2006.[2] These devices were developed to help patients quit smoking. However, in 2015, 40% of those who vaped had never smoked a tobacco cigarette.[3] As of 2018, an estimated 41 million people across the globe were vaping, 16.4 million of which had never smoked a tobacco product. This is a significant increase from the estimated 7 million vape users in 2011.[4] The most common reasons for vaping among adolescents include appealing flavor, curiosity, and the low perceived harm compared to tobacco cigarettes.[5] Vape aerosols come in a wide variety of alluring flavors like mango, crème brulee and even "unicorn puke". [6] While these compounds may taste good, they can be harmful to one's health when inhaled. Flavored compounds can be damaging to the lungs because they often contain heavy metals, ultrafine particles, flavorings additives, tetrahydrocannabinol, and nicotine.[7] The actual content and concentration of many vape aerosols remain unknown. As a result, the U.S. Food and Drug Administration has begun extensive testing on vape aerosols for toxic substances.[4]

Many of these aerosols have been found to contain more nicotine than a tobacco cigarette.[7] Some of these vaping products fail to disclose the accurate amount of nicotine in the product. Even some that claim to contain 0% nicotine have been found to contain nicotine.[7] Nicotine is a lipophilic compound that can be absorbed easily through the skin and respiratory membranes. It is a cholinergic agent that competitively binds to acetylcholine receptors in the brain. When this neurotransmission is altered, memory, attention, and mood become impacted. Nicotine enhances the release of dopamine and leads to pleasure induction and stress reduction.[8] Prolonged use leads to a permanent neurotransmission abnormality which generates a higher tolerance, withdrawal, and addiction to nicotine. The reinforcing effects on mood and the avoidance of withdrawal symptoms contributes to the addiction.[9] The higher concentrations of nicotine in vaping products contribute substantially to addiction and may result in higher levels of dependence.

The number of vaping related illnesses and hospitalizations rises with the prevalence of vaping. Vaping related lung injury is classified as an abnormality in imaging of the lungs, such as acute eosinophilic pneumonia, organizing pneumonia, lipoid pneumonia, and alveolar damage.[10] As of January 7, 2020, there have been 2,602 reported cases of vaping product related lung injuries in the United States. There have been 57 reported deaths linked to the use of a vaping product. Patients with lung injury were between the age of 13 to 75 years, with over half of the cases reported in those under the age of 24. New research points to vitamin E acetate as a likely cause of lung injury. Vitamin E can be found in lotions, cosmetics, and as a dietary supplement. In these formulations and application methods, it usually does not have a harmful effect. However, when inhaled it can lead to lung damage. Another potential cause of lung injury is tetrahydrocannabinol. While these compounds have been linked to vaping related lung injury, there has not been one specific ingredient deemed to be the only cause.[4]

While there are risks associated with vaping to anyone who chooses to partake, adolescents are at a greater risk when inhaling these vapors.[7] The brain continues to develop until the age of 25. Nicotine interfering with neurotransmission before the brain fully develops can have lasting impacts on the central nervous system, long-term behavioral changes and neuronal plasticity changes. Nicotine also affects the circuits that deal with attention and learning. A decrease in academic performance, and an increase in the prevalence of Attention Deficit Hyperactivity Disorder, Obsessive Compulsive Disorder, and depression can all result from changes in these circuits due to nicotine exposure.[5] Nicotine dependence can develop from much lower levels of nicotine for adolescents compared to adults, and the alteration of neuronal pathways can increase susceptibility to the addiction of other substances.[5] As the use of vaping increases, so does the prevalence of associated health concerns. Due to vaping being a relatively new trend, many of the long-term risks remain unknown; however, the acute risk of vaping related lung injury is clear today. Various components within vape aerosols make it difficult to pinpoint the specific cause. Vape devices are not primarily being used to help people stop smoking and can, in reality, increase the chances of smoking tobacco products in the future for adolescents that use them.[7] The perception that vaping

has a low harm level proves to be untrue. There are numerous risks involving the potential for life long effects and even death. This social trend should be avoided and action should be taken to inform the public of the not so hidden dangers of vaping.

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