

FACTS ABOUT TOBACCO PRODUCTS & ADDICTION

The FDA lists tobacco products, ingredients, and components included in cigarettes, cigars, dissolvables, hookah, nicotine gels, pipe tobacco, roll your own (RYO), smokeless, and electronic nicotine delivery systems (ENDS) such as vaporizers and electronic cigarettes (FDA., 2020a).

Table 1: Combustible Tobacco Products

Combustible Tobacco Products		
Product	Characteristics	How Used
Cigarette	Available in tobacco or menthol flavors, cigarettes are composed of tobacco, chemical additives, filter, and paper wrapping. They are manufactured in short, regular, and long lengths and generally sold in packs of 20 cigarettes or ten packs per carton.	Most popular, whether store-bought or roll-your-own (RYO). Individuals who use RYO will purchase tubes or paper, tobacco, and sometimes a rolling machine. The open end is lit on fire with a match or lighter tool; the filter end is placed between the lips where air is inspired to mouth and lungs.
Cigar	Cigars are combustible products composed of tobacco, chemical additives, and a wrapper made from tobacco leaf instead of paper. Cigars come in a variety of sizes and many flavors. Many brands do not have a filter, but some cigars include a white filter tip.	Used in same manner as cigarette. Being larger in circumference and length, the user spends more time using it and may chew on the end. Tobacco manufacturers state that they measure the amount of nicotine to be consistent and satisfy the user in cigarettes and cigars.
Pipe	The typical pipe is of plastic construction with a hollow stem, a small mouthpiece at one end and a bowl perched at the other end in which loose tobacco leaf is packed and lit for use.	Used in similar manner as with cigarette by inspiring air through the burning tobacco. The concentration of nicotine is unknown because the user packs in the tobacco product.
Hookah	A waterpipe system which uses a device that includes water, jar, valve, hose, gasket, plate, bowl, charcoal, and often a wind guard.	The smoke of the tobacco passes through the water before inhalation
		(FDA, 2020)

Table 2: Non-combustible Tobacco Products

Non-Combustible Tobacco Products		
Product	Characteristics	How Used
Chewing Tobacco	It is available as loose leaf, plugs, twists, or ropes. It also comes in a variety of flavors.	The user places the product between their cheek and gum and then sucks or chews on the tobacco to extract the nicotine. The saliva that accumulates in the mouth can be swallowed or spit out.
Snuff/Snus/Dip	Snuff is different from chew as it is finely ground tobacco. It is available in various flavors in dry, moist, or pre-packaged pouches (called snus).	The user puts a pinch or dip of the powder or the pouch between their cheek and gum. The juices will be swallowed or spit out.
Dissolvables	Although not very popular in the United States, they are available as lozenges that resemble a pellet or tablet, orbs that look like small mints, sticks with a toothpick-like appearance, and thin strips. They contain <i>nicotine</i> and other potentially harmful ingredients	They are tobacco products that dissolve in the mouth.
Electronic Cigarettes, Vaping Devices	<p>E-cigarettes (EC), or vaping devices, are relatively new to the tobacco product market, arriving in the United States around 2006. These non-combustible tobacco products are battery-operated devices that heat liquid into a vapor that the user inhales. The device components consist of a battery, heating element, liquid with various flavors, and nicotine of varying levels. Several types of EC are available, including cigar-like devices which look similar to a cigarette and closed systems that disallow customization of the nicotine content or flavor of the liquid. Advanced devices can be shaped like a pen or a box, in which the user adds the liquid to a tank or drips it directly onto the heating element. The advanced level of EC allows the user to vary the voltage or wattage output of the device. This changes the amount of draw resistance and level of heat to the device. In addition, the liquid of the EC contains varying levels of propylene glycol, vegetable glycerin, flavorings, and nicotine, which impact the vapor produced and the nicotine absorbed by the body in the type of EC (CDC, 2021; Yingst et al., 2015).</p> <p>The pod device is a closed system that uses nicotine salts to deliver nicotine to the user. These devices, known commonly as JUUL, have become increasingly popular due to the ease of use, size of device, and effective delivery of nicotine (FDA., 2020b; Yingst et al., 2019). In addition, more information of harm to the body from chemicals in the vapor, such as Vitamin E acetate and marijuana (TCH, CBD) oils has come to light. The difference between TCH and CBD is described at the first crop web site (Firstcrop, 2020).</p>	

The Bio-Chemical Science of Tobacco Use

Tobacco addiction is a chronic disease with deceptive control over smokers. National organizations such as National Cancer Institute and American Cancer Society recognize that nicotine is powerfully addictive and that cigarette smoking is the greatest preventable cause of premature death in the United States, accounting for 1 out of 5 deaths, 87 percent of lung cancer deaths, and at least 30 percent of all cancer deaths each year (American Cancer Society, 2020; NCI, 2017).

Nicotine is naturally present in the tobacco plant; however, it may not be addictive in its natural form. To create uniformity in their products, tobacco companies intentionally load nicotine to create standard levels in each product item. Generally, this level creates and sustains addiction (National Cancer Institute, 2017).

Nicotine imitates the neurotransmitter acetylcholine, which transmits a chemical message across synapses in the brain. Acetylcholine has a receptor called the nicotinic receptor. When this receptor is activated either by acetylcholine or nicotine, channels open, and ions are released, impacting the neuron and exciting the cell. The channel then closes, and the receptor becomes temporarily inactive. With continued exposure to nicotine, the inactive period of the channel becomes prolonged, thus reducing sensitivity and requiring more nicotine to create a response (How Drugs Affect Neurotransmitters, 2020)

The Addiction Cycle. Neurons in the brain's ventral tegmental area have nicotine receptors that activate dopamine release in the nucleus accumbens, setting up an addiction cycle that is crucial to understanding tobacco addiction. More nicotine to this area results in more dopamine release into the brain. However, more dopamine creates dependence on that amount to feel “normal.” Furthermore, continued nicotine use upregulates the number of nicotine receptors and creates a dependency. The more nicotine exposed to the receptors in the nucleus accumbens, the slower the recovery of these receptors, thus reducing the availability of active receptors. When the nicotinic receptors upregulate, more nicotine is needed to feel good or normal. Consequently, when a tobacco user goes for some time without using, they will experience psychological withdrawal symptoms, such as anxiety, irritability, nervousness, and restlessness (Benowitz, 2010).

Nicotine is quickly metabolized in the liver to *cotinine* and has a half-life of about 2 hours (Benowitz, 2010). This short half-life creates peaks and valleys of nicotine levels in the body and requires frequent doses during the day or withdrawal symptoms return. In addition, social and environmental cues, such as waking, work breaks, drinking coffee, or eating dinner, reinforce the use of tobacco products as a person goes through their day. This concurrent engagement allows for the user to associate feeling good and to reduce stress with activities where nicotine is administered (the “pleasure principle”),

hence solidifying a dependence on the use of the nicotine product and making it their lifestyle (Dawkins, 2013).

Nicotine withdrawal can start as soon as 20 minutes after the use of a tobacco product. It generally peaks at about Day 3 of abstinence, and the physical dependence can last for up to four weeks. The psychological cravings can last much longer, however. Smokers, in particular, report cravings well past six months after quitting. Common nicotine withdrawal symptoms include irritability, anxiety, restlessness, difficulty concentrating, sleep disturbance, depressed mood, bad mood, increased appetite, and weight gain. (CDC, 2020b)

Intervention

The use of medications, such as nicotine replacement, Varenicline or Bupropion (Trade name Zyban), to treat smoking dependence has value in controlling stress and moderating the emotions and cravings. However, it only acknowledges the dependent state of physical nicotine addiction. It has little effect on the social (smoking with friends) and sensory (smelling a cigarette, inhaling the smoke, and seeing plume on exhalation) experiences of a person who smokes.

Table 3: Types of Nicotine Replacement Therapy and Oral medications

NRT	Additional Information
<p><i>Nicotine gum</i> -Over the counter (OTC), may be covered by insurance if prescription provided. Dose-2 or 4 mg pieces. Chew hourly as needed not to exceed 24 pieces per day</p>	<p>Chewed until a peppery taste in the mouth occurs and then parked between the gum and the cheek. Once the pepper taste and tingling are gone (about 10 minutes), the user repeats chew. If chewed like a piece of regular gum, it can cause heartburn, hiccups, jaw pain. and park. One piece can last about three rounds of chew and park or about 30 minutes. If chewed like a piece of regular gum, it can cause heartburn, hiccups, jaw pain.</p>
<p><i>Nicotine patch</i>- Over the counter (OTC), may be covered by insurance if prescription provided. Dose-21mg, 14mg, and 7mg</p>	<p>Place the patch on clean, dry skin and change the location daily. It is fully absorbed in about 2 hours and delivers a steady-state of nicotine over 24 hours. If patient experiences disturbed sleep may remove the patch 30 minutes before bedtime. Change location of patch every day. User may see an irritation on the skin. Do not reuse in same location until all redness or irritation resolved.</p>
<p><i>Nicotine Lozenge</i>- Over the counter (OTC), may be covered by insurance if prescription provided. Dose-2mg and 4mg. Not to exceed 24 per day</p>	<p>Comes in regular or mini size and several flavors. Use one hourly as needed. Allow the lozenge to dissolve in the mouth. Do not chew it. The nicotine is absorbed in 20 minutes</p>

<p>Nicotine nasal spray Prescription is required. Dose- One spray each side of the nose, do not sniff.</p>	<p>It is designed for quick delivery of nicotine by spraying into the nose. One spray each side of the nose, do not sniff.</p>
<p>Nicotine inhaler - Prescription required. Dose- Each cartridge can deliver 4 mg of nicotine over 80 small inhalations. Do not exceed 20 cartridges per day.</p>	<p>It is puffed into the oral cavity for mucosal absorption. It should not be inhaled or drawn like a cigarette, or it will cause coughing and throat irritation. The nicotine inhaler is designed to combine pharmacological and behavioral support</p>
<p>Following oral medications, require prescription.</p>	
<p>Zyban (bupropion) Dose at 150 mg once daily for three days, then increase to 150 mg q12hr. Intervention should be continued for 7-12 weeks. If the patient successfully quits after 7-12 weeks, consider ongoing maintenance therapy based on individual patient risk/benefit. Zyban can also be prescribed with NRT for a personalized intervention program.</p>	<p>Stimulates the brain to release the feel-good hormone dopamine. It can be prescribed as a sustained release and is not addictive. Zyban reduces nicotine cravings and withdrawal symptoms. Generally, users have less weight gain. If a patient has a history of seizures, alcohol dependence, or liver disease, consider different medications.</p>
<p>Varenicline Dose- The four-week starter pack is organized to provide correct dosing to patients. 0.5mg once a day for 3 days. Increase to 1 mg daily for 4 days. Then 1 mg BID for duration of Use Intervention. Doses spaced at least 8 hours apart.</p>	<p>The medication should be started one to two weeks before the quit date. The patient can also start it even if there is no interest in quitting as a possible method to reduce or quit tobacco use. Instruct the patient to always take this medication after eating with a full glass of water. The most common adverse effects are nausea and disturbed sleep. Follow patients on this for tolerance to the medication and any new or worsening mental health symptoms. It blocks nicotine from binding to the nicotine receptors in the brain, therefore preventing the release of dopamine.</p>

The behaviorist interventions to treat smoking, such as the act of trigger avoidance, reduced access to cigarettes, and altered environment support behavioral strategies to quit smoking. However, some current tobacco use intervention may lack self-reflection and the connection to smoking that the body learns through repeated actions, senses, and emotions created from years of use. It is important to see other avenues for quitting tobacco use that account for the body's connection to it. While behavioral approaches can be effective, these techniques may not support the sensory and motor connections that have become a way of life for the user. Think about the ingrained ritual (lighting a cigarette first thing in the morning or as soon as you get in the car) that is likely a

subconscious behavior in a daily smoker; to treat this way of being with strictly behavior techniques (taking medication and resisting urges and cravings to smoke) ignores the body's habit or way of being. A smoker learns to use a cigarette, e-cigarette, or vaper, or dissolvable to relieve stress, relax, socialize, and occupy their time. Incorporating these motor and sensory techniques may help people who are not able or ready to quit adapt to the behavior techniques.

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