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**Use Don't Abuse: A Christian's Guide to Drugs and Alcohol**

A Thesis Submitted

To the Teacher and Students of Advanced Apologetics

By

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### **Introduction**

Nearly everyone knows someone who has smoked weed, if they have not already done so themselves. In today's society, the topic of drugs and similar substances is no longer taboo, but has become a widely discussed matter. The Christian community holds a variety of stances on the subjects of alcohol, marijuana, or nicotine, but as a community of one faith, it is important to reach a final, singular consensus on the use of these substances. The intent of this thesis is to reach a conclusion when discussing alcohol, marijuana, tobacco, nicotine, energy drinks, and the use of drugs for religious experiences.

There is a lack of biblical scripture that explicitly states God's desire for Christian use of all of the aforementioned substances, aside from alcohol. Because of this, God's statements on the consumption of alcohol make up a large percentage of the conclusions reached on the discussion of other substances mentioned in this thesis. There is also a section discussing the use of drugs for religious purposes, as well as brief mentions of harder substances for medicinal purposes. The conclusion will consist of two parts. The first part will discuss the use of these substances based on scientific evidence alone, while the second part will then use this scientific review to form a final, Biblical conclusion that fits in with God's desire for a Christian life.

## Scripture

### *Christian Life*

Christians uphold the Bible as the source of all law and authority. The Bible clearly states that “all Scripture is breathed out by God and profitable for teaching, for reproof, for correction, and for training in righteousness, that the man of God may be complete, equipped for every good work.”<sup>1</sup> Therefore, any proposed Christian law must be extracted from Biblical scripture. Similarly, any laws not explicitly stated in the Bible should use Biblical evidence and history to reach its conclusion. R. B. Kuiper even describes how “all Christian teachings, whether doctrinal or ethical, are drawn from the Bible.” According to Christianity, the acid test of truth and goodness is Scripturalness.<sup>2</sup>

To start, one must examine how God tells Christians to live. There is no lack of sources for this topic, as the Bible largely serves as a guidebook for Christian living. God created man from the dust of the ground to then watch over the creation of every human after their formation in the womb.<sup>34</sup> This creation was done with love and should inspire humans to watch and care for their bodies. The Bible states that the “body is a temple of the Holy Spirit within you, whom you have from God, [...] so glorify God in your body.”<sup>5</sup> In this, God is saying that the body should be kept clean and healthy to the best of that person’s ability in order to remain holy. By remaining healthy, Christians glorify God with their bodies and create an environment worthy of the Holy Spirit. Scripture again warns of watching what is consumed in the body by saying

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<sup>1</sup> 2 Timothy 3:16-17

<sup>2</sup> Kuiper, 17

<sup>3</sup> Genesis 2:7

<sup>4</sup> Job 10:8-12

<sup>5</sup> 1 Corinthians 6:19-20

“whether you eat or drink, or whatever you do, do all to the glory of God.”<sup>6</sup> God states that the body is to be kept pure and holy, essentially gives Christians a guideline on how to live a life that will give glory and honor to Him. Therefore, by first examining the Bible for directions on how to live, Christians can then acquire the foundation necessary for forming future conclusions.

Christians are required to be models of the world and set the standard for living. This is the Christian duty because “a city set on a hill cannot be hidden. Nor do people light a lamp and put it under a basket, but on a stand, and it gives light to all in the house.”<sup>7</sup> This means that Christians were made to be examples to others rather than covering up and living a quiet life. For better or worse, the world will scrutinize Christians and the way they live their lives, whether it be in judgement or admiration.<sup>8</sup> God, understanding this, calls for Christians to be “the light of the world.”<sup>9</sup> By examining the health benefits and adverse effects of alcohol, drugs, and energy drinks it will then be clear at what point a line needs to be drawn, as to what a Christian can and cannot fill their body with, according to God’s standards.

As there is little to no information regarding Christian use of drugs and energy drinks in the Bible, the principles of alcohol use will be the primary Biblical source in finding context for determining Christian use of drugs and energy drinks. The criteria found in scripture that do or do not make alcohol an acceptable substance for Christian use will then be applied to other popular substances discussed in this thesis. The conclusions based on the aforementioned criteria can also be used to determine the proper Christian response to substances and situations not be mentioned in this paper.

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<sup>6</sup> 1 Corinthians 10:3

<sup>7</sup> Matthew 5:14-15

<sup>8</sup> Matthew 24:9

<sup>9</sup> Matthew 5:14

### ***Legalization***

Despite whatever conclusions may be made at the end of this thesis, usage of these substances still must be reviewed under general legal authority. However, God's authority on subjects is always first, as "we must obey God rather than men."<sup>10</sup> Romans 13:1-7 begins by describing how Christians are expected to follow holy and earthly authority.<sup>11</sup> All authority comes from God, so anyone who resists God's authority, or any authority in the name of God, will be judged by God as well.<sup>12</sup> The verses continue by stating that a ruler governing under God's authority has the right to make laws that should be obeyed, and anyone fearing the law only fears it because they are breaking it.<sup>13</sup> Laws should be obeyed because those who govern the laws will not hold back in punishment, just as God does not hold back in punishment when His laws are broken.<sup>14</sup> Additionally, laws should not be followed just for the fear of punishment, but also for the sake of a person's conscience.<sup>15</sup> As an example of following laws, Christians pay taxes to the government because it is what is decreed by the governing authority, which is the authority put there by God.<sup>16</sup> To conclude, Scripture states to "pay to all what is owed to them: taxes to whom taxes are owed, revenue to whom revenue is owed, respect to whom respect is owed, honor to whom honor is owed."<sup>17</sup> This serves as a concluding example of God's

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<sup>10</sup> Acts 5:29

<sup>11</sup> Romans 13:1

<sup>12</sup> Romans 13:2-3

<sup>13</sup> Romans 13:4

<sup>14</sup> Ibid.

<sup>15</sup> Romans 13:5

<sup>16</sup> Romans 13:6

<sup>17</sup> Romans 13:7

instruction to Christians about the necessity of following earthly authority as well as holy authority.

### **Addiction and Sin**

First, one must determine if addicts should be condemned for following a sinful path, or be held morally blameless because of their lack of control on their cravings. Sin is any action, or lack of action, that opposes God's law and moral principles.<sup>18</sup> As Edward Welch pointed out

In sin, we are both hopelessly out of control and shrewdly calculating; victimized yet responsible. All sin is simultaneously pitiable slavery and overt rebelliousness or selfishness. This is a paradox to be sure, but one that is the very essence of all sinful habits.<sup>19</sup>

As described, though addicts may not have control over their cravings, it does not mean they are morally blameless. Sins, and the action of sinning, is controllable yet uncontrollable. In a simpler sense, it is not sinful to catch a disease, even though that disease may damage the body. The action of becoming contaminated and having a damaging disease is not sinful because it is out of human control. However, the action of lying to someone is sinful because it is a conscious and controlled decision to disobey God's word.<sup>20</sup> Many people may argue that addicts do not have control over themselves because of the addiction; but even though they go through incredible temptation, in the end, they are they are still making a conscious decision to satiate their addiction desires. It is important to remember that addiction itself, the extreme craving for a substance, thing, or activity is not a sin, while the act of giving into the addiction is. As an example, a baby born with an addiction to a substance because of the mother's indulgence during her pregnancy is not sinful, while a cocaine user snorting another line of coke is sinful.

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<sup>18</sup> 1 John 3:4

<sup>19</sup> Welch, 34

<sup>20</sup> Leviticus 19:11



As to the reason of why addiction is a sin, God clearly states, “you shall have no other gods before me.”<sup>21</sup> To an addict, whatever substance or action that individual is addicted to will take first priority in their mind. In this way, their addiction becomes their god and the one thing they will look up to, which is in direct violation of God’s first commandment, making addiction a sin.

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<sup>21</sup> Exodus 20:3

## Alcohol

### *Alcohol in Scripture*

When discussing the use of alcohol by Christians, there are three main viewpoints: prohibitionist, abstentionist, and moderationist.<sup>22</sup> Prohibitionists believe alcohol should be avoided at all costs and is completely forbidden based on scriptural evidence. Abstentionists believe alcohol is not forbidden by scripture but should not be condoned in today's society. Believers of this perspective think that the abstinence of alcoholic drinks comes from love rather than law.<sup>23</sup> Moderationists believe that alcohol use is acceptable when consumed with self-discipline based on scriptural evidence.

The fact that drunkenness is considered a sin and condemned in the Bible is not even worth arguing against as it is explicitly stated in the Bible multiple times. Verses saying “do not get drunk with wine, for that is debauchery, but be filled with the Spirit,<sup>24</sup>” and “let us walk properly as in the daytime, not in orgies and drunkenness,” are just a couple examples of how God states his disdain against drunkenness. Naturally, those who are drunk have a distorted perception of the world and will most likely have trouble differentiating right from wrong. Drunkards will be unable to follow God's law in their mentality because of the effect alcohol has on their brain.<sup>25</sup> <sup>26</sup> This can be seen in the first recorded case of drunkenness when Noah “drank some of its wine, he became drunk and lay uncovered inside his tent.”<sup>27</sup> Later, the moral depravity of a drunkard is again recorded when Lot becomes drunk and is unaware that his

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<sup>22</sup> Gentry, 45.

<sup>23</sup> Acts 5:29

<sup>24</sup> Ephesians 5:18

<sup>25</sup> Jeremiah 25:16

<sup>26</sup> Proverbs 23:29-30, 33

<sup>27</sup> Genesis 9:21

daughters convince him to sleep with them.<sup>28</sup> Additionally, drunkenness, especially on a regular basis, results in the ruin of a man's reputation and vigor.<sup>29,30</sup> This goes in direct opposition of God's plan for mankind as it prevents God's blessings and promises from entering His people. Those who become drunk do not represent Christians as God says they should be represented, as "wine is a mocker, strong drink a brawler, and whoever is intoxicated by it is not wise."<sup>31</sup>

Following the prohibitionists and abstentionist ideals, God clearly condemns gluttony the same way he condemns drunkenness, saying "for the drunkard and the glutton will come to poverty,<sup>32</sup>" and "this our son is stubborn and rebellious; he will not obey our voice; he is a glutton and a drunkard."<sup>33</sup> If one is to follow the idea that Christians should never even moderately consume alcohol because of the temptation of overindulging and thus becoming drunk, it should be reasonably assumed that Christians should never moderately consume food because of the temptation to overindulge and thus become a glutton.

### ***Old Testament Alcohol use***

Another argument commonly used against moderationists involves the word choice of alcohol in the Bible, including the Hebrew words *yayin*, *tirosh*, *'asis*, and *shekar*. *Yayin* is the most commonly used word for alcohol in the Bible, used in the Hebrew text 144 times, and considered equivalent to the Greek word "*oinos*" and the Hebrew word "*vinum*," meaning an alcoholic beverage.<sup>34</sup> The first time *yayin* is mentioned in the Hebrew Scripture (Genesis 9:21),

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<sup>28</sup> Genesis 19:32-35

<sup>29</sup> Ezekial 23:33

<sup>30</sup> Habakkuk 2:15-16

<sup>31</sup> Proverbs 20:1

<sup>32</sup> Proverbs 23:21

<sup>33</sup> Deuteronomy 21:20

<sup>34</sup> Brown-Driver-Briggs, 406

it is used to describe an alcoholic drink, and there is no Scriptural references to imply that this meaning changes anytime in the Bible.<sup>35</sup> Some scholars, including NIV translator and strong mandatory abstinence advocator Stephen M. Reynolds, argue that *yayin* is not always an alcoholic drink, stating

Isaiah 16:10 says: “No treader shall tread out yayin in the presses.” This obviously means that no treader shall tread grape juice in the presses, because fermentation is a time consuming process. Therefore alcohol is excluded from the word yayin in this passage.<sup>36</sup>

However, the verse in question was written in a poetic context, allowing the use of *yayin* to remain an alcoholic beverage. This is similar to when Job curses his conception and birth, saying “let the day perish on which I was born, and the night that said, ‘A man is conceived.’”<sup>37</sup> In Hebrew, “man” is written as *geber*, which is not meant to describe “man” as a male, but rather “man” as an adult human.<sup>38</sup> By using *geber* to describe his zygote-self, Job is using poetic license to describe his younger self the same way *yayin* is used to describe pre-fermented grape juice in Isaiah.

*Tirosh*, the second most commonly used word for alcohol in Hebrew text, is commonly used to describe freshly fermented wine. As grape juice was incredibly difficult to keep unfermented in the warm and unsanitary environment of ancient Palestine, *tirosh* was created to mean grape juice that was newly fermented, but fermented nonetheless.<sup>39</sup>

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<sup>35</sup> Davis, *Dictionary*, 867

<sup>36</sup> Reynolds, 20

<sup>37</sup> Job 3:3

<sup>38</sup> Brown-Driver-Briggs, 150

<sup>39</sup> Easton, ISBE, V:3086

*Shekar* is mentioned 22 times in Hebrew Scripture to describe a strongly alcoholic drink. The Bible uses *shekar* to describe how “wine is a mocker, strong drink [*shekar*] a brawler, and whoever is led astray by it is not wise.”<sup>40</sup> While it might be assumed by some that God would prohibit such a strongly alcoholic drink, God clearly describes how this “drink offering shall be a quarter of a hin for each lamb. In the Holy Place you shall pour out a drink offering of strong drink [*shekar*] to the Lord.”<sup>41</sup> This shows that God allows and even advocates the production of such a strongly alcoholic drink for use of holy offering toward him. Aside from offering, God also says to “go to the place that the Lord your God chooses and spend the money for whatever you desire—oxen or sheep or wine or strong drink [*shekar*], whatever your appetite craves.”<sup>42</sup> This clearly shows that *shekar* can be enjoyed by God’s people even though it may have the potential to be abused.

*‘Asis* is only used 5 times in Hebrew Scripture and is used to describe alcoholic sweet wine. This is shown in Joel 1:5, stating “awake, you drunkards, and weep, and wail, all you drinkers of wine [ *‘asis*], because of the sweet wine, for it is cut off from your mouth.”<sup>43</sup>

### ***New Testament Alcohol Use***

While the Old Testament relied on Scriptural verses to form conclusions on alcohol use, the New Testament uses the history of the Old Testament as well as Scriptural teaching and examples from Jesus. Jesus himself drank wine as “the Son of Man has come eating and drinking, and you say, ‘Look at him! A glutton and a drunkard, a friend of tax collectors and

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<sup>40</sup> Proverbs 20:1

<sup>41</sup> Numbers 28:7

<sup>42</sup> Deuteronomy 14:25-26

<sup>43</sup> Joel 1:5

sinner!”<sup>44</sup> For this to have been said, Jesus must have, in addition to eating food, drunk wine as well, or it would not have been possible for him to have been accused of being a drunkard.

Just like in the Old Testament, the New Testament Greek word for wine, *oinos*, must first be examined to understand the word and its compounds’ s, such as *oinophlugia* (excess wine), *paroinos* (addicted to wine), and *oinopotes* (drunkard), place in Scripture.<sup>45</sup> The term *oinos* is used 33 times in the New Testament and is clearly used to describe fermented wine.<sup>46</sup> Greek *oinos* is equivalent to Hebrew *yayin*, which as discussed previously, is used to describe a fermented drink.<sup>47</sup> Scripture says not to “get drunk with wine [*oinos*], for that is debauchery, but be filled with the Spirit,”<sup>48</sup> and that deacons, and Christians in general, should “not [be] addicted to much wine [*oinos*], [or] greedy for dishonest gain.”<sup>49</sup> These verses, with *oinos* used to describe a fermented drink, show that even church officials are not forbidden from partaking in moderate alcoholic indulgences. With this background, it is clear that *oinos* is used to mean an alcoholic beverage.

In addition to this, one of the most commonly cited counterarguments against prohibitionists and abstentionist is the story of Jesus turning roughly 120 gallons of water into wine.<sup>50</sup> While some may attempt to argue that the previous wine and the newly created wine were both unfermented grape juice, the term *oinos* is used in this story, implying that both wines were alcoholic. Strong abstentionist Stephen M. Reynolds states

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<sup>44</sup> Luke 7:34

<sup>45</sup> Gentry, 45

<sup>46</sup> Ibid.

<sup>47</sup> Gentry, 45

<sup>48</sup> Ephesians 5:18

<sup>49</sup> 1 Timothy 3:8b

<sup>50</sup> John 2:1-11

The situation appears to have been as follows: The wedding party had been indulging in cheap, foul tasting wine, made perhaps partly from diseased grapes, and having a high alcoholic content. The people were drunk and behaving in a manner which moved to righteous indignation our Lord who was and is absolutely and totally pure of mind and body. His mother's sorrow that the party had run out of that sort of wine and her implied suggestion that He provide more of the same caused Him in righteous sorrow to speak stern words to her which have much puzzled Bible commentators.<sup>51</sup>

There are several reasons this statement is incorrect. Had the party been filled with as many drunkards as Reynolds believes, it is doubtful that Mary, who was chosen by God to give birth to the Savior, would take Jesus to such a party. Second, if the supposed drunkards were so rowdy, Jesus most likely would have left the party or admonished said drunkards for their actions. Third, based on Jesus's comments towards Mary, it is likely he stated his commentary because he realized it was time Mary no longer considered Jesus her son, but rather her Lord and Savior, as this was the first of Jesus's many miracles and marked the beginning of his ministry.<sup>52</sup>

Jesus also partook in Communion wine. The Last Supper itself used alcoholic wine rather than grape juice. Jesus can be seen saying "this is my blood of the covenant, which is poured out for many for the forgiveness of sins. I tell you, I will not drink from this fruit of the vine from now on until that day when I drink it new with you in my Father's kingdom."<sup>53</sup> The figurative use of "fruit of the vine" clearly means alcoholic wine as a literal fruit of the vine would be equal to physical whole grapes in a cup. In addition to this, "fruit of the vine" is a phrase used for *yayin*, which would be an alcoholic drink.

### ***Moderate Alcohol Health Effects***

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<sup>51</sup> Reynolds, 37-38

<sup>52</sup> Gentry, 51

<sup>53</sup> Matthew 26:28-29

While alcohol abuse can be detrimental to the body, wine in moderation has been proven to have multiple health benefits for the body. Wine, containing grapes, water, carbohydrates, organic acids, minerals, alcohol, polyphenols, and aromatics, can have significant effects on overall health.<sup>54</sup> Both red and white wines are full of polyphenols, which are micronutrients composed of antioxidants<sup>55</sup> that protect body tissues against oxidative stress, cancers, heart disease, and inflammation. Red wine has thousands of mg/L GAE (gallic acid equivalents, a measure of polyphenol content), while white wine only has hundreds of mg/L GAE.<sup>56</sup> The most important part of these polyphenols is resveratrol, or lipophilic 3,4',5-trihydroxystilbene, which has proven to be useful for cardioprotective benefits, though long-term intake of resveratrol may have an adverse health effect by decreasing isoenzyme<sup>57</sup> activity.<sup>58 59</sup> In a study of women who took antioxidants from a variety of sources, including coffee, tea, red wine, blueberries, walnuts, oranges, cinnamon, and broccoli, those taking any of these had a lower risk of cardiovascular diseases, heart arrhythmia, hypertension, and diabetes; while the women whose primary sources of antioxidants came from red wine had the lowest risks of all other compared foods.<sup>60</sup> For best

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<sup>54</sup> Snopek L. , Mlček J. , Fic V. , Hlaváčová I. , Škrovánková S. , Fišera M. , Velichová H. , Ondrášová M. Interaction of polyphenols and wine antioxidants with its Sulfur dioxide preservative. *Potravin. Slovak J. Food Sci.* 2018;12:180–185. doi: 10. 5219/899.

<sup>55</sup> Antioxidants are substances that can counteract or remove oxidizing agents, or free radicals, that have the potential to damage the body.

<sup>56</sup> Singleton V. L. , Rossi J. A. Colorimetry of total phenolics with phosphomolybdic-phosphotungstic acid reagents. *Am. J. Enol. Vitic.* 1965;16:144–158.

<sup>57</sup> Isoenzymes, or isozymes, are enzymes with the same structure but different functions. Enzymes are important as they are biological catalysts of an organism.

<sup>58</sup> Tomé-Carneiro J. , González M. , Larrosa M. , Yáñez-Gascón M. J. , García-Almagro F. J. , Ruiz-Ros J. A. , Espín J. C. Resveratrol in primary and secondary prevention of cardiovascular disease: A dietary and clinical perspective. *Ann. N. Y. Acad. Sci.* 2013;1290:37–51. doi: 10. 1111/nyas. 12150.

<sup>59</sup> Tomé-Carneiro J. , Larrosa M. , González-Sarrias A. , Tomas-Barberan F. , Teresa Garcia-Conesa M. , Carlos Espin J. Resveratrol and Clinical Trials: The Crossroad from In Vitro Studies to Human Evidence. *Curr. Pharm. Des.* 2013;19:6064–6093. doi: 10. 2174/13816128113199990407.

<sup>60</sup> Qureshi S. A. , Lund A. C. , Veierød M. B. , Carlsen M. H. , Blomhoff R. , Andersen L. F. , Ursin G. Food items contributing most to variation in antioxidant intake; a cross-sectional study among Norwegian women. *BMC Public Health.* 2014;14 doi: 10. 1186/1471-2458-14-45.



results in lowering the risk of cancer and cardiovascular disease, daily consumption of Pinot noir and St. Laurent red wines in 0.3 L for men and 0.2 L for women is recommended.<sup>61</sup> When the health effects of red wine compared to a control alcohol drink (13.5% alcohol) were tested, immediate blood pressure increased in both test groups, but the prolonged effect of the wine, compared to the control drink, resulted in overall lower blood pressure and a more regular heart-interbeat interval as well as ventricular repolarization interval.<sup>62</sup> A 12 year study of women who consumed 5 to 15 grams of red wine per day had a 26% lower risk of cardiovascular disease, 35% lower risk of total mortality, and a 51% lower risk of cardiovascular disease mortality.<sup>63</sup>

Wine's effects on different parts of the body are varying. In the throat, wine has been proven to reduce the risk of Barrett's esophagus because the phytochemicals in wine act as protectants against esophageal cancer and other diseases.<sup>64 65</sup> In the stomach, 0.1 L of daily wine consumption was shown to reduce the risk of stomach cancer because of its antibacterial properties against *Helicobacter pylori*, having ulcer prevention effects.<sup>66 67</sup> In the intestines, polyphenols were found to prevent/delay inflammatory bowel disease progression in the colon

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<sup>61</sup> Montsko G., Ohmacht R., Mark L. *trans*-Resveratrol and *trans*-Piceid Content of Hungarian Wines. *Chromatographia*. 2010;71:121–124. doi: 10. 1365/s10337-010-1518-9.

<sup>62</sup> Elmadhun N. Y. , Sabe A. A. , Lassaletta A. D. , Sellke F. W. Ethanol promotes new vessel growth in remote nonischemic myocardium. *J. Surg. Res.* 2015;193:536–542. doi: 10. 1016/j. jss. 2014. 05. 048.

<sup>63</sup> Djoussé L., Lee I. -M. , Buring J. E. , Gaziano J. M. Alcohol Consumption and Risk of Cardiovascular Disease and Mortality in Women: Potential Mediating Mechanisms. *Circulation*. 2009;120:237–244. doi: 10. 1161/CIRCULATIONAHA. 108. 832360.

<sup>64</sup> Lin Y. , Yngve A. , Lagergren J. , Lu Y. A dietary pattern rich in lignans, quercetin and resveratrol decreases the risk of oesophageal cancer. *Br. J. Nutr.* 2014;112:2002–2009. doi: 10. 1017/S0007114514003055.

<sup>65</sup> Thrift A. P. , Cook M. B. , Vaughan T. L. , Anderson L. A. , Murray L. J. , Whiteman D. C. , Corley D. A. Alcohol and the Risk of Barrett's Esophagus: A Pooled Analysis from the International BEACON Consortium. *Am. J. Gastroenterol.* 2014;109:1586–1594. doi: 10. 1038/ajg. 2014. 206.

<sup>66</sup> Kasicka-Jonderko A. Alcohol and the digestive system—Should it always be blamed? *Prz. Gastroenterol.* 2012;7:264–275. doi: 10. 5114/pg. 2012. 32064.

<sup>67</sup> Barstad B. , Sørensen T. I. A. , Tjønneland A. , Johansen D. , Becker U. , Andersen I. B. , Grønbaek M. Intake of wine, beer and spirits and risk of gastric cancer. *Eur. J. Cancer Prev.* 2005;14:239–243. doi: 10. 1097/00008469-200506000-00007.

and small intestine, and to delay malignant intestinal cancer.<sup>68</sup> In the liver, 20 mg of resveratrol daily for six weeks was found to prevent liver weight loss and inhibit the increase of dangerously high enzyme levels.<sup>69</sup> Overall, moderate alcohol use (around 0.2 L for women and 0.3 L for men) can have beneficial effects on the body.

### ***Alcohol Abuse***

While moderate alcohol ingestion can have beneficial effects on the body, regularly overindulging in alcohol results in harmful effects on the body. The type of alcohol fit for human consumption is ethyl alcohol, or ethanol. As the liver is the major organ of the body that is responsible for metabolizing alcohol, a large majority of the diseases caused by alcoholism stem from problems in liver function, such as alcoholic hepatitis and cirrhosis. In fact, alcohol abuse is the third leading cause of preventable deaths and up to 40% of elderly folks admitted to hospitals have alcohol-related disorders, equal to the admittance of cardiovascular diseases.<sup>70</sup> It has been found to be a causal factor for 60 different diseases and injuries and it a concurrent cause of another 200.<sup>71</sup> As alcoholism impedes the body's ability to heal, alcoholics admitted to ICUs are two to four times more likely to have infectious complications such as pneumonia or sepsis.<sup>72</sup>

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<sup>68</sup> Biasi F. , Deiana M. , Guina T. , Gamba P. , Leonarduzzi G. , Poli G. Wine consumption and intestinal redox homeostasis. *Redox Biol.* 2014;2:795–802. doi: 10. 1016/j. redox. 2014. 06. 008.

<sup>69</sup> Lee E. S. , Shin M. O. , Yoon S. , Moon J. O. Resveratrol Inhibits Dimethylnitrosamine-Induced Hepatic Fibrosis in Rats. *Arch. Pharm. Res.* 2010;33:925–932. doi: 10. 1007/s12272-010-0616-4.

<sup>70</sup> Adams WL, Yuan Z, Barboriak JJ, et al: Alcohol-related hospitalizations of elderly people. Prevalence and geographic variation in the United States. *JAMA* 1993; 270:1222-1225

<sup>71</sup> Rocco, A. , Compare, D. , Angrisani, D. , Sanduzzi Zamparelli, M. , & Nardone, G. (2014). Alcoholic disease: liver and beyond. *World journal of gastroenterology*, 20(40), 14652–14659. doi:10. 3748/wjg. v20. i40. 14652

<sup>72</sup> Spies CD, Neuner B, Neumann T, et al: In- tercurrent complications in chronic alco- holic men admitted to the intensive care unit following trauma. *Intensive Care Med* 1996; 22:286–293

## Marijuana

### ***Recreational Marijuana***

The use of marijuana, also known as cannabis or weed, has become an increasingly discussed topic in today's society. Cannabis plants originated from central Asia and the Indian sub-continent and have been used for centuries. It contains two main chemical compounds: delta-9-tetrahydrocannabinol (d-9-THC) and cannabidiol (CBD) among its other 60 cannabinoids and over 400 compounds in total.<sup>73</sup> CBD and THC affect different areas of the central nervous system and have two different effects on the body.<sup>74</sup> CBD is a non-psychoactive chemical compound that can be used as a sedative and relaxant, with its anti-inflammatory, painkilling, and antipsychotic effects, shows no negative physical effects to the body, and can be chronically used with minimal adverse effects.<sup>75</sup> CBD oil is a popular way to minimize stress and anxiety and is commonly used by individuals before they go to sleep. It is taken by placing a dropper full of the oil under the tongue and then allowing the oil to be absorbed into the bloodstream for a minute before swallowing. Among the three species of marijuana, *Cannabis sativa* is most commonly used for recreational use as it has the highest THC levels compared to the other species. *Cannabis indica* has the highest levels of CBD while *Cannabis ruderalis* has even lower levels of THC than *Cannabis indica*, making these two species the most commonly used for medical marijuana. In some cases, some patients use a hybrid crossover of the two

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<sup>73</sup> Ribeiro, L. I. , & Ind, P. W. (2016). Effect of cannabis smoking on lung function and respiratory symptoms: a structured literature review. *NPJ primary care respiratory medicine*, 26, 16071. doi:10. 1038/npjperm. 2016. 71

<sup>74</sup> Borgwardt SJ, Allen P, Bhattacharyya S, Fusar-Poli P, Crippa JA, Seal ML, et al. Neural basis of Delta-9-tetrahydrocannabinol and cannabidiol: effects during response inhibition. *Biol Psychiatry* (2008) 64(11):966–7310. 1016/j. biopsych. 2008. 05. 011

<sup>75</sup> Bergamaschi MM, Queiroz RH, Zuardi AW, Crippa JA. Safety and side effects of cannabidiol: a *Cannabis sativa* constituent. *Curr Drug Saf* (2011) 6(4):237–4910. 2174/157488611798280924

species or CBD oil alone in order to achieve the anti-nausea and appetite-gain effects it can be used for.

When inhaling marijuana through a blunt or joint, a cigarette or cigar-looking item made by rolling marijuana leaves in rolling paper, many expect the effects to be as harmful as smoking cigarettes or cigars. Of the many cannabis smokers who also smoked tobacco,  $\frac{1}{3}$  began smoking cannabis first and those who did stop smoking tobacco eventually, only did so after taking up regular marijuana use.<sup>76</sup> While studies have shown that smoking both marijuana and tobacco results in chronic bronchitis, smoking marijuana results in higher forced vital capacity (FVC) while smoking tobacco unsurprisingly results in lower FVC.<sup>77</sup> This is assumed to result from acute bronchodilator as well as the anti-inflammatory effects marijuana has on the body. However, regular cannabis users do have respiratory symptoms such as chronic cough, sputum production, dyspnoea, hoarse voice and chest tightness.<sup>78</sup> The issues with conducting studies on marijuana usage include the THC and CBD levels in the joint the patient used, the various methods of inhalation such as using a water bong, e-cigarette, or a joint/blunt, and the frequency of smoking as a single joint year is counted as 365 joints smoked.<sup>79</sup> In addition to this, many smokers also smoke spliffs, which is a joint with both tobacco and marijuana leaves mixed together, making it more difficult to separate the effects of tobacco, which are well known, from the effects of marijuana, which has a much more unknown effect.

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<sup>76</sup> Simmons MS, Tashkin DP. The relationship of tobacco and marijuana smoking characteristics. *Life Sci*(1995) 56(23-24):2185–9110. 1016/0024-3205(95)00206-L

<sup>77</sup> Ribeiro, L. I. , & Ind, P. W. (2016). Effect of cannabis smoking on lung function and respiratory symptoms: a structured literature review. *NPJ primary care respiratory medicine*, 26, 16071. doi:10. 1038/npjpcrm. 2016. 71

<sup>78</sup> Tetrault, J. M. , Crothers, K. , Moore, B. A. , Mehra, R. , Concato, J. , & Fiellin, D. A. (2007). Effects of marijuana smoking on pulmonary function and respiratory complications: a systematic review. *Archives of internal medicine*, 167(3), 221–228. doi:10. 1001/archinte. 167. 3. 221

<sup>79</sup> Ribeiro, L. I. , & Ind, P. W. (2016). Effect of cannabis smoking on lung function and respiratory symptoms: a structured literature review. *NPJ primary care respiratory medicine*, 26, 16071. doi:10. 1038/npjpcrm. 2016. 71

While some healthy individuals can use marijuana without any adverse effects, majority of people will encounter unpleasant side effects, especially in adolescents, children, and fetuses in pregnant mothers. In pregnant women, studies were often difficult to gain completely accurate results as many of the women who felt safe using marijuana during their pregnancy also felt safe using other substances as well. This made it slightly harder to identify the specific effects of marijuana on individuals, compared to the other substances the women consumed during their pregnancies. Many understand that marijuana is not beneficial to pregnant mothers as research shows it typically results in restricted fetal growth, low birth rate, and greater childhood frontal cortical thickness.<sup>80</sup> While a greater childhood frontal cortical thickness may be seen as a beneficial effect, as the prefrontal cortex is mostly known as the area of the brain that controls decision making and cognitive behavior, children who have this symptom are recorded to have behavior and/or attention problems.

The most commonly cited health effect is marijuana effect on the brain. Cannabinoid receptors, part of the endocannabinoid system, that are used in many physiological processes such as including appetite, pain, mood, and memory. Cannabinoid receptors can also be found in the liver, gastrointestinal tract, skeletal tissue, and adipose tissue. THC and CBD, while having opposing effects, both affect areas of the brain high in cannabinoid receptors, such as the hippocampus, amygdala, striatum, cerebellum, and prefrontal cortex. In studies of individuals who smoked marijuana daily with a range of 1-15 joint-years (365 joints smoked is equal to one joint year) and started from the ages of 15-17, the biggest changes found in the brain were a 12-13% volume reduction in the hippocampus, a part of the brain that is used in memory,

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<sup>80</sup> El Marroun H, Tiemeier H, Franken IH, Jaddoe VW, van der Lugt A, Verhulst FC et al (2016). Prenatal cannabis and tobacco exposure in relation to brain morphology: a prospective neuroimaging study in young children. *Biol Psychiatry* 79: 971–979.

learning, and emotions.<sup>81</sup> In addition to this, there were changes in the shape and gray matter, which contains the majority of neuronal cell bodies, content of the hippocampus as well. The three areas of the brain that were found to have changed in regular marijuana smokers were areas that were high in cannabinoid receptors and were reward-centers of the brain.

In addition to structural brain changes, or rather, because of it, regular marijuana users have a significantly higher chance of acquiring psychosis<sup>82</sup>. In fact, regular marijuana use is linked with schizophrenia, manic-depressive disorder, hypomania, depression, and suicide.<sup>83</sup> When chronic marijuana users were used for PET scans, they were found to have abnormalities around the hippocampus, front and back of the prefrontal cortex, and precuneus, indicating a likelihood of later-onset Alzheimer's disease.<sup>84</sup>

### ***Edibles***

Edibles, as one may guess by their name, are consumed by eating cannabis inside food, typically sweet desserts such as brownies, gummies, or cookies. The effect of edibles are similar to marijuana, although because they are ingested, this effect is often stronger and longer lasting. While marijuana that is consumed through smoking takes an immediate effect and lasts only two to three hours, edibles take about an hour to an hour and a half to take effect and have a peak of

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<sup>81</sup> Yücel M, Solowij N, Respondek C, Whittle S, Fornito A, Pantelis C, et al. Regional brain abnormalities associated with heavy long-term cannabis use. *Arch Gen Psychiatry*. 2008;65:1–8.

<sup>82</sup> Psychosis is a mental disorder that causes individuals to lose touch with external reality

<sup>83</sup> National Academies of Sciences, Engineering, and Medicine, Health and Medicine Division, Board on Population Health and Public Health Practice, Committee on the Health Effects of Marijuana. *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*. Washington (DC): National Academies Press (US); 2017. Jan 12, [Accessed September 8, 2018]. An Evidence Review and Research Agenda.

<sup>84</sup> Lorenzetti V, Solowij N, Yücel M. The role of cannabinoids in neuroanatomic alterations in cannabis users. *Biol Psychiatry*. 2016;79:e17–e31.

two to four hours.<sup>85</sup> The problem with edibles, however, are that, unlike consuming marijuana through smoking, they do not deliver an immediate effect to the body. Because of this, there tends to be a trend of marijuana consumers who over-consume what would be considered a “safe” amount of  $\Delta^9$ -THC in their system, which often results in a “cannabis-induced psychosis” that produces symptoms such as hallucinations, delusions, and anxiety that may persist for several days.<sup>86</sup> The mistaken estimation of how much of an edible to consume for the right amount of THC to feel a high combined with the difficulty of standardizing THC amounts in these treats is a major reason why a large portion of both experienced and inexperienced cannabis users wind up in the hospital from cannabis intoxication from edible products.<sup>87</sup> In one case, a 19 year old man was instructed to eat one serving size (one sixth) of a cannabis-infused cookie, equal to 10 mg of  $\Delta^9$ -THC.<sup>88</sup> After not feeling any effects within an hour, the man consumed the rest of the cookie within two hours of his initial serving. His body was later found after jumping out of a four story window due to marijuana intoxication. While edibles may not be as harmful to the body due to the way they are ingested rather than smoked, marijuana-infused foods still result in marijuana intoxication that is often stronger than intended due to the over-consumption of the edible.

### ***Medical Marijuana***

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<sup>85</sup> Grotenhermen F. Pharmacokinetics and pharmacodynamics of cannabinoids. *Clinical Pharmacokinetics*. 2003;42(4):327–360. <http://dx.doi.org/10.2165/00003088-200342040-00003>.

<sup>86</sup> Wilkinson ST, Radhakrishnan R, D’Souza DC. Impact of cannabis use on the development of psychotic disorders. *Current Addiction Reports*. 2014;1(2):115–128.

<sup>87</sup> Monte AA, Zane RD, Heard KJ. The implications of marijuana legalization in Colorado. *JAMA*. 2015;313(3):241–242. <http://dx.doi.org/10.1001/jama.2014.17057>.

<sup>88</sup> Hancock-Allen JB, Barker L, VanDyke M, Holmes DB. Notes from the Field: Death Following Ingestion of an Edible Marijuana Product—Colorado, March 2014. *MMWR. Morbidity and Mortality Weekly Report*. 2015;64(28):771–772. <http://dx.doi.org/10.15585/mmwr.mm6428a6>.

Medical marijuana has been in use around the world for centuries. In China, it was used as a painkiller around 200 A.D. by physician Hoa-tho; while in India, it was used as a remedy for different illnesses and diseases as early as 1000 B.C.<sup>89</sup> In 1200-1300 A.D., Arabic writers described their unsuccessful attempts at using marijuana for purely medical uses, while in Persia and Assyria, the intoxicating effects of marijuana were noted before the first coming of Christ.<sup>90</sup> Cannabis first entered the United States Pharmacopeia, which recognizes legal drugs that can be used for therapeutic purposes, in 1839, when W.B. O'Shaughnessy, a British physician in India, had seen the drug's use firsthand for both medicinal and recreational purposes.<sup>91</sup> O'Shaughnessy first tested the drug on animals before administering cannabis extract to his human patients. Amazed at the analgesic and sedative effects, he used cannabis to relieve the pain of rheumatism and still the convulsions of a baby. His most surprising discovery of this drug was its use in relieving the muscle spasms and locking of those with rabies and tetanus. In the case of an accidental overdose of medical marijuana, resulting in the psychoactive effects marijuana is typically known for, patients would be given purgatives, vomit-inducing medicine, and/or leeches to the temples.<sup>92</sup> After O'Shaughnessy's introduction of cannabis to the Western medical world, the drug was then used to successfully treat stomach pain, childbirth, psychosis, chronic cough, gonorrhea, and migraines, even when opium did not seem to work.<sup>93</sup> When used in the 18th century, physicians marvelled at the amazing benefits of this new drug's advantages. The

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<sup>89</sup> Walton, Robert P.: *Marihuana: America's New Drug Problem*, J. B. Lippincott, Philadelphia, 1938, pp. 1-18, 86-157.

<sup>90</sup> *Ibid.*

<sup>91</sup> O'Shaughnessy, W. B. : On the preparations of the Indian hemp, or gunjah, *Trans. Med. and Phy. Soc. , Bengal*, 71-102, 1838-40; 421-61, 1842.

<sup>92</sup> *Ibid.*

<sup>93</sup> McMeens, R. R. : Report of the committee on cannabis indica; *From Transactions of the Fifteenth Annual Meeting of the Ohio State Medical Society*, Folet, Foster and Co. , Columbus, Ohio, 1860, pp. 75-100.



only negatives were that the desired effect often took an hour to reach (slower than other drugs at the time), there was no set standard for medical marijuana, (batches often came in varying strengths), and the effect of the drug on each individual patient had varying effects.<sup>94</sup> However, the benefits at the time were thought to considerably outweigh the risks as cannabis did not lead to a physical dependence, unlike the commonly used opioids, had a minimal tolerance level that built over time, resulted in a low level of toxicity, and did not interrupt vegetative functioning.<sup>95</sup> The rise of popularity of medical marijuana, however, decreased during the late 1800s as water-soluble opiates, along with the hypodermic needle, allowed for quicker pain relief in much stronger doses.<sup>96</sup> Recreational marijuana use in the United States is thought to be popularized in New Orleans in 1910 and spread around 1926, after a local newspaper ran a six-part series on the drug.<sup>97</sup> From there, it spread up to Mississippi and onward, where it truly began to blossom during the 1930s, until Congress passed the Marihuana Tax Act in 1937, imposing a heavy tax on the prescription and sale of marijuana. This ended up stopping nearly all medical marijuana use at that point in time, and in 1941, cannabis was taken out of the *National Formulary and Pharmacopoeia*.

Medical Marijuana is still used in today's times. While it is most commonly known for its pain relief on cancer patients specifically, its popularity has grown within the non-cancer patient community as well. In one case, a 60 year old patient with chronic low back pain and left

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<sup>94</sup> Mikuriya TH. Marijuana in medicine: past, present and future. *California Medicine*. 1969;110(1):34.

<sup>95</sup> Mayor's Committee on Marihuana, *The Marihuana Problem in the City of New York*, Jaques Catel, Lancaster, Pa., 1944.

<sup>96</sup> Mikuriya TH. Marijuana in medicine: past, present and future. *California Medicine*. 1969;110(1):34.

<sup>97</sup> Walton, Robert P. : *Marihuana: America's New Drug Problem*, J. B. Lippincott, Philadelphia, 1938, pp. 1-18, 86-157.

leg radicular symptoms, from an accident 19 years ago, needed a new option for pain relief.<sup>98</sup> His previous attempts to curb his symptoms, such as an L2-3 laminectomy in 1996, multiple lumbar epidural steroid injections, selective nerve root blocks, lidocaine infusions, and a trial of a spinal cord stimulator, resulted in a final prescription of 10 mg of oxycodone and 600 mg of ibuprofen every 6 hours.<sup>99</sup> Because of his unrelenting pain, the aforementioned patient received a medical marijuana certification and began to smoke marijuana every night, finding that the sedentary effects helped him sleep and relieve both current and next-morning pain.<sup>100</sup> Because of the growing number of examples of patients whose use of medical marijuana resulted in the alleviation of their pain, medical researchers have begun to research more about the exact effects of marijuana on pain relief.

Many ask what method, smoked or orally consumed, marijuana should be used for medical purposes. While consuming marijuana orally would appear to be the best choice because of the adverse health effects associated with smoking weed, most patients prefer to smoke, rather than orally consume, their cannabis.<sup>101</sup> Oral users reported more frequent negative subjective responses, especially in higher doses of  $\Delta^9$ -THC when it came to the oral consumption of medical marijuana.<sup>102</sup> When HIV/AIDS patients, both popular patients of medical marijuana, tried both smoking and orally consuming weed, through the pill dronabinol, 93% of patients reported that they preferred the method of smoking cannabis

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<sup>98</sup> Hill KP. Medical Marijuana for Treatment of Chronic Pain and Other Medical and Psychiatric Problems: A Clinical Review. *JAMA*. 2015;313(24):2474–2483. doi:10. 1001/jama. 2015. 6199

<sup>99</sup> Ibid.

<sup>100</sup> Ibid.

<sup>101</sup> Grella CE, Rodriguez L, Kim T. Patterns of medical marijuana use among individuals sampled from medical marijuana dispensaries in Los Angeles. *Journal of Psychoactive Drugs*. 2014;46(4):263–272. <http://dx.doi.org/10.1080/02791072.2014.944960>.

<sup>102</sup> Calhoun SR, Galloway GP, Smith DE. Abuse potential of dronabinol (Marinol) *Journal of Psychoactive Drugs*. 1998;30(2):187–196. <http://dx.doi.org/10.1080/02791072.1998.10399689>.

compared to dronabinol.<sup>103</sup> This may be explained by the fact that dronabinol, and similar marijuana pills, contain synthetic  $\Delta^9$ -THC, whereas marijuana that is smoked contains  $\Delta^9$ -THC along with other cannabinoids and chemicals, such as terpenes and cannaflavins.<sup>104</sup> So while it may be healthier for the patient to consume marijuana orally rather than by smoking cannabis, if the patient does not achieve the necessary effects needed for their pain-relief through oral consumption, smoking may be the best way to achieve the pain-relief effect.

Currently, the only two Food and Drug Administration (FDA) approved cannabinoids in America are dronabinol and nabilone, which come in pill form and are popular to combat nausea, vomiting, and loss of appetite, all common symptoms among cancer patients receiving chemotherapy.<sup>105 106</sup> As the strongest uses of marijuana as pharmacotherapies are chronic pain, neuropathic pain, and spasticity associated with multiple sclerosis<sup>107</sup>, the majority of trials concerning use of medical marijuana study the effects on the aforementioned symptoms, with positive results.<sup>108</sup> However, before a patient decides to use medical marijuana for pain relief, they should first consider possible side effects, such as weakened short-term memory loss, motor coordination and judgement, especially if using marijuana while driving, as the rate of car accidents doubles in those with marijuana in their system.<sup>109</sup> Additionally, those consuming marijuana with higher levels of THC may experience psychoactive effects such as paranoia or other psychotic symptoms. Use of medical marijuana in individuals younger than 25 is not

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<sup>103</sup> Ware MA, Rueda S, Singer J, Kilby D. Cannabis use by persons living with HIV/AIDS: Patterns and prevalence of use. *Journal of Cannabis Therapeutics*. 2003;3(2):3–15.

<sup>104</sup> Russo EB. Taming THC: Potential cannabis synergy and phytocannabinoid-terpenoid entourage effects. *British Journal of Pharmacology*. 2011;163(7):1344–1364. <http://dx.doi.org/10.1111/j.1476-5381.2011.01238.x>.

<sup>105</sup> *Marinol*[productinformation]. Marietta,GA: Solvay Pharmaceuticals; 2008.

<sup>106</sup> *Cesamet*[productinformation]. Aliso Viejo,CA: Valeant Pharmaceuticals, 2008.

<sup>107</sup> A chronic disease that causes damage to the sheaths of nerve cells in the brain and spinal cord

<sup>108</sup> Hill KP. Medical Marijuana for Treatment of Chronic Pain and Other Medical and Psychiatric Problems: A Clinical Review. *JAMA*. 2015;313(24):2474–2483. doi:10. 1001/jama. 2015. 6199

<sup>109</sup> Hartman RL, Huestis MA. Cannabis effects on driving skills. *Clin Chem*. 2013;59(3):478-492.

recommended as there are still developing areas of their brains, particularly the nucleus accumbens and amygdala, that may be impeded from early, regular marijuana use.<sup>110</sup> This can result in a loss of functional connectivity, and therefore, a decline in IQ.<sup>111</sup> Patients consuming marijuana with anxiety, depression, and mental illnesses should be carefully monitored, as these symptoms have a likelihood of increasing with marijuana use.<sup>112</sup> Overall, the use of medical marijuana has proven to be effective for managing chronic pain, neuropathic pain, and spasticity from multiple sclerosis, while trials testing medical marijuana's effect on pain relief for other symptoms have proven to have minimal to no effect. Even for patients looking to manage those particular symptoms, medical marijuana would not be recommended if those patients struggle with anxiety, depression, and mental illnesses. Medical marijuana should not be used as the go-to treatment for pain alleviation, but rather as a backup option to other medications and procedures meant to manage pain when recommended and approved by a healthcare professional.

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<sup>110</sup> Gilman JM, Kuster JK, Lee S, et al. Cannabis use is quantitatively associated with nucleus accumbens and amygdala abnormalities in young adult recreational users. *J Neurosci*. 2014;34(16): 5529-5538.

<sup>111</sup> Meier MH, Caspi A, Ambler A, et al. Persistent cannabis users show neuropsychological decline from childhood to midlife. *Proc Natl Acad Sci U S A*. 2012;109(40):E2657-E2664.

<sup>112</sup> PattonGC, CoffeyC, CarlinJB, DegenhardtL, Lynskey M, Hall W. Cannabis use and mental health in young people: cohort study. *BMJ*. 2002;325 (7374):1195-1198.

## Nicotine

### ***Tobacco***

Nearly every single research article published on the effects of smoking tobacco have proven that smoking cigarettes/cigars is harmful to the body. Tobacco consumers result in 5.4 million deaths per year and an estimated 1 billion deaths this century, if tobacco levels remain level.<sup>113</sup> There are three forms of smoke inhalation. First-hand smokers inhale the smoke directly into their lungs. Second-hand smokers inhale the smoke indirectly, when they are near first-hand smokers. Third-hand smokers inhale the smoke residue from poorly ventilated environments.<sup>114</sup> All three forms of smoke inhalation, whether direct or indirect, are proven to have adverse health effects to the body in varying degrees. In studies concerning musculoskeletal health, tobacco smoke has been found to lead to rheumatoid arthritis, periodontitis, and hip fractures.<sup>115</sup> In multiple studies conducted over the effects of smoking tobacco, the bone mineral density rates of smokers are overall lower when compared to non-smokers. Additionally, smokers have lower rates of remission for rheumatoid arthritis. Studies conducted on radiographic progression between smokers and non-smokers found a higher intensity of smoking to be directly associated with higher levels of radiographic progression.<sup>116</sup> For musculoskeletal health, the skeletal muscles of smokers have oxidative fiber atrophy, as those who smoke have lower Types I and IIa muscle fibers when compared to

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<sup>113</sup> WHO Data. Tobacco Fact Sheet; No. 339. Available from: <http://www.who.int/mediacentre/factsheets/fs339/en>. [Last accessed on 2015 Jan 29].

<sup>114</sup> Matt G. E. , Quintana P. J. E. , Destailats H. , et al. Thirdhand tobacco smoke: Emerging evidence and arguments for a multidisciplinary research agenda. *Environmental Health Perspectives*. 2011;119(9):1218–1226. doi: 10. 1289/ehp. 1103500.

<sup>115</sup> General S. The health consequences of smoking—50 years of progress: a report of the surgeon general

<sup>116</sup> Finckh A. , Dehler S. , Costenbader K. H. , Gabay C. Cigarette smoking and radiographic progression in rheumatoid arthritis. *Annals of the Rheumatic Diseases*. 2007;66(8):1066–1071. doi: 10. 1136/ard. 2006. 065060.

non-smokers.<sup>117</sup> Similar, negative effects are also found in the ligaments, cartilage, and joints, with higher intensity of smoking resulting in a higher probability of encountering adverse health effects. Overall, there appears to be no health benefits to smoking cigarettes, or any other form of tobacco, in neither short-term use nor long-term use.

Oral tobacco, through chewing, spitting, dipping, and snuff, is another popular way to consume the substance. However, this smokeless tobacco, while not inhaled through the lungs, still contains 28 different carcinogenic chemicals.<sup>118</sup> One of the most prevalent of these chemicals is nitrosamine, a carcinogenic compound that forms the extremely carcinogenic N-nitrosonornicotine after going through metabolic activation by cytochrome P40 enzymes, which. This, combined with other carcinogens found in tobacco, results in DNA damage, and later, oral cancer.<sup>119</sup> Unsmoked tobacco consumption is associated with oral and pancreatic cancers, cardiovascular disease, periodontal disease, asthma, and reproductive deformities in women.<sup>120</sup> Oral submucous fibrosis, a premalignant disease that causes fibrosis of the submucosal tissues, is one of the main results that come from unsmoked tobacco consumption. Free radicals and reactive oxygen species that come from consuming smokeless tobacco damage both DNA and RNA, eventually leading to genotoxicity and oral cancer.<sup>121</sup> Overall, just because tobacco is consumed through a smokeless manner, does not mean it is any less toxic to consume.

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<sup>117</sup> Montes De Oca M. , Loeb E. , Torres S. H. , De Sanctis J. , Hernández N. , Tálamo C. Peripheral muscle alterations in non-COPD smokers. *CHEST*. 2008;133(1):13–18. doi: 10. 1378/chest. 07-1592.

<sup>118</sup> Banerjee SC, Ostroff JS, Bari S, D’Agostino TA, Khera M, Acharya S, et al. Gutka and Tambaku paan use among South Asian immigrants: a focus group study. *J Immigr Minor Health*. 2014;16:531–539.

<sup>119</sup> Nair U, Bartsch H, Nair J. Alert for an epidemic of oral cancer due to use of the betel quid substitutes gutkha and pan masala: a review of agents and causative mechanisms. *Mutagenesis*. 2004;19:251–262.

<sup>120</sup> Banerjee SC, Ostroff JS, Bari S, D’Agostino TA, Khera M, Acharya S, et al. Gutka and Tambaku paan use among South Asian immigrants: a focus group study. *J Immigr Minor Health*. 2014;16:531–539.

<sup>121</sup> Niaz, K., Maqbool, F., Khan, F., Bahadar, H., Ismail Hassan, F., & Abdollahi, M. (2017). Smokeless tobacco (*paan* and *gutkha*) consumption, prevalence, and contribution to oral cancer. *Epidemiology and health*, 39, e2017009. doi:10.4178/epih.e2017009

### *Nicotine Effects*

Those attempting to quit their smoking habit may look to nicotine replacement therapy (NRT) for help. Nicotine gum, a chewing gum that releases nicotine into the body through absorption of the mouth tissues, and nicotine patches, a patch containing nicotine that is placed on the skin to release nicotine to the bloodstream, are two of the most popular forms of NRT, but there are also nasal sprays, lozenges, and inhalers. These methods are preferable and easier to some smokers when compared to going “cold turkey.” In fact, NRTs are proven to help smokers quit by 50-70%.<sup>122</sup> Using NRTs for the purpose of quitting smoking is recommended if previous attempts to quit have proven to be unsuccessful in the past.

Nicotine itself is an addictive substance. It can be absorbed through the skin, lungs, gut, and oral mucous.<sup>123</sup> Once in the body, it is first absorbed into the liver through microsomal oxidation to form metabolites and is then excreted out after N'-and O'-glucuronidation of the metabolites.<sup>124 125</sup> Studies done with brain imaging show nicotine increases activity in the prefrontal cortex, visual systems, and reward-centers in the brain.<sup>126</sup> Additionally, nicotine has been shown to cause increased oxidative stress, neuronal apoptosis, DNA damage, reactive oxygen species, and an increase in lipid peroxide.<sup>127</sup> It affects the nicotinic acetylcholine

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<sup>122</sup> Stead LF, Perera R, Bullen C, Mant D, Lancaster T. Nicotine replacement therapy for smoking cessation. Cochrane Database of Systematic Reviews 2008, Issue 1. Art. No. : CD000146. DOI: 10. 1002/14651858. CD000146. pub3.

<sup>123</sup> Langone JJ, Gjika HB, Van Vunakis H. Nicotine and its metabolites. Radioimmunoassays for nicotine and cotinine. Biochemistry 1973;12:5025-30.

<sup>124</sup> Nakajima M, Tanaka E, Kwon JT, Yokoi T. Characterization of nicotine and cotinine N-glucuronidations in human liver microsomes. Drug Metab Dispos 2002;30:1484-90.

<sup>125</sup> Seaton MJ, Kyrematen GA, Vesell ES. Rates of excretion of cotinine, nicotine glucuronide, and 3-hydroxycotinine glucuronide in rat bile. Drug Metab Dispos 1993;21:927-32.

<sup>126</sup> Mishra A, Chaturvedi P, Datta S, Sinukumar S, Joshi P, Garg A. Harmful effects of nicotine. Indian J Med Paediatr Oncol 2015;36:24-31

<sup>127</sup> Ibid.

receptors which then releases dopamine.<sup>128</sup> Nicotine taken regularly desensitizes GABAergic neurons, which are partly in charge of inhibiting dopamine.<sup>129</sup> This inhibition leads to an increase in cravings and addictions and has been proven to affect the CYP2A6 gene, which can lead to a hereditary nicotine dependence.<sup>130</sup>

When discussing the use of nicotine gum for purely recreational use, it is important to first look at any and all effects it may have on the body. Nicotine gum, unlike cigarettes, has no serious side effects and no adverse long-term health effects on the vascular system.<sup>131</sup> The LD50 for nicotine in adults is 30-60 mg, while the average nicotine gum releases either 1 or 3 mg of nicotine into the body.<sup>132</sup> The main problem with nicotine gum is its addiction levels, but even these have proven to be miniscule. The less than 10% of those who continue to use nicotine gum past the recommended three months, use it because they are scared to slip back into their old smoking habits.<sup>133</sup> While there is a small population of those who do become addicted to nicotine gum, the vast majority of users do not. Nicotine patches have proven to be the least addictive form of NRTs because they only require one application in the morning that then releases a steady form of nicotine throughout the day, unlike other NRTs that require multiple doses a day. Because of this, nicotine patches have proven to be one of the best forms of weaning someone off of a nicotine addiction.

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<sup>128</sup> Mansvelder HD, McGehee DS. Cellular and synaptic mechanisms of nicotine addiction. *J Neurobiol* 2002;53:606-17.

<sup>129</sup> Vezina P, McGehee DS, Green WN. Exposure to nicotine and sensitization of nicotine-induced behaviors. *Prog Neuropsychopharmacol Biol Psychiatry* 2007;31:1625-38.

<sup>130</sup> Leslie FM. Multigenerational epigenetic effects of nicotine on lung function. *BMC Med* 2013;11:27.

<sup>131</sup> "Addicted to Nicorette." WebMD. WebMD. Accessed December 3, 2019. <https://www.webmd.com/smoking-cessation/features/addicted-to-nicorette#2>.

<sup>132</sup> Centre for Disease Control and Prevention. Available from: <http://www.cdc.gov/niosh/idlh/54115.html>. [Last accessed on 2014 Sep 27].

<sup>133</sup> Ibid.



### ***E-Cigarettes***

While e-cigarettes are widely regarded as a safe and easy transition from cigarette habits, they are still unhealthy for the body. E-cigarettes are a small device the size of a USB drive that contains a battery and nicotine pod. The battery heats up the pod to deliver a spray of vaporized nicotine into the user's mouth and lungs. When vaping, the temperature of the vaporizer, depth of the inhale, and concentration of nicotine in the pod can all contribute to the amount of nicotine inhaled by the user.<sup>134</sup> While this device was originally created for cigarette users to receive their nicotine dosage a healthier way, e-cigarettes have become wildly popular in today's teenage and young adult society. Vaping is most commonly used to wean cigarette smokers off of cigarette smoking and avoid second-hand smoke effects, because it is generally considered safer and cheaper. Studies that examined the effects of second-hand vaping found that nicotine content in an individual's oral fluid is considerably lower than the nicotine content from second-hand inhalation of cigarette smoke.<sup>135</sup> In addition to this, white blood cell, granulocyte, and lymphocyte count are all found to be higher in second-hand smokers, while second-hand vapers have no effect on complete blood count.<sup>136</sup> When it comes to vaping and its effect on cells, studies show that while vaping does increase cell death and place oxidative stress on exposed cells, the effect is not nearly as intense on cells as smoking.<sup>137</sup> Interestingly enough, some pod

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<sup>134</sup> Talih S, Balhas Z, Eissenberg T, Salman R, Karaoghlanian N, El Hellani A, Baalbaki R, Saliba N, Shihadeh A. Effects of user puff topography, device voltage, and liquid nicotine concentration on electronic cigarette nicotine yield: measurements and model predictions. *Nicotine Tob Res.* 2015;17:150–157.

<sup>135</sup> Gallart-Mateu D, Elbal L, Armenta S, de la Guardia M. Passive exposure to nicotine from e-cigarettes. *Talanta.* 2016;152:329–334.

<sup>136</sup> Flouris AD, Poulitaniti KP, Chorti MS, et al. Acute effects of electronic and tobacco cigarette smoking on complete blood count. *Food Chem Toxicol.* 2012;50(10):3600–3603.

<sup>137</sup> Yu V, Rahimy M, Korrapati A, et al. Electronic cigarettes induce DNA strand breaks and cell death independently of nicotine in cell lines. *Oral Oncol.* 2016;52:58–65.

flavors do have more cytotoxic effects than others by preventing cell survival as well as placing higher levels of stress on the cells, with cinnamon acting as the most harmful.<sup>138</sup>

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<sup>138</sup> Bahl V, Lin S, Xu N, Davis B, Wang YH, Talbot P. Comparison of electronic cigarette refill fluid cytotoxicity using embryonic and adult models. *Reprod Toxicol.* 2012;34(4):529–537.

### **Energy Drinks**

Among children and young adults, the catastrophic health effects of popular energy drinks are often overlooked. Energy drinks, such as Monster, Red Bull, and Bang, come in brightly colored cans offering energy and great taste while containing more caffeine than the average cup of coffee. These energy drinks have become wildly popular among adolescents, as most individuals begin to consume these drinks in their early teens or preteen years because of the increased loss of sleep due to school and stress. When asked why they consumed energy drinks, consumers cited taste as their primary reason and energy-seeking as their secondary reason.<sup>139</sup> Among athletes, particularly boys, energy drinks are primarily used before sports games to enhance their performance. Alcohol energy-drinks, also known as AEDs are popular among teenagers and young adults as an opportunity to get a different feel between the sloppiness of alcohol or the hyperactivity of energy drinks.

When examining patterns, boys are more likely than girls to consume these drinks and in higher amounts<sup>140</sup> In addition to this, adolescents were more likely to consume these energy drinks if they were underweight or overweight, black or hispanic minorities, living with a single parent, receiving free school lunches, attending classes for special education, and/or have a higher-than-average amount of pocket money.<sup>141 142</sup> In contrast, adolescents with high grades, more parental supervision, and from more educated families are less likely to consume energy

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<sup>139</sup> Bunting H, Baggett A, Grigor J. Adolescent and young adult perceptions of caffeinated energy drinks. A qualitative approach. *Appetite* 2013;65:132–8. 10. 1016/j. appet. 2013. 02. 011

<sup>140</sup> Bryant Ludden A, Wolfson AR. Understanding adolescent caffeine use: connecting use patterns with expectancies, reasons, and sleep.

<sup>141</sup> Azagba S, Langille D, Asbridge M. The consumption of alcohol mixed with energy drinks: prevalence and key correlates among Canadian high school students. *CMAJ Open* 2013;1:E19–26. 10. 9778/cmajo. 20120017

<sup>142</sup> Richards G, Smith AP. Breakfast and energy drink consumption in secondary school children: breakfast omission, in isolation or in combination with frequent energy drink use, is associated with stress, anxiety, and depression cross-sectionally, but not at 6-month follow-up. *Front Psychol* 2016;7:106 10. 3389/fpsyg. 2016. 00106

drinks.<sup>143</sup> Those who consume energy drinks are more likely to frequently drink alcohol as well. In addition, those who mix energy drinks with alcohol are more likely to feel intoxicated and have vehicular accidents. Those who consume energy drinks are more likely to have “sensation-seeking, self-destructive behaviour, problems with behavioural regulation and metacognitive skills, and poor lifestyle behaviours, including regularly eating junk food or fast food.”<sup>144</sup> Consumption is also more likely in individuals who have either very active lives, such as playing multiple sports, or those who have very inactive lives, such as sitting in front of the TV for hours on end.<sup>145</sup> A study of adolescent Finns aged 12-18 showed that 44% of those used energy drinks, with an average of 3% (2% of girls and 4% of boys) consuming them everyday.<sup>146</sup> Of those who drank energy drinks at least once a day, there were consistent complaints of headaches, sleeping problems, irritation, and fatigue, with the chance of receiving a headache 4.5 times higher, and the chance of having sleeping problems 3.5 times higher, than those who did not consume any energy drinks at all.<sup>147</sup>

Many sports players, especially boys, consume energy drinks for enhanced performance. This can be minimally beneficial for some sports, but not all. Among tennis players, a caffeinated energy drink with 3 mg of caffeine per kg of body mass results in increased handgrip, running pace at high intensity, amount of sprints in a simulated match, maximal running velocity

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<sup>143</sup> Terry-McElrath YM, O'Malley PM, Johnston LD. Energy drinks, soft drinks, and substance use among United States secondary school students. *J Addict Med* 2014;8:6–13. 10. 1097/01. ADM. 0000435322. 07020. 53

<sup>144</sup> Visram, S. , Cheetham, M. , Riby, D. M. , Crossley, S. J. , & Lake, A. A. (2016). Consumption of energy drinks by children and young people: a rapid review examining evidence of physical effects and consumer attitudes. *BMJ open*, 6(10), e010380. doi:10. 1136/bmjopen-2015-010380

<sup>145</sup> Al-Hazzaa HM, Al-Sobayel HI, Abahussain NA et al. Association of dietary habits with levels of physical activity and screen time among adolescents living in Saudi Arabia. *J Hum Nutr Diet* 2014;27(Suppl 2):204–13. 10. 1111/jhn. 12147

<sup>146</sup> H Huhtinen, P Lindfors, A Rimpelä, Adolescents' use of energy drinks and caffeine induced health complaints in Finland: Arja Rimpelä, *European Journal of Public Health*, Volume 23, Issue suppl\_1, 1 October 2013, ckt123. 050, <https://doi.org/10.1093/eurpub/ckt123.050>

<sup>147</sup> Ibid.

during sprints, and points won on average than non-caffeinated players, but it did not improve ball velocity during serves.<sup>148</sup> In a similar study, basketball players who were given 3 mg per kg of body mass had their mean jump height increase in both the counter-movement jump as well as the repeated maximal jumps test for 15 seconds, but they did not improve shot accuracy.<sup>149</sup> On average, energy drinks are shown to improve sports performance in some, but not all, areas.

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<sup>148</sup> Gallo-Salazar C, Areces F, Abián-Vicén J et al. Enhancing physical performance in elite junior tennis players with a caffeinated energy drink. *Int J Sports Physiol Perform* 2015;10:305–10. 10. 1123/ijspp. 2014-0103

<sup>149</sup> Abian-Vicen J, Puente C, Salinero JJ et al. A caffeinated energy drink improves jump performance in adolescent basketball players. *Amino Acids* 2014;46:1333–41. 10. 1007/s00726-014-1702-6

### **Religious Experiences Through Drug Use**

When discussing drug use, it is also important to mention the use of drugs by others for religious purposes.

Classically, there are three ways in which humans try to find transcendence- religious meaning- apart from God as revealed through the cross of Jesus: through the ecstasy of alcohol and drugs, through the ecstasy of recreational sex, through the ecstasy of crowds.

<sup>150</sup>

Various religions offer psychoactive substances for mystic/spiritual experiences (MSE), especially traditional plant-based drugs. The use of these hallucinogenic drugs to induce MSEs have been used throughout history, such as the Aztec's use of teonanácatyl, the Wixáritari Indian's use of peyote cactus, and the Amazonian Indian's use of ayahuasca, or "yage." It is only in the more Westernized societies that the use of psychoactive drugs for MSEs has been rejected in favor of clear-mindedness and self-control. Because of the nature of these psychoactive drugs, many individuals who ingest these drugs for religious purposes claim they are able to communicate and/or become closer with their god and spiritual realm.

In a 1962 Walter Pahnke, a graduate at Harvard Divinity School, worked under Dr. Timothy Leary, for the Harvard Psilocybin Project, a double-blind study to determine if psilocybin, the psychoactive ingredient of magic mushrooms, can create MSEs in religious individuals before a religious event. For his experiment, the Marsh Chapel Experiment, Pahnke recruited 20 individuals from Andover Newton Theological School to give either 30 mg of psilocybin or a placebo right before a Good Friday service and then continued to monitor those individuals during the service. After the service, only one student with a placebo reported

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<sup>150</sup> Peterson, 157

noticeable effects from the drugs (an hour-long flush of warmth), while the majority of the students given the psilocybin reported considerable psychoactive effects. These effects were rated on eight different sections to describe the user's altered state of conscience, including sense of unity, transcendence of time and space, sacredness, sense of objective reality, deep positive mood, ineffability, paradoxicality, and transiency. Based on the feedback Pahnke received from his testers, he discovered that the use of psilocybin considerably enhanced the religious meaningfulness of the service to the user. This response did not fade over time as he continued to receive the same overwhelmingly positive reviews in a 25-year follow-up.<sup>151</sup> The Marsh Chapel Experiment is considered the first study to test the use of drugs to enhance religious experiences and a critical trial in the scientific study of religion. Replications of the experiment only result in a similar outcomes.<sup>152</sup>

Psychoactive drugs result in hallucinations and an altered perception of sight, touch, sound, time, and space, which is where the revelation of profound religious insights stem from. There is strong evidence based on overlapping neurotransmitters, especially serotonin, to suggest that MSEs and psychedelic drug effects have shared neurological pathways.<sup>153</sup> Because of this, researchers are able to create a stronger pharmacological profile on MSEs based on the profile of psychoactive drugs because of the similar psychological effects of serotonergic hallucinogens,

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<sup>151</sup> Rick Doblin, "Pahnke's 'Good Friday Experiment': A Long-Term Follow-Up and Methodological Critique," *J. Transpers. Psychol.* 23 (1991): 1-28.

<sup>152</sup> R. R. Griffiths et al., "Psilocybin Can Occasion Mystical-Type Experiences Having Substantial and Sustained Personal Meaning and Spiritual Significance," *Psychopharmacology (Berl.)* 187 (2006): 26883; Griffiths et al., "Psilocybin Occasioned Mystical-Type Experiences," *Psychopharmacology (Berl.)* 218 (2011): 649-65; Felix Hasler et al., "Acute Physiological and Physiological Effects of Psilocybin in Healthy Humans: A Double-Blind, Placebo-Controlled Dose-Effect Study," *Psychopharmacology (Berl.)* 172 (2004): 145-56.

<sup>153</sup> Ibid.

empathogenic drugs, and NMDA antagonists.<sup>154</sup> Phenethylamines (peyote/mescaline), lysergamides (Lysergic acid/LSD), psilocybin, and ayahuasca/DMT that induce these psychedelic effects have found to be structurally similar to serotonin (5-hydroxytryptamine, 5-HT), commonly referred to as the “happy” chemical.<sup>155</sup> Because of this structural similarity, the drugs used for MSEs are serotonergic psychedelics, as they both the drug and the neurotransmitter effect the same 5-HT receptors. In fact, most of those serotonergic psychedelics also affect other neurotransmitters such as dopamine and norepinephrine, increasing its addiction potential in the user.<sup>156</sup> Additionally, because these drugs are serotonergic psychedelics, there has been an increase in their use to treat certain disorders, such as anxiety, addiction, and depression, mainly using psilocybin and ayahuasca/DMT.<sup>157</sup>

In addition to the psychedelic effects, the drugs used for MSEs also have a strong emotional effect on their users because they are also empathogen. “Good trips,” where the user experiences positive emotions such as joy, gratitude, and serenity, can result in the user feeling a closer emotion to God while “bad trips,” where the user experiences negative emotions such as guilt, anxiety, or fear, can result in the user assuming these feelings come from a dissatisfaction from a higher power. Because of the effects of empathogens, these drugs, specifically 3,4-methylenedioxymethamphetamine (MDMA), more commonly known as ecstasy, have been used to adjunctively treat certain disorders. In brain imaging studies, concerning MDMA, results

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<sup>154</sup>Struthers, William M. “Neuropharmacoformation: Christian Formation in an Age of Stupefaction.” In *Tending Soul Mind and Body: The Art of and Science of Spiritual Formation*, 160–73, n. d.

<sup>155</sup> Michael Winkelman, “Psychedelics as Medicines for Substance Abuse Rehabilitation: Evaluating Treatments with LSD, Peyote, Ibogaine and Ayahuasca,” *Curr. Drug Abuse Rev.* 7 (2015): 101-16.

<sup>156</sup>Struthers, William M. “Neuropharmacoformation: Christian Formation in an Age of Stupefaction.” In *Tending Soul Mind and Body: The Art of and Science of Spiritual Formation*, 160–73, n. d.

<sup>157</sup> Elisabet Domínguez-Clavé et al. , “Ayahuasca: Pharmacology, Neuroscience and Therapeutic Potential,” *Brain Res. Bull.* 126 (2016): 89-101; Filip Tyls, Tomás Palenicek, and Jiri Horáček, “Psilocybin-Summary of Knowledge and New Perspectives,” *Eur. Neuropsychopharmacol. J. Eur. Coll. Neuropsychopharmacol.* 24 (2014): 342-56.



showed that there was an increase in cerebral blood flow to multiple areas of the brain such as the ventromedial prefrontal cortex, ventral anterior cingulate, inferior temporal lobe, medial occipital cortex, and the cerebellum, all vital areas of the brain for socialization.<sup>158</sup> Additionally, MDMA usage leads to an increase in serotonin levels, 5-HT receptor activation, inhibit limbic fear-activation by the amygdala, increase ventromedial prefrontal cortex, and regulate emotional response through increased orbitofrontal cortical activity.<sup>159</sup> Because of this, drugs such as MDMA have been used in psychotherapy to treat disorders such as posttraumatic stress disorder (PTSD).<sup>160</sup> This treatment has proven to be successful in PTSD patients largely because of MDMA's loosening effects on the mind that may interfere with traditional PTSD therapy.

Aside from the altered perceptions that make up many MSEs, out of body experiences are also a large part of MSEs. This can also be referred to as a dissociative dissolution or boundlessness, and most commonly come from psychoactive drugs such as ketamine or phencyclidine (PCP), both of which are being experimented with as possible treatments for depression.<sup>161</sup> During these experiences, the user will find themselves outside of time or their environment and able to directly converse with the universe, god, or any other spiritual/transcendental reality.<sup>162</sup> Drugs such as these were originally called “dissociative

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<sup>158</sup>Struthers, William M. “Neuropharmacof ormation: Christian Formation in an Age of Stupefaction. ” In *Tending Soul Mind and Body: The Art of and Science of Spiritual Formation*, 160–73, n. d.

<sup>159</sup> Oehen et al. , “A Randomized, Controlled Pilot Study of MDMA”; Johansen and Krebs, “How Could MDMA (Ecstasy) Help?”

<sup>160</sup> Peter Oehen et al. , “A Randomized, Controlled Pilot Study of MDMA (+3,4-Methylenedioxymethamphetamine)- Assisted Psychotherapy for Treatment of Resistant, Chronic Post-Traumatic Stress Disorder (PTSD),” *J. Psychopharmacol.* (Oxf. ) 27 (2013): 40-52; Po Johansen and Ts Krebs, “How Could MDMA (Ecstasy) Help Anxiety Disorders? A Neurobiological Rationale,” *J. Psychopharmacol.* (Oxf. ) 23 (2009): 389-91

<sup>161</sup> K Hirota and D. G. Lambert, “Ketamine: New Uses for an Old Drug?, *Br. J. Anaesth.* 107 (2011): 123-26; Hamilton Morris and Jason Wallach, “From PCP to MXE: A Comprehensive Review of the Non-Medical Use of Dissociative Drugs,” *Drug Test. Anal.* 6 (2014): 614-32

<sup>162</sup>Struthers, William M. “Neuropharmacof ormation: Christian Formation in an Age of Stupefaction. ” In *Tending Soul Mind and Body: The Art of and Science of Spiritual Formation*, 160–73, n. d.

anesthetics,” and developed as an anesthetic or sedative, but their lack of effect as either made them considerably useless for these purposes and considerably useful to others looking for a fun time.<sup>163</sup>

These dissociative effects have been found to mainly come from the inhibition of glutamate receptor N-methyl-D-aspartate (NMDA) receptor antagonists.<sup>164</sup> Additionally, these drugs also appear to primarily affect the parietal lobe, as it contains parts of the brain that discern sense of time, space, and self.<sup>165</sup>

The main problem with the use of psychoactive drugs for MSEs is the authenticity of the religious experience on the user. For Christians, it is important to remember that not all religious experiences must have an extreme effect on the mind, like altered perception or dissociative dissolutions. In fact, many religious experiences in the Christian world do not have a large alteration of the mind by God. With this in mind, those who use MSEs for a religious experience must be carefully monitored to be able to discern what truly comes from God and what comes from the psychoactive drug. While the experience the user hears, sees, and feels during their MSE may seem completely real to them, it is most likely only effects from the drugs. Similarly, any profound religious knowledge the user may feel has been imparted on them by God Himself is doubtful and lacks any solid evidence or proof of its validity.

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<sup>163</sup> Ibid.

<sup>164</sup> Ibid.

<sup>165</sup> Ibid.

### **The Body and Mind as a Temple**

As previously stated, it is important to remember that the body is a temple of God.<sup>166</sup> If the body is a temple, then it should be treated as one, by being kept clean and holy in order to best glorify God. Because of this, it is the Christian duty to keep the body pure in a way that will honor God, including watching what is absorbed into the body.<sup>167</sup> Additionally, God reminds us “for no one ever hated his own flesh, but nourishes and cherishes it, just as Christ does the church.”<sup>168</sup> In this, God makes an analogy that the body is a vessel that is created for humans to take care of in the same way the church is a structure that Christ takes care of: with nourishment and love.

Christians are called to care for their minds as well as their bodies. It is important for Christians to be able to understand the creation of the world God has set. When people indulge in substances to purposely alter their perception of God’s creation, they often find themselves sinking deeper into a hole of sorrow and misery.<sup>169</sup> God, who cares for his people’s mental health, does not advocate this and says to “be on guard, that your hearts may not be weighed down with dissipation and drunkenness and the worries of life.”<sup>170</sup> Aside from the consequences of falling into a pit of overall unhappiness, losing control of the mind can also result in a corruption of morals. When this happens, Christians lose their sense of what God establishes as

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<sup>166</sup> 1 Corinthians 6:19-20

<sup>167</sup> 1 Corinthians 10:3

<sup>168</sup> Ephesians 5:29

<sup>169</sup> Hosea 4:11

<sup>170</sup> Luke 21:34

morally right and wrong, which can lead to their loss of their inheritance to the Kingdom of God.

<sup>171</sup>

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<sup>171</sup> Galatians 5:19-21

## **Drawing the Line**

### ***Drawing the Line with Science***

To reach a conclusion on what should be done about substance use, the evaluation must first be viewed from a scientific standpoint to completely understand how these substances affect the body.

As previously discussed, alcohol in moderation has considerable benefits to the body while overconsumption has proven to be detrimental to overall health.

For marijuana, while CBD has shown to have considerable health benefits with minimal to no adverse effects, it is safe to be recommended for both regular and occasional use, when its user deems necessary. The THC side of marijuana, however, has proven to have more detrimental effects on the brain. As THC use has shown to have primarily negative effects on both brain and body, it is not recommended to use in neither high nor low amounts. To err on the side of caution, it is not recommended to recreationally consume marijuana. Those looking for the health benefits of marijuana can look to CBD oil for the relaxation effects they desire. While smoking does result in a higher amount of adverse health effects compared to edibles, the THC components in edibles still have the same effect on the brain as smoking cannabis does. Additionally, it is important to remember the likely possibility of over-consuming edible that will result in a strong marijuana intoxication.

In the case of those who use marijuana for medical purposes, it is recommended that they first consider other forms of pain treatment, such as pain-relief drugs and/or surgical corrections recommended by a medical professional. For cases of pain that are unaffected by other

pain-relief drugs and/or surgical treatment, medical marijuana may be recommended by a health professional for pain relief. However, even in cases where medical marijuana is suggested, it is not recommended for individuals who may struggle with anxiety, depression, or mental illnesses, as marijuana can be a trigger and/or intensify the symptoms for these conditions.

Tobacco use, through smoked or unsmoked consumption, is not recommended because it has no proven health benefits. The only proven health effects tobacco has on the body have been incredibly negative, with high addiction levels, increased chances of developing cancer, and overall deterioration of the body. In smokers, these effects are especially concentrated in the lungs, where the inhalation and residue of the tobacco smoke resides in the body. In unsmoked tobacco users, the risk of damaging DNA and RNA and later developing oral cancer remains high. For nicotine gum, and similar NRTs, they should be used to wean off smokers from smoking tobacco. Nicotine patches would be the first recommended NRT because of it is considerably hard to become addicted to it as it comes it a singular daily dose when all other NRTs come in multiple daily doses. Those who may become dependent on NRTs would then be recommended to use nicotine patches to wean themselves off their addiction. However, for those looking to use NRTs for recreational use, they must first consider the addictive qualities of nicotine. While nicotine gum does not give off enough nicotine to be addictive to most people, there is a small percentage of people who do become addicted to the substance. For those who have an addictive personality, it is not recommended for them to regularly use nicotine gum. For others, nicotine gum has not been proven to have any adverse health effects like cigarettes or chewing tobacco does and can be used for recreational use.

The conclusions for e-cigarettes are similar to tobacco. While e-cigarettes may appear to be a healthier alternative to cigarettes, they are still not recommended for regular use. Though the inhalation from e-cigarettes is water vapor as opposed to smoke from cigarettes, they can still have harmful effects on the lungs. While the water vapor is indeed a healthier alternative to smoke, e-cigarette pods contain as much nicotine as a pack of cigarettes. Because of this, e-cigarettes are easier to become addicted to than cigarettes. In general, e-cigarette may be recommended for cigarette users looking for a healthier alternative than cigarettes, but it is not recommended for individuals who have never before smoked as it will become strongly addictive to its users, especially first-time users.

Though energy drinks of all kinds have become popularized in today's society, they have a number of adverse health effects on the body. Energy drink consumption has been linked to headaches, obesity, and self-destructive behavior. Aside from having nearly no nutritional value, they are loaded with incredibly high levels of caffeine and sugar. These drinks have nearly no benefit to the body except for an energy rush that can be achieved through other means, if necessary. Overall, it would not be recommended at all to consume energy drinks as they are harmful to the body and the results they produce can be achieved other ways.

### ***Drawing the Line with the Bible***

After looking at the scientific evidence on why certain substances should/should not be used, Christians must then look at biblical evidence on the next conclusions that should be reached.

Alcohol is the only one of the previously discussed topics that has been mentioned in the Bible. Based on previously mentioned texts, drinking alcohol in moderation is supported by the Bible, while overindulging clearly goes against God's intended purpose of keeping the body holy and clean. Drunkenness results in a distorted perception of the world God created, an inability to decipher right from wrong, moral depravity, the ruin of a Christian's reputation, and does not represent God's idea of a Christian life.

Based off of these issues that arise from drunkenness, it is not possible to evaluate recreational marijuana under the same concepts. Like the results that come from overindulging in alcohol, marijuana distorts the mind's perception of reality and God's creation, making it unfit for Christians to consume. Additionally, weed has been proven to have detrimental effects on the body, whether orally consumed or smoked, which goes against God's will to keep the body clean.

For medical marijuana, the beneficial mental effects marijuana has on the patient outweigh the adverse health effects the substance may have. Because medical marijuana is used in cases where other pain-relief options do not work, it often offers immense relief to pain that patients are unable to find in other medications and treatments. In these cases, it is important to remember that God calls others to care for those who are sick and in need.<sup>172</sup> This includes allowing Christians to use medical marijuana for pain relief.

Tobacco and energy drinks have no strong mind-altering effects that disrupt a Christian's perception of God's creation, but there are strong adverse health effects that come with the consumption of these two products. For tobacco, there are no short-term nor long-term health

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<sup>172</sup> Matthew 25:41-46



benefits. For energy drinks, the only short term health benefits are the sudden burst of energy that comes with consuming these drinks, but those effects can be achieved through other means that are less detrimental to the body. To summarize, both tobacco and energy drinks should not be consumed by Christians because of their adverse health effects that do not fall in line with God's instructions to keep the body holy and pure.

For nicotine, through NRTs and e-cigarettes, the line is slightly more crooked. NRTs do not alter the mind in any way that would go against God's intended life for Christians, nor do they have any major adverse health effects. However, nicotine itself is a highly addictive substance, and addiction means placing another substance or action over God, breaking the First Commandment. Therefore, if those using NRTs or e-cigarettes are using them for the purpose of weaning themselves off of their smoking addiction, it is alright to use. If using these products for recreational reasons, it is important to remember that if any kind of dependency begins to form, the user must stop using the substance. Because of the high dosage of nicotine released into the bloodstream when using e-cigarettes, it is not recommended to use e-cigarettes for recreational use. While NRTs are considerably less addictive than e-cigarettes, it is easier to use them for recreational use without becoming dependent on them. If an addiction to any nicotine product begins to form, it is important to stop immediately and use nicotine patches to wean oneself off of nicotine, if necessary.

Additionally, it is important to mention that while discussing the use of substances that have been concluded to be acceptable for Christians to use, it is vital to remember that this usage is discussed in a legalized situation. As God states that we should obey both holy and earthly authority, substances that may be acceptable for Christian use but are not legalized should still

not be consumed. While God's authority does come first, which was the primary focus on drawing the line with the Bible, earthly authority comes second, making the legalization of acceptable substances for Christians necessary for consuming any substance.

### **Conclusion**

The purpose of this thesis was to create a better understanding of how Christians should act in a society filled with casual drug and alcohol use. After the walkthrough of alcohol use in the Bible and why its consumption was acceptable in moderation, it was then possible to form conclusions on other substances not mentioned in the Bible. The basis of these conclusions can be summed up with the idea that if the substance does not affect a Christian's perspective of God's creation, does not affect the ability to decipher wrong from right, does not lead to moral depravity, and does not negatively impact the body in a way that goes against God's word, then the substance is acceptable to consume, if it does not lead to dependence or addiction of the substance. If an overindulgence of said substance does later lead to one of these negative effects, then the consumption of the substance should be moderated. However, if the substance has these effects but can be used for medicinal purposes when other treatments have not worked, then it is morally acceptable for that substance to be consumed. If nothing from this thesis was read except for this last, concluding sentence, it is important to remember: use, don't abuse.

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### About the Author



Faith Avila is currently a senior at Fort Bend Christian Academy. She wrote this paper as she does many things: procrastinating before perfecting. She is scared of spiders, the dark, and the unceasing knowledge of a looming death. It is commonly said that Faith is a stress eater and is quoted that she “probably gained, like, so many pounds writing this thesis.” When she is not busy saving the world, Faith enjoys hanging out with her friends, who have have described her as “an intelligent yet humorously complex individual” (Borazjanian), “mentally grating” (Garcia), and “stubborn as heck” (Ogden). Faith aspires to be a world dictator, although failing that, her Plan B is to become a physician assistant as “either way [she’s] helping people. It’s basically the same job.” She would like to thank her apologetics teacher, Hendy, for “making [her] head hurt all the time,” google, for “always having stuff [she] can’t quote,” and Mark Lanier, for “making that bomb\*\*\* library [the students] always use.”