

# Marijuana and Your Health: Just The Facts Part I

This paper comprises three decades of scientific study on the negative and potential positive effects of marijuana and human health.

## **JUST THE FACTS: Marijuana and Health**

Marijuana is the subject of heated debate in our country. Despite one's view on marijuana policy, it is critical to be well-versed in the science.

Marijuana is one of the most misunderstood drugs of our time. Sifting through the rhetoric about the drug can be difficult, but now we have a plethora of scientific studies from which to draw firm conclusions about the use of the drug and its public health implications.

## **Marijuana and The Brain**

Marijuana use directly affects the brain, specifically the parts of the brain responsible for memory, learning, attention, and reaction time. These effects can last up to 28 days after abstinence from the drug.<sup>1</sup> Science confirms that the adolescent brain, particularly the part of the brain that regulates the planning complex cognitive behavior, personality expression, decision making and social behavior, is not fully developed until the early to mid-20s. Developing brains are especially susceptible to all of the negative effects of marijuana and other drug use.<sup>2</sup>

## **What makes marijuana harmful? Three simple letters: delta9-THC**

Marijuana contains about 500 components, most of which we know little about. The most prominent component is called delta9-THC. Scientists have found that delta9-THC is what produces the "high" users experience. In today's street marijuana, which is usually smoked, producers have increased delta9-THC levels by more than four-fold<sup>3</sup>, and reduced the natural levels of other components that have actually been shown to reduce the high. Higher delta9-THC content can increase all of the usual negative effects of the drug.<sup>4,5</sup> In the U.S., for example, since 1990, more people have gone to the emergency room after using marijuana even though the overall numbers of marijuana users has remained relatively stable.<sup>6,7</sup>

## **The main health harms of marijuana can be summarized as follows:**

**Heart:** Marijuana use can cause an increase in the risk of a heart attack more than four-fold in the hour after use, and provokes chest pain in patients with heart disease.<sup>8</sup>

**Lungs:** Research has shown marijuana smoke to contain carcinogens and to be an irritant to the lungs, resulting in greater prevalence of bronchitis, cough, and phlegm production.<sup>9</sup> Marijuana smoke contains 50-70 percent more carcinogenic hydrocarbons than does tobacco smoke, as

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<sup>1</sup> Hall W & Degenhard L (2009). Adverse health effects of non-medical cannabis use. *Lancet*, 374:1383-1391.

<sup>2</sup> Giedd. J. N. (2004). Structural magnetic resonance imaging of the adolescent brain. *Annals of the New York Academy of Sciences*, 1021, 77-85.

<sup>3</sup> [http://news.olemiss.edu/index.php?option=com\\_content&view=article&id=4545%3Acannabispotency051409&Itemid=10](http://news.olemiss.edu/index.php?option=com_content&view=article&id=4545%3Acannabispotency051409&Itemid=10)

<sup>4</sup> Hall W & Degenhard L (2009). Adverse health effects of non-medical cannabis use. *Lancet*, 374:1383-1391.

<sup>5</sup> NIDA, Research Report Series: Cannabis Abuse, 2010

<sup>6</sup> Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. (2011). Drug Abuse Warning Network, 2008: National Estimates of Drug-Related Emergency Department Visits. HHS Publication No. SMA 11-4618. Rockville, MD.

<sup>7</sup> See for example Compton, W., Grant, B., Colliver, J., Glantz, M., Stinson, F. (2004). Prevalence of Cannabis Use Disorders in the United States: 1991-1992 and 2001-2002 *Journal of the American Medical Association*. 291:2114-2121. And Sabet, K. (2006). The (often unheard) case against cannabis leniency. In *Pot Politics* (Ed. M. Earleywine). Oxford University Press, pp. 325-355.

<sup>8</sup> Hall W & Degenhard L (2009). Adverse health effects of non-medical cannabis use. *Lancet*, 374:1383-1391.

<sup>9</sup> Tetrault, J.M., et al. Effects of cannabis smoking on pulmonary function and respiratory complications: a systematic review. *Arch Intern Med* 167, 221-228 (2007).

reported by the American Lung Association.<sup>10</sup> Scientists have not found a definitive marijuana-lung cancer link.

**Mental Health:** Marijuana use has been shown to be significantly linked with mental illness, especially schizophrenia and psychosis, but also depression and anxiety.<sup>11</sup>

**Pregnancy:** Marijuana smoking during pregnancy has been shown to decrease birth weight, most likely due to the effects of carbon monoxide on the developing fetus.<sup>12</sup>

## **Marijuana and Addiction**

An often heard phrase is that “marijuana is not addictive.” In fact, scientific research has found that 1 in 10 marijuana users will become addicted to the drug. And if one begins in adolescence, that number rises to 1 in 6.<sup>13</sup> Users who try to quit experience withdrawal symptoms that include irritability, anxiety, insomnia, appetite disturbance, and depression.<sup>4, 5</sup> Additionally, data from the National Institute on Drug Abuse found that in 1993 marijuana comprised approximately 8% of all treatment admissions, but by 2009 that number had increased to 18%.<sup>14</sup> For those under 18, marijuana related treatment admissions increased by 188 percent from 1992 to 2006 while other drugs remained steady.<sup>15</sup>

Data in the United States is corroborated with data from other countries. In the European Union, the percentage of marijuana as the primary reason for entering treatment increased by 200 percent from 1999 to 2006, and currently stands at around 30 percent of all admissions.<sup>16</sup> The Netherlands has the highest rate of marijuana addiction in Europe.<sup>17</sup>

## **Marijuana and Driving**

In the past decade, researchers from all corners of the world have documented the problem of marijuana use and driving.<sup>18,19,20,21,22,23</sup> Linked to deficits in the parts of the brain that are important for driving, including the impairment of motor coordination and reaction time, a widely-cited article in the British Medical Journal from 2012 concluded that marijuana use doubles the risk of car crashes.<sup>24</sup> Another recent meta-analysis of nine studies found that

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<sup>10</sup> Hoffman, D.; Brunnemann, K.D.; Gori, G.B.; and Wynder, E.E.L. On the carcinogenicity of marijuana smoke. In: V.C. Runeckles, ed., *Recent Advances in Phytochemistry*. New York: Plenum, 1975.

<sup>11</sup> See, for example: Moore TH, Zammit S, Lingford-Hughes A, et al. Cannabis use and risk of psychotic or affective mental health outcomes: A systematic review. *Lancet* 370(9584):319–328, 2007. Also Large, M., Sharma S, Compton M., Slade, T. & O., N. (2011). Cannabis use and earlier onset of psychosis: a systematic meta-analysis. *Archives of General Psychiatry*. 68. Also see Arseneault L, et al. (2002). Cannabis use in adolescence and risk for adult psychosis: longitudinal prospective study. *British Medical Journal*. 325, 1212-1213.

<sup>12</sup> Hall W & Degenhard L (2009). Adverse health effects of non-medical cannabis use. *Lancet*, 374:1383-1391.

<sup>13</sup> Wagner, F.A. & Anthony, J.C. From first drug use to drug dependence; developmental periods of risk for dependence upon cannabis, cocaine, and alcohol. *Neuropsychopharmacology* 26, 479-488 (2002).

<sup>14</sup> Substance Abuse and Mental Health Services Administration. (2009). Office of Applied Studies. Treatment Episode Data Set (TEDS): 2009 Discharges from Substance Abuse Treatment Services, DASIS.

<sup>15</sup> Substance Abuse and Mental Health Services Administration. (2009). Office of Applied Studies. Treatment Episode Data Set (TEDS): 2009 Discharges from Substance Abuse Treatment Services, DASIS. Also see Non-medical cannabis: Rite of passage or Russian roulette? (2011). Center on Addiction and Substance Abuse, Columbia University.

<sup>16</sup> Room, R., Fischer, B., Hall, W., Lenton, S. and Reuter, P. (2010). *Cannabis Policy: Moving Beyond Stalemate*, Oxford, UK: Oxford University Press.

<sup>17</sup> MacCoun, R. J. (2011), What can we learn from the Dutch cannabis coffee shop system?. *Addiction*, 106: 1899–1910.

<sup>18</sup> Drummer, O.H., Gerostamoulos, J., Batziris, H., Chu, M., Caplehorn, J.R., Robertson, M.D., Swann, P. (2003). The incidence of drugs in drivers killed in Australian road traffic crashes. *Forensic Science International*, 134(2-3), 154-162.

<sup>19</sup> European Monitoring Centre for Drugs and Drug Addiction. (2003) *Drugs and driving: ELDD comparative study*. Lisbon, Portugal: Author. Retrieved March 29, 2011 from [http://www.emcdda.europa.eu/attachements.cfm/att\\_5738\\_EN\\_Quantities.pdf](http://www.emcdda.europa.eu/attachements.cfm/att_5738_EN_Quantities.pdf)

<sup>20</sup> Mørland J. (2000) Driving under the influence of non-alcoholic drugs, *Forensic Science Review*, 12, 80-105.

<sup>21</sup> ROSITA Roadside Testing Assessment: [www.rosita.org](http://www.rosita.org)

<sup>22</sup> DRUID: [www.druid-project.eu](http://www.druid-project.eu)

<sup>23</sup> Verstraete, A.G. & Raes, E. (Eds.). (2006). *Rosita-2 Project Final Report*. Ghent Belgium: Ghent University.

<sup>24</sup> M. Asbridge, J. A. Hayden, J. L. Cartwright. Acute cannabis consumption and motor vehicle collision risk: systematic review of observational studies and meta-analysis. *BMJ*, 2012; 344 (feb09 2): e536 DOI:10.1136/bmj.e536

marijuana “...use by drivers is associated with a significantly increased risk of being involved in motor vehicle crashes.”<sup>25</sup>

### **Marijuana use and Performance at School and on the Job**

One of the most well designed studies on marijuana and intelligence, released in 2012, found that marijuana use reduces IQ by as much as eight points by age 38 among people who started using marijuana regularly before age 18 but then stopped.<sup>26</sup> Other studies have found that marijuana use is linked with dropping out of school, and subsequent unemployment, social welfare dependence, and a lower self-reported quality of life than non-marijuana abusing people.<sup>27</sup>

According to the U.S. National Survey on Drug Use and Health, youth with poor academic results were more than four times as likely to have used marijuana in the past year than youth with an average of higher grades. This is consistent with an exhaustive meta-analysis examining four dozen different studies by Macleod and colleagues, published by Lancet, who found that marijuana use is consistently associated with reduced grades and a reduced chance of graduating from school.<sup>28</sup> Ellickson and colleagues at the RAND Corporation surveyed almost 6,000 students aged 13 to 23 and found that the teens who smoked cannabis from once a week to monthly at age 13, decreased their abuse by age 18, and as young adults smoked 3 to 10 times a year, lagged behind all other groups in earnings and education when resurveyed at age 29.<sup>29</sup>

In addition, studies have linked employee marijuana use with “increased absences, tardiness, accidents, workers' compensation claims, and job turnover.”<sup>30</sup>

**Health Recap:** To recap, the science is emerging on the effects of marijuana, but we can say with some certainty that marijuana use is significantly linked with:

- Addiction
- Heart and Lung Complications (the jury is out on a connection to lung cancer, though)
- Mental Illness
- Car Crashes
- IQ loss and poor school outcomes
- Poor quality of life outcomes
- Poor job performance

Science has learned more about marijuana in the past twenty years than in the preceding two hundred. Ironically, however, there has been a major incongruence between the scientific knowledge gained and the public's understanding of the drug. People often refer to their own experiences with marijuana rather than what scientific data has taught us. It is important to be aware of the growing scientific literature about a drug that is widely misunderstood.

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<sup>25</sup> Li, M., Brady, J., DiMaggio, C., Lusardi, R., Tzong, K. and Li, G. (in press). Cannabis use and motor vehicle crashes. *Epidemiologic Reviews*.

<sup>26</sup> Meier et al. (2012). Persistent cannabis users show neuropsychological decline from childhood to midlife. *Proceedings of the National Academy of Sciences*.

<sup>27</sup> Fergusson, D. M. and Boden, J. M. (2008), Cannabis use and later life outcomes. *Addiction*, 103: 969–976.

<sup>28</sup> Macleod, J.; Oakes, R.; Copello, A.; Crome, I.; Egger, M.; Hickman, M.; Oppenkowski, T.; Stokes-Lampard, H.; and Davey Smith, G. Psychological and social sequelae of cannabis and other illicit drug use by young people: A systematic review of longitudinal, general population studies. *Lancet* 363(9421):1579-1588, 2004.

<sup>29</sup> Ellickson, P.L.; Martino, S.C.; and Collins, R.L. Cannabis use from adolescence to young adulthood: Multiple developmental trajectories and their associated outcomes. *Health Psychology* 23(3):299-307, 2004.

<sup>30</sup> National Institute on Drug Abuse (NIDA). (2011). Research Report Series: Cannabis Abuse. Accessed November 2011 at <http://www.drugabuse.gov/ResearchReports/Cannabis/cannabis4.html>