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THE IMPACT OF SUBSTANCE ABUSE ON THE MIND, BODY AND SOUL: II

The topic of substance abuse is a controversial and complex subject. There are few issues today that cause such stir and/or create such strong, passionate feelings and opinions as do the themes surrounding this topic. Although the science and data can be misinterpreted, few could or would deny the overwhelming scientific and anecdotal evidence that supports the conclusion that drugs negatively impact the mind, body and soul of the abuser, their families and communities. In this edition of the Journal, our subject matter experts further explore the complex themes surrounding the world of substance abuse.

Included in this issue is an article about the use of cannabis for medical purposes, often termed “medical marijuana”. This topic is of concern throughout the world, on many levels: health, policy, society and economy. The authors discuss the history of “medical marijuana” and the current research on marijuana, the most used illegal drug globally.

Also included in this edition are two commentaries. The first commentary is a look at marijuana from a historical perspective, and as yet another failed human experiment; comparing it to other drugs in years past, that have become normalized and widely used, such as over-the-counter heroin, smoked opium, and morphine.

The second commentary piece offers an explanation of and perspective on the controversial subject of using mycoherbicides, naturally occurring fungi, to control illicit drug crops. The author discusses the how and why, plus the politics, of the potential use of these living organisms in the fight against the growth of illicit narcotic plants.



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COMMENTARY

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The Politics of Using Mycoherbicides to Control Illicit Drug Crops

The Use of Cannabis for Medical Purposes

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Abstract

There is widespread global discussion about the use of cannabis for medical purposes. Often termed ‘medical marijuana’, the matter has reached high levels of government in many countries.

Of interest is the fact that the concept of ‘medical marijuana’ did not originate from those in the medical profession, but rather through a drug legalization lobby. These lobby groups generally focus on ‘smoked’ marijuana as the vehicle for administering cannabis.

World-wide, there are many well-informed government authorities who are continuing to stand firm against such pro-drug lobby groups. For example, in Australia, the Therapeutic Goods Administration, does not endorse the use of marijuana for medical use, nor does the Drug Enforcement Agency (DEA) in the United States. In addition numerous high profile medical and allied health organizations oppose the concept of ‘medical marijuana’.

The challenge arises because cannabis is, globally, the most used illicit drug, with current research indicating that Australia and New Zealand have the highest prevalence of cannabis users. The research also confirms that the early uptake of cannabis is a likely cause for lifetime adverse health issues – both physical and psychological. Legalizing ‘medical marijuana’ leads to increased use and misuse, which, in turn exacerbates cannabis-related harms.

The following facts are not controversial in that they are settled in the epidemiological and scientific literature. The long term smoking of cannabis is associated with numerous respiratory complaints and numerous psychiatric disorders. Cannabinoids are known to shut down synaptic transmission between neurones which accounts for its sedative effects. Since synaptic function and traffic intensity rates are coupled to synaptic structure and neuronal network architecture, cannabis use in key developmental periods, such as adolescence and intrauterine growth, is believed to alter brain microstructure and network function accounting for the various neuropsychiatric deficits. Cannabis is associated with driving under the influence of cannabis (DUIC) and high rates of motor vehicle accidents and fatalities. Long-term longitudinal studies have repeatedly shown that adolescent cannabis use is associated with a gateway effect increasing the use of other hard drugs in later life, and of severely

impairing the long-term life trajectory reducing the attainment of normal life goals such as marriage, and continuing productive employment.

Other effects which have been demonstrated in the literature include genetic and chromosomal damage, harm to cellular metabolism and mitochondrial energy production, alteration of the appetite control mechanism, association with eight cancers, various circulatory disorders including heart attack, and impaired fertility and germ cell defects. When exposure occurs in utero, there is an association with many congenital abnormalities including cardiac septal defects, anotia, anophthalmos, gastroschisis and anencephaly.

This paper will address the key issues about legalizing 'smoked marijuana' for medical purposes. We acknowledge that currently there is some research on the development of processed 'nabiximols' - non-smoked extracts of cannabis. Some contend that this could be a way forward for regulated medical use of extracts of cannabis that are neither smoked nor psychoactive.

However, it is concluded that the overall harms of legalizing the use of cannabis for medical purposes far outweigh any perceived benefits. These conclusions are based on modern epidemiological and scientific studies, and confirm the case against increased cannabis use, because of the high health risks to users, their children, and in the overall costs to the wider community.

Introduction

Across the globe there is increasingly widespread discussion about the use of cannabis for medical purposes. Often termed 'medical marijuana', the matter has reached high levels of government in many countries, with some political and community leaders incorporating it into their policy development. In Australia, there is currently a New South Wales Parliamentary Inquiry into *'The Use of Cannabis for Medical Purposes'*. In the United States a number of state jurisdictions have made decisions on 'medical marijuana' that contravene Federal Law. (1)

This paper will outline the origins of 'medical' marijuana and address the major issues related to legalizing marijuana, as well as provide current scientific research that will demonstrate the harms caused to both physical and mental health, due to the toxicity of cannabis.

HISTORY OF 'MEDICAL' MARIJUANA

The history of 'medical' marijuana is of relevance to the context of this paper. Of importance is the fact that the concept of so called 'medical marijuana' did not originate from those in the medical profession, but rather through the drug legalization lobby, who continue to use it as a precedent to achieve illicit drug legalization. In the United States in 1979 Keith Stroup, a lawyer and founder of the National Organisation for Reform of Marijuana Laws (NORML), stated at Emory University, "*We will use the medical marijuana argument as a 'red herring' on the road to full legalisation*". His

successor, Richie Cowan said, “*Medical marijuana is our strongest suit. It is our point of leverage which will move us towards the legalisation of marijuana for personal use*”. (2)

Although promoters of ‘medical’ marijuana have worked to promote its legalization in the United States, the Drug Enforcement Administration (DEA) remains firm on its stand that smoked marijuana is harmful and continues to prohibit ‘medical’ marijuana, as can be seen in the following: ‘*Since the prescription medicine Marinol, which is a synthetic form of Delta-9-THC, the chemical found in smoked marijuana that treats distressing symptoms, is available for the medical consumption, DEA believes that legalizing smoked marijuana will only lead to misuse*’. (3)

The DEA’s position is supported by renowned experts in the field, as well as high-profile government and medical authorities.

For example, according to Dr Robert DuPont MD, Psychiatrist and former ONDCP Director and NIDA Director: ‘*Promoters of ‘medical’ marijuana are using the public’s compassion for the suffering of sick people; it is emotional blackmail. There are important differences between modern scientific medicine that is administered as single chemicals (usually synthetic) by the oral route of administration and smoked herbal marijuana*’. (4)

As with the DEA, the Therapeutic Goods Administration (TGA) which oversees the safety and quality of therapeutic goods for medical use in Australia, does not endorse the use of marijuana for medical use.

Nor do numerous major medical and allied health organizations. Examples include:

- American Academy of Child & Adolescent Psychiatry (AACAP) opposes medical marijuana dispensing to adolescents 2012 (5)
- American Society of [Addiction](#) Medicine (ASAM)2010 (6)
- The American Glaucoma Society (AGS)2010 (7)
- The American [Cancer](#) Society (ACS)2001 (8)
- The American Academy of Pediatrics (AAP)2004 (9)
- The National Multiple Sclerosis Society (NMSS)2008 (10)
- The British Medical Association (BMA)2005 (11)

In addition, the American Medical Association (AMA) is of the opinion that *'cannabinoid-based medicines and alternate delivery methods should be developed for the safe consumption of marijuana and discourages smoking or legalization of marijuana'*. (12)

The British Lung Foundation issued major statements in recent years acknowledging the known deleterious effects of cannabis on the lungs. For example: *'Cannabis is smoked differently from tobacco. Users commonly inhale deeply to a maximal breath and then retain the smoke in the lungs, which generates higher pressures during breath holding and on expiration'*. Dame Helena Shovelton, Chief Executive of The British Lung Foundation's survey of 1,000 adults said that the findings were alarming *'Young people in particular are smoking cannabis unaware that each cannabis cigarette they smoke increase their chances of developing lung cancer by as much as an entire packet of 20 tobacco cigarettes.'* (13)

The American Cancer Society (ACP)'s research explicitly discusses the harm associated with chronic use of smoked marijuana and stresses the need for development of non-smoked forms of cannabinoid delivery systems strictly for therapeutic purposes supported by the evidence. Current examples might include Marinol and Savitex. (14)

Community Anti-Drug Coalitions of America (CADCA)'s position statement on 'medical' marijuana and marijuana legalization states: *'There is a direct correlation between "medical" marijuana initiatives and decreases in perception of harm and social disapproval'*. (15)

National Association of Drug Court Professionals (NADCAP) – An extract from the 2013 Position Statement provides compelling evidence to reject both the legalization of cannabis and the concept of medical marijuana: *NADCP has long been committed to guiding the Drug Court field and the broader criminal justice and treatment communities with science, not ideology. After thoroughly reviewing the research regarding the safety of legalization of marijuana and the use of smoked marijuana as "medicine." Our reasons for doing so are thoroughly explained in the Position Statement.* (16)

Clearly, from the examples given above, there is a strong evidence base of well-founded reasons for those in highly respected scientific organizations, to oppose smoked marijuana for medical purposes.

CANNABIS - HIGH USE RATES EXACERBATE HARMES

Cannabis is, globally, the most used illicit drug, which in itself creates a significant challenge. By legalizing it for 'medical' purposes, use rates would soar, as this would constitute 'acceptance' of the substance and send a message that it is 'safe' to use. A 2012 report in the medical journal *The Lancet* indicates that Australia and New Zealand have the highest proportion of cannabis use in the world. This is confirmed in the United Nations World Drug Report, 2012, which states that: *'cannabis is the most widely used illicit substance across the globe, with the highest prevalence of use among Australians and New Zealanders. Between 9.1 and 14.6 per cent of the population use the drug,*

compared to the estimated annual worldwide usage of 2.6 to 5.0 per cent. These figures show marijuana use in Australia is three times the global average. The research also confirms that the early uptake of cannabis is a likely cause for lifetime adverse health issues – both physical and psychological. (17)

Concern about legalizing cannabis for medical purposes is associated with the potential for abuse and an increase in use. For example, a study in the United States, in the September 2011 issue of [*Annals of Epidemiology*](#) found that, among youths age 12 to 17, marijuana usage rates were higher in states with medical marijuana laws (8.6%) compared with those without such laws (6.9%). A similar study of people age 18 and older, published in the journal *'Drug and Alcohol Dependence'*, found the odds of marijuana abuse or dependence were almost twice as high in states with medical marijuana laws compared with those without such laws. (18) While it could be claimed that the states with medical marijuana laws already had higher use rates, the matter of abuse has not eased with the introduction of these laws. However, most would argue that, in fact, such laws may create the perception that medical marijuana is safe, because of its legal status, as has been demonstrated historically, with tobacco.

In Colorado, there is evidence that supplies of 'medical marijuana' have been diverted for 'recreational' use. For example in 2012, a Drug Enforcement Administration (DEA) study in Colorado collected reports from a range of law enforcement agencies, showing criminal drug traffickers being caught with large amounts of 'medical' marijuana being sold for recreational use 'out the back door of a legal dispensary'. The DEA's Denver field officer was quoted in the report as saying: *'Colorado's medical marijuana system allows for widespread exploitation and illicit marijuana distribution... Colorado is on track to become a primary source of supply for high-grade marijuana throughout the country.'* Other states that have legalized 'medical' marijuana are experiencing similar problems. Further studies indicate similar patterns of misuse of 'medical' marijuana, enabling supply and use to increase, and therefore associated health problems. (19)

CANNABIS HARMS

The harms caused by cannabis toxins to both physical and mental health have been widely documented. Some of the most recent research is summarized in this section.

Over 1,500 toxic chemicals have been identified in the smoke of cannabis, including carbon monoxide, carcinogens and irritants. These all greatly affect the body's respiratory and cardiovascular systems in a similar manner to the known effects of smoking tobacco. Moir et al's 2007 study of marijuana smoke found ammonia at levels up to 20-fold greater than that found in tobacco, hydrogen cyanide at concentrations 3-5 times those in tobacco smoke, and confirmed the presence of known carcinogens and other chemicals implicated in respiratory diseases. The Institute of Medicine of Washington DC produced a detailed table, which shows a comprehensive comparison of the chemicals in cannabis and tobacco. (20)

In a paper entitled, *Chronic Toxicology of Cannabis*, Reece et al states that there is evidence for the implication of cannabis in various psychiatric, respiratory, cardiovascular, and bone pathologies. The reports of social disruption, as a consequence of widespread cannabis use within a number of communities, are of substantial concern. The features associated with chronic cannabis use imply that a clear public health cautionary message is warranted along the lines employed for other environmental intoxicants such as tobacco, which should be targeted strategically to young and otherwise vulnerable populations. Chronic cannabis use also has oncogenic, teratogenic and mutagenic effects, all of which depend upon dose and duration of use. (21)

The following facts, as listed in the same reference, are not controversial in that they are settled in the epidemiological and scientific literature.

- The long-term smoking of cannabis is associated with numerous respiratory complaints and numerous psychiatric disorders.
- Cannabinoids are known to shut down synaptic transmission between neurones which accounts for its sedative effects.
- Since synaptic function and traffic intensity rates are coupled to synaptic structure and neuronal network architecture, cannabis use in key developmental periods is believed to alter brain microstructure and network function accounting for the various neuropsychiatric deficits, especially when cannabis exposure occurs in key developmental periods such as adolescence and intrauterine growth.
- Cannabis is associated with driving under the influence of cannabis (DUIC) and high rates of motor vehicle accidents and fatalities.
- Adolescent cannabis use has been shown repeatedly by long-term longitudinal human studies to be associated with a gateway effect, increasing the use of other hard drugs in later life; and of severely impairing the long-term life trajectory, reducing the attainment of normal life goals such as marriage, and long-term productive employment.

Other effects which have been demonstrated in the literature include:

- effects of genetic and chromosomal damage,
- damage to cellular metabolism and mitochondrial energy production,
- alteration of the appetite control mechanism,
- association with eight cancers,
- various circulatory disorders including heart attack, impaired fertility and germ cell defects,

- when exposure occurs in utero, association with many congenital abnormalities including cardiac septal defects, anotia, anophthalmos, gastroschisis and anencephaly. (22)

Recent research from Auckland University, New Zealand, indicates that cannabis use may more than double the risk of stroke in young adults. The study of 160 stroke and mini-stroke victims, aged between 18 and 55, was presented to a conference in Hawaii in February 2013. It showed they were 2.3 times more likely than other patients to have cannabis detected in urine tests. (23)

Cannabis has 60% more of the dangerous cancer causing hydrocarbons than tobacco and the latest research count suggested a total 116 carcinogens. (24)

Cannabis and tobacco are both linked with Liver Cancer Induction. (25)

Health officials have seen a growing increase in the number of cases of a certain type of testicular cancer, one that is difficult to cure, and now a study has found that smoking marijuana has been linked to an increased risk of developing that subtype of cancer. In fact, young men who have ever smoked marijuana are twice as likely to develop mixed germ cell tumors. (26)

Testicular cancer is the most common cancer diagnosed in young men ages 15 to 45 years. From the above results, combined with previous studies, the authors conclude that they can confirm '*the epidemiological association of marijuana use with TGCT risk,*' specifically for nonseminomatous tumors. Broadly, the mechanism at play may be due to the fact that human cannabinoid receptors, THC binds, are expressed in the pituitary, hypothalamus, and male reproductive system. (27)

The strong link between cannabis and mental health has been well documented and includes research into the onset of psychosis and schizophrenia, as well as other mood disorders including depression, bi-polar disorder and amotivational syndrome. Research has also explored the links to suicide, especially in young people. For instance, Professor Jenny Williams states that the regular use of cannabis can trigger suicidal thoughts in some users, particularly young men; according to the results of a 30-year study that experts say strengthens the need for stronger warnings about the drug, particularly for adolescents and young adults. (28)

Further evidence is demonstrated by Fergusson et al who looked at The Christchurch Health and Development Study (1265 NZ children born in 1977 and studied at 4 months, 1 year, then yearly until age of 16, then at 18, 21, 25 and 30). These research findings were presented at the Second National Cannabis Conference in Brisbane on September 20, 2012. Not only did cannabis use precipitate suicidal thoughts but the higher the frequency of regular use, the faster susceptible individuals became suicidal. If all males used cannabis less frequently than several times/week, suicidal ideation would be experienced by 15% of 18 year olds, 24% of 21 year olds and 30% of 30 year olds. If they had all started using cannabis several times a week from the age of 17, then all males would show an increase of 24% for 18 and 31% for 21. (29)

Manrique-Garcia re-assessed a study of 50,000 military conscripts in Sweden, who had reported their cannabis use since adolescence and over a 35 year period. The study revealed that *'the individuals who used cannabis regularly were almost four times more likely to develop schizophrenia than those who never used cannabis'*. They were also more than twice likely to experience a brief psychosis episode. There are some who claim that these people were already at risk of these conditions, but this has been discounted in the majority of scientific evidence now available.

Manrique-Garcia states that, *"Of the cases related to cannabis use, 60% occurred during the first decade compared with 45% among non-users of cannabis."* However, the findings also demonstrated a clear relationship between dose and risk. In particular, those who used the highest amounts of cannabis for the longest periods of time had the highest risk of schizophrenia. This risk was increased by early episodes of psychosis, regardless of whether they were cannabis induced or not. The individuals who experienced episodes of cannabis-induced psychosis and those who had non-cannabis-related psychotic episodes were equally at risk for schizophrenia. But Manrique-Garcia points out that *'the individuals with cannabis-related psychosis may not have experienced any psychotic episodes if they had not used cannabis. Further research is needed to determine if this would ultimately decrease their risk for the later development of schizophrenia'*. (30)

CANNABIS, PREGNANCY AND THE UNBORN

Marijuana is now up to 20 times more potent than the herbal grades that existed and may have been used by many, some 40 years ago. Most pregnant women, who use the drug, are totally unaware that it could harm their unborn child, before they even know they are pregnant.

Writing in the journal *Drug Testing and Analysis*, American researchers state that *'the argument that marijuana is a harmless drug is no longer valid due to the emergence of 'high potency' marijuana and synthetic marijuana which pose a potential real threat for pregnant women.*

The THC contained in 'high potency' marijuana and the potent THC analogues contained in Spice products and other brands of 'synthetic marijuana', are potentially harmful to embryonic development, as early as two weeks after conception. This is because these psychoactive chemicals have the ability to interfere with the first stages in the formation of the brain of the fetus; this event occurs two weeks after conception, earlier than before signs of pregnancy appear. By the time a woman realizes she is pregnant and stops taking these substances it may already be too late for her unborn child."

"Given that marijuana is the most widely used illicit drug by pregnant women worldwide -- one study estimates the rate is as high as 20 per cent -- this is a major issue." (31)

Psychoyos, in August 2012, found that new high-potency marijuana can interfere with early brain development in developing foetuses. *'Some new high-potency strains, including some medicinal cannabis blend, contain up to 20 times more THC than did 'traditional marijuana from decades past.*

Easy access to drugs via the internet or dispensaries makes the problem worse'. Harmful effects can begin as early as 2 weeks from conception. Exposure to today's marijuana in early pregnancy is associated with anencephaly, a devastating birth defect in which infants are born with large parts of the brain or skull missing. Early pre-natal use was also connected to ADHD, learning disabilities, memory problems in toddlers and 10 year olds as well as depression, aggression and anxiety in the teens. (32)

CANNABIS AND THE DEVELOPING BRAIN

A study of marijuana users who began using during adolescence revealed a profound deficit in connections between brain areas responsible for learning and memory. And a large prospective study (following individuals across time) showed that people who began smoking marijuana heavily in their teens lost as much as 8 points in IQ between age 13 and age 38; importantly, the lost cognitive abilities were not restored in those who quit smoking marijuana as adults. Individuals who started smoking marijuana in adulthood did not show significant IQ declines. (33)

Nora D. Volkow, M.D., Director of the National Institute on Drug Abuse (NIDA) stated on Jan 16 2013 that: *'the message inherent in these and in multiple supporting studies is clear. Regular marijuana use in adolescence is known to be part of a cluster of behaviors that can produce enduring detrimental effects and alter the trajectory of a young person's life—thwarting his or her potential. Beyond potentially lowering IQ, teen marijuana use is linked to school dropout, other drug use, mental health problems, etc. Given the current number of regular marijuana users (about 1 in 15 high school seniors) and the possibility of this number increasing with marijuana legalization, we cannot afford to divert our focus from the central point: regular marijuana use stands to jeopardize a young person's chances of success—in school and in life'.*(34)

In addition, a [recent international study](#) found a link between *'persistent cannabis use and neuropsychological decline.'* Cannabis may exert a cumulative toxic effect on individuals on the pathway to developing psychosis, the manifestation of which is delayed for approximately 7–8 years, regardless of age at which cannabis use was initiated. (35)

The system of the brain responsible for mediating the effects of cannabis, the endocannabinoid system, is most vulnerable to the drug during adolescence, according to new research by Dr. Long of Neuroscience Research Australia (NeuRA). *'Disrupting endocannabinoid signaling through exposure to cannabis, is likely to have a higher impact if the exposure happens at a time of change and when achieving balance in communication between neurons is very important, such as during adolescence.'*”(36)

CANNABIS AND DRIVING

Increasing empirical evidence demonstrates that cannabis use impairs the ability to drive safely. Mark Asbridge's research reported in the British Medical Journal reached the following conclusions: *'Acute cannabis consumption is associated with an increased risk of a motor vehicle crash, especially for fatal collisions. Drivers who consume cannabis within three hours of driving are nearly twice as likely to cause a vehicle collision as those who are not under the influence of drugs or alcohol. This information could be used as the basis for campaigns against drug impaired driving, developing regional or national policies to control acute drug use while driving, and raising public awareness'*.(37)

In the United States, Liberty Mutual Insurance and Students Against Destructive Decisions (SADD) commissioned a report into teens driving under the influence of marijuana. Nearly 1 in 5 said they had driven after smoking the drug. Almost 2,300 11th and 12th graders were studied. A growing percentage do not see marijuana as a distraction. More than a third of those who had driven after smoking failed to acknowledge their driving may have been impaired. The figure is higher than those who drove after drinking alcohol (13%). (38)

CANNABIS AND VIOLENCE

Current evidence indicates that the increased potency of cannabis is a cause for violent and psychotic episodes. For example, a 2009 report by [Marta Di Forti](#), MD, MRCPsych, demonstrates that *'people who use cannabis have an increased risk of psychosis, an effect attributed to the active ingredient Δ^9 -tetrahydrocannabinol (Δ^9 -THC). There has recently been concern over an increase in the concentration of Δ^9 -THC in the cannabis available in many countries'*. (39)

By way of example, the Dutch Commission has advised that THC above 15 per cent puts cannabis on a par with heroin or cocaine and also has a high risk of addiction to the user. Today's 'skunk' averages 18% THC in Holland. Sixties/seventies herbal cannabis averaged 1 to 2%. Hash (resin) THC has been constant at around 4 - 6%. (40)

Research by Arseneault et al showed that young men who regularly smoke cannabis are five times more likely to be violent than those who avoid the drug. Using data from a study of 961 young adults in Dunedin, New Zealand, she discovered that one-third of those with a cannabis habit had a court conviction for violence by the time they hit 21 or had displayed violent behaviour. (41)

The impact of cannabis use on youth and the developing brain and risk of permanent compromise of highest level executive functions is well recorded. These detrimental effects impact the following, which can ultimately lead to violent, psychotic behaviours with long-term use:

- their developmental trajectory including cognitive effects, propensity for school dropout, progression to friends who ‘use’;
- relationships including parents, friends, partners; and
- employment and productivity in the workplace.

“Teens Drugs and Violence”, a special report from the Office of National Drug Control Policy in the USA, in June 2007, concluded that “Early use of marijuana – the drug most widely used by teens – is a warning sign for later gang involvement and teens who participate in gangs are more likely to be involved in violent acts and drug use. Teens who report current and regular marijuana use are 9 times more likely than non-users to experiment with other illegal drugs or alcohol, and five times more likely to steal....Children who use marijuana are nearly four times more likely to join gangs. Being a member of a gang dramatically increases a teen’s risk of being a victim of violence, not just a perpetrator”. (42)

Conclusion

Given the overwhelming evidence on the harms associated with cannabis, we conclude that governments and society should stand firmly against any change that would relax the law on the use of cannabis for medical purposes. To achieve this, governments and community leaders should implement comprehensive, ongoing public education programs in all jurisdictions. The goal of these programs would be to inform communities of the well documented ill-effects of cannabis use, to both the physical and mental health of the individual, and to the families and the community as a whole.

We acknowledge that currently there is research on the development of processed ‘nabiximols’ - non-smoked extracts of cannabis. Some contend that this could be a way forward for regulated medical use of extracts of cannabis that are neither smoked nor psychoactive.

For example, Kevin A.Sabet, in his work with ‘Smart Approaches to Marijuana’ (SAM), recently stated:

“SAM wants to encourage the development of cannabis-based medications and the establishment of a program to allow the seriously ill to receive non-smoked, non-inhaled/ingested components of marijuana before they are fda approved”.

However, given the weight of evidence demonstrated in this paper, we emphasise that any measure of government policy that could influence increased ‘recreational’ use would be highly detrimental.

It is a vital time for all community stakeholders, decision makers and leaders of nations to acknowledge that modern epidemiological and scientific studies show a continually increasing case against increased cannabis use because of the high risk to the health of users, their children, and in the

overall social costs to the wider community. These are largely supported in the serious scientific literature. As such, it is not appropriate to be having a public discussion about policies which may potentially increase its use, and therefore an exponential increase in harm and community cost.

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A. Stuart Reece, MD, has been a medical doctor for 32 years and has been actively involved in addiction medicine for 15 years. He was one of the Australian pioneers in the use of naltrexone for opiate addiction. His major clinical interest is in the long-term toxicology of drug dependence, and is studying the long-term effects of addiction to all classes of drugs. Dr. Reece believes there is overwhelming evidence that supports the theory that the multisystem disease seen in drug dependency is consistent with classical observations of accelerated aging. He is interested in using the modern science techniques of aging medicine to drug dependency. Dr Reece has published 65 papers in the peer reviewed literature on these themes, and was appointed a clinical associate professor of the University of Western Australia in 2010.

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The authors declare that we have no proprietary, financial, professional or other personal interest of any nature or kind in any product, service and/or company that could be construed as influencing the position presented in, or the review of, the manuscript entitled except for the following: Dr Stuart Reece works in Addiction Treatment in Brisbane and is an Associate Professor at a Queensland University. Mr Herschel Baker is a Director of Drug Free Australia and Josephine Baxter is Executive Officer, Drug Free Australia and Vice President of the World Federation Against Drugs.

Marijuana: A Human Experiment Without Informed Consent

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The United States is on the threshold of a national experiment, a human experiment that tests the health and safety of marijuana. The first experiments with psychoactive drugs began in the late 19th century, following the extraction and proliferation of active compounds from opium and coca plants. An exponential and unacceptable rise in human *behavioral and biological* calamities followed and elicited an aggressive response from the medical, legal and legislative communities. Over-the-counter use of heroin, smoked opium, morphine and cocaine died within a few decades in the early 20th century. The “War on Opium” led to a greater than 90% reduction in opium use internationally starting in the early 20th century. Since then, the popularity of illegally obtained heroin and cocaine has risen and fallen with public perception and access, but these heroin excursions affect much smaller populations than at the turn of the 20th century. We will never have an accurate tally of the human, legal and economic anguish that arose from the legal promotion and proliferation of heroin or cocaine in the few decades that these drugs were legally and widely available. Populations currently addicted are relatively small, but the grim consequences persist and are visible.

The second experiment with another chemical class of psychoactive drugs, amphetamines, emerged in the 1930's. This wave petered out by the late 1960's, as data on its hazardous effects (e.g. addiction, psychosis) shifted public perception and led to legal constraints, especially with over-the-counter pills. Use of amphetamines (e.g. methamphetamine and ecstasy) rose once again in the 2000's and then declined to current relatively low levels, partly because of supply reduction strategies (e.g. tightening of precursor availability, international cooperation) and increased perception of harm (addiction, brain toxicity). The third experimental wave, hallucinogen use (e.g. LSD) in the 60's, waned within two decades, conceivably as a result of “bad trip” publicity, enduring psychoactive effects, and restrictive legislation. The 1960's also witnessed a surge in marijuana use in tandem with other drugs. Its use has fluctuated since then, rising and waning as perception of harm and cultural norms change.

From my perspective, the underlying value that drives our national response is to protect human brain function, the repository of our humanity. Drugs that compromise brain function, cognition and behavior compel a unique form of vigilance. The federal government finally assembled these behavioral, psychiatric and biological outcomes of naturalistic human experiments into the Controlled

Substances Act (CSA) of 1970. The CSA regulated the manufacture, importation, possession, use and distribution of psychoactive substances and ranked them in five categories or Schedules, on the basis of their potential for abuse and medical use. Marijuana was placed in the most restrictive Schedule I category, as a substance with high abuse potential and no medical use.

Current Federal law prohibits the sale, distribution and possession of the hallucinogen-intoxicant-sedative marijuana, a decision driven by unacceptably high biological, medical and behavioral risks (e.g. intoxication, cognitive impairment, sensory, auditory and temporal distortions/hallucinations, vehicular or workplace accidents, others). The status of marijuana has now entered a new, decentralized phase in American and international culture. Billionaire-funded, disingenuous, and proliferating state ballot initiatives are swelling legal access of very high potency marijuana through the guise of medical marijuana laws, or decriminalization and outright legalization. This accelerating access by the ballot box is associated with a tandem decline in public perception of harm and a rise in marijuana use and use disorders. The financially well-endowed legalization movement has catalyzed yet another naturalistic, uncontrolled, human experiment with a drug. This experiment requires no informed consent, no signatures approving human experimentation, no oversight from a professional Institutional Review Board, no protections based on the Nuremberg Code, the Helsinki Declaration, the Belmont Report, the federal Office of Human Research Protection or the Food and Drug Administration and no recourse for adverse outcomes. No effective prevention strategy is in place for our most vulnerable population - youth. The experiment may last a few decades and the laws conceivably will be reversed, as even more data on human consequences pour in and society deems them too costly to bear. In the meanwhile, a generation of *susceptible* youth will be transformed and derailed by the drug's consequences: addiction, IQ reduction, psychosis, cognitive impairment, educational underachievement. In a valid clinical trial, the sponsors are held responsible for health and financial consequences for adverse events. No such recourse exists against the unethical perpetrators of this human marijuana experiment.

About The Author:

Dr. Bertha K. Madras is Professor of Psychobiology, Department of Psychiatry at Harvard Medical School (HMS), and is cross-appointed at the Massachusetts General Hospital. She served as Deputy Director for Demand Reduction (prevention, intervention, treatment) in the White House Office of National Drug Control Policy (ONDCP), a Presidential appointment confirmed unanimously by the US Senate. At Harvard, her multidisciplinary research focuses on neuropsychiatric diseases and addiction biology, documented in over 150 manuscripts and as co-editor of books “The Cell Biology of Addiction” (2006), “The Effects of Drug Abuse on the Human Nervous System” (2012), “Imaging of the Human Brain in Health and Disease” (2012). At ONDCP, she incorporated Screening, Brief Intervention, Referral to Treatment (SBIRT) into the national drug control strategy and into health care systems. In service to the public, she directed creation of a Museum exhibit, a CD (licensed by Disney

Corp), “Changing Your Mind: Drugs in the Brain” with the Boston Museum of Science. She has given hundreds of presentations worldwide, on how drugs affect the brain and consults to government, organizations and industry. She holds 19 patents, is a recipient of a number of awards, and a citation by The Better World Report, 2006, for developing a brain imaging agent as one of “25 technology transfer innovations that changed the world”. Her experiences in translational neurobiology, government and public service afford her a unique perspective on science and public policy.

The Politics of Using Mycoherbicides to Control Illicit Drug Crops

Walton Cook, Author

In utilizing the rapid increase of scientific knowledge in the control of illicit narcotics, technology is available. The most discussed method has been the USG funded effort to find naturally occurring fungi (the fancy word is mycoherbicides) that could effectively cause plant disease on certain illicit crops, vastly reducing commercial yield potential. Since most people never heard this word, mycoherbicides are living organisms, not chemical pesticides. They are not intended to kill plants, but to greatly reduce their yield, and thus the cost/value relationships. Delivery systems also now exist for distribution of carefully treated live seeds carrying the selected organism, thus establishing the chosen control pathogen into the pre-selected target soil. It is vaccination--of the soil.

That was reported in the 2011 National Research Council publication: *Feasibility of Using Mycoherbicides for Controlling Illicit Drug Crops*. This U.S. Department of State funded scientific panel of plant science experts was the result of an almost unanimous Congressional mandate, Public Law 109-469, which asked the feasibility question. This scientific panel met over the 2009-2011 period. Their conclusion was that mycoherbicides are considered feasible for the control of drug crops, but that more detailed study and field testing is needed. This answer needs a political response. This issue is common knowledge among plant scientists, but not well understood by ordinary citizens, particularly when the body of scientific data is growing at such lightning speeds.

The science of biocontrol is blossoming with new breakthroughs. Hopefully, these gains will be considered to reduce blossoms of some of the world's most troubling weeds. If scientists are actually doing further testing now, they are (for their sake) working in secrecy. As an outsider, however, I fear for the safety of those acting while waiting for further political action, those individuals who, despite lack of security, want to see this needed area of supply reduction research through to approval. When

we speak of danger, we refer to criminal interests going to extremes to protect their sources of revenue. People, good or bad, tend to use force to protect their money.

Perhaps it will not be the U.S. Congress that calls for more detailed study and field tests, but Brasilia or Moscow? Neither country wants the increasing flow of cocaine and opiates now flooding into their nations. Brazil is having an increasing problem with imported cocaine, Russia with opiates. Perhaps such a nation will respond without considering Washington, diplomacy or farmers? Brazil, for example, is in conflict with Peru and has an 11,000 mile border with drug producers: Peru, Bolivia and Columbia.

There are desirable diplomatic options that might assist nations struggling to contain illegal narcotics plant cultivations that are compatible with applied biocontrol. Simply paying current farmers and farm workers not to grow illicit crops might work well. Farmers would receive no loss in income-- nor any risk from the vagaries of weather, but instead could be paid the exact same amount for a legal alternative crop and in addition, also keep the revenue, resulting in a substantial increase in farm income. This carrot probably would not be very effective were it not for the concurrent driver-- mycoherbicides to keep the illicit crops from "cropping up" in neighborhood regions. Mycoherbicides can become the "diplomatic drones of drug diplomacy," acting against precise geographies without endangering pilots, nor causing collateral damage to humans, other plants or animals. Such an approach can be, of course, extended to all major narcotics producing nations: Afghanistan, Bolivia, Colombia, Mexico, Myanmar and Peru. The farm income of all farmers and farm workers in all those nations is a cumulative \$5 billion annually.

This \$5 billion of illegal agricultural activity results in an annual \$350 billion "societal cost" of drugs to just the richest 30 OECD nations, with the cost in 166 less affluent user nations being a substantial added but unknown amount. Therefore, for every one dollar invested in the diplomatic carrot and mycoherbicides, there is at least a \$70 profit--a sum to either improve needed investment or to reduce debt. Some countries, once convinced that mycoherbicides are an effective deterrent, might wish to solve their problem forthwith, no carrot necessary. Farmers would have to shift to crops that yield a

less risky return without any handout. Diplomats, so often the co-dependents in drug control, would be left out of the picture.

The undeniable fact is that there are 40,000 annual drug deaths in the U.S. and well over 250,000 each year throughout the world, and those grim figures are growing with increases in populations. Are those lost or damaged by illicit narcotics not important? Narcotics are, in themselves, weapons of mass destruction. Although lives are snuffed out one-at-a-time for the most part, they are no less loved or mourned than the 26 lives lost so suddenly in the tragic Newtown, CT shooting. Neither can we forget that the 9/11 Commission concluded that our national tragedy was probably the result of Afghan drug revenues in criminal hands. Someone recently asked "Do you think drug money is so pervasive throughout government and society, that politicians secretly do not want to eliminate the drug trade, but seek merely to control it?" I don't think that is possibly true, but we need to remind our political leaders, beginning right now, that the massive annual deaths of their constituents are invoked by those who wish us harm.

About the Author:

Walton Cook is the author of *Buzzword*, the 2001 fictional account on the biocontrol of narcotics producing plants in the Andean region of South America. In 2002 he wrote *Birthright of Freedom*, on social security and healthcare reform, with CPA David Wigfield, and in 2011 he wrote *Compound Capitalism, Slaying the Dragon of Debt*, on financial reform. His views have been published in a wide variety of media, including *The Economist*, *UPI*, *The Washington Times* and others.