A Teenager's Medical Marijuana Story

By Mark Bogart

My name is Mark Bogart. I am 17 years old and I live in Charlotte, North Carolina.

Starting at about the age of 12, I started to experience one hardship after another, ranging from my parents getting divorced to my grandparents dying. This was when I first started to experience depression, though back then I wasn't quite sure what it was that I was feeling. Soon after, I started having problems with my dad. We would get in a fight almost every time we were around each other. After the fights started to become physical, I chose to stop living with him and went to live with my mom. I soon realized I had only traded one evil for another. Added onto all of this, one of my best friends was killed in a car accident. This became too much to handle. I stopped sleeping, I stopped eating, I found it hard to do anything at all. I went to multiple therapists and had multiple psychological evaluations which only led to me being heavily medicated for depression, insomnia and for being bipolar. But my problems didn't go away. One day when I was about 15, my friend introduced me to marijuana. Finally, an escape. Not only did it make me feel happier than I could ever remember feeling, but it also helped me sleep and it definitely gave me back my appetite. I had found the perfect medicine to cure what ailed me. I am now seventeen and I have been smoking marijuana regularly for

the past couple years. I had always been told by my parents and by the media about how bad drugs are and how bad marijuana in general is. Nowadays when I hear this, all I can think about is how ignorant most of these people are to it. How can you tell me how bad what I do is, when you have never even done it? Don't get me wrong, I don't believe in drug dealing and recreational use of the drug. But I do believe that it serves as a very useful medicine. I believe this not only because it is medically proven but because I know through experience that marijuana has helped me more than any prescription medicine I have ever used.

Marijuana had done nothing but good for me until about three weeks ago when I was arrested for possession with intent to distribute. I was not distributing nor had I ever been distributing. But because of the amount of marijuana I had on me, that is what they charged me with. I had about a half ounce on me which, for me, is maybe two days worth of marijuana (Most people would probably think that this is an obscene amount but not all of this is smoked, I also use some of the marijuana to make hash to ingest the marijuana as food). Being arrested changed my entire life for the worst. I spent two days in jail (with a large black man named Diesel who like to eat my Bologna sandwiches and drink my juice boxes) before I was able to get out on bail. I am now facing possible expulsion from my school. Because of this, I have been without any marijuana for the three weeks since. Over those three weeks I have truly realized what marijuana did to help me deal with my mental ailments.

I have gone back to constant unhappiness and spending night after night without sleep. I am on probation for the next year and I am drug tested every two weeks. So it looks like I am going to be without my marijuana for a long time. But that does not mean that I am going to change my opinion of it. Not only have I been telling my story to people who have the same view of it as I do but I have also spent plenty of time emailing my senator and actively pursuing the legalization of medical marijuana. I believe with all of my heart that there is no reason for it not to be legal. And I will continue to do whatever I can to support this cause.

Won't Somebody Please Think of the Children!

Endocannabinoid System Dysfunction and ADD/ADHD

By Ally (aka pflover)
"Preserve Neural Plasticity!"

ADD and Me

Attention Deficit/Hyperactivity Disorder (ADHD), inattentive type, used to be known as Attention Deficit Disorder (ADD). This class of conditions, including ADHD, hyperactive type, holds personal import to me and my family. In preschool, when the very rudimentary parts of reading were being taught, I appeared to do reasonably well "getting it" even if I did have trouble sitting through a whole lesson. In first grade, when the first real reading assignments were being given, I started to develop a troubling behavior. Instead of actually reading the stories in full sentences I would kind of skim through them, skipping from what seemed to be important word to important word, never really comprehending the attempted communication. Test results by the end of that year made it clear to my teachers that I was not doing my reading assignments, though I am not sure they suspected it to be anything more than laziness on my part. It was conveyed to my mother that I would be given a chance to progress to the next grade if I was able to complete the year's English curriculum over that following summer.

Having no doubts about my inherent curiosity and developing intellect, my mother was determined to have me caught up by the time school began. That summer was spent out on the Californian coast in Mendocino County, where my father was stationed at PUC's marine biology field station. I am not sure what my mom thought of the fact that I appeared to be having trouble in English at the beginning of that summer, however, I remember very clearly the day it became evident to both of us that something was wrong, and that I was not progressing normally in the department of reading. My father was interim manager for the field station that summer while the college attempted to locate and hire a replacement for the previous manager, who had retired that year. This meant we were staying in the manager's cabin, which had more room and more luxuries of modern living than the student cabins we had stayed in the last two or three summers. One of these luxuries was a big viewing window looking out onto a small semi-private back lawn area, that sloped up to the richly-forested north wall of the canyon in which the field station was nestled. That day I had been subjected to another torturous reading assignment while my little brother and the rest of my family got to go play out in the yard, where I could see them clearly through that window. I was so jealous of their freedom and resentful of my reading. The assignment in question was a story involving a girl, a boy, and maybe a dog, and was about three pages long. Previously that summer I had managed to glean enough information from what I was suppose to have read to at least meet my mother's minimum requirements for quizzes of later retention and comprehension. That day, however, the story just seemed so long and my brother was having so much fun outside — in plain view of my educational dungeon.

After struggling through a grueling two paragraphs, I no longer could stand it and began the most egregious skipping I had tried to get away with yet. I read three to five nouns and maybe a verb out of each of the remaining paragraphs, putting most attention to the first and last paragraph of each page as these parts intuitively at the time seemed most important to my young mind. Keep in mind I was only 5 or 6 at the time, and this seemed as logical a way as any to determine importance. "Skimming" through the last two and a half pages of my assignment, if indeed one could call the brevity of what I did skimming, I closed the book and went outside to join in the fun. Part of me knew what I had done was wrong. After all, I had not actually done everything asked of me and was trying get to the fun stuff without completing my responsibilities. However, I was not prepared for the look of concern that came over my mother's face upon my premature appearance outside. She asked dubiously if I had finished my reading and I said I had. She then said it was time to

see how I had done and headed in to quiz me. I gulped a little at this but figured as in the past I had done enough that I could inch by and fool her again and would soon be out playing.

After a few questions however, my mom quickly confirmed I had not actually read the assignment and ask that I read it aloud with her. As I began to struggle through the text my mom started to realize, perhaps consciously for the first time, that I really had a problem reading. I could see and hear first the frustration and then the concern come over her. Because I never did finish the first grade English curriculum that summer and was not allowed to enroll in second grade, my mother began homeschooling me. My parents also decided to take me to a center in LA specializing in children with learning disabilities to have me tested. The results came back as positive for dyslexia with aphasic tendencies. For the next two years, my mom continued to homeschool me and the following year began taking me to a tutor specializing in the Montessori Method. In a very real sense, my ability to read and write began here with this tutor, tracing three inch tall plates of the individual letters of the alphabet with my finger and then copying this shape in a tray of sand. After a short time of this, I graduated to reading the "See Dick, Jane, and Spot" books and with real pleasure found I could actually read and understand these simple stories. By fifth grade, I had entered the Montessori elementary school my tutor owned and operated with his wife. I had no concept at the time how much of a sacrifice my tuition must have been for my parents. After all, I was making friends with the children and grandchildren of some of the richest families in the Napa Valley, including members of both the Martini and Mondavi families. Despite this lack of awareness of the expense at the time, I have always been very grateful for my time there. The techniques and coping mechanisms I learned from the Montessori Method have been invaluable in my continued education ever since.

In the sixth grade I entered public school. Despite the occasional bump, an understanding was reached between the schools, my teachers, my parent(s) and I, which lasted until I took the SATs and graduated high school. This understanding consisted of a set of coping mechanisms that allowed me to compensate for the fact that it seemed to take me three to four times as long to read or process information as my typical age-matched peer (I did not, and still do not, feel I have a learning disability ▷

as much as a learning difference. After all, it is generally accepted that both Einstein and Edison had dyslexia.). These coping mechanisms and accommodations often included about one third the number of math problems on a given topic as was assigned to everyone else, extra time on tests, and sometimes extensions on longer written projects. I maintained a high GPA (grade point average) and in high school enrolled in as many advanced placement, honors and college prep classes as possible. Around my sophomore year of high school, a new policy was instituted which allotted a greater weight to the GPA calculation used for these advanced classes. Where classes historically get a max GPA rating of 4.0 for an A, these classes were given a GPA rating of 5.0 for the same grade. This resulted in a new trend that had never before been seen and I do not know how it ultimately got dealt with. GPAs higher than 4.0, or "perfect", were possible and during my senior year — for the first time at my school — there were four valedictorians and we all gave speeches. My GPA was the highest of the four at 4.331, even with the four Bs I got for the last quarter of that year in my morning classes.

From here I spent a year at Fresno community college, where I was once again tested for learning disorders before being allowed any extra time on tests or other considerations. This set of tests lasted me through most of my following time at Reed College in Portland, Oregon until I decided I might want to eventually take the GRE. If I wanted to take advantage of the extra time which had been so crucial in my achieving even mediocre standardized test scores in the past, I was going to need a more recent and comprehensive set of documentation for my dyslexia. I applied for testing in the spring of my junior year and, after an introductory interview and a brief mental health survey, was assigned a testing time slot the following fall.

The psychologist testing me seemed convinced from the onset that I might have ADD and set out to prove it. Throughout the month and a half or so of family interviews and rigorous weekly testing sessions, some of which lasted for more than 6 hours, I was quite skeptical of his belief I had ADD. After all, I had not been that hyperactive as a kid; maybe a little fidgety, but nothing that excessive. I had met others diagnosed with ADD before and I didn't feel I was one of them most of the time. (I later learned that this was because most of them had the hyperactive sub-type of ADHD and I did not). However, when the testing was finally over and he went over his psychological write up with me, he concluded that I did in fact appear to have the inattentive subtype of ADHD formally known as ADD. When he was done, he handed me a photocopy from a book profiling the typical life of a person with adult ADD. I spent the next several days in a kind of shock because the words on the page seemed to describe me so well that I almost got paranoid someone was secretly watching me. That was nine years ago. I have since become comfortable with this addition to my perception of self. Considering my early struggles with literacy and that it can still take me three to four times as long to read a given length of text compared to most people I know (I still usually sub-vocalize every word as I read), I never would have thought the entire time I was growing up and even after I graduated from Reed that I would become a writer. In more ways than I might be able to express, I owe my current occupation and my success at it to cannabis.

Ptotic Enumerations:

A Story of Cannabis Self Medication

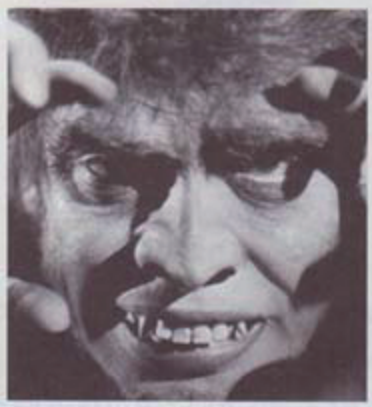
Before the age of eleven or so, I had no concept of cannabis, weed, pot, marijuana or whatever else one might call it. Then, one night when I was ten or eleven, I was woken up by a strange smell I did not recognize. I got up and asked my little brother if he smelled it too, he said yes, and we went to investigate its source. My parents appeared to have gone for a walk as they had recently been in the habit of doing and there was no one else in the house. The smell seemed smoky and strongest by their bedroom but we had no idea what it was, so went back to bed. For about a month or so, this became a fairly common experience until one day my dad decided he and my mom were going to sit both my little brother and I down individually and give use the marijuana talk. It consisted basically of, "Here is a thing we have been enjoying recently, you may not really understand now but in the future you will; don't be tempted if someone offers you some at ▷

school, you never know what's in it or if it's safe, so if you ever are tempted to try, it come to me and I will let you try some I know is safe." One thing was clear. Now was not that time, and anyway, I was not particularly interested (Although a year or two later I did try a bit of pot brownie my dad had wrapped in tin foil and "hidden" in the back of the freezer. I had no idea what it was, simply thinking it was a brownie. Luckily for all, I thought it tasted horrible and was probably bad so spat it out and threw away the rest. It wasn't until years later that we both learned the truth of that brownie and its fate.).

Through much of my time in junior high and high school I was strongly anti-drug, other than tobacco, completely buying into the whole DARE rhetoric. By early high school, I was aware that cannabis was probably a pretty innocuous drug and should probably be legalized for adult use and its many industrial uses, although I was still very anti-underage-use and discouraged my friends from such activities. This, however, is funny, since I identified myself as a "Stoner" since at least eighth grade, dressing mostly in black and hanging out with other "Stoners." I've always claimed that being a stoner is a state of mind and acceptance of a subculture, and that inclusion in this group does not require that one get stoned. Eventually, the day came, however, when I was interested and I spent several months of my junior year of high school planning how I was going to bring the topic up with my dad and step mom. So, during spring break on a visit to their tiny cabin in Gasquet, northern California, I broached the topic. That night, on the evening walk up Gasquet Flat Road, I was allowed to hit their little metal pipe a few times. After promising that I would never reveal this social atrocity which had just occurred to another living soul, I was warned that sometimes you don't feel anything the first few times until you become sensitized to the effect, and mostly that seemed true for me that night. I went back and listened to Pink Floyd's "The Wall" before going to sleep. It seemed deeper and richer than usual, but that was about all I noticed.

A month or so later the Pink Floyd Division Bell Tour came to town (Well, the Oakland Coliseum) and I knew I had to go — after all, pflover stands for "Pink Floyd lover." I knew too that some kind of mind-altering experience was appropriate for the event. I wanted to get high at the show, and feel it this time. A week before the show, I smoked a small bowl after school at a friend's house and this time there was no question it had an effect and that I got high. What a bike ride home that was! Following the concert, I did not smoke again until school was out for summer. By the time my senior year of high school started, I had had a few more intense experiences with cannabis but was not by any means a regular smoker. Half way through that year, I got in a bike accident on the way home from school and badly skinned my knee. For the next week, it was excruciating to try and walk. I had occasionally smoked cannabis on my lunch break before this week but did not make it a regular occurrence because it was too overwhelming and disruptive. The day after my accident, I was given the opportunity to smoke a little cannabis off campus during lunch break. Lo' and behold, my knee felt much better and I could suddenly walk again. For the rest of the week, I self-medicated at lunch, allowing at least half my day to be pain-free with unhindered ambulation. A week or so later, I moderately twisted both my ankles and again had pain walking for about a week, and again relieved it each day at lunch. I was amazed to find that by the end of week two I had little trouble functioning in my two after-lunch classes of Physics and Advanced Placement English. If anything, my performance appeared to improve. In fact, those were the only two classes in which I still had As that last quarter of my senior year. This began my nearly daily use of cannabis. By the time I had gotten through my first year of Reed College, I had become convinced that my cannabis use, when applied judiciously, was providing some benefit for my dyslexia. Fellow students and friends I talked to who used cannabis and had been diagnosed with ADD, dyslexia or both seemed to pretty universally agree with me. By our junior and senior years at Reed, many of us — including myself — felt that our continued success at Reed would not be possible without the benefit of the sacred weed, cannabis.

When I started the learning disability screening process my senior year, I had made the mistake of being too honest with my health care professionals about my past drug experience, especially my use of cannabis, and I was required to start taking urinalysis tests every few weeks to make sure I was not on the pot. Before the two months of testing could commence, I was first required to clear my system for a month. This three month abstinence was the first time I had not used cannabis for longer than approximately three weeks since



my bike accident seven years before. I found I had trouble controlling myself, I was emotionally impulsive, I got in significantly more fights with my spouse and I had trouble sitting still long enough to focus on my studies. Interestingly, those three months were the closest I ever came to landing on academic probation during my attendance at Reed.

The psychologist testing me, a man by the name of Dr. Bruce Kenofer, was convinced my cannabis use was a bad thing, that I should start stimulant treatments right away, that I should be treated for my cannabis dependence and encouraged to make non-cannabis-using friends. He had to be specifically asked to include my nicotine dependence in the write-up, with a recommendation that I be treated for this as well. He appeared to have bought the party line concerning cannabis hook, line and sinker — and frankly, I found his unyielding adversarial nature on the topic quite disturbing. I wanted to be able to contradict him but at the time there was virtually no literature on the topic. Even 3 years ago, when I wrote the article "Holy Hemp Nut" concerning the wonders of the hemp seed, there was essentially no direct literature on ADHD and cannabis use. Now there is a growing abundance of both directly and indirectly-related research papers on the topic.

This article is devoted to exploring our growing knowledge of how the endocannabinoid system relates to ADHD and how CB1 cannabinoid receptor agonists might produce the benefits reported by so many cannabis using ADD/ADHDers.

(**Author's note:** *I did try stimulant therapy for a few years but found I needed other medications to control the side effects — like severe paranoid anxiety over the smallest thing, and explosive emotional sensitivity in the evening, sometimes called "the evening stimulant monster" by ADHDers. Although I did find stimulants to reduce some symptoms of the ADHD, I did not find them to work for all symptoms. On top of this, the "on the verge of snapping/on the verge of psychosis" feeling they produced after a short period of mood elevation was uncomfortable and the other side effects weren't worth their drawbacks. Now there are only rare occasions for which I find them necessary or useful. It is worth noting that I was at a place in my life at this time where if Dr. Kenofer had treated me with a little intellectual respect, as an adult capable of making informed decisions, and took a conversational approach which left room for discussion, instead of taking a condescending, inflexible, patronizing, authoritarian approach and actually just talked to me about cannabis, he quite possibly would have been able to convince me to stop using it during that portion of my life. The approach which he actually chose to take instead drove me to a determination to prove him wrong which can still be seen in my writing today. Interestingly, every time I saw Dr. Bruce on campus after my testing was completed, he got this strangely shameful look and would hang his head as he walked by. Perhaps this was because he could tell I was thumbing my nose at his wisdom by clearly still using cannabis and yet earned an academic commendation for that final year of college, even while writing a hundred page research thesis. Or maybe it was just that no matter how he viewed the situation, I represent one of his failures. I may never know. Although the details may differ, the basics of the picture I have painted here are typical of the average cannabis-using ADHDer.)*

What is ADD/ADHD?

Currently ADHD is believed to be a neurobehavioral developmental disorder with a strong genetic component; however, we have yet to discover one agreed-upon set of pathologies which appear to be responsible for the occurrence of this condition. ADHD appears at a rate of 4% +/-1% in general population, with two out of three of those diagnosed being male. However, some have suggested this is due to observational bias. It is most commonly diagnosed in childhood but 30% +/-10% do not appear to grow out of it, expressing symptoms into adulthood. If left untreated, coping mechanisms are usually adopted on the path to adulthood in an attempt to compensate (1). The basic symptomology of ADHD consists of three main categories of behavioral issues. The most central behavioral set involves issues of impulse control such as emotional outbursts, disorganization in daily activities, quickly jumping from one activity to another, acting without thinking through the consequences, a tendency to blurt out inappropriate remarks and to interrupt the conversations of others. The next affected behavioral set concerns an inability to control locomotion, known as hyperactivity. When thinking of hyperactivity in children most people have an image of a child "bouncing off the walls," unable to sit still for any period of time, although this is only the most extreme part of the hyperactivity spectrum. It can also be expressed in more subtle ways such as fidgetiness, constant fiddling or tinkering with the hands, non-stop talking, simple restlessness and restless sleep. The final set of behavioral issues concerns an impaired ability to maintain attention for extended periods of time. This can manifest as difficulty listening or following simple sets of instructions unless delivered one at a time, day-dreaming, hyper-distractibility, reduced processing speed, and difficulty finishing tasks and projects at school, home or work (2). Although the hyperactivity symptoms may often subside substantially or even completely by adulthood, the impulsivity and attentional deficits tend to be significantly more persistent (1). A new symptom belonging to both the behavioral set of inattentiveness and that of impulsivity has been recently identified in ADHDers. It is known as delay aversion and consists of a greater tendency to pick a much smaller immediate reward in favor over a much larger reward following a delay (3). This process can be seen in action in my account of the day my mother and I really realized I had reading problems. The cause of ADHD appears to be predominately genetic, involving the co-occurrence of variants of several different genes coding for specific components of the dopamine (DA) (1), serotonin (5-HT) (1), norepinephrine (NE) (4), and endocannabinoid systems (5, 6, 7, 8), resulting in specific alterations in CNS (central nervous system) functioning combined with cumulative effects from various environmental factors (1). Catecholamine dysfunction especially with DA, and to a lesser extent NE, is one of the primary theories of ADHD. This theory suggests that abnormalities in the availability of free dopamine and norepinephrine, combined with changes in the sensitivities and densities of their receptors, accounts for the majority of symptoms associated with ADHD (9, 10, 11). It is primarily this theory combined with their general efficacy which drives the use of prescription stimulant treatments such and methylphenidate (Ritalin and Concerta) and the amphetamines (Dexadrine, Adderall, d-methamphetamine) as well as the non-stimulant NE transporter inhibitor Strattera in the management of ADHD symptoms. However, a competing theory of phospholipid/endocannabinoid system dysfunction has also recently begun to develop growing support in the medical and scientific communities (12).

Anecdotal and Case Reports

For years, the cannabis-using subpopulation of the ADHD community has reported that use of cannabis provided them with a degree of relief from their symptoms. Until Prop. 215 was passed in California many doctors simply took these reports as attempts to justify one's use of cannabis. This may have been in part due to the fact that ADHD and substance abuse disorders often co-occur and appear to have genetically related risk factors. However after Prop. 215 passed, a growing number of doctors began to take these claims more seriously and eventually case reports began to appear supporting what the cannabis-using portion of ADHDers had known all along. One such report, in this case by a surprised group of German researchers, involves the effect of THC and cannabis on driving skills in a 28 year old man diagnosed with ADHD. It is generally well accepted the ADHDers express deficits in driving skills with one study suggesting deficits on par with alcohol intoxication (13). Furthermore, as with other ADHD symptoms, these deficits are generally improved by stimulant medications (14). In the particular case in question, the young man had tried methylphenidate therapy but did not find it significantly improved his symptoms. His psychiatrist had then observed that cannabis appeared to provide noticeable symptom relief and prescribed THC in the form of Marinol. The young man had subsequently lost his driver's license after high levels of THC were found in his blood after being stopped for a traffic violation. After reapplying for his license the man was told he must ▷

undergo an evaluation of his driving skills and that he must do so free of any medication or recreational drugs (15). The young man capitulated however the evaluation team was completely unprepared for the individual they were presented with upon his arrival. He was described as impatient, pushy, demanding, lacking distance, with a generally negative emotionality. He constantly shifted position, drummed his fingers on the table, and in general appeared easily distractible and physically agitated. When it came to discussing the effects of cannabis on driving and the terms of reinstatement of his license he was completely inflexible and quickly escalated to an aggressive approach which culminated in the young man getting up, grabbing the table, leaning forward and shouting that he required cannabis and he required a license. This presentation is reasonably typical of an unmedicated ADHDer and one that my family and I are quite familiar with. The evaluation team quickly determined that he would not be able to perform the required driving performance tests in this disturbed state and he was offered the opportunity to undergo evaluation of his driving performance, as affected by Marinol, at a later date (15). The individual who appeared at the next visit was:

"fundamentally changed and was not disturbed at all. He stated that he had stopped smoking cannabis, was taking dronabinol on a regular basis and that he had consumed it just two hours ago. He appeared calm, but not sedated, organized and restrained. Unlike during the first meeting he was able to accept and discuss arguments. When trying to make clear that THC was indispensable for his quality of life he became more engaged but without losing restraint. Rather, he was understanding of the position of the expert and indicated that the path to get back his driver license may be long but that he was willing to undertake it. His behaviour, motor function, mood and consciousness did not give any indications of a prior use of a psychoactive substance (15)."

It was later determined that he had actually smoked a *large* quantity of cannabis before the meeting instead because Marinol was too expensive (15). This extreme makeover which cannabis can produce on ADHD symptoms is again something which my family and I are very familiar with and why I emphatically insist cannabis *"makes me a better person."*

The young man's scores on the driving performance test were all at or above average, even in the very demanding tests of vigilance and divided attention (Figure 1). These findings lead the startled researchers to conclude "that the consumption of cannabis had a positive impact on performance, behavior and mental state of the subject (15)." This is in stark contrast to the effects of cannabinoids on healthy human subjects. In people without ADHD, THC and synthetic CB1 receptor agonists increase impulsivity, the reverse effect is produced by CB1 antagonists (16). Although few comprehensive studies of (endo)cannabinoid/ADHD interactions in humans have yet been conducted, there is a growing body of animal model and cell culture literature indicating an strong link between endocannabinoid system abnormalities and ADHD symptoms.

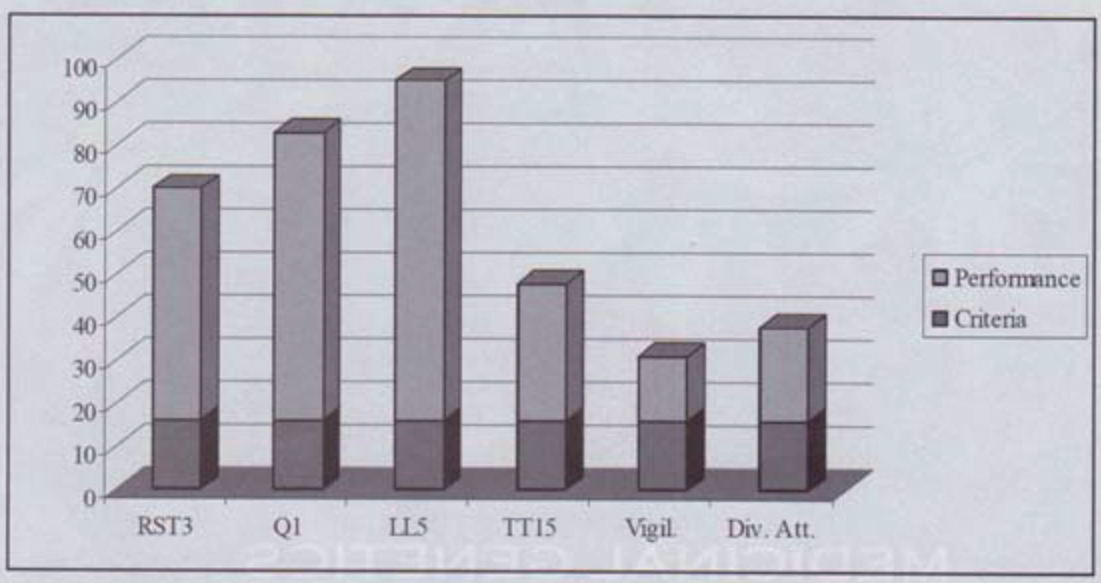


Figure 1: Subjects actual performance and minimum criteria.

The Adolescent Spontaneously-Hypertensive-Rat

The spontaneously-hypertensive-rat (SHR) is an accepted animal model of hyperactivity and impulsivity in the study of ADHD. There is one interesting difference between human ADHD and the SHR rats. Where pretty much all ADHDers are impulsive but only a portion of ADHDers appear hyperactive, the reverse is true for the SHR rats such that all are hyperactive but only a subpopulation are impulsive (17). As with ADHDers, this impulsivity appears to be linked to significant delay aversion (17). If the delay to reward gets long enough, some degree of delay aversion is normal and healthy. Although it is not clear what import, if any, the following finding has to human ADHD, the non-impulsive SHR rats appeared to show little to no delay aversion even with long delays. In other words, they appeared to lack even a healthy level of delay aversion (17). Now here is where it really starts to get interesting for us.

Compared to either wild-type controls or their non-impulsive SHR counterparts, the impulsive SHR rats expressed significantly lower CB1 receptor densities in the prefrontal cortex. Furthermore, administration of the synthetic cannabinoid agonist WIN55,212-2 (WIN) reduced impulsivity and normalized self control in this impulsive subgroup at a dose which did not appear to impact wild-type controls (17, 18). Methylphenidate (Ritalin) was also able to improve self-control in these rats (18). Interestingly, as observed above with humans (16), healthy rats which do not evidence any signs of preexisting impulsivity issues become more impulsive with CB1 agonist WIN but demonstrate reduced impulsivity when given a CB1 antagonist

(19). This further supports the notion that ADHDers respond atypically to cannabinoid administration when compared to the general population at large.

Genetic Evidence for an Endocannabinoid/ADHD Link

The finding that impulsive SHR rats express lower CB1 densities in their prefrontal cortexes suggests that there may be genetic components to the development of ADHD located within the genes encoding for the components of the endocannabinoid system. Some of the first evidence for such endocannabinoid gene variants being associated with ADHD was published in 2000 by Bennett and Horrobin. The endogenous agonists and antagonist for the endocannabinoid system belong to the group of chemicals know as phospholipids and fatty acids and both include and are metabolized from the omega-3,6 & 9 essential fatty acids. Bennett and Horrobin found that a review of the literature indicated that chromosomal locations suspected to be involved with ADHD were also related "to the known locations of genes directly or indirectly involved in phospholipid and fatty acid metabolism (5)." Any change in phospholipid and fatty acid metabolic processes could alter availability of free anandamide, 2-AG, and other endocannabinoids, which could further result in alterations in corresponding receptor densities.

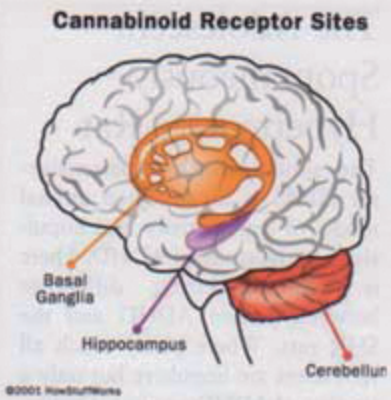
More recently, ADHD has been associated with specific variants of the CNR1 gene, the gene encoding for the CB1 receptor, in a diverse range of human populations. Specifically, the CNR1 gene carries a polymorphism (variant) encompassing the repetition of an allele consisting of the three nucleotides, ATT. In this particular polymor- ▷

phism, the allele can be repeated up to nine times. The longer the allele gets, the greater the association with ADHD, with alleles containing five or more repeats progressively correlating with both increased in rates of ADHD and increased severity of symptomology. This result was first found in adult Spanish alcoholic males with a history of ADHD (6). It was again confirmed in a population of aboriginal Americans from Southwest Californian where the six allele polymorphism was found to be especially associated with ADHD. In addition, this study found that four single nucleotide polymorphisms (SNPs), in or near the CNR1 gene, were also strongly associated with ADHD (7). Last year, a study in Northern Finland found a specific SNP variant which was associated with ADHD with "a sex by genotype interaction" such that there was a greater association among males than females. That said, the association for both sexes was significant (8). This particular finding leads biological credence to the general observation that ADHD appears almost twice as frequently in males than in females (1). The Northern Finnish study was conducted on both a population of unselected adolescents and a population of selected trios composed of ADHD positive adolescents and their parents, confirming the heritability of the association between ADHD and having the particular CNR1 gene related SNP variant discovered in the study (8). Now that we have established that there is a likely link between abnormalities in genes encoding the endocannabinoid system and the manifestation of ADHD symptoms, the questions remain: Can we integrate these findings into our previous theories of ADHD, and how might we take advantage of this knowledge pharmacologically?

The Cannabinergic/ Dopaminergic Relationship

As mentioned above, the theories of ADHD which have been around the longest and gained the largest followings in the scientific and medical communities are those which involve dysfunction in the catecholamine systems, which include the dopaminergic systems of the brain (11, 20). In support of these theories, variants of several genes encoding for parts of the dopaminergic systems have been implicated in ADHD. These include the genes encoding for the DA transporter (DAT), the D4 and D5 DA receptors, DA beta-hydroxylase (the enzyme responsible for converting DA into NE), catecholamine-methyl transferase (the enzyme responsible for converting NE into epinephrine), and MAO-A (the enzyme which deactivates NE and 5-HT and one of two enzymes responsible for the deactivation of DA) (9, 20). Variants in the NE transporter gene have also been observed (4). These genetic associations are backed by numerous findings of physiological abnormalities associated with ADHD such as up to 70% more DAT activity in the brains of ADHDers compared to controls (21, 22) and depleted DA and NA levels in the prefrontal cortex (PFC) and striatum of ADHDers (9). When these abnormalities are addressed such as with NE transport inhibitor, Strattera, or with the psychostimulants like methylphenidate (DAT inhibitor) and amphetamines (stimulation of DA release, and inhibition of both DAT and MAO (23)) most ADHD symptoms are improved (1). In light of all, this it makes sense to ask how administration of a CB1 agonist like WIN or THC might affect DA levels throughout the brain given the ability of these drugs to improve symptoms of ADHD.

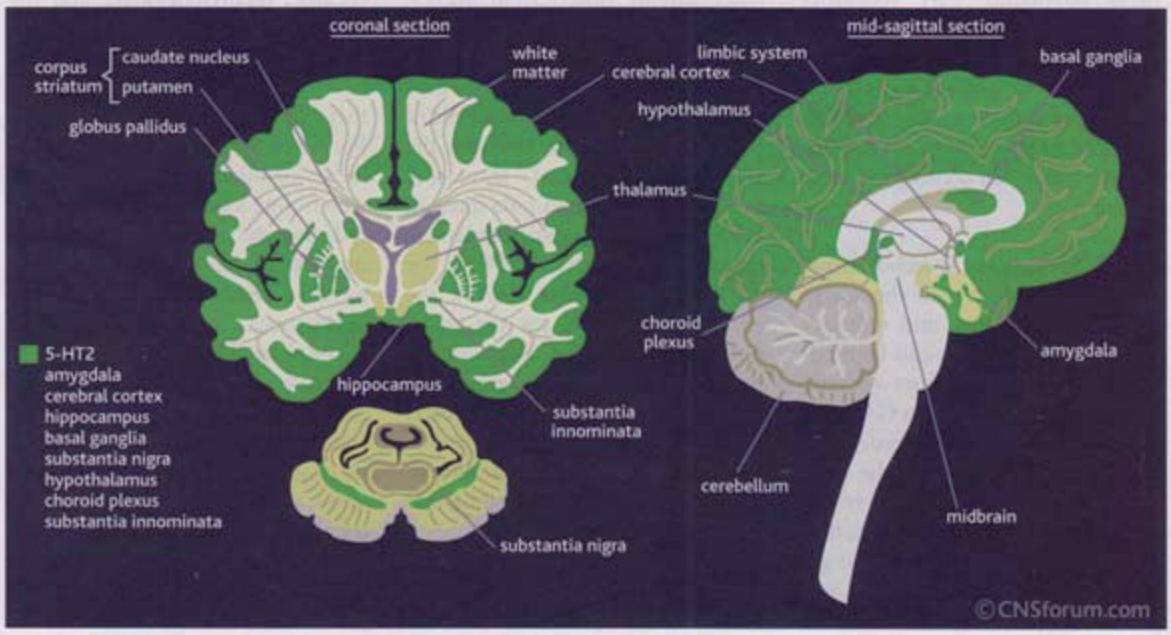
There are several lines of evidence suggesting CB1 activation might modulate dopaminergic functioning. To start with, the distribution of CB1 receptors appears to overlap with that of D1 and D2 receptors in several brain regions. In the striatum, CB1 receptors are co-localized with both excitatory D1 receptors and inhibitory D2 receptors, whereas in the hippocampus they were only found to be associated with the D2 receptors (24). This finding alone might not mean too much other than that the two systems might interact. A team investigating if the sedating effects of CB1 agonists like THC could be alleviated by activation of either the D1 or the D2 receptors found that administration of D2 agonists alone appeared to have little effect, whereas co-administration of a D2 receptor agonist with a CB1 agonist produced marked sedation over the same dose of CB1 agonist alone. Furthermore, it was possible to lower the sedation threshold for CB1 agonists by co-administration with a D2 agonist, meaning it took less THC to induce sedation. Co-administration of a D1 agonist with the CB1 agonist appeared to produce no significant interactions (25). Therefore, when cannabinoids are taken with either nonselective DA agonists like cocaine, methylphenidate or amphetamine or more selective D2 agonists like Zyprexa or Seroquel, a synergism of sedative effects may be observed. The use of such a combination could lead to a reduction in the size of psychostimulant dose required for people with ADHD-hyperactive type. Single acute doses of THC have also been found to result in a downregulation of D2 receptor



densities in the striatum at low doses and in downregulation of D1 receptors in the limbic forebrain at both high and low doses. Although their densities were reduced, no changes in the binding affinities of either type of DA receptor were detected in this study (26). DA receptors are also downregulated in humans with ADHD following stimulant treatment, an effect which correlates with improvement in ADHD symptoms (27).

In some cases, receptors can physically link into a larger receptor group with differential properties from either receptor expressed on its own. These structures are called heteromers. In heteromers of the CB1 and D2 receptors co-expressed in the striatum, the D2 side of the heteromer appears to have a reduced binding affinity. On a behavioral level this means that the hyperactivity produced by administration of D2 agonists can be significantly reduced or even blocked by administration of doses of CB1 agonists which do not effect locomotor activity when taken alone (28). Administration of THC can also stimulate the release of DA in multiple locations in the brain. Early investigations into how THC might alter the dopaminergic systems of the brain only found hints suggesting elevated DA levels following use of THC. Indications of increased DA release following administration of THC have been found both in the form of an increase in relative DA levels compared to one of its metabolites in the hypothalamus and from evidence of increased DA-induced inhibition of prolactin in the blood stream (26). Another study has also found evidence implying an increase in DA release in the PFC following administration of THC (29). This last finding is especially important because the PFC has been found to play a critical role in behavioral regulation and the regulation of attention. A functional PFC is required for effectively divided attention, maintaining attention over a delay, and successfully inhibiting distraction. The PFC of the right hemisphere is especially responsible for top down behavioral control. Lesions to the PFC produce a nearly identical profile to ADHD including poor planning, impulsivity issues and hyperactivity. Interestingly, both too little PFC-catecholamine activity (sleepy or being sick) and too much PFC-catecholamine activity (stressed or excited) produce very similar behavioral issues. The role of DA in the PFC appears to be in the regulation of "noise" in the cortex. Moderately activating D1 receptors in this region therefore results in a reduction of stimulation of this region. On the other hand, stimulation of NE release in this region increases signal strength. Changes in PFC/striatum interactions in particular appear to play a role in the expression of ADHD symptoms (30). For example, too little PFC activity can result in a disinhibition of the striatum and resulting ADHD symptoms, whereas moderately stimulating both DA and NE activity in the PFC improves ADHD. This finding lies at the center of the "lack of top down control" theory of ADHD, which posits that individuals with ADHD are unable to exert appropriate executive control over their own behavior.

More recent investigations into the effects of THC on PFC-catecholamine tone have found more direct evidence of enhanced DA and NE release in the PFC than the simple hints of this reported in earlier studies. In 1997, Jentsch, Andrusiak, Tran, Bowers and Roth ▷



found that THC increased both DA and NA activity in the PFC. The authors suggested that this could be responsible for some of the detrimental cognitive effects of acute cannabis use in healthy individuals (31). This year, THC was also found to produce marked increases in release of DA in the striatum (32). This effect of THC on dopaminergic tone in the striatum is shared with methylphenidate, Adderall and the other amphetamines used to treat ADHD. Novelty/stimulus seeking is another trait associated with ADHD and may be neurologically related to delay aversion. Novelty seeking appears to be induced by activation of the medial PFC region know as the infralimbic cortex which in turn stimulates dopamine release in the ventral tegmental area (VTA) via a brain structure known as the bed nucleus of the stria terminalis (BNST) (33, 34, 35). The axon terminals of neurons originating in the infralimbic cortex and extending into the BNST contain presynaptic CB1 receptors which when activated by a cannabinoid agonist like THC result in an inhibition of infralimbic cortex mediated activation of DA containing VTA neurons (35). One result of activating these particular CB1 receptors should be a reduction in novelty seeking behavior and may also account for the sense of complacency and ambivalence to less than satisfactory surroundings or circumstances which can accompany daily cannabis use.

In a similar process, catecholamine-containing pathways in the amygdala, hippocampus and primary somatosensory cortex can be modulated by activation of pre-synaptic CB1 receptors located on GABAergic and glutamatergic interneurons interfacing the PFC with the midbrain. Interneurons are the traffic lights of the brain's information super-highways. GABAergic interneurons are the red lights and glutamatergic are green. Information transfer slows down when the red lights come on and speeds up with green lights. If one of these interneurons interfaces with a post synaptic neuron which thinks the interneuron is doing its job too well, the post synaptic neuron has some recourse. On demand, the post synaptic neuron is able to release endocannabinoids by metabolically extracting them from the phospholipid structure of its own cellular membrane. When these endocannabinoids have reached a high enough extracellular concentration, they eventually bind to the presynaptic CB1 receptors on the axon terminals of the interneurons telling them to chill for a bit. This process is known as retrograde synaptic messaging (36, 37, 38). In 2000, The Neurosciences Institute of San Diego, California, published a report that the anandamide transport inhibitor AM404 — the active metabolite of Tylenol responsible for much if its effect — dose-dependently inhibited the hyperactivity associated with D2 receptor agonists without inducing signs of cannabinoid intoxication. This was achieved through a CB1 mediated mechanism. This same report indicated that AM404 was also able to reduce expression of the hyperactivity usually observed in adolescent SHR rats, our previously discussed animal model of ADHD (39, 40). In a mouse model which simulates some of the symptoms of ADHD, anandamide levels in the striatum are reduced. Increasing availability of anandamide through either inhibition of the anandamide transporter with AM404 or through inhibition of FAAH, the enzyme responsible for the metabolic breakdown of anandamide, reduces spontaneous hyperlocomotion in these animals. In this case, anandamide produces this reduction in hyperactivity via binding to the TRPV1 vanilloid receptor and not the CB1 receptor (41).

If an electrode is placed in the reward pathway in the midbrain and a small electric current is sent through the electrode, DA is released in the pathway which produces a rewarding sense of pleasure associated with many drugs of abuse, including cocaine and morphine. Administration of such drugs will decrease the reward threshold of the electrical stimulation and increase the reward potential of the stimulation, in other words, increasing the incentive salience of the electrical stimulation. Interestingly, the administration of CB1 agonists like WIN and AM404 do not produce this potentiation of the electrical stimulation of the reward pathway. At higher doses, they even seem to actually inhibit the incentive salience of the electrical stimulation. Furthermore, both WIN and AM404 have been found to reduce the reward facilitating properties of dopaminergic agonists like cocaine. They are also able to reduce cocaine-induced hyperlocomotion at doses which do not significantly affect locomotion when administered alone. These inhibitory effects of WIN and AM404 on the DA linked effects of cocaine appear to be mediated through the CB1 receptor (42). Considering the highly addictive nature of psychostimulants like cocaine, methylphenidate and the amphetamines, being able to reduce their reward potential could be very advantageous when using them in the treatment of ADHD. For example, formulations of methylphenidate could be made which included AM404, thereby reducing the chance that excessive use would be associated with a sense of reward (a.k.a. a positive experience). At the same time, the AM404 would help reduce the anxiety-like effects produced by methylphenidate in some people. Indeed, moderate/intermittent users of cannabis who had ADHD and were receiving treatment for cocaine dependence were found to have better treatment retention rates compared to their counterparts who did not use cannabis or

used it heavily. In other words, moderate cannabis use appears to improve treatment outcome for cocaine dependence in individuals with ADHD (43).

Not all the positive benefits of cannabis consumption on ADHD symptoms may be due to THC. Other constituents of the cannabis plant, such as the atypical antipsychotic drug cannabidiol (CBD), can modulate the endocannabinoid levels. Although it is a weak reverse agonist at the CB1 receptor, meaning it binds to the receptor and activates it to produce the opposite pharmacodynamic effect of THC, CBD is also capable of inhibiting both the anandamide transporter and metabolic breakdown of anandamide via inhibition of FAAH. Cannabidiol therefore increases the availability of free intercellular anandamide. Cannabinoids like CBD may also be beneficial to ADHD because they are strong antioxidants and as such are neuroprotective (44). Some findings suggest that oxidative stress, specifically lipid peroxidation, may play a role in ADHD (45); however, this has not been universally confirmed (46).

ADHD as EFA Deficiency/Phospholipid Dysfunction

The concept that many developmental psychiatric conditions like ADHD, dyslexia and autism might be relate to either essential fatty acid deficiency (EFAD) or phospholipid dysfunction first really started to gain support in the scientific community around the turn of the millennium (47). Phospholipids are the primary structural component of cellular membranes and they are mainly comprised of a phosphate group and two fatty acid tails. Fatty acids are metabolic derivatives of the EFAs like the omega three, six and nine essential fatty acids. What quantifies some fatty acids as "essential" is that the body cannot manufacture these building blocks of other fatty acids from raw materials and so they must be included in the diet. Foods rich in EFAs include fish, shellfish, most nuts, and some seeds especially hemp and flax. One important group of fatty acids and fatty acid metabolites include the fatty acid metabolite of Tylenol, AM404, and the endocannabinoids like anandamide and 2-AG. It has even been demonstrated that eating a diet rich in the right EFAs, for they aren't all equal, can actually increase free CNS endocannabinoid levels by as much as tenfold (48). Any metabolic dysfunction in the processes between EFAs and phospholipids and from phospholipids back to fatty acids could present as symptoms of EFAD and would affect the endocannabinoid system. In 2004, researchers at the University of Guelph in Canada found significant changes in fatty acid levels of both the blood serum and the cellular membrane of red blood cells taken from adults with ADHD compared to their healthy counterparts. Most of the polyunsaturated fatty acids were lower across the board while monosaturated fatty acids and saturated fatty acids were increased in the serum and cellular membrane respectively (49). These findings were confirmed in 2006 by Antalis, et al., who also found that children with ADHD had higher rates of excessive thirst and skin conditions like eczema which are strongly associated with EFAD (46). Phospholipids and the fatty acids they contain make up most of the mass of the brain and a neural imaging study has found lower neuronal membrane levels of specific phospholipids in the PFC and the basil ganglia of children diagnosed with ADHD (50). Some evidence indicates that omage-3 fatty acids are not particularly affected in ADHD rather the omega-6 fatty acids, from which arachidonic acid and its metabolite anandamide are produced, are implicated in ADHD related changes in fatty acid and phospholipid levels (51). One potential source for these changes may be due to oxidative stress in the form of lipid peroxidation. Indeed, a meta-analysis of previous research found evidence of significant lipid peroxidation in ADHD and several other closely associated psychological conditions (45). Another selling point to this approach to ADHD is that unlike dopaminergic dysfunction, blood levels of endocannabinoids mirror their levels in the brain such that evidence of CNS endocannabinoid dysfunction should appear in the blood. Furthermore, a mechanism has been discovered that allows the CB1 receptors in the blood to cooperate with CB2 receptors in the CNS to drive the transport of anandamide and other endocannabinoids in a unidirectional fashion across the blood-brain barrier allowing the circulatory system to act as a reservoir of endocannabinoids for the brain (52); thereby, allowing increases in endocannabinoid and endocannabinoid precursor serum levels to drive up CNS endocannabinoid levels as well. Although they would not address all symptoms of EFAD or phospholipid dysfunction, the symptoms which were related to changes in endocannabinoid levels would be addressed by exogenous cannabinoids like THC, CBD, and preparations of whole cannabis.

Now, as mentioned before, when it comes to EFA supplementation for individuals with ADHD, not all EFAs or sources of those EFAs are equal. First off, the research team from the University of Guelph tell us that sources which contain more omega-6 fatty acids like arachidonic acid and its precursor, linolenic acid, may be preferable to omega-3 fatty acids. Borage, evening primrose and hemp seed are all significant sources of these omega-6 fatty acids, with borage having the highest percentage of omega-6 fatty ▷

acids to total oil content. Flax seed, on the other hand, contains almost exclusively omega-3 fatty acids and appears to provide minimal improvement in children with ADHD (53). Another study found that administering omega-3s in the form of phospholipids was significantly more effective at decreasing saturated fatty acid levels in cellular membranes when compared to omega-3s in the form of triacylglycerols (fish oil). Improved scores of attention only significantly correlated with changes in fatty acid levels in the group given omega-3 containing phospholipids and not those who received fish oil (54). Phospholipids are found more in meat than in oil and sources containing high amounts include chicken heart and seafood like krill, Atlantic mackerel and herring. Good sources with more moderate amounts of these specific phospholipids include tuna, dark chicken meat and chicken liver (55). Monitoring the ratio between arachidonic acid (AA) and the long chain fatty acid eicosapentaenoic acid (EPA) and adjusting intake of EPA containing phospholipids so that the AA:EPA ratio is about 1.7 in individuals with ADHD appears to provide the most benefit from EFA supplementation (53, 56). Low dietary intake of omega-3s during gestation and early life are associated with reduced levels of omega-3s in the brain of males and with ADHD-like cognitive/behavioral impairments. Docosahexaenoic acid (DHA) levels in the CNS appear to be particularly affected. Reduced CNS levels of DHA may also be inversely associated with increased hyperactivity post-adolescence in these individuals (57). Therefore, maternal nutritional deficiencies may play a critical role in the development of some cases of ADHD, especially in boys. Such observations of nutritional imbalances in ADHDers asks the question: just how effective is targeted dietary supplementation at treating ADHD compared to conventional treatments like the psychostimulants? At least one study has attempted to address this question and the results so far are quite promising. Using a shotgun technique, Harding, Judah and Gant, 2003, determined eight major risk factors associated with ADHD and constructed a nutritional supplement intended to address all eight risk factors as effectively as possible. This supplement contained "a mix of vitamins, minerals, phytonutrients, amino acids, essential fatty acids, phospholipids, and probiotics." Half the children in Harding, Judah, and Gant's study received the supplement while the other half received methylphenidate. Measures of ADHD symptoms improved in both groups to the same degree and in a nearly indistinguishable fashion (58). How I wish this supplement was commercially available!

"Won't Somebody PLEASE Think of the Children??!?"

Helen Lovejoy, *The Simpsons*

Some readers might think to themselves: how could anybody give powerful psychoactive drugs like cannabis and THC to children?

To me, the more immediate and important question is, how could anybody give psychostimulants like Ritalin, amphetamine and methamphetamine to children?

That said, perhaps you are right. Let us compare the side effect profiles for stimulants to Marinol, a.k.a. dronabinol.

Marinol

Common:

General weakness, Forced, fast, or fluttery heart rate, gastrointestinal distress*

"(Amnesia), anxiety/nervousness, (ataxia) [a.k.a., difficult controlling movement], confusion, depersonalization, dizziness*, euphoria*, (hallucination), paranoid reaction*, somnolence*, thinking abnormal*"

Occasional:* *Incidence of events 3% to 10%*

Hypotension, nonspecific muscular pain, diarrhea "Depression, nightmares, speech difficulties, tinnitus" flushing of the skin, vision difficulties

Rare:

Chills, headache, Anorexia, cough and sinusitis, sweating

The THC in Marinol "is one of the psychoactive compounds present in cannabis, and is abusable and controlled [Schedule III (CIII)] under the Controlled Substances Act. Both psychological and physiological dependence have been noted in healthy individuals

receiving **dronabinol**, but **addiction is uncommon and has only been seen after prolonged high dose administration.**" Symptoms of severe overdose "include decreased motor coordination, lethargy, slurred speech, and postural hypotension. Apprehensive patients may experience panic reactions. The estimated lethal human dose of intravenous dronabinol is 30 mg/kg (2100 mg/70 kg) (59)." With a therapeutic threshold intravenous dose at approximately 0.01 mg/kg (0.7 mg/70 kg), that gives THC and cannabis a therapeutic index or index of safety of around 3000:1. That said, there has never been a confirmed death in humans from the administration of cannabinoids alone.

Let's now compare this to Adderall, a mix of D-amphetamine and L-amphetamine salts. When looking up drug information on Adderall, this is the first thing you should see:

*"AMPHETAMINES HAVE A HIGH POTENTIAL FOR ABUSE. ADMINISTRATION OF AMPHETAMINES FOR PROLONGED PERIODS OF TIME MAY LEAD TO DRUG DEPENDENCE AND MUST BE AVOIDED. PARTICULAR ATTENTION SHOULD BE PAID TO THE POSSIBILITY OF SUBJECTS OBTAINING AMPHETAMINES FOR NON-THERAPEUTIC USE OR DISTRIBUTION TO OTHERS, AND THE DRUGS SHOULD BE PRESCRIBED OR DISPENSED SPARINGLY. **MISUSE OF AMPHETAMINE MAY CAUSE SUDDEN DEATH AND SERIOUS CARDIOVASCULAR ADVERSE EVENTS.**"*

Side effects of Adderall:
Heart attack, Hypertension, Fast fluttering heart rate, Sudden death, Overstimulation, Restlessness, Dizziness, Insomnia, Euphoria or dysphoria, Depression Tremor, Headache, Stroke (compare this to cannabinoids, which are neuroprotective during stroke), Seizure, Psychotic episodes at recommended doses, GI disturbances, Anorexia, Hives or rash, Anaphylaxis (Anaphylactic shock can lead to death), Toxic epidermal necrolysis, Impotence/changes in libido, Aggression, Disturbances to vision

"Amphetamines have been extensively abused. Tolerance, extreme psychological dependence, and severe social disability have occurred... The most severe manifestation of chronic intoxication is psychosis, often clinically indistinguishable from schizophrenia." There is a long list of contraindicated drugs with the use of amphetamines. In a randomized study, Ritalin was found to inhibit proper growth in children and it is believed all stimulants carry this risk. Overdose induces "restlessness, tremor, hyperreflexia, rapid respiration, confusion, assaultiveness, hallucinations, panic states, hyperpyrexia and rhabdomyolysis... nausea, vomiting, diarrhea, and abdominal cramps. Fatal poisoning is usually preceded by convulsions and coma (60)." Amphetamines appear to have a physiological therapeutic index for acute oral doses somewhere around 50:1 to 100:1. For methylphenidate, it appears to be a bit larger at about 200:1. However, the psychological therapeutic index for both these drugs, as defined by the appearance of adverse psychological reactions in a majority of users, may be as low as 2:1 or 3:1, especially with non-oral routes of administration.

It should be immediately clear which of these two drugs posses the most risk. It should also be taken into account that like many other psych-meds such as Strattera for ADHD, Paxil for depression, and Zyprexa for manias/psychotic disorders, but unlike psychostimulants, the acute effects of cannabinoid based drugs will differ from chronic administration. Most psych-meds do not start working right away and take some time to reach equilibrium with your system before the full beneficial effects are observed. Furthermore, their acute effects can be quite disruptive and even disturbing for the patient taking them. Cannabis is no different in this regard. When used to treat psychological issues, cannabis can produce an unwanted acute intoxication which tends to diminish to tolerable levels or even disappear with chronic administration. Cannabinoids also do not produce the severe and even potentially fatal withdrawal syndrome seen with so many of the other addictive psychoactive medications like the antidepressants and antipsychotics. Although a cannabinoid withdrawal syndrome does occur in some patients, it is generally mild and easily tolerated.

Conclusion

Let's imagine you wake up one day and find you have a condition which, if left untreated, may significantly reduce your general success in life, as well as your overall quality of life. Or better yet, your child is diagnosed with this condition. Do you choose the treatment which, at recommended doses, can induce irrational outburst of anger and aggression, severe panic attack, stunted growth, psychosis, sudden death, stroke or heart attack? The treatment with a small therapeutic index and risk of severe addiction? Or, do you choose the treatment with minimal severe side effects, minimal addiction potential, neuroprotective properties, a huge therapeutic index, and which has never induced a single confirmed death when taken alone — even with severe overdose? If both treatments have similar success rates and induce similar degrees of improvement, ▷

the choice should be simple. The future of ADHD treatment, however, may start to move away from pharmacological intervention as a tier one treatment, opting instead to shoot for targeted nutritional supplementation based on individual genome and environmental risks. Treatment with pharmaceuticals would then take a back seat, only being used for the most severe treatment resistant cases. As you can tell, I've been thinking a lot recently about both the current state and the future of cannabinoid/endocannabinoid manipulation therapy for ADHD, and as I sit here loading this wonderful icon of the future my wife owns — her iPod — with the first episode of her favorite Canadian canna-comedy, while possible slightly overdosed on my meds (I'll never tell which one!), I have come to realize that quite possibly the future of ADD/ADHD med delivery may already lay in our hands. Something not much bigger than the recently speculated iPod touch 9" might be perfectly adapted for hypodermic spray delivery of one long term and maybe up to three short term meds for a healthy young adult. The drug could be in a pressurized format quickly degraded to non-active constituents when exposed to normal environmental conditions, and could only be administered on a given schedule. Depending on potency of the drug and frequency of administration, refills could last from a week to a month. There is a trend hypothesized by the show, How William Shatner Changed the World on the History Channel, which suggests similar recent oddities such as this iPod itself were inspired by the mind of Gene Roddenberry and his Star Trek creations, so it's possible. On a related note, in the even more eminent future of the iPod, the line of devices will share stored apps and files on a much larger home portable hard drive devoted solely to this purpose. Apps capable of allowing the parental control of one or more slave iPod devices through encrypted passwords on a Master iPod are a logical next step. It would not take a huge leap from here to enable such a setup to allow parents the ability to monitor and control the drug delivery apps on their child's iPod. The age of the communicator is upon us, and as my cat says, the future is "Weow"!

Regardless of what the future holds, one thing is certain. There exists substantial evidence to back the anecdotal claims of the hoards of cannabis-using ADHDers for whom cannabis appears to offer symptomatic relief and improvements in quality of life. It is time we take them seriously. Risk of psychosis and sudden death syndrome should not be something parents have to face in order to improve the life prognosis for their child, especially when other less-dangerous options are both effective and available.

This work is dedicated to Jeffery Jefferies and his family.

For more information visit:
http://www.jeffreysjourney.com/

References

[illegible]