September 15, 2019

Dear Regina,

Welcome to BioMarketing Insight's monthly newsletter.

Last month, I covered "The Pros and Cons to Legalizing Marijuana" If you missed last month's article, click here to read it. This month we'll cover "How Does Marijuana Affects the Brain and Body?"

Read on to learn more about this topic and other current news. The next newsletter will be published on October 15th, 2019.

We encourage you to share this newsletter with your colleagues by using the social media icons below, or by simply forwarding this newsletter or use the link below. Should you or your colleagues want to join my mailing list, click on the link below.

Sincerely,
Regina Au
Principal, New Product Planning/
Strategic Planning Consultant
BioMarketing Insight

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Developing a Product? Commercializing a Product?

If you are developing a product and have not conducted the business due diligence to determine commercial viability or success, contact me for an appointment. For successful commercial adoption of your product or looking to grow your business, contact me for an appointment.

For more information on our services, click on the links below:

Product Development
Market Development
Marketing Strategies

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Microbiome Therapeutics US

Developing a Successful Microbiome Commercial Strategy

I am pleased to announce that my article entitled "Developing a Successful Microbiome Commercial Strategy" was published in the KNect365 Magazine under the heading of Next Generation Therapeutics. This is a sneak preview to my presentation on Wednesday, September 11, 2019 at the Microbiome Therapeutics conference at the Boston Convention Center. To read my article, click here. To attend the conference, click here.

BioProcess International

Why Conducting Marketing Due Diligence Early in Product Development Is Important

I am pleased to announce that my article entitled "Why Conducting Marketing Due Diligence Early in Product Development Is Important" was published in the BioProcess International Magazine. To read the article, click here.

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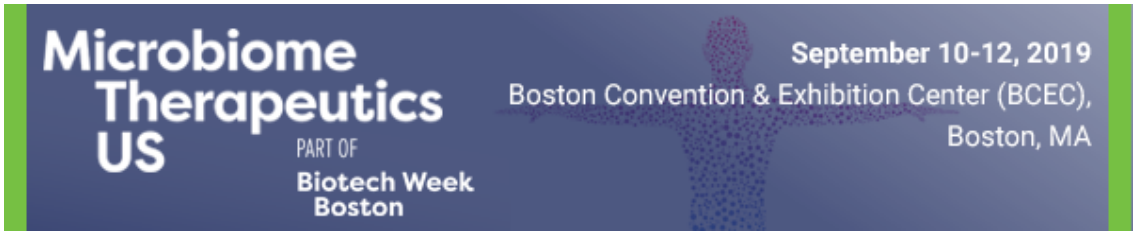

Save the Date: Microbiome Therapeutics Conference, September 10-12, 2019 - Boston Convention & Exhibition Center

I am pleased to announce that I will be speaking at the Microbiome Conference on "Important Early Considerations to Developing a Successful Commercial Strategy," Wednesday, September 11, 2019. For more information, click here.

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Save the Date: BioProcess International Conference, September 9-12, 2019 - Boston Convention & Exhibition Center

Cost of Speed – How Preclinical Shortcuts Impact Molecule Value and Tech Transfer", Thursday, September 12th. For more information and to register, click here.

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3D Medical Printing Potential

I am pleased to announce that my article on 3D Medical Printing, Printing Potential has been published in the April 2019 issue of *Innovations in Pharmaceutical Technology* (IPT). This article reviews where 3D printing is the most beneficial and why. To read the article, click here, p26-29.

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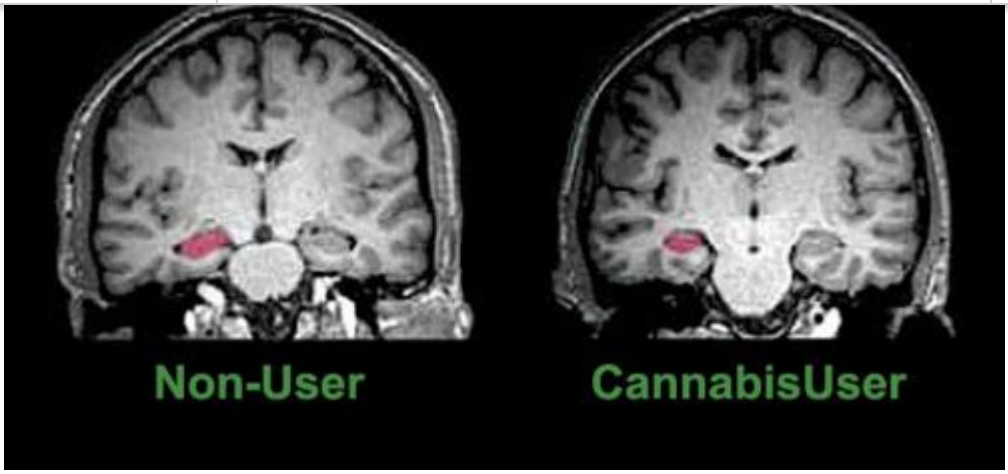


How Does Marijuana Affects The Brain and Body?

Photo source: anonhq.com

Last month I discussed the pros and cons to legalizing marijuana and from a health perspective, people may not realize how it affects our brain and body both short and long-term. Scientists studying the effects of marijuana made several discoveries:

1. The active ingredient in marijuana is delta-9-tetrahydrocannabinol (THC), which is a unique communications system in the brain and body affecting many important functions, including how a person feels, moves, and reacts.
2. Scientist discovered a new system called the endocannabinoid system (ECS) in regards to the mechanism of action and its location.
3. Cannabinoids, a natural chemical produced by the body interacts with receptors within the ECS to regulate important body function.

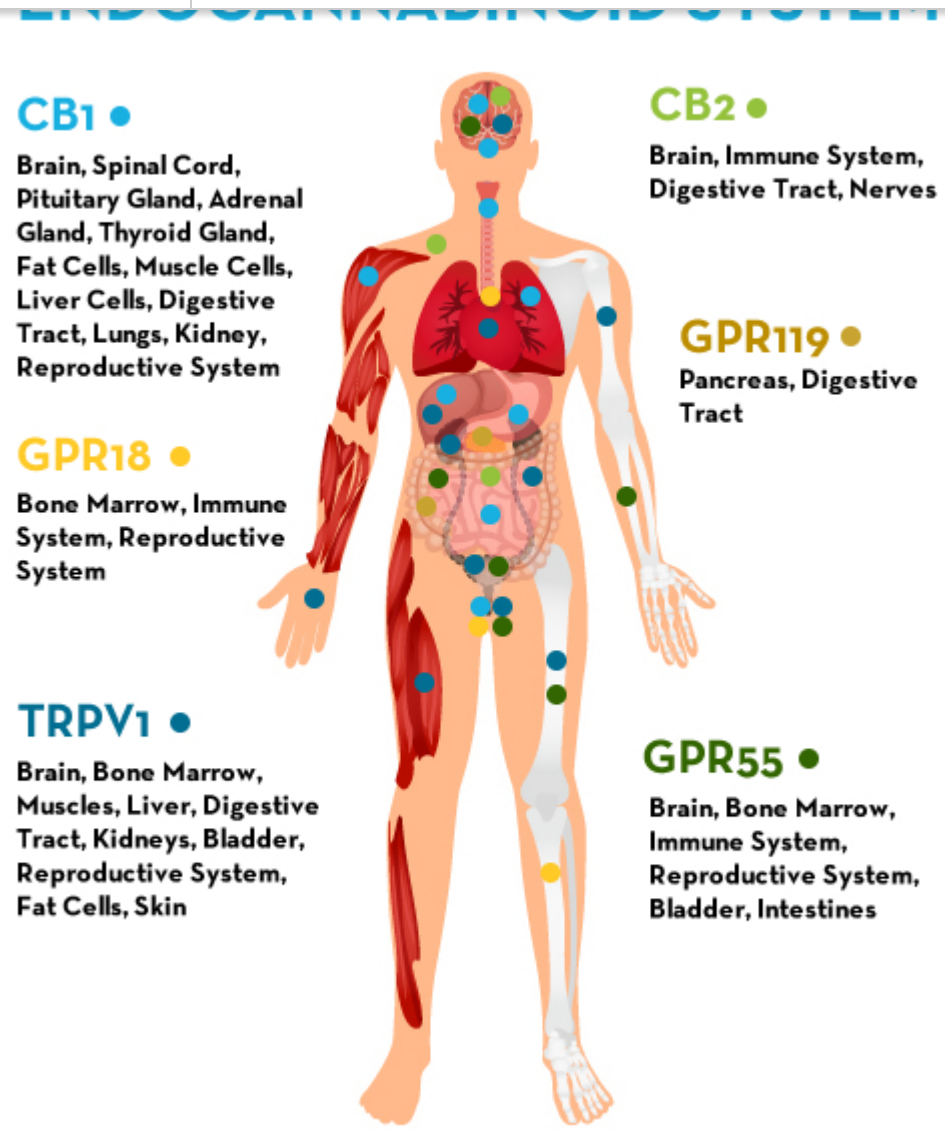


Figure 1: photo source - wainatural.com

The endocannabinoid system is a widespread neuromodulatory system that plays important roles in the central nervous system (CNS) development, synaptic plasticity, and the response to endogenous and environmental insults. The ECS is comprised of cannabinoid receptors (CB1 and the most abundant, CB2, transient receptor potential (TRP) channels, and peroxisome proliferator activated receptors (PPAR's)), endogenous cannabinoids (endocannabinoids), and the enzymes responsible for the synthesis and degradation of the endocannabinoids, see Figure 1 above.

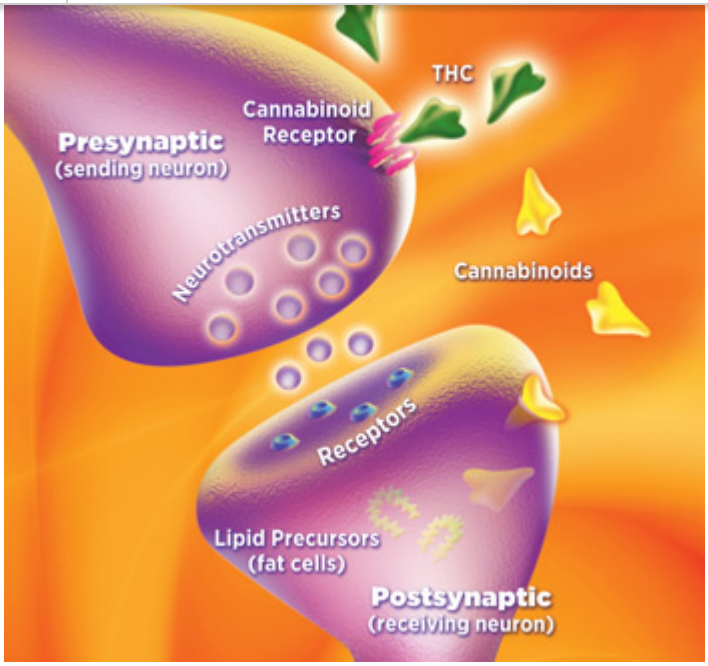


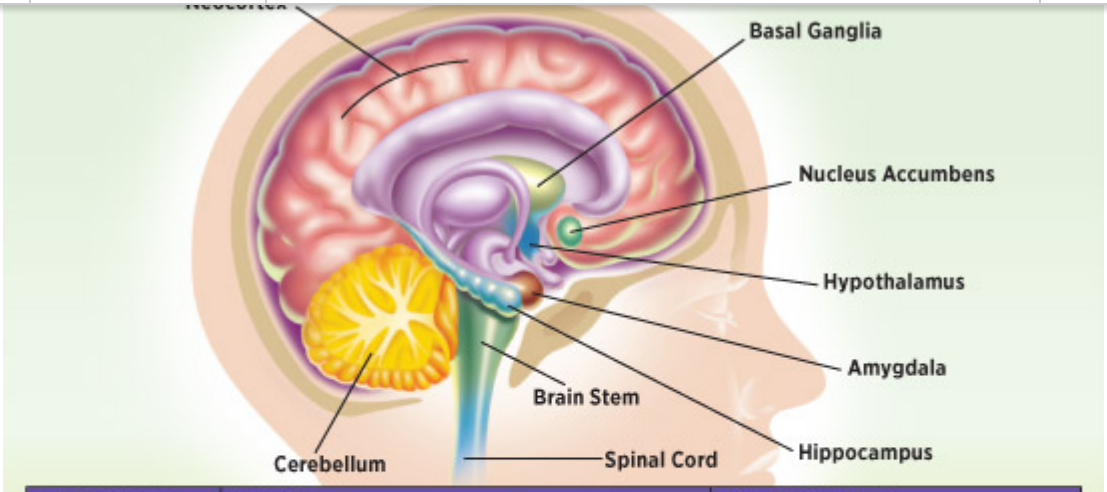
Figure 2: sources - headsup.scholastic.com

Cannabinoids work differently from other neurotransmitters in that they work backwards. A typical message from the brain will trigger chemicals (called neurotransmitters) from a neuron (a presynaptic cell), to be release and it travels across a small gap (the synapse), and then attach to specific receptors located on a nearby neuron (postsynaptic cell). See Figure 2. This series of events allows the message to be passed along.

When the postsynaptic neuron is activated, cannabinoids (chemical messengers of the EC system) are made “on demand” from lipid precursors (fat cells) already present in the neuron. They are released from that cell and travel backward to the presynaptic neuron, where they attach to cannabinoid receptors.

When marijuana is smoked, THC is released they compete for the cannabinoid receptors and prevents the natural chemical cannabinoids from doing its job in fine-tuning communication between neurons, which can throw the entire system off balance.

Since cannabinoid receptors are present in numerous areas of the body and brain, the effects of THC can be wide spread from slowing down a person's reaction time to immediate memory lost that could lead to anxiety and impaired judgment. Most people only hear about THC affecting, the part of the brain called the nucleus accumens that makes people feel good, euphoria or a sense of "high".



Brain Structure	Regulates	THC Effect on User
Amygdala	emotions, fear, anxiety	panic/paranoia
Basal Ganglia	planning/starting a movement	slowed reaction time
Brain Stem	information between brain and spinal column	antinausea effects
Cerebellum	motor coordination, balance	impaired coordination
Hippocampus	learning new information	impaired memory
Hypothalamus	eating, sexual behavior	increased appetite
Neocortex	complex thinking, feeling, and movement	altered thinking, judgment, and sensation
Nucleus Accumbens	motivation and reward	euphoria (feeling good)
Spinal Cord	transmission of information between body and brain	altered pain sensitivity

The brain structures illustrated above all contain high numbers of CB receptors

Figure 3: The affects of THC on the different parts of the brain, source:headsup.scholastic.com

However, the long-term affect could lead to memory lost, addiction (1 in 11 adults who use marijuana become addicted. And the younger someone starts smoking, the higher the risk. One in six people who start in their teens will become addicted) and mental health. See Figure 3 for the affects of THC on the different parts of the brain.

Scientists are investigating the involvement of endocannabinoid system and schizophrenia. This is supported by the epidemiological observation that increased cannabis use is associated with a heightened risk for schizophrenia and that acute consumption of cannabis or synthetic cannabinoids can elicit psychotic symptoms in susceptible individuals.

One disturbing 2010 survey report conducted by the National Institute of Drug Abuse (NIDA), found that in previous years marijuana use among teen were declining but this 2010 survey indicate the use is rising again, particularly among eighth graders.

The reason? Teens don't see marijuana as being harmful. In 2012, Colorado and Washington were the first to legalize recreational marijuana. However, much discussion regarding the legalization of recreational marijuana was years before 2012.

Dr. Susan Weiss, a scientist at the National Institute on Drug Abuse (NIDA) believes that the myth that marijuana is no big deal is nearly everywhere; your phone, computer, TV,

are concerned about this because we know that as teens' perception of risk goes down, their use goes up."

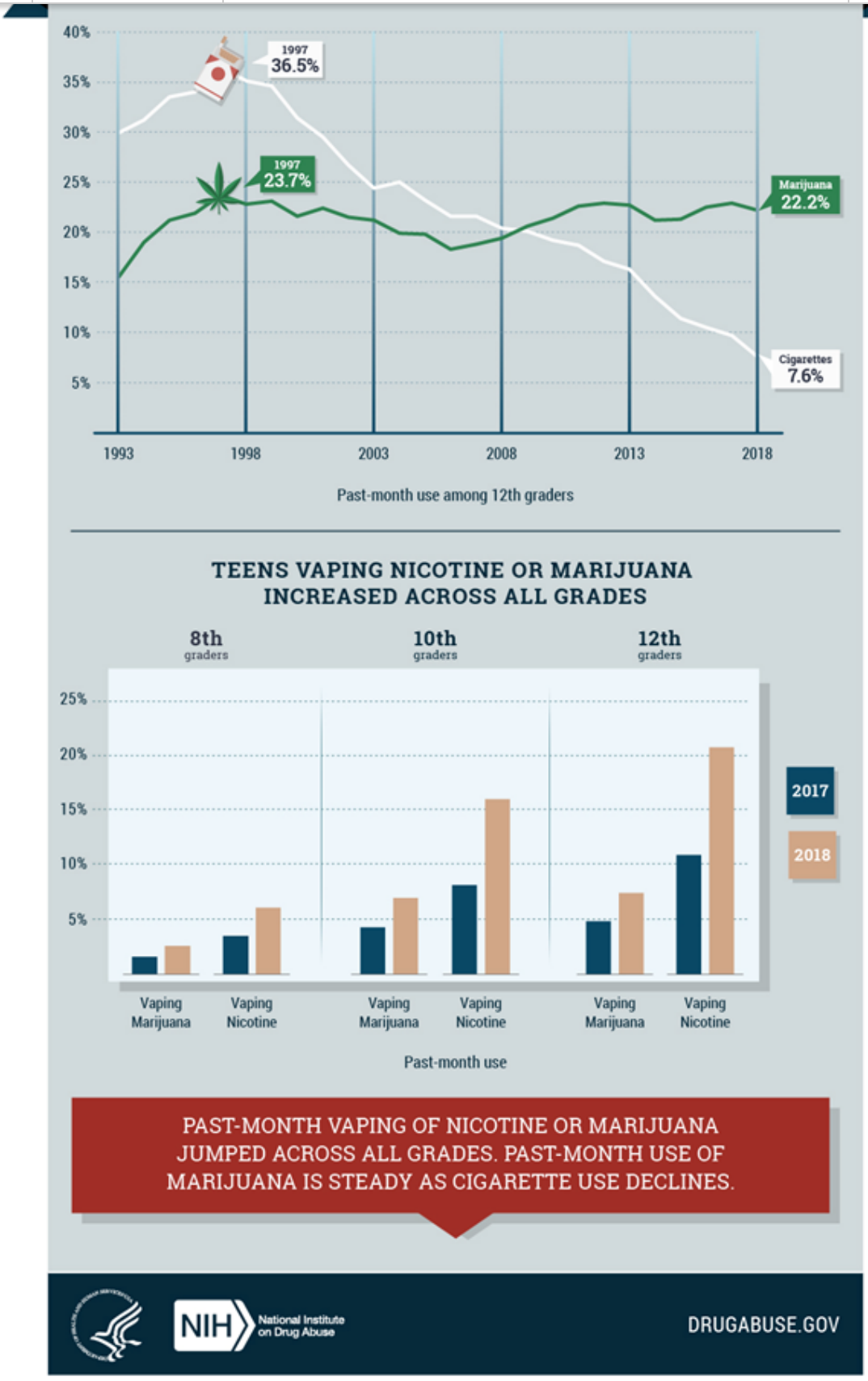


Figure 4: source - National Institute of Drug Abuse

What is even more disturbing is that the use of marijuana is holding steady at 22-23%

theoretically not actually inhaling smoke) nicotine or marijuana have increased across all grades. See Figure 4 above.

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Closing Thoughts

Should we have legalized marijuana? In last month's newsletter, I mentioned "yes" to medical marijuana and "no" to recreational marijuana. The reason, the long-term effect on our health and society. The consequences of marijuana use is worst than cigarette smoking.

While cigarette smoking can leads to addiction and lung cancer, marijuana use leads to addition, impaired or loss of memory that leads to anxiety and panic, impair coordination and decrease reaction time such as driving a car, altered thinking and judgment and sometimes being irrational, increase appetite that could lead to obesity, and altered pain sensitivity that could lead to serious injury or being unaware of early warning signs to a serious illness. Marijuana by all purposes is a drug and should be treated as drug.

The bigger concern is the increase of marijuana among teenagers. One in six people who start in their teens will become addicted. Scientists are also finding that the increase us of cannabis increases the risk of Schizophrenia and psychotic symptoms.

Although a 2011 study found that, "States that legalize medical marijuana see fewer fatal car accidents", it concluded that the cause of fewer fatal car accidents were due to the fact that people may be substituting marijuana smoking for drinking alcohol. This conclusion is

substituted for alcohol. There could have been a number of reasons why in 2011 there were fewer fatal car accidents and one has to define what they mean by fewer. Does fewer mean 2 accidents less or 50 less accidents?

According to the National Institute of Drug Abuse, it is a fact that marijuana impairs coordination and decrease reaction time in driving that could lead to fatal car accidents. It's too soon to say whether we will see more fatal car accidents as the use of marijuana goes up. Only time will tell, but I surmise that we will see more accidents with increase marijuana smoking coupled with people still talking on their cell phones while driving regardless whether it is hands free because they are not paying attention to their driving.

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Should you have any questions or need of assistance with your business due diligence, determining your product's value proposition, target product profile and economic value of your product for reimbursement, feel free to contact me at 781-935-1462 or regina@biomarketinginsight.com.
