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Feb. 9, 2022

I am a trained physiologist, and have been teaching Human Anatomy and Physiology at the university level since 1999 and studying the medical uses and health impact of marijuana, or Cannabis, since 2015. I have published several peer reviewed research papers on this topic. The evidence shows that Cannabis is effective medicine for certain medical conditions. It's efficacy as medicine is best established for chronic pain, for which it works better, is safer, and is cheaper than other treatment options.

Chronic pain is one of the leading causes of disability worldwide, and is difficult to treat effectively. It is physiologically different than acute pain, the type that occurs in the days following an injury or surgery, and therefore requires a different approach. Drugs commonly used to treat pain include opiates such as morphine and fentanyl, and acetaminophen. Opiates are effective for short term pain. However, they do not work well for chronic pain, and using them over long periods of time can lead to addiction. There is a significant risk of fatal overdose with use of opiates, especially when mixed with alcohol or anti-anxiety drugs. Similarly, accidental overdoses of acetaminophen cause many cases of liver disease or failure. Compared with these medications, Cannabis works better and has milder side effects, and there is no risk of fatal overdose or organ failure with Cannabis.

Multiple peer-reviewed studies have shown that, when patients initiate medical marijuana, they are able to reduce the use of other medications, including opiates. For example, Lucas and coauthors from the University of British Columbia published an article "*Substituting cannabis for prescription drugs, alcohol and other substances among medical cannabis patients: the impact of contextual factors*", Drug and Alcohol Review (2015). In this article, they showed that patients supplied with medical marijuana experienced a 51% decrease in alcohol use, a 33% decrease in use of illicit drugs, and an 80% decrease in use of prescription drugs, especially painkillers. It thus reduced the use of other, more harmful substances.

Similarly, Bradford and Bradford, of the University of Georgia, published a study in the journal Health Affairs. "*Medical marijuana laws reduce prescription medication use in Medicare Part D*. (2016). Health Affairs, 35, 7, 1230 – 1236. In this study, they found that states legalizing medical marijuana reduced Medicare part D spending by \$165 million per year due to reduced prescriptions for a range of medications. The greatest impact was on pain medications. Compared with states without access to medical marijuana, legal access to marijuana was associated with 1,826 fewer daily doses of pain medications filled annually, per physician.

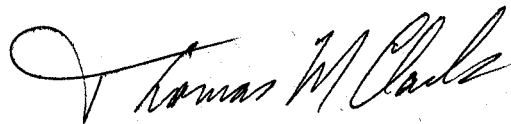
Another article from 2016, from researchers at the University of Michigan, showed a steep drop in the use of a variety of medications following access to medical marijuana. Prescriptions for opioids decreased by 64%, and prescriptions for NSAIDS, another class of pain medications, decreased by 67%. Patients reported using fewer medications and experiencing fewer side effects, and many patients reported improved quality of life. Boehnke et al. (2016), *Medical cannabis use is associated with decreased opiate medication use in a*

retrospective cross-sectional survey of patients with chronic pain. The Journal of Pain, vol 17 (6), pages 739 – 744.

Similar results were obtained in another study, performed in Jerusalem. In this study, 44% of chronic pain patients provided access to medical marijuana stopped use of opiates entirely, those continuing to use opiates decrease the dosage needed for effective pain reduction, and patients reported improved social functioning and quality of life upon access to medical marijuana. Haroutounian et al., 2016. *The effect of medicinal cannabis on pain and quality-of-life outcomes in chronic pain. A prospective open-label study*. The Clinical Journal of Pain, vol. 32 (12), pages 1036 – 1043.

These studies represent a small fraction of the studies showing the efficacy of marijuana for treatment of chronic pain. Nevertheless, they show that patients using medical marijuana are able to reduce the use of more dangerous drugs, reducing their risk of becoming addicted to drugs with strong fatal overdose potential. At the same time, because medical marijuana is more effective for chronic pain than opiates, they often experience improved quality of life. It is worth noting that the United States is currently in the midst of an epidemic of opioid overdoses. Reducing opioid use through use of medical marijuana contributes to efforts to reduce opioid overdoses.

Sincerely, Thomas Clark,

A handwritten signature in black ink that reads "Thomas M. Clark". The signature is written in a cursive style with a large initial 'T'.

Professor
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