

Medical Marijuana Science and Studies

Following are excerpts from numerous studies showing the medical efficacy of marijuana and its active components, known as cannabinoids, for a wide array of medical conditions, including cancer, HIV, multiple sclerosis, and glaucoma. Also included are scientific findings refuting some long-held beliefs about potential health hazards posed by marijuana use, most notably in relation to cancer and neurotoxicity. This is merely a representative sample of the large body of scientific evidence on the subject; it is not a comprehensive list.

Due to government interference and restrictions placed on the use of the actual marijuana plant for scientific studies in the U.S., a large number of these studies were able to examine only the medical efficacy of component compounds extracted from marijuana or, in some instances, synthetic versions of those compounds. Additional clinical trials, which would require the lifting of governmental roadblocks, are especially desirable in view of the current availability of vaporizers, which allow use of whole marijuana without the potential dangers of smoking.

- ◆ **“[M]arijuana has now been shown to have strong antioxidative and neuroprotective effects, which may prolong neuronal cell survival. From a pharmacological perspective, marijuana is safe with minimal possibility of overdose. In states where it is legal to do so, marijuana should be considered in the pharmacological management of ALS.” The article also noted: “[Cannabinoids] will vaporize at a temperature much lower than actual combustion. Heated air can be drawn through marijuana and the active compounds will vaporize, which can then be inhaled ... Theoretically, this removes most of the health hazards of smoking.”**

— Carter, Gregory T. Rosen, Bill S., “Marijuana in the Management of Amyotrophic Lateral Sclerosis,” *American Journal of Hospice and Palliative Care*, July/August 2001

- ◆ **“[THC] inhibited tumour-cell proliferation in vitro and decreased tumour-cell Ki67 immunostaining”; “THC does not facilitate tumor growth nor decreases patient survival”**

— Guzman M., et al., “A Pilot Clinical Study of Delta-9-tetrahydrocannabinol in Patients With Recurrent Glioblastoma Multiforme,” *British Journal of Cancer*, July 2006

- ◆ **Post-operative nausea and vomiting (PONV) is a “significant problem in breast surgical patients. Preoperative treatment with dronabinol [oral THC] and prochlorperazine significantly reduced the number and severity of episodes of PONV.” The rate of nausea decreased from 59 percent to 15 percent and the rate of vomiting from 29 percent to 3 percent compared to non-treated patients.**

— Layeeque R., et al., “Prevention of Nausea and Vomiting Following Breast Surgery,” *American Journal of Surgery*, June 2006

- ◆ **“Exposure of leukemia cells to cannabidiol led to CB2-mediated reduction in cell viability and induction in apoptosis ... [and] a significant decrease in tumor burden and an increase in apoptotic tumors in vivo.”**

— McKallip, Robert J., et al., “Cannabidiol-Induced Apoptosis in Human Leukemia Cells: A Novel Role of Cannabidiol in the Regulation of p22^{phox} and Nox4 Expression,” *Molecular Pharmacology*, June 5, 2006

- ♦ **“A strong and statistically significant anti-tumor effect was observed ... In particular, for a highly malignant human breast carcinoma cell line ... cannabidiol and a cannabidiol-rich extract counteract cell growth both in vivo and in vitro as well as tumor metastasis in vivo.”**
 - Ligresti, Alessia et al., “Anti-Tumor Activity of Plant Cannabinoids with Emphasis on the Effect of Cannabidiol on Human Breast Carcinoma,” *Journal of Pharmacology And Experimental Therapeutics*, May 25, 2006

- ♦ **“[N]o pattern consistent with evidence of cerebral atrophy or loss of white matter integrity was detected. It is concluded that frequent cannabis use is unlikely to be neurotoxic to the normal developing adolescent brain.”**
 - DeLisi, Lynn E., et al., “A Preliminary DTI Study Showing No Brain Structural Change Associated With Adolescent Cannabis Use,” *Harm Reduction Journal*, May 9, 2006

- ♦ **“We did not observe a positive association of [Marijuana] use — even heavy long-term use — with lung ca[n]cer], controlling for tob[acco] smoking and other potential confounders.” Even lifetime use totaling 20,000 cannabis cigarettes did not result in an increase in risk of lung cancer.**
 - Tashkin, D.P., et al., “Marijuana Use and Lung Cancer: Results of a Case-Control Study,” *Presentation at the 2005 Meeting of the International Cannabinoid Research Society Conference*, 2005

- ♦ **“[R]ecent randomised controlled clinical trials have pointed to potential therapeutic benefits of cannabinoids for patients with MS and chronic neuropathic pain. This suggests that patients’ reports of the effectiveness of cannabis ... could serve as a valid indicator of target diseases and symptoms for cannabinoid drug development.”**
 - Ware, M.A., et al., “The Medicinal Use of Cannabis in the UK: Results of a Nationwide Survey,” *International Journal of Clinical Practice*, March 2005

- ♦ **“Our results indicate that cannabinoid receptors are important in the pathology of [Alzheimer’s Disease] and that cannabinoids succeed in preventing the neurodegenerative process occurring in the disease.”**
 - Ramierz, Belen, et al., “Prevention of Alzheimer’s Disease Pathology by Cannabinoids: Neuroprotection Mediated by Blockade of Microglial Activation,” *The Journal of Neuroscience*, February 25, 2005

- ♦ **“These data suggest that medicinal use of marijuana may facilitate, rather than impede, [antiretroviral therapy] adherence for patients with nausea. ... Adherence to medications is a challenge to any chronically ill patient and is critically important to HIV-infected individuals ...”**
 - DeJong, Bourke, “Marijuana Use and Its Association With Adherence to Antiretroviral Therapy Among HIV-Infected Persons With Moderate to Severe Nausea,” *Journal of Acquired Immune Deficiency Syndromes*, 2005

- ♦ **“The results indicate that cannabis may be moderately effective at reducing symptoms of appetite loss, depression, pain, spasticity, and drooling.”**
 - Amtmann, Dagmar, et al., “Survey of Cannabis Use in Patients With Amyotrophic Lateral Sclerosis,” *American Journal of Hospice & Palliative Medicine*, March-April 2004

- ♦ **“There is significant evidence that cannabinoids may be involved in the modulation of pain, especially of neuropathic origin. Preliminary results from a small, uncontrolled trial of smoked marijuana in HIV peripheral neuropathy are encouraging.”**
 - Abrams, Donald, et al., “The Effects of Smoked Cannabis in Painful Peripheral Neuropathy and Cancer Pain Refractory to Uploads,” IACM 2nd Conference on Cannabinoids in Medicine, Cologne, September 2003

- ♦ **“The clinical potential of the cannabinoids is large; some people suggest that cannabis could be ‘the aspirin of the 21st century’ ... Cannabinoids inhibit pain in virtually every experimental pain paradigm.”**
 - David Baker, et al., “The Therapeutic Potential of Cannabis,” *The Lancet Neurology*, May 2003

- ♦ **“There is rapidly emerging evidence that the cannabinoid receptor system has the potential to reduce both excitotoxic and oxidative cell damage ... [delta-9-THC] delays progression of disease and increases survival time ... even when administered after onset of signs.” *The authors found that delta-9-THC is both anti-excitotoxic and antioxidant in vitro.***
 - Raman, Chandrasekaran, et al., “Amyotrophic Lateral Sclerosis: Delayed Disease Progression in Mice by Treatment with a Cannabinoid,” *Amyotrophic Lateral Sclerosis and Other Motor Neuron Disorders*, March 2004

- ♦ **“Remarkably, cannabinoids kill glioma cells selectively and can protect non-transformed glial cells from death ... Cannabinoids have a favorable drug safety profile.”**
 - Vasco, Guillermo, et al., “Hypothesis: Cannabinoid Therapy for The Treatment of Gliomas?” *NeuroPharmacology*, January 2004

- ♦ **“Cannabinoids exert palliative effects in patients with cancer and inhibit tumor growth in laboratory animals ... Cannabinoids are selective anti-tumor compounds, as they can kill tumor cells without affecting their non-transformed counterparts.”**
 - Guzman, Manuel, “Cannabinoids: Potential Anticancer Agents,” *Nature Reviews*, October 2003

- ♦ **“Our short-duration clinical trial suggests acceptable safety in a vulnerable immune-compromised patient population.”**
 - Abrams, Donald, et al., “Short-Term Effects of Cannabinoids on Patients With HIV-1 Infection: A Randomized, Placebo-Controlled Clinical Trial,” *Annals of Internal Medicine*, August 19, 2003

- ♦ **“Cannabinoids are now known to have the capacity for neuromodulation, via direct, receptor-based mechanisms at numerous levels within the nervous system. These have therapeutic properties that may be applicable to the treatment of neurological disorders ... This class of compounds not only holds tremendous therapeutic potential for neurological disease, but it is also confirmed as having remarkably low toxicity.”**
 - Carter, Gregory, et al., “Overview: Cannabis: Old Medicine With New Promise for Neurological Disorders,” *Current Opinion in Investigational Drugs*, March 2002

- ◆ **“Patients who smoked marijuana experienced 70-100% relief from nausea and vomiting, while those who used the THC capsule experienced 76-88% relief.”**

— “Effects of Smoked Cannabis and Oral Δ 9-Tetrahydrocannabinol on Nausea and Emesis After Cancer Chemotherapy: A Review of State Clinical Trials,” *Journal of Cannabis Therapeutics*, 2002

- ◆ **“Cannabis smoking, even of a crude, low-grade product, provides effective symptomatic relief of pain, muscle spasms, and intraocular pressure elevations in selected patients failing other modes of treatment. These clinical cannabis patients are able to reduce or eliminate other prescription medicines and their accompanying side effects; Clinical cannabis provides an improved quality of life in these patients.”**

— Russo, Ethan, et al., “Chronic Cannabis Use in the Compassionate Investigational New Drug Program: An Examination of Benefits and Adverse Effects of Legal Clinical Cannabis,” *Journal of Cannabis Therapeutics*, 2002

- ◆ **“For patients such as those with AIDS or who are undergoing chemotherapy and who suffer simultaneously from severe pain, nausea, and appetite loss, cannabinoid drugs might offer broad-spectrum relief not found in any other single medication. ... In conclusion, the available evidence from animal and human studies indicates that cannabinoids can have a substantial analgesic effect.”**

— Institute of Medicine, Division of Neuroscience and Behavioral Health,
Marijuana and Medicine: Assessing the Science Base, 1999

- ◆ **“[W]e concluded that there are some limited circumstances in which we recommend smoking marijuana for medical uses.”**

— Principle Investigator John Benson, National Institute of Medicine news conference for release of study
Marijuana and Medicine: Assessing the Science Base, March 1999

- ◆ **[D]elta-8-THC was effective in preventing nausea and vomiting in eight children, aged three to fifteen, who suffered from hematologic cancers. Throughout up to eight months of treatment with a variety of chemotherapeutic drugs, delta-8-THC was totally effective and had negligible side effects.**

— Abrahamov, A. and Mechoulam, R., “An Efficient New Cannabinoid Antiemetic in Pediatric Oncology,”
Life Sciences, May 5, 1995

- ◆ **“Conclusion: THC is an effective appetite stimulant in patients with advanced cancer. It is well tolerated at low doses.”**

— Nelson, K., et al., “A Phase II Study of Delta-9-Tetrahydrocannabinol for Appetite Stimulation in Cancer-Associated Anorexia,” *Journal of Palliative Care*, Spring 1994

- ◆ **“Fifty-six patients who had no improvement with standard antiemetic agents were treated and 78% demonstrated a positive response to marijuana ... inhalation marijuana is an effective therapy for the treatment of nausea and vomiting due to cancer chemotherapy.”**

— Vinciguerra, Vincent, et al., “Inhalation Marijuana as an Antiemetic for Cancer Chemotherapy,”
New York State Journal of Medicine, October 1988

- ◆ **“The anticonvulsant nature of cannabidiol suggests that it has a therapeutic potential in at least three of the four major types of epilepsy: grand mal, cortical focal, and complex partial seizures.”**

— Karler, R. and Turkanis, S.A., “The Cannabinoids as Potential Antiepileptics,”
The Journal of Clinical Pharmacology, August 1981

- ◆ **“For the group, 10 mg THC significantly reduced spasticity by clinical measurement.” “THC was administered to eight other patients with spasticity and other CNS lesions. Responses varied, but benefit was seen in three of three patients with ‘tonic spasms.’”**

— Petro, D., et al., “Treatment of Human Spasticity With Delta-9-Tetrahydrocannabinol,”
The Journal of Clinical Pharmacology, 1981

- ◆ **“We conclude that THC is an effective antiemetic in many patients who receive chemotherapy for cancer and for whom other antiemetics are ineffective.”**

— Sallan, S.E., et al., “Antiemetics in Patients Receiving Chemotherapy for Cancer,”
New England Journal of Medicine, 1980

- ◆ **“Oral tetrahydrocannabinol has antiemetic properties and is significantly better than a placebo in reducing vomiting caused by chemotherapeutic agents.”**

— Sallan, S.E., et al., “Antiemetic Effect of Delta-9-Tetrahydrocannabinol in Patients Receiving Cancer Chemotherapy,” *New England Journal Medicine*, 1975