Marijuana and Cancer

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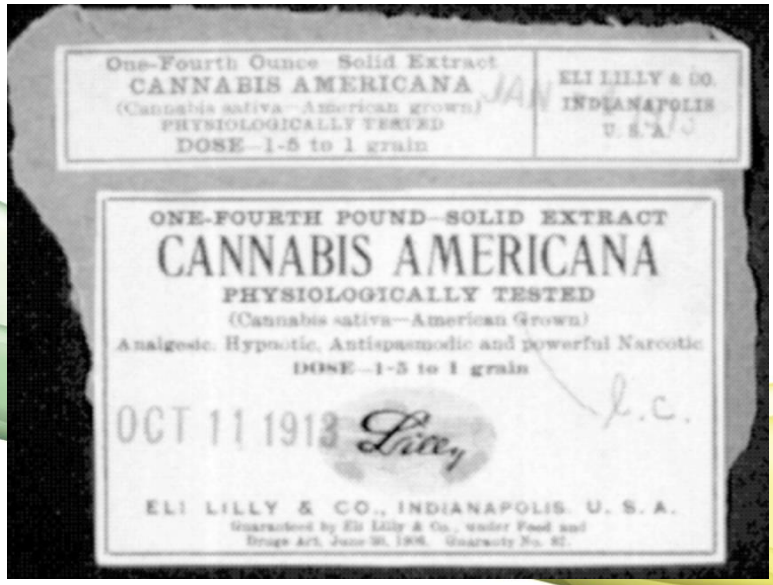

WINDSOR REGIONAL HOSPITAL

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Chemical Makeup

- 60 pharmacologically active compounds ("cannabinoids")
- THC (tetrahydrocannabinol)
  - Gives the high
  - Treats pain & nausea / anti-oxidant / reduce inflammation
- Cannabidiol (non-psychoactive cannabidol)
  - Treats seizures, paranoia, anxiety
  - Blocks the THC "high" features

The "High" Compound

How it is Taken is Important

- When **taken by mouth**, such as in baked goods, the THC is absorbed poorly and can take hours to be absorbed. Once it's absorbed, it's processed by the liver, which produces a second psychoactive compound (a substance that acts on the brain and changes mood or consciousness) that affects the brain differently than THC.
- When marijuana is **smoked or vaporized (inhaled)**, THC enters the bloodstream and goes to the brain quickly. The second psychoactive compound is produced in small amounts, and so has less effect. The effects of inhaled marijuana fade faster than marijuana taken by mouth.

Can Marijuana Treat Cancer?

British Journal of Pharmacology (2006) 148, 123–135

www.nature.com/bjp

MINI REVIEW

Cannabinoids and cancer: pros and cons of an antitumour strategy

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In a Petri Dish cannabanoids can treat and cause cancer

Table 2 Potential use of cannabinoids in cancer treatment: pro and cons evidence

Tumour (cell type)	*Cannabinoid (concentration or dose)*	*Anticancer effect*	*Procancer effect*	*Mechanism of action*	*References*
Bronchial epithelium	THC		+	Molecular abnormalities and histopatological alterations	Barsky *et al.* (1998)
Murine hepatoma cell line (Hepa)	THC (2–10 μg/ml)		+	Induction of CYP1A1	Roth *et al.* (2001)
Lung cancer cell line (A549)	THC		+	Inhibition of Fas-induced caspase-3 activity	Sarafian *et al.* (2001)
Endothelial cell line	THC (1.77 or 3.95%)		+	Increased ROS generation	Sarafian *et al.* (1999)
Murine Lewis lung carcinoma (3LL); alveolar cell carcinoma (L1C2)	THC (5–40 mg/kg)		+	*In vivo*, decreased production of cytokines and/or CB2-mediated immune suppression	Zhu *et al.* (2000)
	CBD (⩾5 μg/ml)		+		Srivastava *et al.* (1998)
Human breast cancer cell lines (MCF7; EFM-19)	AEA (2–10 μM) 2-AG (2–10 μM) HU210 (⩾4 μM)	+		Inhibition of the mitogen-induced stimulation of the G0/G1–S phase	De Petrocellis *et al.* (1998)
	AEA (⩾2 μM) 2-AG, HU210 (⩾1 μM)	+			Melck *et al.* (2000)
Human breast cancer cell lines (MCF7; MDA-MB-231) Mouse mammary carcinoma (4T1)	THC (⩽5 μM)		+	Increased tumour growth and metastasis; *in vivo*, decreased antitumour immune response	McKallip *et al.* (2005)
Androgen-independent prostate cancer cells (PC3, DU145)	AEA, *R*-(+)-MET (⩾2 μM)	+		Inhibition of mitogen-induced proliferation, G1 arrest	Mimeault *et al.* (2003) Melck *et al.* (2000)
	THC (1 μM)	+		Apoptosis	Ruiz *et al.* (1999)
Androgen-dependent prostate cancer cells (LNCaP)	AEA, *R*-(+)-MET (⩾2 μM)	+		Inhibition of mitogen-induced proliferation, G1 arrest	Mimeault *et al.* (2003)
Androgen-dependent prostate cancer cells (LNCaP)	WIN-55,212-2 (⩾2.5 μM)	+		Dose- and time-dependent induction of apoptosis; decreased expression of AR and PSA	Sarfaraz *et al.* (2005)
Androgen-dependent prostate cancer cells (LNCaP)	*R*-(+)-MET (0.1–0.2 μM)		+	Increased proliferation and AR expression	Sanchez *et al.* (2003)
Rat glioma cell line (C6)	THC (1 μM)	+		Apoptosis *via* ceramide *de novo* synthesis *In vivo*, regression of C6-derived glioma	Galve-Roperh *et al.* (2000)
	JWH133, WIN-55,212-2 (0.1 μM)	+		Apoptosis *via* ceramide *de novo* synthesis	Sanchez *et al.* (2001a, b)
	WIN-55,212-2 (15 μM)	+		Apoptosis *via* activation of caspase cascade	Ellert-Miklaszewska *et al.* (2005)

Animal Models

- In animal models, cannabinoids exert a direct antiproliferative effect on tumours, but they could indirectly enhance tumour growth *via* inhibition of immunogenicity (for immunosuppressive effect of cannabinoids, see **Klein, 2005**).

Association Between Marijuana and Lung Cancer

- 19 studies were found
- Studies that examined lung cancer risk factors or pre-cancerous changes in the lung found an association of marijuana smoking and increased tar exposure, as well as other microscopic evidence of pre-cancerous lesions
- Observational studies failed to demonstrate an increased risk of lung cancer (some problems with these studies include small sample size, young participants)

REVIEW ARTICLE

The Association Between Marijuana Smoking and Lung Cancer

A Systematic Review

Reena Mehra, MD, MS; Brent A. Moore, PhD; Kristina Crothers, MD; Jeanette Tetrault, MD; David A. Fiellin, MD

Does Marijuana Cause Cancer?

- No increased risk for lung cancer, but patients smoked more tobacco than marijuana
- Increased risk for testicular cancer 1.09–2.23 for higher frequency and 1.50 (95% CI, 1.08–2.09) for ≥10 years]
- Other cancers studies did not show increased risk

An Epidemiologic Review of Marijuana a

marijuana use and cancer are warranted. *Cancer Epidemiol Biomarkers Prev; 24(1); 15–31. ©2015 AACR.*

Yu-Hui Jenny Huang, Zuo-Feng Zhang, Donald P. Tashkin, Bingjian Feng, Kurt Straif, and Mia Hashibe

DOI: 10.1158/1055-9965.EPI-14-1026 Published January 2015

Cancer Causes & Control
September 1997, Volume 8, Issue 5, pp 722–728

Marijuana use and cancer incidence (California, United States)

- Among nonsmokers of tobacco cigarettes, ever having used marijuana was associated with increased risk of prostate cancer (RR = 3.1, CI =1.0-9.5) and nearly significantly increased risk of cervical cancer (RR =1.4, CI = 1.0-2.1)
  - In Head and Neck cancers:
    - 3 studies found increased risk of cancer

Cancer

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Article

Maternal drug use and risk of childhood nonlymphoblastic leukemia among offspring. An epidemiologic investigation implicating marijuana (a report from the childrens cancer study group)

Leslie L. Robison PHD, Jonathan D. Buckley MBBS, PHD, Anne E. Daigle PHD, Robert Wells MD, Denis Benjamin BSc, MB, BCH, Diane C. Arthur MD, G. Denman Hammond MD

First published: 15 May 1989 Full publication history

Moms that smoked marijuana had a 11x higher chance of having a child with acute leukemia

The Childrens Cancer Study Group conducted a case-control study designed to assess*in utero* and postnatal exposures in children with acute nonlymphoblastic leukemia (ANLL). Analyses were performed for reported maternal use of medications and drugs in the year preceding and during the index pregnancy of the 204 case-control pairs. An 11-fold risk ($P = 0.003$) was found for maternal use of mind-altering drugs just prior to or during the index pregnancy. Compared with ANLL cases not exposed to marijuana, exposed cases were significantly younger at diagnosis of ANLL ($P < 0.01$) and were more often of the myelo-monocytic and raonocytk subtypes ($P < 0.01$). Use of antinausea medication for more than 11 weeks was also associated with a significantly elevated relative risk of 2.81 and a dose-response relationship was noted ($P = 0.05$ for trend). These results suggest that maternal drug use of marijuana may have an etiologic role in childhood ANLL and may be specific for morphologically defined subgroups.

Comparison of Orally Administered Cannabis Extract and Delta-9-Tetrahydrocannabinol in Treating Patients With Cancer-Related Anorexia-Cachexia Syndrome: A Multicenter, Phase III, Randomized, Double-Blind, Placebo-Controlled Clinical Trial From the Cannabis-In-Cachexia-Study-Group

VOLUME 24 · NUMBER 21 · JULY 20 2006

JOURNAL OF CLINICAL ONCOLOGY

ORIGINAL REPORT

Marijuana and Weight Loss in Cancer Patients

- 289 patients with > 5% body weight loss in 6 months
- Randomized to either cannabis extract, THC or placebo
- Monitored appetite, mood, nausea
- Results: No difference between the three arms for appetite, Quality of Life or toxicity

Did not stimulate appetite in advanced cancer patients

How can marijuana affect symptoms of cancer?

A number of small studies of smoked marijuana found that it can be helpful in treating nausea and vomiting from cancer chemotherapy.

A few studies have found that inhaled (smoked or vaporized) marijuana can be helpful treatment of neuropathic pain (pain caused by damaged nerves).

Smoked marijuana has also helped improve food intake in HIV patients in studies.

There are no studies in people of the effects of marijuana oil or hemp oil.

May help nausea and vomiting from chemotherapy; and may help neuropathic pain.

American Cancer Society

Summary

- Cannabanoids do not help end stage cancer patients to gain weight
- They may help with chemo-induced nausea and vomiting
- Cannabanoids may have both an anti-cancer and a pro-cancer effect
- We need more research before we can conclude either of those statements.
- We strongly recommend that you do not use marijuana products instead of standard therapies for your cancer