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Cannabinoids: potential anticancer agents.

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Abstract

Cannabinoids - the active components of Cannabis sativa and their derivatives - exert palliative effects in cancer patients by preventing nausea, vomiting and pain and by stimulating appetite. In addition, these compounds have been shown to inhibit the growth of tumour cells in culture and animal models by modulating key cell-signalling pathways. Cannabinoids are usually well tolerated, and do not produce the generalized toxic effects of conventional chemotherapies. So, could cannabinoids be used to develop new anticancer therapies?

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Nature Reviews Cancer 3, 745-755 (October 2003) | :10.1038/nrc1188

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Cannabinoids: potential anticancer agents

Manuel Guzmán

Abstract

Cannabinoids — the active components of *Cannabis sativa* and their derivatives — exert palliative effects in cancer patients by preventing nausea, vomiting and pain and by stimulating appetite. In addition, these compounds have been shown to inhibit the growth of tumour cells in culture and animal models by modulating key cell-signalling pathways. Cannabinoids are usually well tolerated, and do not produce the generalized toxic effects of conventional chemotherapies. So, could cannabinoids be used to develop new anticancer therapies?

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"Ceramide: a new second messenger of cannabinoid action." [Trends in pharmacological sciences](#) 22, No. 1 2001, pp. 19-22.

[Guzmán, M](#); [Galve-Roperh, I](#) ; [Sánchez, C](#)

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Cannabinoids, the active components of Cannabis sativa (marijuana), and their endogenous... that the CB(1) cannabinoid receptor is coupled to the generation of the lipid second messenger ceramide... mediates cannabinoid-induced apoptosis, as shown by in vitro and in vivo studies. These findings

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[Guzmán, Manuel](#); Sánchez, Cristina; [Galve-Roperh, Ismael](#)

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of cannabinoids usually induce growth arrest or apoptosis. The potential therapeutic applications...Cannabinoids recently have been shown to control the cell survival/death decision. Thus, cannabinoids induce growth arrest or apoptosis in a number of transformed neural and non-neural cells

"A new age for MAGL." [Chemistry & biology](#) 17, No. 1 2010, pp. 4-6.

[Guzmán, Manuel](#)

"Is there an astrocyte-neuron ketone body shuttle?" [Trends in Endocrinology and Metabolism](#) 12, No. 4 2001, pp. 169-173.

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Cancer Chemotherapy

URL of this page: <http://www.nlm.nih.gov/medlineplus/cancerchemotherapy.html>

Normally, your cells grow and die in a controlled way. Cancer cells keep forming without control. Chemotherapy is drug therapy that can stop these cells from multiplying. However, it can also harm healthy cells, which causes side effects.

During chemotherapy you may have no side effects or just a few. The kinds of side effects you have depend on the type and dose of chemotherapy you get. Side effects vary, but common ones are nausea, vomiting, tiredness, pain and hair loss. Healthy cells usually recover after chemotherapy, so most side effects gradually go away.

Your course of therapy will depend on the cancer type, the chemotherapy drugs used, the treatment goal and how your body responds. You may get treatment every day, every week or every month. You may have breaks between treatments so that your body has a chance to build new healthy cells. You might take the drugs by mouth, in a shot or intravenously.

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Cancer

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Also called: [Carcinoma](#), [Malignancy](#), [Neoplasms](#), [Tumor](#)

Cancer begins in your cells, which are the building blocks of your body. Normally, your body forms new cells as you need them, replacing old cells that die. Sometimes this process goes wrong. New cells grow even when you don't need them, and old cells don't die when they should. These extra cells can form a mass called a tumor. Tumors can be benign or malignant. **Benign tumors** aren't cancer while malignant ones are. Cells from malignant tumors can invade nearby tissues. They can also break away and spread to other parts of the body.

Most cancers are named for where they start. For example, lung cancer starts in the lung, and breast cancer starts in the breast. The spread of cancer from one part of the body to another is called metastasis. Symptoms and treatment depend on the cancer type and how advanced it is. Treatment plans may include surgery, [radiation](#) and/or [chemotherapy](#).

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- [Cancer Prevention Overview \(PDQ\)](#) [NIH](#) (National Cancer Institute)
- [Cancer Prevention: 7 Tips to Reduce Your Risk](#) (Mayo Foundation for Medical Education and Research)
- [Cancer Screening Overview \(PDQ\)](#) [NIH](#) (National Cancer Institute)
- [Cancer Vaccines](#) [NIH](#) (National Cancer Institute)
- Also available in [Spanish](#)
- [Cancer: Early Detection](#) (American Academy of Family Physicians)
- Also available in [Spanish](#)
- [Eliminate Disparities in Cancer Screening & Management](#) (Centers for Disease Control and Prevention)
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- **Alternative Therapy**

- [MedlinePlus: Cancer Alternative Therapies](#) **NIH** (National Library of Medicine)
- Also available in [Spanish](#)
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- **Disease Management**

- [MedlinePlus: Cancer--Living with Cancer](#) **NIH** (National Library of Medicine)
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- **Specific Conditions**

- [Cancer of Unknown Primary Origin](#) **NIH** (National Cancer Institute)
- [Metastatic Cancer: Questions and Answers](#) **NIH** (National Cancer Institute)
- Also available in [Spanish](#)
- [Occupational Cancer](#) (National Institute for Occupational Safety and Health)
- [Second Cancers Caused by Cancer Treatment](#) (American Cancer Society)
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- **Related Issues**

- [Cancer and Fitness](#)  (HealthDay)
- [Cancer Causes: Popular Myths about the Causes of Cancer](#) (Mayo Foundation for Medical Education and Research)
- [Cancer Clusters](#) **NIH** (National Cancer Institute)
- [Cancer Information Service](#) **NIH** (National Cancer Institute)
- [Cancer Risk: Understanding the Puzzle](#) **NIH** (National Cancer Institute)
- [Cancer Risk: What the Numbers Mean](#) (Mayo Foundation for Medical Education and Research)
- [Cancer Survival Rate: What It Means for Your Prognosis](#) (Mayo Foundation for Medical Education and Research)
- [Chemicals in Meat Cooked at High Temperatures and Cancer Risk](#) **NIH** (National Cancer Institute)
- [How to Find a Doctor or Treatment Facility If You Have Cancer](#) **NIH** (National Cancer Institute)
- Also available in [Spanish](#)
- [Known and Probable Human Carcinogens](#) (American Cancer Society)
- [Obesity and Cancer: Questions and Answers](#) **NIH** (National Cancer Institute)
- Also available in [Spanish](#)
- [Paraneoplastic Syndromes](#) **NIH** (National Institute of Neurological Disorders and Stroke) - Short Summary
- [Physical Activity and Cancer](#) **NIH** (National Cancer Institute)
- [Psychological Stress and Cancer](#) **NIH** (National Cancer Institute)
- [Seasonal and H1N1 Flu Vaccine Information for Cancer Patients](#) (American Cancer Society)
- [Smoking Cessation and Continued Risk in Cancer Patients \(PDQ\)](#) **NIH** (National Cancer Institute)
- Also available in [Spanish](#)
- [Understanding Cancer Series: Cancer and the Environment](#) **NIH** (National Cancer Institute)

Institute)

- [Understanding Cancer Series: Nanodevices](#) **NIH** (National Cancer Institute)
- [When Cancer Returns](#) **NIH** (National Cancer Institute)
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• **Health Check Tools**

- [Cancer Risk Questionnaire](#) (Siteman Cancer Center)
- Also available in [Spanish](#)
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• **Tutorials**

- [Inside Cancer](#) (Dolan DNA Learning Center)
- [Understanding Targeted Therapies: Overview](#) **NIH** (National Cancer Institute)
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• **Financial Issues**

- [Cancer Fund-Raising Organizations](#) **NIH** (National Cancer Institute)
- [Managing the Cost of Cancer Care](#) (American Society of Clinical Oncology)
- [Need Help Navigating the Medical Minefield?](#) (American Cancer Society)
- [Spending to Survive: Cancer Patients Confront Holes in the Health Insurance System](#) (Henry J. Kaiser Family Foundation, American Cancer Society) - PDF
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• **Clinical Trials**

- [ClinicalTrials.gov: Carcinoma](#) **NIH** (National Institutes of Health)
- [ClinicalTrials.gov: Neoplasms](#) **NIH** (National Institutes of Health)
- [Cancer Clinical Trials](#) **NIH** (National Cancer Institute)
- Also available in [Spanish](#)
- [Clinical Trials and You](#) **NIH** (National Cancer Institute)
- [Educational Materials about Clinical Trials](#) **NIH** (National Cancer Institute)
- [How to Find a Cancer Treatment Trial](#) **NIH** (National Cancer Institute)
- [If You Want to Find Ways to Prevent Cancer...Learn about Prevention Clinical Trials](#) **NIH** (National Cancer Institute)
- Also available in [Spanish](#)
- [More Choices in Cancer Care: Information for Beneficiaries on Medicare Coverage of Cancer Clinical Trials](#) **NIH** (National Cancer Institute)
- [Taking Part in Cancer Treatment Research Studies](#) **NIH** (National Cancer Institute)
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• **Genetics**

- [Cancer Genetics Overview \(PDQ\)](#) **NIH** (National Cancer Institute)
- [Genetics Home Reference: Bloom syndrome](#) **NIH** (National Library of Medicine)
- [Genetics Home Reference: Costello syndrome](#) **NIH** (National Library of Medicine)
- [Genetics Home Reference: Cowden syndrome](#) **NIH** (National Library of Medicine)
- [Genetics Home Reference: Peutz-Jeghers syndrome](#) **NIH** (National Library of Medicine)

Medicine)

- [Genetics Home Reference: Werner syndrome](#) **NIH** (National Library of Medicine)
- [Understanding Cancer Series: Cancer Genomics](#) **NIH** (National Cancer Institute)
- [Understanding Cancer Series: Genetic Variation \(SNPs\)](#) **NIH** (National Cancer Institute)
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• **Research**

- [150 Years of Advances Against Cancer](#) **NIH** (National Cancer Institute)
- [Cancer Screening among Adults Who Have Survived Childhood Cancer](#) (American College of Physicians) - PDF
- [Cancer](#) **NIH** (National Cancer Institute)
- [Donating Tissue for Cancer Research: Biospecimens and Biorepositories](#) **NIH** (National Cancer Institute)
- [Gene Toxicity and Cancer](#) **NIH** (National Institute of Environmental Health Sciences)
- [Genetic Hunt Turns up Deafness-Causing Mutation in a Gene Associated with Cancer](#) **NIH** (National Institute on Deafness and Other Communication Disorders)
- [Hair Dyes and Cancer Risk](#) **NIH** (National Cancer Institute)
- [NCI Community Cancer Centers Program](#) **NIH** (National Cancer Institute)
- [New Class of Drugs Promising for BRCA-Related Cancers](#) (American Cancer Society)
- [Over 100,000 Cancers Linked to Excess Body Fat](#) (American Cancer Society)
- [Proteomics and Cancer](#) **NIH** (National Cancer Institute)
- [Smoking Remains Potent Risk Factor for Death from Heart Disease, Cancer](#) (American Heart Association)
- [Tea and Cancer Prevention: Strengths and Limits of the Evidence](#) **NIH** (National Cancer Institute)
- [Vitamin D and Cancer Prevention: Strengths and Limits of the Evidence](#) **NIH** (National Cancer Institute)
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• **Journal Articles**

References and abstracts from MEDLINE/PubMed (National Library of Medicine)

- [Article: Cytopathology including fine-needle aspiration in sub-Saharan Africa: a Cameroon experience.](#)
- [Article: Evidence-based mini-review: should all patients with idiopathic venous thromboembolic events...](#)
- [Article: Prognostic and diagnostic value of spontaneous tumor-related antibodies.](#)
- [Cancer -- see more articles](#)
- [Cancer prevention -- see more articles](#)
- [Cancer therapy -- see more articles](#)
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• **Dictionaries/Glossaries**

- [Cancer: Medical Vocabulary](#) (American Academy of Family Physicians)
- Also available in [Spanish](#)
- [Dictionary of Cancer Terms](#) **NIH** (National Cancer Institute)

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• **Directories**

- [Cancer Genetics Services Directory](#) *NIH* (National Cancer Institute)
- [Cancer Information Sources](#) *NIH* (National Cancer Institute)
- [Find an Oncologist](#) (American Society of Clinical Oncology)
- [Find Treatment Centers](#) (American Cancer Society)
- [NCI-Designated Cancer Centers](#) *NIH* (National Cancer Institute)
- Also available in [Spanish](#)
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• **Organizations**

- [American Cancer Society](#)
- [National Cancer Institute](#) *NIH*
- Also available in [Spanish](#)
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• **Newsletters/Print Publications**

- [National Cancer Institute News Center](#) *NIH* (National Cancer Institute)
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• **Law and Policy**

- [Advance Directives](#) *NIH* (National Cancer Institute)
- [States That Require Health Plans to Cover Patient Care Costs in Clinical Trials](#) *NIH* (National Cancer Institute)
- [Understanding Financial and Legal Matters](#) (American Cancer Society)
- [Understanding the Approval Process for New Cancer Treatments](#) *NIH* (National Cancer Institute)
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• **Statistics**

- [Cancer Data and Statistics](#) (Centers for Disease Control and Prevention)
- [Cancer Facts and Figures 2009](#) (American Cancer Society) - PDF
- [Cancer Statistics](#) *NIH* (National Cancer Institute)
- [Rates for New Cancer Cases and Deaths by Race/Ethnicity and Sex](#) (Centers for Disease Control and Prevention)
- [Snapshot of Adolescent and Young Adult Cancer](#) *NIH* (National Cancer Institute) - PDF
- [Understanding Prognosis and Cancer Statistics](#) *NIH* (National Cancer Institute) - PDF
- Also available in [Spanish](#)
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• **MedlinePlus Magazine**

- [Cancer Today](#) *NIH*

- [Transforming Discovery into Health \(Cancer Therapy and Obesity\) NIH](#)
- [Understanding Cancer: Survivability and Hope NIH](#)
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• **Children**

- [MedlinePlus: Cancer in Children NIH](#) (National Library of Medicine)
- Also available in [Spanish](#)
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• **Men**

- [Cancer and Men](#) (Centers for Disease Control and Prevention)
- [Top 10 Cancers Among Men](#) (Centers for Disease Control and Prevention)
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• **Women**

- [Reducing Your Risk of Cancer](#) (American College of Obstetricians and Gynecologists)
- [Women and Cancer NIH](#) (National Cancer Institute)
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• **Seniors**

- [Cancer Facts for People over 50 NIH](#) (National Institute on Aging)
- Also available in [Spanish](#)
- [Cancer in Older Adults](#) (American Society of Clinical Oncology) - PDF
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• **Patient Handouts**

- [Cancer](#)
- Also available in [Spanish](#)
- [Tumor Grade: Questions and Answers NIH](#) (National Cancer Institute) - PDF
- Also available in [Spanish](#)
- [Understanding Prognosis and Cancer Statistics NIH](#) (National Cancer Institute) - PDF
- Also available in [Spanish](#)
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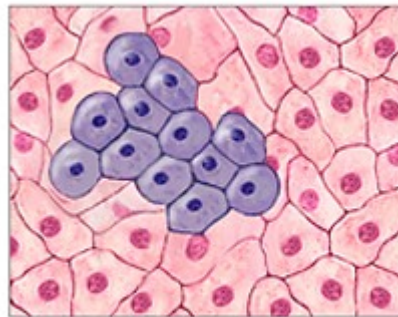
• **You may also be interested in these related encyclopedia pages:**

- [Cancer \[http://www.nlm.nih.gov/medlineplus/ency/article/001289.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/001289.htm)
- [CEA \[http://www.nlm.nih.gov/medlineplus/ency/article/003574.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/003574.htm)
- [CSF analysis \[http://www.nlm.nih.gov/medlineplus/ency/article/003369.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/003369.htm)
- [CSF cell count \[http://www.nlm.nih.gov/medlineplus/ency/article/003625.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/003625.htm)
- [Ectopic ADH secretion \[http://www.nlm.nih.gov/medlineplus/ency/article/000314.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/000314.htm)
- [Lactate dehydrogenase test](#)

- [\[http://www.nlm.nih.gov/medlineplus/ency/article/003471.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/003471.htm)
- [Lymphangiogram \[http://www.nlm.nih.gov/medlineplus/ency/article/003798.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/003798.htm)
- [Malignant teratoma \[http://www.nlm.nih.gov/medlineplus/ency/article/001316.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/001316.htm)
- [Mediastinal tumor \[http://www.nlm.nih.gov/medlineplus/ency/article/001086.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/001086.htm)
- [Peutz-Jeghers syndrome \[http://www.nlm.nih.gov/medlineplus/ency/article/000244.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/000244.htm)
- [Pleural fluid analysis \[http://www.nlm.nih.gov/medlineplus/ency/article/003624.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/003624.htm)
- [Protein electrophoresis - serum \[http://www.nlm.nih.gov/medlineplus/ency/article/003540.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/003540.htm)
- [Tumor \[http://www.nlm.nih.gov/medlineplus/ency/article/001310.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/001310.htm)
- [Upper airway biopsy \[http://www.nlm.nih.gov/medlineplus/ency/article/003856.htm\]](http://www.nlm.nih.gov/medlineplus/ency/article/003856.htm)

• **You may also be interested in these related MedlinePlus topics:**

- [Cancer Alternative Therapies \[http://www.nlm.nih.gov/medlineplus/canceralternativetherapies.html\]](http://www.nlm.nih.gov/medlineplus/canceralternativetherapies.html)
- [Cancer and Pregnancy \[http://www.nlm.nih.gov/medlineplus/cancerandpregnancy.html\]](http://www.nlm.nih.gov/medlineplus/cancerandpregnancy.html)
- [Cancer Chemotherapy \[http://www.nlm.nih.gov/medlineplus/cancerchemotherapy.html\]](http://www.nlm.nih.gov/medlineplus/cancerchemotherapy.html)
- [Cancer--Living with Cancer \[http://www.nlm.nih.gov/medlineplus/cancerlivingwithcancer.html\]](http://www.nlm.nih.gov/medlineplus/cancerlivingwithcancer.html)
- [Radiation Therapy \[http://www.nlm.nih.gov/medlineplus/radiationtherapy.html\]](http://www.nlm.nih.gov/medlineplus/radiationtherapy.html)
- [Cancers \[http://www.nlm.nih.gov/medlineplus/cancers.html\]](http://www.nlm.nih.gov/medlineplus/cancers.html)
- The primary NIH organization for research on *Cancer* is the [National Cancer Institute](http://www.nationalcancer.org)



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- [Cancer](#)
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- [Ectopic ADH secretion](#)
- [Lactate dehydrogenase test](#)
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- [Cancer and Pregnancy](#)
- [Cancer Chemotherapy](#)
- [Cancer--Living with Cancer](#)
- [Radiation Therapy](#)
- [Cancers](#)

National Institutes of Health

- The primary NIH organization for research on *Cancer* is the [National Cancer Institute](#)

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