NIH NATIONAL CANCER INSTITUTE

Cannabis and Cannabinoids (PDQ®)–Patient Version

Go to Health Professional Version

Overview

- *Cannabis*, also known as marijuana, is a plant grown in many parts of the world. It makes a resin (thick substance) that contains compounds called cannabinoids (see Question 1).
- By federal law, possessing *Cannabis* is illegal in the United States outside of approved research settings. However, a growing number of states, territories, and the District of Columbia have passed laws to legalize medical and/or recreational marijuana (see Question 1).
- Cannabinoids are chemicals in *Cannabis* that cause drug-like effects in the body, including the central nervous system and the immune system (see Question 2).
- The main psychoactive cannabinoid in *Cannabis* is delta-9-THC. Another active cannabinoid is cannabidiol (CBD), which may relieve pain, lower inflammation, and decrease anxiety without causing the "high" of delta-9-THC (see Question 2).
- Cannabinoids can be taken by mouth, inhaled, or sprayed under the tongue (see Question 4).
- *Cannabis* and cannabinoids have been studied for relief of pain, nausea and vomiting, anxiety, and loss of appetite caused by cancer or the side effects of cancer therapies (see Question 6).
- Two cannabinoid drugs (dronabinol and nabilone) are approved by the U.S. Food and Drug Administration (FDA) for the prevention or treatment of nausea and vomiting caused by chemotherapy (see Question 6 and Question 8).
- The FDA has not approved *Cannabis* or cannabinoids for use as a cancer treatment (see Question 8).

Questions and Answers About Cannabis and Cannabinoids

1. **What is *Cannabis*?**

   Cannabis, also known as marijuana, is a plant first grown in Central Asia that is now grown in many parts of the world. The *Cannabis* plant makes a resin (thick substance) that contains compounds called cannabinoids. Some cannabinoids are psychoactive (affects your mind or mood). In the United States, *Cannabis* is a controlled substance and has been classified as a Schedule I agent (a drug with a high potential for abuse and no accepted medical use).

   Hemp is a mixture of the *Cannabis* plant with very low levels of psychoactive compounds. *Hemp oil* or cannabidiol (CBD) are made from extracts of industrial hemp, while *hemp **seed** oil* is an edible fatty oil that contains few or no cannabinoids. Hemp is not a controlled substance.

   See the General Information section of the health professional version of the Cannabis and Cannabinoids summary for more information on medicinal *Cannabis* products.

Clinical trials that study *Cannabis* for cancer treatment are limited. To start a clinical trial with *Cannabis* in the United States, researchers must file an Investigational New Drug (IND) application with the FDA, have a Schedule I license from the U.S. Drug Enforcement Administration, and have approval from the National Institute on Drug Abuse.

By federal law, possessing *Cannabis* (marijuana) is illegal in the United States unless it is used in approved research settings. However, a growing number of states, territories, and the District of Columbia have passed laws to legalize medical and/or recreational marijuana. (See Question 3).

2. **What are cannabinoids?**

Cannabinoids, also known as phytocannabinoids, are chemicals in *Cannabis* that cause drug-like effects in the body, including the central nervous system and the immune system. Over 100 cannabinoids have been found in *Cannabis*. The main psychoactive cannabinoid in *Cannabis* is delta-9-THC. Another active cannabinoid is cannabidiol (CBD).

Cannabinoids may help treat the side effects of cancer and cancer treatment.

3. **If *Cannabis* is illegal, how do some cancer patients in the United States use it?**

Although federal law prohibits the use of *Cannabis*, the map below shows the states and territories that have legalized *Cannabis* for medical use. Some other states have legalized only one ingredient in *Cannabis*, such as cannabidiol (CBD), and these states are not included in the map. Medical marijuana laws vary from state to state.

A map showing the U.S. states and territories that have approved the medical use of Cannabis.

4. **How is *Cannabis* given or taken?**

Cannabis may be taken by mouth (in baked goods or as an herbal tea) or may be inhaled. When taken by mouth, the main psychoactive part of *Cannabis* (delta-9-THC) goes through the liver and is changed into a different psychoactive chemical (11-OH-THC).

When *Cannabis* is smoked and inhaled, cannabinoids quickly enter the bloodstream. The psychoactive chemical (11-OH-THC) is made in smaller amounts than when taken by mouth.

Clinical trials are studying a medicine made from an extract of *Cannabis* that contains specific amounts of cannabinoids. This medicine is sprayed under the tongue.

5. **Have any laboratory or animal studies been done using *Cannabis* or cannabinoids?**

In laboratory studies, tumor cells are used to test a substance to find out if it is likely to have any anticancer effects. In animal studies, tests are done to see if a drug, procedure, or treatment is safe and effective in animals. Laboratory and animal studies are done before a substance is tested in people.

Laboratory and animal studies have tested the effects of cannabinoids in laboratory experiments. See the Laboratory/Animal/Preclinical Studies section of the health professional version of Cannabis and Cannabinoids for information on laboratory and animal studies done using cannabinoids.

6. **Have any studies of *Cannabis* or cannabinoids been done in people with cancer?**

No ongoing studies of *Cannabis* as a treatment for cancer in people have been found in the CAM on PubMed database maintained by the National Institutes of Health.

Small studies have been done, but the results have not been reported or suggest a need for larger studies.

- An oral spray of *Cannabis* extract given with temozolomide to treat recurrent glioblastoma multiforme.
- CBD taken by mouth to treat acute graft-versus-host disease in patients who have undergone allogeneic hematopoietic stem cell transplantation.

***Cannabis* and cannabinoids have been studied as ways to manage side effects of cancer and cancer therapies**.

Nausea and vomiting

Cannabis and cannabinoids have been studied in the treatment of nausea and vomiting caused by cancer or cancer treatment:

- **Delta-9-THC taken by mouth:** Two cannabinoid drugs, dronabinol and nabilone, approved by the U.S. Food and Drug Administration (FDA), are given to treat nausea and vomiting caused by chemotherapy in patients who have not responded to standard antiemetic therapy. Clinical trials have shown that both dronabinol and nabilone work as well as or better than other drugs to relieve nausea and vomiting.
- **Oral spray with delta-9-THC and CBD:** Nabiximols, a *Cannabis* extract given as a mouth spray, was shown in a small randomized, placebo-controlled, double-blinded clinical trial in Spain to treat nausea and vomiting caused by chemotherapy.

- **Inhaled *Cannabis*:** Small trials have studied inhaled *Cannabis* for the treatment of nausea and vomiting caused by chemotherapy.

Newer drugs given for nausea caused by chemotherapy have not been compared with *Cannabis* or cannabinoids in cancer patients.

There is growing interest in treating children for symptoms such as nausea with *Cannabis* and cannabinoids, but studies are limited. The American Academy of Pediatrics has not endorsed *Cannabis* and cannabinoid use because of concerns about its effect on brain development.

Appetite

The ability of cannabinoids to increase appetite has been studied:

- **Delta-9-THC taken by mouth:** A clinical trial compared delta-9-THC (dronabinol) and a standard drug (megestrol, an appetite stimulant) in patients with advanced cancer and loss of appetite. Results showed that delta-9-THC did not help increase appetite or weight gain in advanced cancer patients compared with megestrol.
- **Inhaled *Cannabis*:** There are no published studies of the effect of inhaled *Cannabis* on cancer patients with loss of appetite.

Pain relief

Cannabis and cannabinoids have been studied in the treatment of pain:

- **Vaporized *Cannabis* with opioids:** In a study of 21 patients with chronic pain, vaporized *Cannabis* given with morphine relieved pain better than morphine alone, while vaporized *Cannabis* given with oxycodone did not give greater pain relief. Further studies are needed.
- **Inhaled *Cannabis*:** Randomized controlled trials of inhaled *Cannabis* in patients with peripheral neuropathy or other nerve pain found thatinhaled *Cannabis* relieved pain better than inhaled placebo. A retrospective study of patients who received an anticancer drug for gastrointestinal cancers found that those who also inhaled *Cannabis* had less nerve pain, including those who took *Cannabis* before they began the anticancer drug.
- ***Cannabis* plant extract:** A study of *Cannabis* extract that was sprayed under the tongue found it helped patients with advanced cancer whose pain was not relieved by strong opioids alone. In another study, patients who were given lower doses of cannabinoid spray showed better pain control and less sleep loss than patients who received a placebo. Control of cancer-related pain in some patients was better without the need for higher doses of *Cannabis* extract spray or higher doses of their other pain medicines. Adverse events were related to high doses of cannabinoid spray.
- **Delta-9-THC taken by mouth:** Two small clinical trials of oral delta-9-THC showed that it relieved cancer pain. In the first study, patients had good pain relief, less nausea and vomiting, and better appetite. A second study showed that delta-9-THC could relieve pain as well as codeine. An observational study of nabilone also reported less cancer pain along with less nausea, anxiety, and distress when compared with no treatment. Neither dronabinol nor nabilone is approved by the FDA for pain relief.
- **Non-specific *Cannabis* products:** A randomized controlled trial studied patients with advanced cancer who used *Cannabis* in addition to opioids early in treatment compared to patients who added *Cannabis* later in treatment. Patients who were given *Cannabis* later showed an increase

in opioid use during the 3-month study. Opioid use was stable in patients who began *Cannabis* use earlier. There were no changes in symptoms or adverse effects between the two groups. Over 100 different *Cannabis* products were given during the study.

Anxiety and sleep

Cannabis and cannabinoids have been studied in the treatment of anxiety.

- **Inhaled *Cannabis***: A small case series found that patients who inhaled *Cannabis* had improved mood, improved sense of well-being, and less anxiety. In another study, 74 patients newly diagnosed with head and neck cancer who were *Cannabis* users were matched to 74 nonusers. The *Cannabis* users had lower anxiety or depression and less pain or discomfort than the nonusers. The *Cannabis* users were also less tired, had more appetite, and reported greater feelings of well-being.
- **Oral *Cannabis* oil**: A randomized controlled trial studied two different doses of oral *Cannabis* oil in patients with brain cancer that could not be removed by surgery or had come back. Physical side effects such as sleep were noted to be better in the 1:1 ratio dose group. Both doses were well tolerated without any adverse effects.

7. **Have any side effects or risks been reported from *Cannabis* and cannabinoids?**

Side effects of *Cannabis* and cannabinoids can include:

- Fast heartbeat.
- Low blood pressure.
- Muscle relaxation.
- Bloodshot eyes.
- Slow digestion.
- Dizziness.
- Drowsiness.
- Depression.
- Hallucinations.
- Paranoia.

Both *Cannabis* and cannabinoids may be addictive. Symptoms of withdrawal from cannabinoids include:

- Being easily annoyed or angered.
- Trouble sleeping.
- Unable to stay still.
- Hot flashes.
- Nausea and cramping (rare).

These symptoms are mild compared with symptoms of withdrawal from opiates and usually go away after a few days.

Studies on cancer risk from *Cannabis* use

Studies on the risk of various cancers linked to *Cannabis* smoking have shown the following:

- **Lung cancer:** Because *Cannabis* smoke contains many of the same substances as tobacco smoke, there are concerns about how inhaled *Cannabis* affects the lungs. A cohort study of men in Africa found that there was an increased risk of lung cancer in tobacco smokers who also inhaled *Cannabis*. A population study of lung cancer patients found that low *Cannabis* use was not linked to an increased risk of lung cancer or other aerodigestive tract cancers.
- **Testicular cancer:** A 1970 study interviewed over 49,000 Swedish men aged 19 to 21 years about their personal history of using *Cannabis* at the time they enlisted in the military and then followed them for up to 42 years. The study did not find a link between those who had "ever" used *Cannabis* and testicular cancer, but did find that "heavy" use of *Cannabis* (more than 50 times in a lifetime) was linked to more than twice the risk of testicular cancer. The study was limited by the way data was gathered and did not note whether the testicular cancers were seminoma or nonseminoma types or whether *Cannabis* use also occurred after enlistment.
- **Bladder cancer:** A review of bladder cancer rates in *Cannabis* users and non-users was done in over 84,000 men who took part in the California Men's Health Study. After more than 16 years of follow-up and adjusting for age, race, ethnic group, and body mass index, rates of bladder cancer were found to be 45% lower in *Cannabis* users than in men who did not report *Cannabis* use.

Larger studies that follow patients over time are needed to find if there is a link between *Cannabis* use and a higher risk of testicular germ cell tumors.

Studies on *Cannabis* use and impact on cancer treatment

Few studies have been done to find out how *Cannabis* interacts with conventional treatment. A retrospective observational study in Israel showed that *Cannabis* reduced the effect of immunotherapy. A prospective observational study of immunotherapy and *Cannabis* in patients with metastatic cancer reported that the *Cannabis* users did not benefit from immunotherapy as much as those who did not use *Cannabis*.

8. **Are *Cannabis* or cannabinoids approved by the U.S. Food and Drug Administration for use as a cancer treatment or treatment for cancer-related symptoms or side effects of cancer therapy?**

   The U.S. Food and Drug Administration (FDA) has not approved *Cannabis* or cannabinoids for use as a cancer treatment.

   Cannabis is not approved by the FDA for the treatment of any cancer-related symptom or side effect of cancer therapy.

   Two cannabinoids (dronabinol and nabilone) are approved by the FDA for the treatment of nausea and vomiting caused by chemotherapy in patients who have not responded to antiemetic therapy.

Current Clinical Trials

Use our clinical trial search to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. General information about clinical trials is also available.

About This PDQ Summary

About PDQ

Physician Data Query (PDQ) is the National Cancer Institute's (NCI's) comprehensive cancer information database. The PDQ database contains summaries of the latest published information on cancer prevention, detection, genetics, treatment, supportive care, and complementary and alternative medicine. Most summaries come in two versions. The health professional versions have detailed information written in technical language. The patient versions are written in easy-to-understand, nontechnical language. Both versions have cancer information that is accurate and up to date and most versions are also available in Spanish.

PDQ is a service of the NCI. The NCI is part of the National Institutes of Health (NIH). NIH is the federal government's center of biomedical research. The PDQ summaries are based on an independent review of the medical literature. They are not policy statements of the NCI or the NIH.

Purpose of This Summary

This PDQ cancer information summary has current information about the use of Cannabis and cannabinoids in the treatment of people with cancer. It is meant to inform and help patients, families, and caregivers. It does not give formal guidelines or recommendations for making decisions about health care.

Reviewers and Updates

Editorial Boards write the PDQ cancer information summaries and keep them up to date. These Boards are made up of experts in cancer treatment and other specialties related to cancer. The summaries are reviewed regularly and changes are made when there is new information. The date on each summary ("Updated") is the date of the most recent change.

The information in this patient summary was taken from the health professional version, which is reviewed regularly and updated as needed, by the PDQ Integrative, Alternative, and Complementary Therapies Editorial Board.

Clinical Trial Information

A clinical trial is a study to answer a scientific question, such as whether one treatment is better than another. Trials are based on past studies and what has been learned in the laboratory. Each trial answers certain scientific questions in order to find new and better ways to help cancer patients. During treatment clinical trials, information is collected about the effects of a new treatment and how well it works. If a clinical trial shows that a new treatment is better than one currently being used, the new treatment may become "standard." Patients may want to think about taking part in a clinical trial. Some clinical trials are open only to patients who have not started treatment.

Clinical trials can be found online at NCI's website. For more information, call the Cancer Information Service (CIS), NCI's contact center, at 1-800-4-CANCER (1-800-422-6237).

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Disclaimer

The information in these summaries should not be used to make decisions about insurance reimbursement. More information on insurance coverage is available on Cancer.gov on the Managing Cancer Care page.

Contact Us

More information about contacting us or receiving help with the Cancer.gov website can be found on our Contact Us for Help page. Questions can also be submitted to Cancer.gov through the website's E-mail Us.

General CAM Information

Complementary and alternative medicine (CAM)—also called integrative medicine—includes a broad range of healing philosophies, approaches, and therapies. A therapy is generally called complementary when it is used in addition to conventional treatments; it is often called alternative when it is used instead of conventional treatment. (Conventional treatments are those that are widely accepted and practiced by the mainstream medical community.) Depending on how they are used, some therapies can be considered either complementary or alternative. Complementary and alternative therapies are used in an effort to prevent illness, reduce stress, prevent or reduce side effects and symptoms, or control or cure disease.

Unlike conventional treatments for cancer, complementary and alternative therapies are often not covered by insurance companies. Patients should check with their insurance provider to find out about coverage for complementary and alternative therapies.

Cancer patients considering complementary and alternative therapies should discuss this decision with their doctor, nurse, or pharmacist as they would any type of treatment. Some complementary and alternative therapies may affect their standard treatment or may be harmful when used with conventional treatment.

Evaluation of CAM Therapies

It is important that the same scientific methods used to test conventional therapies are used to test CAM therapies. The National Cancer Institute and the National Center for Complementary and Integrative Health (NCCIH) are sponsoring a number of clinical trials (research studies) at medical centers to test CAM therapies for use in cancer.

Conventional approaches to cancer treatment have generally been studied for safety and effectiveness through a scientific process that includes clinical trials with large numbers of patients. Less is known about the safety and effectiveness of complementary and alternative methods. Few CAM therapies have been tested using demanding scientific methods. A small number of CAM therapies that were thought to be purely alternative approaches are now being used in cancer treatment—not as cures, but as complementary therapies that may help patients feel better and recover faster. One example is acupuncture. According to a panel of experts at a National Institutes of Health (NIH) meeting in November 1997, acupuncture has been found to help control nausea and vomiting caused by chemotherapy and pain related to surgery. However, some approaches, such as the use of laetrile, have been studied and found not to work and to possibly cause harm.

The NCI Best Case Series Program which was started in 1991, is one way CAM approaches that are being used in practice are being studied. The program is overseen by the NCI's Office of Cancer Complementary and Alternative Medicine (OCCAM). Health care professionals who offer alternative cancer therapies submit their patients' medical records and related materials to OCCAM. OCCAM carefully reviews these materials to see if any seem worth further research.

Questions to Ask Your Health Care Provider About CAM

When considering complementary and alternative therapies, patients should ask their health care provider the following questions:

- What side effects can be expected?
- What are the risks related to this therapy?
- What benefits can be expected from this therapy?
- Do the known benefits outweigh the risks?
- Will the therapy affect conventional treatment?
- Is this therapy part of a clinical trial?
- If so, who is the sponsor of the trial?
- Will the therapy be covered by health insurance?

To Learn More About CAM

National Center for Complementary and Integrative Health (NCCIH)

The National Center for Complementary and Integrative Health (NCCIH) at the National Institutes of Health (NIH) facilitates research and evaluation of complementary and alternative practices, and provides information about a variety of approaches to health professionals and the public.

NCCIH Clearinghouse

Post Office Box 7923 Gaithersburg, MD 20898–7923

Telephone: 1-888-644-6226 (toll free)

TTY (for deaf and hard of hearing callers): 1-866-464-3615

E-mail: info@nccih.nih.gov

Website: https://nccih.nih.gov

CAM on PubMed

NCCIH and the NIH National Library of Medicine (NLM) jointly developed CAM on PubMed, a free and easy-to-use search tool for finding CAM-related journal citations. As a subset of the NLM's PubMed bibliographic database, CAM on PubMed features more than 230,000 references and abstracts for CAM-related articles from scientific journals. This database also provides links to the websites of over 1,800 journals, allowing users to view full-text articles. (A subscription or other fee may be required to access full-text articles.)

Office of Cancer Complementary and Alternative Medicine

The NCI Office of Cancer Complementary and Alternative Medicine (OCCAM) coordinates the activities of the NCI in the area of complementary and alternative medicine (CAM). OCCAM supports CAM cancer research and provides information about cancer-related CAM to health providers and the general public via the NCI website.

National Cancer Institute (NCI) Cancer Information Service

U.S. residents may call the Cancer Information Service (CIS), NCI's contact center, toll free at 1-800-4-CANCER (1-800-422-6237) Monday through Friday from 9:00 am to 9:00 pm. A trained Cancer Information Specialist is available to answer your questions.

Food and Drug Administration

The Food and Drug Administration (FDA) regulates drugs and medical devices to ensure that they are safe and effective.

Food and Drug Administration

10903 New Hampshire Avenue

Silver Spring, MD 20993

Telephone: 1-888-463-6332 (toll free)

Website: http://www.fda.gov

Federal Trade Commission

The Federal Trade Commission (FTC) enforces consumer protection laws. Publications available from the FTC include:

- *Who Cares: Sources of Information About Health Care Products and Services*
- *Fraudulent Health Claims: Don't Be Fooled*

Consumer Response Center

Federal Trade Commission

600 Pennsylvania Avenue, NW

Washington, DC 20580

Telephone: 1-877-FTC-HELP (1-877-382-4357) (toll free)

TTY (for deaf and hard of hearing callers): 202-326-2502

Website: http://www.ftc.gov

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