



Summary of Systematic Review for **PATIENTS** and their **FAMILIES**

MEDICAL MARIJUANA IN CERTAIN NEUROLOGICAL DISORDERS

This fact sheet presents the current research on medical marijuana (cannabis) for treating certain neurological disorders.

The American Academy of Neurology (AAN) is the world's largest association of neurologists and neuroscience professionals. The AAN is dedicated to promoting the highest quality patient-centered care for people with diseases of the brain and nervous system. Experts from the AAN carefully reviewed the available scientific studies on the safety and effectiveness of cannabis use in certain neurological disorders. The following information is based on evidence from those studies.*

To read the full systematic review, visit AAN.com/guidelines.

What is medical marijuana?

Marijuana is an herb that grows naturally in the United States. It is also known as cannabis. Medical marijuana is cannabis used as medicine. When used as a drug, marijuana can produce both mental and physical effects. These result from two main types of chemicals in the plant: cannabidiol (CBD) and tetrahydrocannabinol (THC). CBD and THC are taken from the cannabis plant for use in medicine. They also can be created (synthesized) in a lab. THC has a stronger intoxicating effect than CBD.

Is medical marijuana legal to use? Is it regulated?

Cannabis is a federally controlled substance. Until recently, it has been illegal to sell, possess/carry, or use. At this time, doctors can prescribe medical marijuana legally in 21 US states and Washington, DC.

The US Food and Drug Administration (FDA) has approved only two forms of marijuana for medical use: dronabinol (Marinol) and nabilone (Cesamet), both available in pill form. Dronabinol and nabilone are synthetic forms of key ingredients in marijuana. The FDA approved both drugs for treating nausea and vomiting associated with cancer chemotherapy that do not respond to standard treatment. Dronabinol also is approved for loss of appetite associated with weight loss in patients with AIDS. At this time, the drugs are not approved for other uses. In general, clinicians prescribe medical marijuana only when standard treatment has not helped.

The studies examined here looked at four forms of medical marijuana:

- Oral cannabis extract (OCE), a pill made of either pure CBD or a combination of CBD and THC
- Synthetic THC, a human-made form of THC available as a pill
- Nabiximols (Sativex), a mixture of THC and CBD available in oral spray form
- Smoked marijuana in cigarettes of standard drug strength

Which disorders were studied? What do the studies show about medical marijuana for treating these disorders?

This review examined only those studies that met AAN quality standards. Studies with the best design produce the highest quality evidence.

The available studies examined evidence for the safety and effectiveness of medical marijuana for these conditions:

- Various symptoms of multiple sclerosis (MS)
- Temporary, uncontrolled movements as a drug side effect in Parkinson disease (PD)
- Motor (movement) symptoms in Huntington disease (HD)
- Tics in Tourette syndrome
- Cervical dystonia (abnormal neck movements)
- Seizures in epilepsy

Of the studies examined here, only two looked at use of smoked marijuana. One study focused on smoked marijuana for treating pain related to spasticity in MS. The other looked at safety for use in MS. The studies did not provide enough evidence* to show if smoked marijuana is safe or effective.

The evidence from the studies is described below and in the table that follows.

Symptoms of MS

The studies showed that medical marijuana in pill or oral spray form can help treat certain MS symptoms.

Spasticity and Related Symptoms

Spasticity is chronic muscle tightness. It causes the muscles to become stiff and hard to the touch. Spasticity also can cause pain and painful muscle spasms. These occur when the muscle contracts (tightens) uncontrollably.

Evidence Supporting Use

- There is strong evidence* that OCE pills made from pure CBD:
 - Can help lessen patients' reported spasticity symptoms short-term
- Moderate evidence* shows that THC pills and oral spray:
 - Probably help lessen patients' reported symptoms of spasticity short-term
 - Probably help lessen cramp-like pain or painful spasms
- There is weak evidence* that OCE pills and THC pills:
 - Might help lessen patients' reported spasticity symptoms if treatment is continued for at least one year
 - Might lead to improvement on tests for spasticity a doctor performs, but only if treatment is continued for at least one year

Evidence Against Use

- There is moderate evidence* that OCE pills, THC pills, and oral spray:
 - Probably do *not* lead to improvement short-term on tests for spasticity a doctor performs

Other MS Symptoms

Evidence Supporting Use

- Strong evidence* shows OCE pills:
 - Can help lessen central pain (feelings of painful burning, "pins and needles," and numbness)
- Moderate evidence* also shows the oral spray:
 - Probably helps lessen frequent urination

Evidence Against Use

- Moderate evidence* shows that OCE pills and THC pills:
 - Probably do *not* help lessen frequent urination and bladder control problems
 - Probably do *not* help lessen tremor (shaking) in MS
- Weak evidence* shows the oral spray:
 - Might *not* help lessen tremor in MS

There is not enough evidence to show if the oral spray helps lessen overall bladder symptoms.

Other Neurological Conditions

Temporary, Uncontrolled Movements in PD

For people with PD, common symptoms are shaking, stiffness, and slowness of movement. Clinicians typically treat these symptoms with the drug levodopa. However, in the late stages of the disease, the drug itself can cause temporary, abnormal movements to develop. Moderate evidence* shows that OCE pills likely do *not* help relieve abnormal movements caused by levodopa.

HD, Tourette Syndrome, Cervical Dystonia, Epilepsy

There is not enough evidence* to show whether medical marijuana in pill or oral spray form:

- Reduces motor symptoms in HD
- Relieves tic severity in Tourette syndrome
- Lessens abnormal neck movements in cervical dystonia
- Reduces how often seizures occur in epilepsy

Important Concerns About Cannabis

There are safety concerns about the use of cannabis. All cannabis products have side effects, and some can be serious. Side effects include:

- Difficulty with attention or concentration
- Dizziness or fainting symptoms
- Drowsiness or tiredness
- Dry mouth
- Feelings of intoxication
- Hallucinations (seeing or hearing things that are not there)
- Impaired judgment or coordination
- Increased spasticity
- Increased weakness
- Loss of balance and falls
- Nausea, vomiting, and constipation
- Psychological problems such as depression or psychosis
- Thinking (cognition) and memory problems

The long-term safety of cannabis is unknown. Most of the studies were short in duration. More research is needed on complications from long-term use. These include serious psychological problems such as depression, suicidal thoughts, and psychosis. About one in every 100 people (or 1 percent of the population) will be affected. More research also is needed on the risk of lung cancer from long-term use of smoked cannabis.

Table: Evidence for Safety and Effectiveness of Medical Marijuana

Findings, by Disorder and Drug Formulation	Strength of Evidence
MS: Spasticity and Related Symptoms	
OCE <ul style="list-style-type: none"> • Can reduce patients' reported symptoms of spasticity 	Strong
OCE <ul style="list-style-type: none"> • Probably does not lead to improvement short-term (12–15 weeks) on tests for spasticity a doctor performs 	Moderate
Synthetic THC <ul style="list-style-type: none"> • Can probably reduce patients' reported symptoms of spasticity • Can probably lessen cramp-like pain or painful spasms • Probably does not lead to improvement short-term (15 weeks) on tests for spasticity a doctor performs 	
Oral Spray (Nabiximols) <ul style="list-style-type: none"> • Can probably lessen patients' reported symptoms of spasticity short-term (6 weeks) • Probably does not lead to improvement short-term (6 weeks) on tests for spasticity a doctor performs • Can probably lessen cramp-like pain or painful spasms 	
OCE and Synthetic THC <ul style="list-style-type: none"> • Might lessen patients' reported symptoms of spasticity if continued for at least one year • Might lead to improvement on tests for spasticity a doctor performs, if treatment continued for at least one year 	Weak
Smoked Cannabis <ul style="list-style-type: none"> • Not enough evidence to show if safe or helpful for pain related to spasticity 	Unknown
MS: Central Pain	
OCE <ul style="list-style-type: none"> • Can help lessen central pain (feelings of painful burning, "pins and needles," and numbness) 	Strong
MS: Bladder Problems	
OCE and Synthetic THC <ul style="list-style-type: none"> • Probably do not help lessen frequent urination and bladder control problems 	Moderate
Oral Spray (Nabiximols) <ul style="list-style-type: none"> • Probably helps lessen frequent urination (at 10 weeks) 	
Oral Spray (Nabiximols) <ul style="list-style-type: none"> • Not enough evidence to show if helps lessen bladder problems overall 	Unknown
MS: Tremor	
OCE and Synthetic THC <ul style="list-style-type: none"> • Probably do not help lessen tremor in MS 	Moderate
Oral Spray (Nabiximols) <ul style="list-style-type: none"> • Might not help lessen tremor in MS 	Weak
PD: Temporary, Uncontrolled Movements	
OCE <ul style="list-style-type: none"> • Probably does not help lessen abnormal movements caused by levodopa 	Moderate

HD: Motor Symptoms	Synthetic THC • Not enough evidence to show if helps lessen motor symptoms	Unknown
Tourette Syndrome: Tic Severity	Synthetic THC • Not enough evidence to show if helps lessen tic severity	Unknown
Cervical Dystonia (Abnormal Neck Movements)	Synthetic THC • Not enough evidence to show if helps lessen abnormal neck movements	Unknown
Epilepsy: Seizure Frequency	Any Form of Cannabis • Not enough evidence to show if helps lessen how often seizures occur	Unknown

Note: For spasticity in MS, more improvements were seen from patients' reports of symptom relief than from doctors' tests of spasticity. For seizure frequency in epilepsy, there were no studies of high enough quality to review.

This systematic review was endorsed by the American Autonomic Society, the American Epilepsy Society, the Consortium of Multiple Sclerosis Centers, the International Organization of Multiple Sclerosis Nurses, and the International Rett Syndrome Foundation.

This statement is provided as an educational service of the American Academy of Neurology. It is based on an assessment of current scientific and clinical information. It is not intended to include all possible proper methods of care for a particular neurologic problem or all legitimate criteria for choosing to use a specific procedure. Neither is it intended to exclude any reasonable alternative methodologies. The AAN recognizes that specific patient care decisions are the prerogative of the patient and the physician caring for the patient, based on all of the circumstances involved.

*After the experts review all of the published research studies, they describe the strength of the evidence supporting each conclusion:

Strong evidence = more than one high-quality scientific study

Moderate evidence = at least one high-quality scientific study or two or more studies of a lesser quality

Weak evidence = the studies, while supportive, are weak in design or strength of the findings

Not enough evidence = either different studies have come to conflicting results or there are no studies of reasonable quality

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