**[Myasthenia Gravis – Medical Marijuana Research Overview](http://www.medicalmarijuanainc.com/myasthenia-gravis-medical-marijuana-research/)**

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*Myasthenia gravis is a neuromuscular disease that causes weakness and rapid fatigue and is more common in women younger than 40 and men older than 60. Studies have shown cannabis provides therapeutic effects by limiting acetylcholine degradation and thus improving nerve and muscle communication.*

**Overview of Myasthenia Gravis**

Myasthenia gravis is a chronic autoimmune neuromuscular disease characterized by a breakdown in communication between nerves and muscles, resulting in weakness and rapid fatigue. The muscle weakness associated with myasthenia gravis increases when one is active, but then improves after periods of rest. The degree of muscle weakness varies greatly between individuals.

Myasthenia gravis causes the immune system to produce antibodies that either block or destroy muscles’ receptor sites for the neurotransmitter acetylcholine. With some receptors blocked, the muscles receive fewer signals and subsequently prevent muscles from contracting, resulting in weakness. Production of the antibodies that block acetylcholine is likely triggered by the thymus, which is found to be abnormally large in people with myasthenia gravis. Sometimes the antibodies, rather than block receptor sites, block the function of a protein called muscle-specific receptor tyrosine kinase, which is involved in creating the nerve-muscular junction.

Due to muscular weakness and fatigue, myasthenia gravis also commonly causes eyelids to droop and can make it difficult to speak, swallow, chew, and make facial expressions. The neck and breathing muscles can also be affected in some cases.

There is no cure for myasthenia gravis. However, anticholinesterase medications are effective at inhibit the enzyme acetylcholinesterase, which is responsible for catalyzes the breakdown of acetylcholine. By inhibiting acetylcholinesterase, the amount of acetylcholine at the neuromuscular junction increases and eventually overcomes the blocked receptors.

**Findings: Effects of Cannabis on Myasthenia Gravis**

Research suggests that cannabis, like anticholinesterase agents, has the capability of inhibiting acetylcholinesterase, the enzyme responsible for the degradation of acetylcholine. By inhibiting acetylcholinesterase, acetylcholine has more time to interact with its receptor before its breakdown, or turnover, and can therefore overcome the blocked receptor and cause muscle contractions.

Multiple cannabinoids have demonstrated effective at increasing acetylcholine levels and slowing acetylcholine turnover. One study found that tetrahydrocannabinol (THC), a major cannabinoid found in cannabis, completely inhibited acetylcholinesterase, thereby raising the levels of the neurotransmitter (Eubanks, et al., 2006). Additional studies have demonstrated THC and CBD’s effectiveness at decreasing acetylcholine turnover rate (Revuelta, Moroni, Cheney & Costa, 1978) (Revuelta, et al., 1980).

Cannabinoids’ long understood pharmacological effects are caused by their activation of cannabinoid receptors. However, the cannabinoid’s effects on enzymes and neurotransmitter transporters appear to be due to a mechanism other than their activation of cannabinoid receptors, but the exact method is yet to be fully understood (Oz, et al., 2014).

**States That Have Approved Medical Marijuana for Myasthenia Gravis**

Currently, only the state of [Illinois](http://www.medicalmarijuanainc.com/illinois-marijuana-laws/) has approved medical marijuana specifically for the treatment of myasthenia gravis. However, in [Washington D.C.](http://www.medicalmarijuanainc.com/washington-dc-marijuana-law/), any condition can be approved for medical marijuana as long as a DC-licensed physician recommends the treatment. In addition, a number of other states will consider allowing medical marijuana to be used for the treatment of myasthenia gravis with the recommendation from a physician. These states include: [California](http://www.medicalmarijuanainc.com/california-marijuana-laws/) (any debilitating illness where the medical use of marijuana has been recommended by a physician), [Connecticut](http://www.medicalmarijuanainc.com/connecticut-marijuana-laws/) (other medical conditions may be approved by the Department of Consumer Protection), [Massachusetts](http://www.medicalmarijuanainc.com/massachusetts-marijuana-laws/) (other conditions as determined in writing by a qualifying patient’s physician), [Nevada](http://www.medicalmarijuanainc.com/nevada-marijuana-laws/) (other conditions subject to approval), [Oregon](http://www.medicalmarijuanainc.com/oregon-marijuana-laws/) (other conditions subject to approval), [Rhode Island](http://www.medicalmarijuanainc.com/rhode-island-marijuana-laws/) (other conditions subject to approval), and [Washington](http://www.medicalmarijuanainc.com/washington-marijuana-laws/) (any “terminal or debilitating condition”).

**Recent Studies on Cannabis’ Effect on Myasthenia Gravis**

* **THC shown to completely inhibit acetylcholinesterase, the enzyme responsible for the degradation of acetylcholine.**  
  *A Molecular Link Between the Active Component of Marijuana and Alzheimer’s Disease Pathology.*   
  (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2562334/>)

**References:**

Eubanks, L. M., Rogers, C. J., Beuscher, A. E., Koob, G. F., Olson, A. J., Dickerson, T. J., & Janda, K. D. (2006). A Molecular Link Between the Active Component of Marijuana and Alzheimer’s Disease Pathology. *Molecular Pharmaceutics*, *3*(6), 773–777. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2562334/>.

Myasthenia gravis. (2013, April 23). *Mayo Clinic*. Retrieved from <http://www.mayoclinic.org/diseases-conditions/myasthenia-gravis/basics/definition/con-20027124>.

Myasthenia Gravis Fact Sheet. (2015, July 27). *National Institute of Neurological Disorders and Stroke*. Retrieved from <http://www.ninds.nih.gov/disorders/myasthenia_gravis/detail_myasthenia_gravis.htm.>

Oz, M., Al Kury, L., Keun-Hang, S.Y., Mahgoub, M., and Galadari, S. (2014, May 15). Cellular approaches to the interaction between cannabinoid receptor ligands and nicotinic acetylcholine receptors. *European Journal of Pharmacology*, 731, 100-5. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0014299914001915>.

Revuelta, A.V., Cheney, D.L., Costa, E., Lander, N., and Mechoulam, R. (1980, August 18). Reduction of hippocampal acetylcholine turnover in rats treated with (-)-delta 8-tetrahydrocannabinol and its 1′,2′-dimethyl-heptyl homolog. *Brain Research*, 195(2), 445-52. Retrieved from <http://www.sciencedirect.com/science/article/pii/0006899380900785>.

Revuelta, A.V., Moroni, F., Cheney, D.L., and Costa, E. (1978, September). Effect of cannabinoids on the turnover rate of acetylcholine in rat hippocampus, striatum and cortex. *Naunyn-Schmiedeberg’s Achives of Pharmacology*, 304(2), 107-10. Retrieved from <http://link.springer.com/article/10.1007/BF00495546>.

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